SERVICE MANUAL

SAAB 95, 96 AND SPORT
YEAR MODEL 1965–

Ordering No. 787903

SVENSKA AEROPLAN AKTIEBOLAGET
LINKÖPING - TROLLHÄTTAN * SWEDEN

Vänersborgs Boktryckeri (F. Berg) Nov. 1964

FOREWORD

This Service Manual has been prepared to aid SAAB service shops in their work and to contribute towards the attainment of the best results. The recommendations and instructions given in the Manual are based on our accumulated experience up to date. As further experience is gained, or if design modifications are introduced, all SAAB general agents and service shops will be informed accordingly, either through Service Information Bulletins or through complementary pages for the loose-leaf edition of the Service Manual. The Service Information Bulletins should be kept in a special binder, while complementary manual pages should be inserted in the appropriate position according to their chapter, section and page numbers.

The Service Manual, the Repair Timetable and the Spare Parts List are arranged in the same order as the Repair Timetable issued by the Swedish Automobile Servicing and Retailing Employers' Association. This arrangement in similar groups facilitates the use of the different publications.

Description

This comprises a brief description of the design and construction, intended primarily for those wishing to become more familiar with the construction and function of the car.

Shop instructions

Technical data such as dimensions, tolerances, torque ratings, etc., will be found in chapter O. These sections include detailed descriptions of all service jobs and are primarly intended for servicemen who are not familiar with work on the Saab. They include plenty of illustrations, in the belief that a good picture is often more instructive than a lengthy explanation.

SVENSKA AEROPLAN AKTIEBOLAGET

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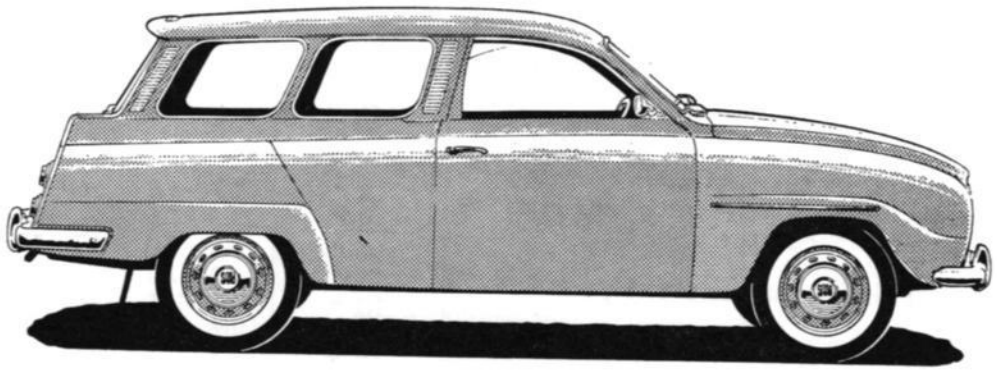

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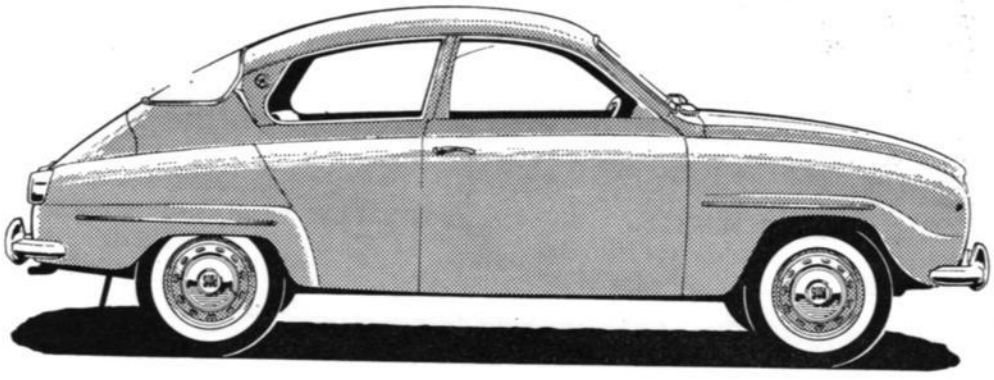
SAAB 95 (SAAB STATION WAGON)



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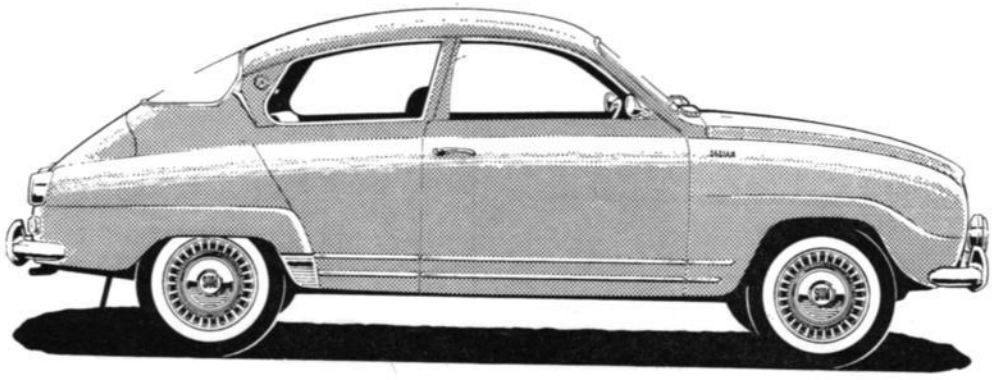
SAAB 96 (SAAB 2 DOOR SEDAN)



SAAB SPORT (USA-VERSION: SAAB MONTE CARLO 850)

Chassis and engine numbers

The illustrations below show the locations of the chassis and engine numbers. To ensure correct identification in the case of a particular car or engine, these numbers, together with the mileage, must always be quoted in warranty claims, etc. If a replacement engine is fitted in a car, the number of the original engine must, without fail, be stamped in the appropriate place. This is of the utmost importance if customs difficulties are to be avoided in the event that the car is subsequently used in a country other than that of registration.

Chassis number limits for different year models:

Scab 95	1965	23,101 —
Saab 96 and Sport	1965	310,001 —

LOCATION OF CHASSIS NUMBER

The chassis number is also die-stamped on the left hand side of the cross beam under neath the front edge of the back seat.

General tightening torques

Normal tightening torques for standard bolts and nuts. For special nuts and bolts see the technical data for the appropriate section.

Size	Wrench torgue		
	kpm	in.—lb.	ft.—lb.
1/4 "	0,7— 1.0	61—87	5—7
5/16"	1.5— 2.5	130—220	10—18
3/8 "	2.5— 4.0	220—350	18—28
7/16"	4.0— 7.0	350—600	28—50
1/2 "	7.0—10.0	600—850	50—72
9/16"	10.0—14.0	850—1200	72—100
5/8 "	14.0—20.0	1200—1700	100—145

LOCATION OF ENGINE NUMBER BEHIND THE CARBURETOR

Technical information
General data

	SAAB 95	SAAB 96	SAAB SPORT
Overall length, including bumpers (approx.)	14 ft. 0 in. (4270 mm)	13 ft. 8 in. (4165 mm)	13 ft. 8 in. (4165 mm)
Overall width	5 ft. 2 in. (1580 mm)	5 ft. 2 in. (1580 mm)	5 ft. 2 in. (1580 mm)
Overall height, unladen (approx.)	4 ft. 10 in. (1470 mm)	4 ft. 10 in. (1475 mm)	4 ft. 10 in. (1475 mm)
Ground clearance (2 people front) (approx.)	7.5 in. ca (190 mm)	7.5 in. ca (190 mm)	7.5 in. ca (180 mm)
Track, front and rear	4. ft. 0 in. (1220 mm)	4 ft. 0 in. (1220 mm)	4 ft. 0 in. (1220 mm)
Wheelbase	8 ft. 2 in. (2498) mm)	8 ft. 2 in. (2498 mm)	8 ft. 2 in. (2498 mm)
Turning radius (approx.)	17 ft. 6 in. (5.3 m)	17 ft. 6 in. (5.3 m)	17 ft. 6 in. (5.3 m)
Empty weight, incl. fuel, water, tools and spare wheel	1930 lb. ca (880 kg)	1780 lb. ca (810 kg)	1965 lb. (890 kg)
Total weight, incl. permissible passengers and luggage	3300 lb. (1500 kg)	2745 lb. (1250 kg)	2690 lb. (1250 kg)
Weight distribution:			
Empty	front 53 %	front 58 %	front 58 %
Fully laden, incl. passengers and luggage	front 43 %	front 48 %	front 50 %
Number of seats	7	5	2+2
Available load luggage space	39 cu. ft. (1.1 m³)	13 cu. ft. (0.37 m³)	13 cu. ft. (0.37 m³)

Loading deck with 5 passengers	39×37 in. (1000×950 mm)	39×37 in. (1000×950 mm)	(39×37 in.) (1000×950 mm)
Loading deck with 2 passengers	63×37 in. (1600×950 mm)	—	—
Height of load luggage space	31.5 in. (800 mm)	18 in. (460 mm)	18 in. (460 mm)

ENGINE

GENERAL DATA

	SAAB 95, 96	SAAB SPORT
Cubic capacity	51.9 cu. in. (841 c.c.)	51.9 cu. in. (841 c.c.)
Brake horsepower, DIN	40 at 4250 r.p.m.	55 at 5000 r.p.m.
Torque, DIN	60 ft-lb (8.35 kgm) at 3000 r.p.m.	68 ft-lb (9.5 kgm) at 3800 r.p.m.
Bore	2.76 in. (70 mm)	2.76 in. (70 mm)
Stroke	2.87 in. (73 mm)	2.87 in. (73 mm)
Compression ratio	8.1:1	9:1
Order of firing (cylinder 1 at rear)	1—2—3	1—2—3

DIMENSIONS AND TOLERANCES in millimetres

Bore, standard:		
Class A	69.987—69.994	69.987—69.994
Class AB	69.994—70.001	69.994—70.001
Class B	70.001—70.008	70.001—70.008
Class C	70.036—70.046	70.036—70.046
Bore, oversizes (ÖD*)		
Öd 0.5 A	70.501—70.508	70.501—70.508
B	70.508—70.515	70.508—70.515
Öd 1.0 A	71.001—71.008	71.001—71.008
B	71.008—71.015	71.008—71.015
Piston diameter, standard:		
Class A	69.927—69.939	69.895—69.902
Class AB	69.934—69.946	69.902—69.909
Class B	69.941—69.953	69.909—69.916
Class C	69.976—69.988	69.944—69.951
Piston diameter, oversizes (ÖD*)		
ÖD 0.5 A	70.444—70.451	70.409—70.416
B	70.451—70.458	70.416—70.423
ÖD 1.0 A	70.944—70.951	70.909—70.916
B	70.951—70.958	70.916—70.923
Measuring the piston diameter		
Measure at an angle of 90° to piston pin		
Distance from lower edge of piston when measuring	0,8 in. (20 mm)	0,6 in. (15 mm)
Piston clearance	0.048—0.067 mm	0.085—0.099 mm
Max. permissible clearance between piston and cylinder, limit of wearing	0.0059 in. (0.15 mm)	0.0059 in. (0.15 mm)

	in.	millimetres	in.	millimetres
Out-of-round, piston:				
Difference in measurements at 90° to pin and in line with pin	0,03—0,04	0.08—0.10	0,03—0,04	0.08—0.10

Distance from lower edge of piston when measuring:	0,8 in. 20 mm)	0,6 in. (15 mm)
Width of piston ring 95 and 96	2.478—2.490	
Width of piston rings, upper		2.478—2.490
Width of piston ring, lower		1.978—1.990

* The letters ÖD are stamped into the oversize pistons, respectively into the cylinder block

	SAAB 95, 96	SAAB SPORT
Piston-ring gap	0,01—0,02 in. (0.25—0.50 mm)	0,01—0,02 in. (0.25—0.50 mm)
Piston-ring clearance in groove:		
upper ring	0,0027—0,0047 in. (0.07—0.12 mm)	0.0035—0.0043 in. (0.08—0.11 mm)
center ring	0,0027—0,0047 in. (0.07—0.12 mm)	0.0027—0.0040 in. (0.07—0.10 mm)
lower ring	0,002—0,0035 in. (0.05—0.09 mm)	0.0024—0.0035 in. (0.06—0.09 mm)
Diameter of piston pin	0.75 in. (18 mm)	0.75 in. (18 mm)
Axial clearance of connecting rod:		
a. at crankpin	0,807—0,913 in. (2.05—2.32 mm)	0,807—0,913 in. (2.05—2.32 mm)
b. at piston pin	0,004—0,016 in. (0.1 —0.4 mm)	0,004—0,016 in. (0.1 —0.4 mm)
Radial clearance of connecting rod bearing	(0.010—0.016 mm)	0,0004—0,0006 (0.010—0.016 mm)
Radial clearance of piston pin bearing	Should fit with light thumb pressure. Pin easily rotable with 2 fingers	
Max. lateral throw of crankshaft	0.02 in. (0.05 mm)	0.02 in. (0.05 mm)
Compression in new engine (measured at an engine temp. of 175°F or 80°C with throttle wide open and full starter r.p.m.)	cyl. 1 and 3,121±7.1 p.s.i., (8.5±0.5 kg/cm²) 114±7,1 p.s.i. cyl. 2 (8.0±0,5 kg/cm²)	all cyl. 128±7.1 p.s.i. (9.0±0.5 kg/cm²)

WRENCH TORQUES

Unit	Bolts		Wrench torque		
	Quant.	Size	kgm	in.—lb.	ft—lb.
Spark plugs					
Conventional spark plugs	3	M 18	4.5	390	32
Champion UK-16V	3	M 18	2	175	14
Cylinder head	12	7/16"	3[1])	275[1])	22[1])
Crankcase halves 95 and 96	9	5/16"	2.5	220	18
	8	3/8 "	4	340	29
Crankcase halves Saab Sport	8	5/16"	2.5	220	18
	8	3/8 "	4	340	29
Flywheel bolts	8	5/16"	3	275	22
Crankshaft pulley	1	1/2 "	5	440	36

Note! Agle torqueing of cylinder head bolts.

[1]) After tightening to a torque of 3 kgm (= 275 in.-lb or 22 ft-lb.), turn bolt through 90°. When the engine has warmed up, turn through a further 20°. After 1200 miles (2000 km) driving, a further 20°.

Fuel system

Fuel tank capacity, approx.:	
Saab 95	11.5 U.S. gal. (43 liters)
Saab 96 and Sport	10.5 U.S. gal. (40 liters)
Fuel pump, all models	Pierburg PE 15201
Pressure above pump at zero capacity and starter r.p.m.	SAAB 95, 96: 2.1—3.5 lbs./sq.i. (0.15—0.25 kg/cm²); SAAB SPORT: 2.1—4.3 lbs./sq.in. (0.15—0.30 kg/cm²)

CARBURETOR SOLEX

Normal setting and type of Solex carburetor:	Solex 40 BI
Main system:	
Choke tube	1.1 in. (28 mm)
Main jet	140
Emulsion jet	250
Emulsion tube	1
Idling system:	
Idling r.p.m.	600—750 r.p.m.
Idling air jet	100
Idling fuel jet	40
Cold-starting system:	
Starter air jet	3.5
Starter fuel jet	190
Needle valve	1.5
Weight of float	0.75 oz. (21 grammes)
Float level, float chamber filled when idling	0.83 ± 0.04 in. (21 ± 1 mm)
Volume screw set for the highest idling r.p.m.	

CARBURETOR ZENITH

Normal setting and type of Zenith carburetor:	Zenith 34 VNN
Main system:	
Choke tube	1.2 in. (30 mm)
Main jet	105
Compensating jet	105
Emulsion jet	200
Idling system:	
Idling r.p.m.	600—750 r.p.m.
Air jet	50
Fuel jet	45
Air duct (drilled in barrel)	140
Volume screw set for the highest idling r.p.m.	
Needle valve (with 0.08 in. = 2 mm washer)	1.5
Throttle opening with closed choke flap:	0.043—0.047 in. (1.1—1.2 mm)
Float level, (float chamber filled when idling) measured with float chamber removed:	
Float in position	1.0 in.±0.04 in. (25.5±1 mm)
Float removed	1.18 in.±0.04 in. (30.0±1 mm)
(Fuel level with float chamber fitted)	0.83 in. (21.0 mm)
Weight of float	0.22—0.24 oz. (6.2—6.8 grammes)

CARBURETOR SPORT, SOLEX

Normal setting and type of Solex carburetor:	34 W
Choke tube	1.1 in. (28 mm)
Main jet	120
Holder, Main jet	A
Emulsion jet	200
Emulsion tube	21
Lowspeed system:	
Fuel jet	60
Idling system:	
Idling r.p.m.	600—750 r.p.m.
Fuel jet	35

Cold-starting system:	
Fuel jet	170
Air jet	3.5
Needle valve	1.5
Float weight	5.7g
Float level, measured at 1500 mm fuel column, with level tube 784210	0.84 in.±0.04 in. (21.5±1 mm)
Float level, (float chamber filled when idling) measured (float removed) with a vernier guage at the choke tube	0.97 in.±0.04 in. (24.5±1 mm)

Exhaust system

GENERAL DATA

Inside diameter of exhaust pipe

Saab 95 and 96	1.34 in. (34 mm)
Saab Sport, twin exhaust pipe	1.34 in. (34 mm)

Cooling system

SPECIFICATION

Capacity of cooling system:	
Excl. heater system	1.51 U.S. gal. (5.7 liters)
Incl. heater system	1.72 U.S. gal. (6.5 liters)
Thermostat opening temperature range	178—197,5° F (81—92° C)
Radiator pressure cap opens at	3.4—4.25 p.s.i. (0.25—0.30 kg/cm²)

TABLES

The freezing point in the table below is the temperature at which ice crystals begin to form in the cooling system. The use of alcohol as anti-freeze is not recommended, since it evaporates at relatively low temperatures. Both glycol and alcohol are injurious to paintwork and must therefore be handled with care.

AMOUNT OF GLYCOL IN THE COOLING AND HEATING SYSTEM

U.S. quarts (liters) of gycol in the system	Approx. percentage by volume	Freezing point °C	Freezing point °F	Boiling point °C	Boiling point °F	Specific gravity
1	15	—7	19	101	214	1.020
2	31	—18	± 0	102	216	1.035
3	46	—33	—27	105	221	1.053

ELECTRICAL SYSTEM

BATTERY

Voltage	12 V
Capacity	34 Ah

GENERATOR, BOSCH

Type	EG(R)14V25A31
Rated output	200 W
Rated voltage	12 V
Rated speed	3150 r.p.m.
Max. permissible continuous load	25 A
Direction of rotation	Clockwise
Brush-spring pressure	450—600 grammes (16—21 oz.)

CHARGING REGULATOR, BOSCH

Type designation	RS/VA 200/12/A2
Cut-in voltage	12.4—13.1 V
Voltage setting when idling	13.5—14.5 V
Voltage setting with a load of 25 A	13.3—14.3 V
Reverse current relay breaks at	2—7,5 A
Max. output of warm regulator	300 W
Max. output of cold regulator (2—3 min. after starting)	420 W

STARTER MOTOR, BOSCH

Type designation	AL/EDD 0.5/12 R 4 or DD(R)12V 0,5 PS
No. of teeth on pinion	9
No. of teeth on ring gear	97
Brush-spring pressure	800—900 grammes (19—25 oz.)

DISTRIBUTOR, BOSCH

	SAAB 95, 96	SAAB SPORT
Type designation	JFU3(R) or VJU3 BR2T	JF3(R) or VJ3 BR11T
Capacitor	LMKO 1 Z42Z	LMKO 1 Z42Z
Ignition setting:		
Basic setting	7° B.T.D.C.	10° B.T.D.C.
At 3000 r.p.m.	17° B.T.D.C. (Vacuum hose disconnected)	20° B.T.D.C.
Order of firing (cyl. 1 at rear)	1—2—3	1—2—3
Breaker gap	0.3—0.4 mm (0.012—0.016 in.)	0.3—0.4 mm (0.012—0.016 in.)
Dwell angle	80—84°	80—84°
Contact pressure	400—530 grammes (14—19 oz.)	400—530 grammes (14—19 oz.)
Direction of rotation	Clockwise	Clockwise
Axial play, distr. shaft	(0.1—0.2 mm) 0.004—0.008 in.	(0.1—0.2 mm) 0.004—0.008 in.

IGNITION COIL, BOSCH

	SAAB 95, 96	SAAB SPORT
Type designation	K 12	KW 12V
Series resistance	—	Mallory Scott 201005

SPARK PLUGS

MODEL	SAAB 95, 96	SAAB SPORT	
Normal driving	Bosch M 225 T1	Champion UK—7	——
Hard driving	Bosch M 240 T1	——	Champion UK—16V
Type of spark plug	Side elektrode	Side electrode	Surface gap
Electrode gap with resistance ignition cable	0.032 in. (0.8 mm)	0.032 in. (0.8 mm)	New 0.028 in. (0.7 mm) max. 0.047 in. (1.2 mm)
Thread	0,75 in. (18 mm)	(18 mm)	(18 mm)
Tightening torque	32 ft—lb (4.5 kgm)	32 ft—lb. (4.5 kgm)	14 ft—lb. (2 kgm)

BULBS	ALL MODELS	PHILIPS NO.	WATTS
Headlamps, asymmetric	2	12620	45/40 W
Parking lights and flashers, front	2	1034	25/7 W or 32/4 Cp
Stop lights and flashers, rear	4	1073	25 W or 32 Cp
Tail lights	2	12821	5 W
Number-plate lights	2	12844	5 W

	SAAB 95	SAAB 96	SAAB SPORT	PHILIPS NO.	WATTS
Ceiling light	2	1	1	12844	5 W
Long-range and fog light			2	12247	35 W
Instrument lights and warning lamps	5	10	10	12829	2 W
Other instrument lights	4	—	2	12913	2 W
Back-up lights	—	—	2	1034	20 W
Trunk light	—	1	1	12929	4 W
Fuses	12	12	12	—	8 Amps.

FLASHER UNIT

Type designation:

Lucas ..... FL5 12V 42 W

Hella ..... 91 PSt 2×32 Cp 12 V

HORN, HELLA

Type designation ..... B 32/5 — 12 V

FUEL GAGE TANK UNIT

Type designation, Saab 95 ..... Veglia 67—8011

Saab 96 ..... VDO 20.228

Saab Sport ..... VDO 625

HEATER FAN MOTOR

Type designation, Electrolux ..... KS 3430/220 12 V

WINDSHIELD WIPER MOTOR

Type designation SWF ..... SWA 1105/66

WINDSHIELD WASHER (Saab Sport) ..... Make Dahlberg

TRANSMISSION

Clutch

FICHTEL & SACHS CLUTCH

	SAAB 95, 96	SAAB SPORT
Clutch type	single dry plate	single dry plate
Clearance release bearing-clutch measured at the slavecylinder	0,2 in. (5 mm)	0.2 in. (5 mm)
Clearance between release plate and flywheel	1.02±0.02 in. (26±0.5 mm)	1.02±0.02 in. (26±0.5 mm)
Pressure-plate springs:		
Length uncompressed	1.95 in. (49.5 mm)	1.15 in. (49.5 mm)
Length compressed	1.16 in. (29.4 mm)	1.16 in. (29.4 mm)
Tension when compressed	108—115 lb. (49—52 kg)	108—115 lbs. (49—52 kg)
Min permissible tension when compressed	100 lb. (45 kg)	100 lbs. (45 kg)
Inner springs (Saab Sport only):		
Length uncompressed		1.95 in. (49.5 mm)
Length compressed		1.03 in. (26.2 mm)
Tension when compressed		35—40 lb. (16—18 kg)
Min. permissible tension when compressed		33 lb. (15 kg)
Dimensions of clutch facing	7×5×0.14 in. (180×125×3.5 mm)	(180×125×3.5 mm)
New clutch disc:		
Thickness, unloaded	0.358—0.370 in. (9.1—9.4 mm)	0.358—0.370 in. (9.1—9.4 mm)
" loaded with 770 lbs (350 kg)	0.327—0.343 in. (8.3—8.7 mm)	0.327—0.343 in. (8.3—8.7 mm)
Max throw clutch disc	0.024 in. (0.6 mm)	0,024 in. (0,6 mm)
Engagement pressure	648—688 lb. (294—312 kg)	860—926 lb. (390—420 kg)

SAXOMAT CLUTCH

Release bearing clearance at approx. 2000 r.p.m.	0.08—0.12 in. (2—3 mm)
Release bearing clearance at approx. 2000 r.p.m., measured at pull-rod	0.35—0.51 in. (9—13 mm)
New clutch disc:	
Thickness, unloaded	0.327—0.343 in. (8.3—8.7 mm)
Thickness, loaded with 770 lb. (350 kg)	0.299—0.315 in. (7.6—8.0 mm)
Gear-shift lever contact gap	0.006—0.008 in. (0.15—0.20 mm) or back off sleeve nut 1/4 turn

BORG & BECK CLUTCH

Clutch type	single dry plate	single dry plate
Clearance, release bearing-clutch measured at the slavecylinder	0,2 in. (5 mm)	0.2 in. (5 mm)
Clearance between release plate and flywheel	1.0±0.02 in. (26±0.5 mm)	1.0±0.02 in. (26±0.5 mm)
Pressure-plate springs:		
Length uncompressed	1.79 in. (45.5 mm)	1.79 in. (45,5 mm)
Length compressed	1.34 in. (34 mm)	1.34 in. (34 mm)
Tension when compressed	73—77 lb. (33—35 kg)	84—88 lb. (38—40 kg)
	66 lb. (30 kg)	77 lb. (35 kg)
Dimensions of clutch facing	180×124×3.8 mm)	180×124×3.8 mm)
	7×5×0.15 in.	7×5×0.15 in.
New clutch disc:		
Thickness, unloaded	0.358—0.370 in. (9.1—9.4 mm)	0.358—0.370 in. (9.1—9.4 mm)
Thickness loaded with 770 lb. (350 kg)	0.327—0.343 in. (8.3—8.7 mm)	0.327—0.343 in. (8.3—8.7 mm)
Max. throw, clutch disc	0.024 in. (0.6 mm)	0.024 in. (0.6 mm)
Engagement pressure	661—694 lb. (300—315 kg)	754—794 lb. (342—360 kg)

CLUTCH OPERATION, HYDRAULIC

Type:	MASTER CYLINDER	SLAVE CYLINDER
Make and type	Girling 5/8"	Girling D2
Cylinder diameter	5/8"	3/4"
Max. permissible stroke	1.38 in. (35 mm)	
Hose connection	3/8" UNF-24	3/8" UNF-24
Stroke between master and slave cylinder	14 in. (355.6 mm)	
Distance from clutch-pedal foot plate to toe-board (max. pedal stroke)	approx. 6.3 in. (160 mm)	
Clearance, release bearing-clutch measured at the slave-cylinder	0.2 in. (5 mm)	

Transmission

Specifications

Oil capacity	approx. 1.4 U.S. quarts (1.4 liters)
Type of oil	SAE 80 EP

	Saab 96 3-speed	Saab 95 96 4-speed	Saab Sport 4-speed
Gear ratios, totalt:			
1st gear	16.7:1	19.3:1	18.3:1
2nd gear	8.5:1	11.4:1	10.8:1
3rd gear	5.1:1	7.0:1	6.6:1
4th gear	—	4.5:1	4.3:1
Reverse	21.0:1	17.6:1	16.7:1
Differential gear ratio, pinion: ring gear	5.43:1	5.43:1	5.1:1
No. of teeth, pinion: ring gear	7:38	7:38	7:36

Road speed in m.p.h. at 1000 r.p.m. engine speed:	Saab 96 3-speed	Saab 96 4-speed	Saab 95 4-speed	Saab Sport 4-speed
1st gear	4.3	3.7	3.7	3.8
2nd gear	8.4	6.2	6.3	6.5
3rd gear	14.0	10.2	10.4	10.7
4th gear	—	15.6	15.8	16.2
Reverse	3.4	4.0	4.0	4.2
Road speed in km/h at 1000 r.p.m. engine speed:				
1st gear	6.9	5.9	6.0	6.1
2nd gear	13.4	10.0	10.2	10.4
3rd gear	22.4	16.4	16.8	17.1
4th gear	—	25.1	25.5	26,0
Reverse	5.4	6.5	6.6	6.7

Pinion/ring-gear adjustment: specified dimension ±0.002 in. (0.05 mm).
Ring-gear backlash: specified dimension ±0.002 in. (0.05 mm).

MATCHED GEAR SETS	
3-speed transmission	4-speed transmission
3rd speed gear Pinion shaft 3rd gear	3rd speed gear Pinion shaft 3rd gear
2nd speed gear Pinion shaft 2nd gear	4th speed gear Pinion shaft 4th gear
Ring gear Pinion shaft	Ring gear Pinion shaft
Synchromesh	Synchromesh

TIGHTENING TORQUES

Application	Bolts		Tightening torques		
	Quant.	Size	kpm	in.-lb.	ft.-lb.
Transmission case end cover	6	5/16"	2,5	220	18
Differential bearings	4	3/8"	4	340	29
Ring gear bolts	12	5/16"	2,5	220	18
Pinion-shaft nut. First tightening	1	7/8"	12	1050	87
Then slacken and retighten			6	530	44
Nut, primary shaft	1	3/4"	5	425	36
Nut, countershaft	1	9/16"	8	700	60

BRAKE SYSTEM

General

	SAAB 95 AND 96	SAAB SPORT
Make	Lockheed	Lockheed
Type, front	Two leading shoe, self-adjusting	Disc brake
Type, rear	One leading shoe	One leading shoe
Footbrake	Hydraulic two-circuit type	Hydraulic two-circuit type
Handbrake	Mechanical	Mechanical
DIMENSIONS, ETC.:		
Brake drum, front	9" (228.6 mm)	
Brake disc, front		10¾" (273 mm)
Brake drum, rear	8" (203.2 mm)	8" (203,2 mm)
Master cylinder	¾"	¾"
Wheel cylinder, front	0.8"	2"
Wheel cylinder, rear	¾"	¾"
Brake shoes, front	9" × 1¾"	
Brake shoes, rear	8" × 1½"	8" × 1½"
Brake hoses, front, length of	10½"	10"
Brake hoses, rear, length of	8½"	8½"
Other brake lines	3/16" Bundy tube	3/16" Bundy tube
Clearance between master-cylinder piston and push-rod	0.024—0.047 in. (0.6—1.2 mm)	0.024—0.047 in. (0.6—1.2 mm)
Same clearance at tip of brake pedal	0.12—0.24 in. (3—6 mm)	0.12—0.24 in. (3—6 mm)

Distance from brake-pedal footplate to toe-board max stroke approx. 6.3 in. (160 mm)

Brake fluid — Satisfying the requirements of spec. SAE 70 R 3, e.g. Lockheed Super Heavy Duty Brake Fluid. For Saab Sport, Lockheed 328 Brake Fluid.

Adjustment machining of brake drums permitted to max. diameter:	
Front	9.059 in. (230.1 mm)
Rear	8.059 in. (204.7 mm)
Max. total indicated radial brake-drum throw	0.006 in. (0.15 mm)
Max. total indicated axial brake drum throw	0.08 in. (0.2 mm)
Centerless grinding of brake linings	0.010—0.012 in. (0.25—0.30 mm)
Tightening torques:	
Castle nut, front wheel hub	18 kgm, 1500 in—lb, 130 ft—lb
Castle nut, rear wheel hub	9 kgm, 800 in—lb, 65 ft—lb

Wheel alignment

Front wheel alignment, no load:	
"King-pin" inclination	7° ± 1
Caster	2° ± ½
Camber	¾° ± ¼
Toe-in at wheel rim	0.09 in. ± 0.04 (2 mm ± 1)
Turning angles:	
Outside wheels	20°
Inside wheels	22½° ± 1½

STEERING GEAR

Steering-gear adjustment:	
Pinion axial clearance	0.04—0.08 in. (0.1—0.2 mm)
Radial clearance of rack,	max. 0.012 in. (0.3 mm)
Steering, ratio,	14:1
Wheel travel between limit positions	2¼ turns
Tie-rod ends	
Distance between wrench flat and retaining nut	Max 1.5 in. (40 mm)
Permissible difference between lefthand and righthand dimension	Max. 0.08 in. (2 mm)

TIGHTENING TORQUE

Nut, tie-rod end: 3.5—5 kgm, 300—440 in—lb, 25—36 ft—lb.

FRONT COIL SPRING

Max. spring expansion, front	5½ in. (140 mm)
Front coil springs, length	15.4 in (391 mm)
Front coil springs, No. of coils	11
Wire diameter	0.46 in. (11.7 mm)

REAR COIL PRING	SAAB 95	SAAB 96 AND SPORT
Max. spring expansion	6¾ in. (170 mm)	6¾ in. (170 mm)
Rear coil springs, length	13½ in. (342 mm)	13½ in. (342 mm)
No. of coils	9	9
Wire diameter	0.45 in. (11.4 mm)	0.43 in (11.0 mm)

REAR WHEEL ALIGNMENT

Camber	0° ± 1
Toe-in (toe-out):	0° ± 1
Both wheels together or Measured rim-to-rim	0 ± 0.28 in. (7 mm)
Toe-in (toe-out) per wheel must not exceed	0° ± ¾
Max. difference in wheelbase, left and right (front wheels pointing straight ahead)	0.6 in. (15 mm)

FRONT SHOCK ABSORBERS

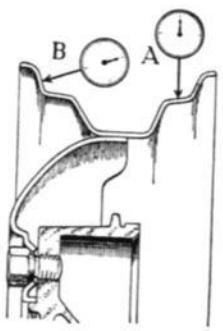
Type of shock absorber	Telescopic, hydraulic
Length of front shock absorber	9¾ in. (250 mm) Extended 14½ in. (390 mm)
Front shock-absorber stroke, fitted	3¼ in (82 mm)

REAR SHOCK ABSORBERS

	SAAB 95	SAAB 96 AND SPORT
Type of shock absorber	Arm, hydraulic	Telescopic, hydraulic
Length of rear shock absorber between centre hole and shoulder for washer		10″ (255 mm)
Extended	16″ 7/16″ (417 mm)	
Stroke, shock absorbers	4¼ in. (106 mm)	4¼ in. (106 mm)

WHEELS

Type	"wide base"
Size	4J × 15″
Depth of drop center	1.77 in. (45 mm)
Permissible out-of-round of rim, see fig. A	0.06 in. (1.5 mm)
Permissible rim throw, see fig. B	0.06 in. (1.5 mm)



MEASURE POINTS ON THE RIM

TIRES

Size, Saab 96, tubeless	5.20 × 15″	
Size, Saab 95, tubeless	5.60 × 15″	
Size, Saab Sport, with tube	155 × 15″	
Tire pressures, Saab 96:	Front	Rear
Light load	26 p.s.i. (1.8 kg/cm²)	23 p.s.i. (1.6 kg/cm²)
Full load	26 p.s.i. (1.8 kg/cm²)	26 p.s.i. (1.8 kg/cm²)
Tire pressures, Saab 95:	Front	Rear
Light load	26 p.s.i. (1.8 kg/cm²)	24 p.s.i. (1.7 kg/cm²)
Full load	26 p.s.i. (1.8 kg/cm²)	29 p.s.i. (2.0 kg/cm²)
Tire pressure, Saab Sport:	Front	Rear
Light load	(21 p.s.i. .1.5 kg/cm²)	20 p.s.i. (1.4 kg/cm²)
Full load	24 p.s.i. (1.7 kg/cm²)	24 p.s.i. (1.7 kg/cm²)

Wheel bolts

Width across flats	¾ in. (19.05 mm)
Thread SAAB 95 and 96	UNC 9/16"
Thread Saab Sport	UNC 5/8"

Tightening torques

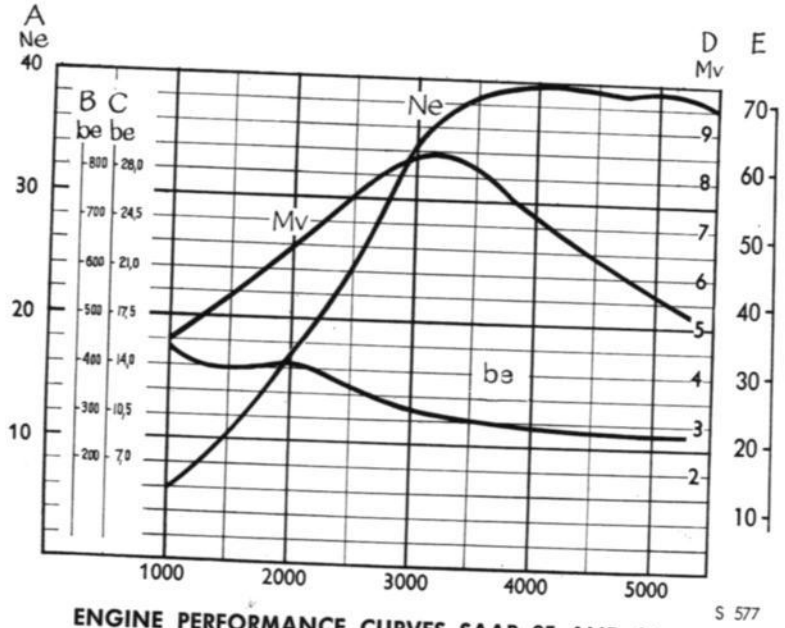
Castle nut, front wheel hub	18 kgm, 1500 in—lb, 130 ft—lb.
Castle nut, rear wheel hub	9.5 kgm, 850 in—lb, 70 ft—lb.
Wheel bolts	8—10 kgm, 670—850 in—lb, 58—72 ft—lb.

BODY
Specifications

	SAAB 95	SAAB 96 AND SPORT
Body dimensions (approximate)		
Overall length	13 ft. 7 in. (4160 mm)	12 ft. 10 in. (3930 mm)
Overall width	5 ft. 2 in. (1585 mm)	5 ft. 2 in. (1585 mm)
Overall height	4 ft. 1½ in. (1256 mm)	4 ft. 1 in. (1240 mm)
Weight of body, total	646 lb (293 kg)	555 lb (252 kg)
excl. hood, doors, fenders and luggage-compartment cover	496 lb (225 kg)	415 lb (188 kg)

INSTRUMENTS
Speedometer drive ratio

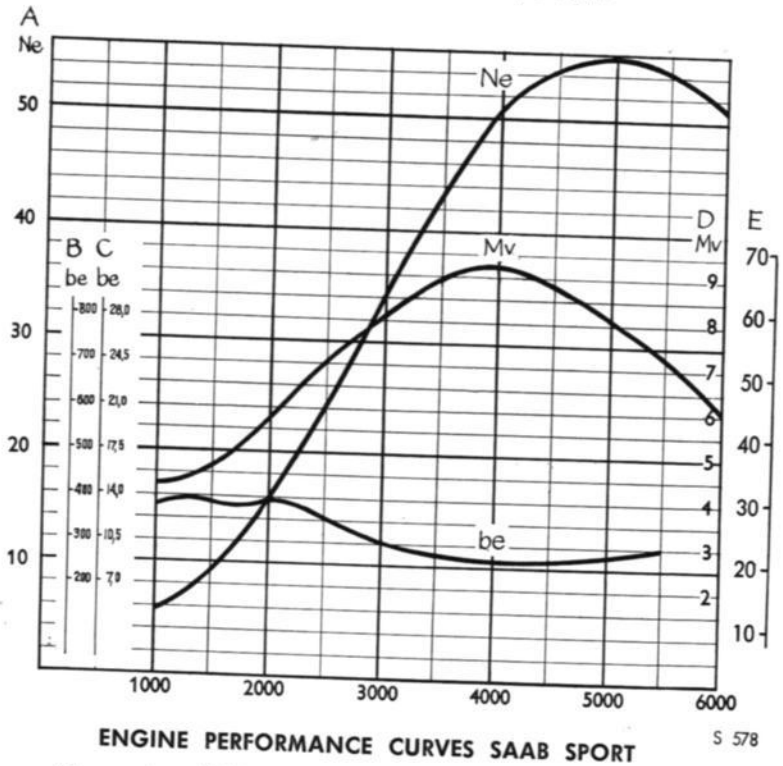
Model	Ratio ring gear: pinion	Dynamic radius of road wheel in.	mm	Speedometer Rev. per kilometer covered	Rev. per mile covered
95	38:7	12.2	310	643	1035
96 3-speed and 4-speed	38:7	12.0	305	654	1052
Saab Sport	36:7	11.7	298	634	1020



ENGINE PERFORMANCE CURVES SAAB 95 AND 96

Ne = output (DIN)
Mv = Torque
be = fuel consumption

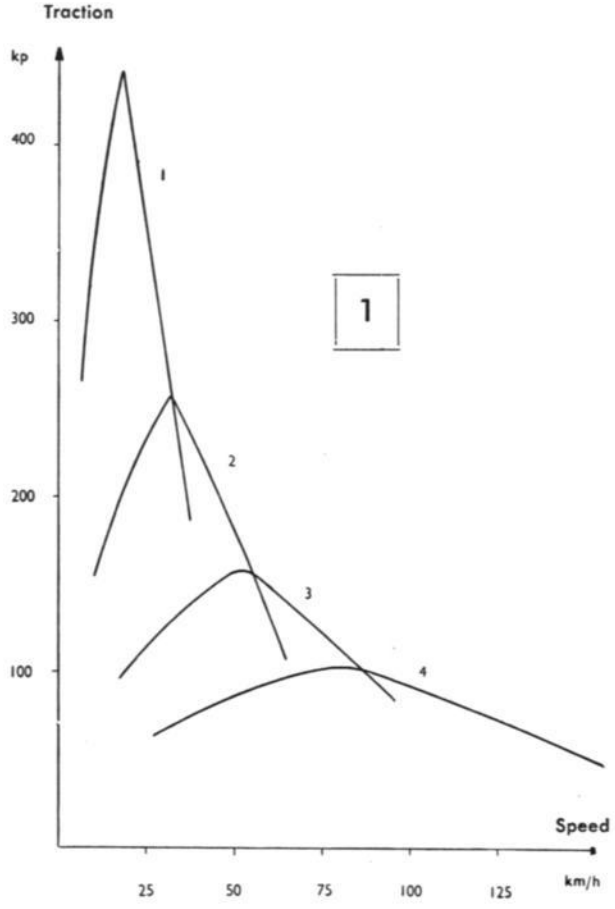
A = net output b.h.p.
B = g/hph
C = oz/hph
D = Torque kgm
E = Torque ft/lbs



ENGINE PERFORMANCE CURVES SAAB SPORT

Ne = output (DIN)
Mv = Torque
be = fuel consumption

A = net output b.h.p.
B = g/hph
C = oz/hph
D = Torque kgm
E = Torque ft/lbs



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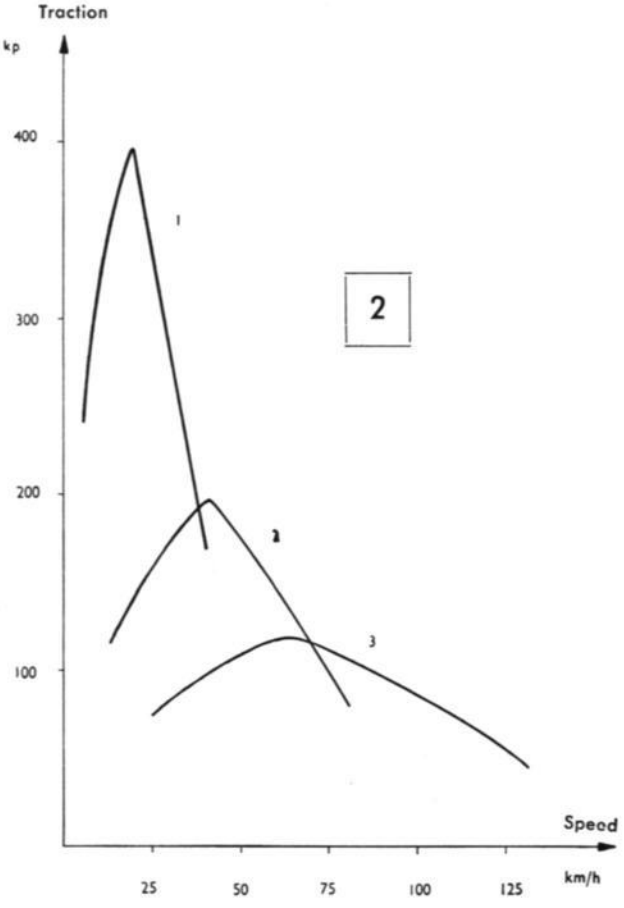

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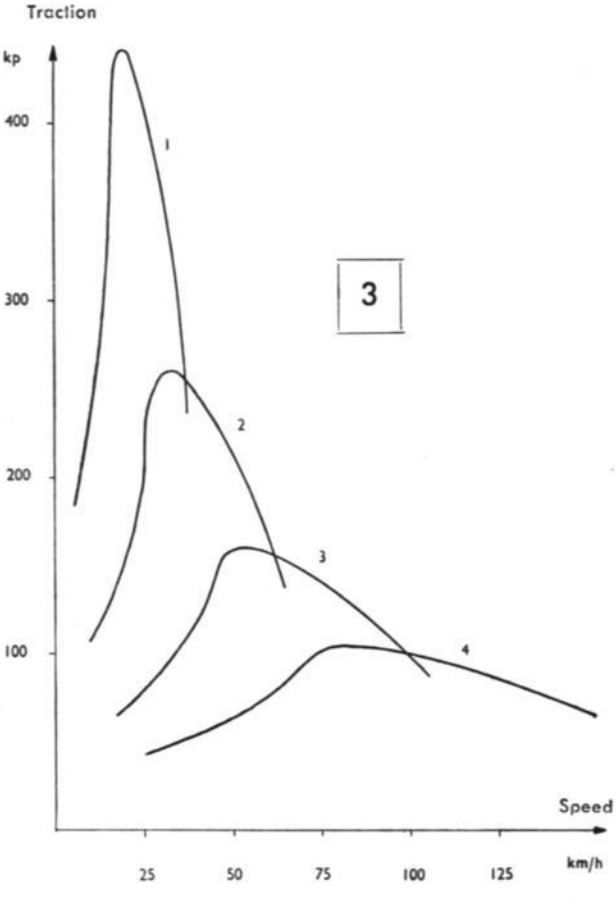


3

TRACTION CURVES IN DIFFERENT GEARS FOR

1. Saab 95 and 96, 4-speed
2. Saab 96, 3-speed
3. Saab Sport

TROUBLE SHOOTING

General

The localization of faults in a car is often the most difficult part of the service work, and no written instruction on the subject can replace familiarity with the car and knowledge of its construction. The information contained in this section has been prepared with the object of facilitating systematic diagnosis, but does not claim to be exhaustive. Under each heading, the most likely sources of trouble are listed in order of probability, together with the appropriate corrective measures.

SOURCE OF TROUBLE	REMEDY
STARTING DIFFICULT — COLD ENGINE	
A. Dirty spark plugs, or flashover in ignition system due to moisture on plug insulators, ignition cables, coil and/or distributor cover.	Clean or replace spark plugs and wipe ignition cables, plug terminals, ignition coil and distributor cover.
B. No fuel in the carburetor.	Check that the pump is feeding fuel by pulling off hose at carburetor and running with starter motor. If no fuel is supplied, check pump filter, pipes and hoses for leaks and clogging. If fuel supply still fails after a new test, running with starter motor for about 12—15 sec., the pump itself is probably defective. Remove the pump for examination, and repair as necessary.
C. Jets and ducts in the cold-starting device choked up.	Blow ducts and jets clean with air.
D. No primary current to coil and distributor. No secondary current.	Check all cable connections, especially at ignition switch, to confirm that current is supplied to ignition system when starter motor is on. Cable rupture can have occured at the ignition lock.
STARTING DIFFICULT — WARM ENGINE	
A. Float riding too high in carburetor.	Adjust float level. See Chapter 2, Fuel System.
B. No primary current to coil and distributor. No secondary current.	Check and correct as per D above.

SOURCE OF TROUBLE	REMEDY
PINGING	
A. Ignition timed too early.	Adjust ignition timing. See Chapter 3, Electrical System.
B. Wrong jets in carburetor. (Mixture too weak).	Fit jets of right size. See Chapter 0.
C. Automatic ignition advance in distributor sticks at earliest timing.	Test distributor on a test rig, if available. Clean and lubricate all parts. Provide replacements for any worn parts.
D. Spark plugs too soft.	Check that spark plugs of correct type and heat grading are fitted.
E. Heavy deposits of carbon in compression chambers due to excessive city driving.	Decarbonize top lock.
IGNITION BY INCANDESCENCE	
A. Incandescence under light loads at high r.p.m. Ignition setting too low, or wrong spark plugs fitted.	Check ignition setting and that correct type of plugs is fitted. See chapter 3, Electrical System.
B. Incorrect combination of jets in carburetor. Fuel mixture too weak.	Fit jets of the correct size. See Chapter 0.
EXCESSIVE FUEL CONSUMPTION	
It should be borne in mind that apparently excessive fuel consumption may result from extraneous causes such as roof rack, winter tires, preponderantly city driving, etc. To check fuel consumption, use may be made of a smaller tank installed in the engine compartment prior to the fuel pump so that the same pump pressure is obtained. A test based merely on consumption between two fill-ups cannot be regarded as completely reliable.	
A. Incorrect carburetor adjustment. Float riding too high, wrong type of jets fitted, or incorrect richness adjustment.	Check carburetor settings and adjust as necessary. See Chapter 2.
B. Cold-starting control incorrectly adjusted.	Check that control wire returns properly.
C. Choked air cleaner.	Blow air cleaner to remove dirt, or possibly replace.
D. Dragging brakes.	Check brake adjustment and free rolling of wheels. NOTE! Make sure that handbrake wire returns properly.
E. Leaky fuel system.	Check for leaks and repair as necessary.

SOURCE OF TROUBLE	REMEDY
LACK OF ENGINE PERFORMANCE	
A. Engine not firing on all cylinders.	Inspect spark plugs and check connections at plug terminals and distributor cover. Test radio interference suppressor, if fitted.
B. Plugged or restricted exhaust system. Muffled exhaust noise.	Check entire exhaust system, paying particular attention to rear muffler.
C. Incorrect carburetor adjustment.	Check carburetor jet sizes, float level and richness adjustment.
D. Icing in the emulsion jet. Induction preheater tube removed from air cleaner.	Refit preheater tube to air cleaner. Preheater must always be connected.
E. Poor compression. Sticking or damaged piston rings.	Test compression. Disassemble engine, decarbonize piston rings and fit new ones as necessary.
ENGINE NOISE	
Always remove the fan belt before attempting to trace engine noise, but having done so do not run the engine too long, as this would result in overheating. If the slightest doubt is entertained as to whether the noise originates from the transmission or the engine, depress the clutch pedal to disengage the transmission unit.	
A. Grinding noise from engine.	If the noise sounds different when clutch pedal is depressed and an axial load applied to the crankshaft, defective main bearings may be suspected. Disassemble crankshaft and inspect the main bearings. Note! The front main bearing is exchangeable.
B. Knocking, related to engine r.p.m. and most pronounced when engine speed goes down from high to low.	Piston-scoring due to overheating or other cause. Pistons can be roughly checked if induction and exhaust manifolds, and possibly cylinder head, are removed. If scoring is found, disassemble engine, change the worn pistons and recondition scored cylinder bores by honing or reboring. Excessive piston clearance may cause similar knocking after considerable mileage. In most cases, elimination of this noise involves repistoning, and reclassification may be necessary if specified clearances are not maintained with the new pistons. Grease breaker cam assembly in distributor. Refill distributor-gear grease cup.

SOURCE OF TROUBLE	REMEDY
C. Rustling noise when engine is idling. If noise is thought to originate from distributor or distributor gear, grip distributor housing for confirmation.	If noise disappears temporarily but reappears after driving a few miles, check the distributor gear and replace as necessary.
D. Irregular ticking. Broken piston ring or ring retainer.	Largely the same checks and measures as under B above.
E. Rattle occuring in all gears at roughly the same r.p.m. Nut on crankshaft for vibration damper not properly tightened. A similar noise can be caused by front muffler.	Retighten nut for vibration damper with torque of 36 ft-lb (5 kgm). If noise persists, try a new front muffler.
OVERHEATING	
A. Fan belt slipping.	Adjust belt tension.
B. Faulty thermostat.	Inspect thermostat and check its opening temperature. Possibly try a new thermostat in the car.
C. Ignition unduly retarded.	Check ignition setting and adjust as necessary.
D. Incorrect carburetor adjustment. (Mixture too weak).	Check jets and carburetor adjustments.
E. Cooling-water hoses dissolved by oil and grease.	Inspect hoses and replace as necessary.
F. Choked cooling system.	Flush cooling system until clear.
ENGINE MISSES ON ACCELERATION, FAILS TO REV.-UP PROPERLY	
A. Defective or dirty spark plugs.	Clean and test spark plugs, fitting new ones as necessary.
B. Flashover in ignition cables. Moisture in distributor cover.	Inspect and wipe ignition cables and distributor cover, fitting replacements as necessary.
C. Defective ignition coil.	Test coil and replace if necessary.

SOURCE OF TROUBLE	REMEDY
D. Incorrectly gapped and/or burnt contact points.	Examine breaker points and replace if necessary. Adjust to correct gap, 0.012—0.016 in. (0.3—0.4 mm).
E. Restricted exhaust system.	Check exhaust system, paying particular attention to rear muffler.
F. Water in fuel.	Look for water in fuel-pump filter (at lowest point) and in float chamber.
G. Irregular fuel supply.	Examine jets, float level, etc., and check fuel-pump pressure. See Chapter 2. Check that no air leakage occurs at gasket between induction manifold and engine block or at carburetor.
FUEL SYSTEM	
Fuel pump does not work or works improperly.	
A. Leakage at connections and filter housing.	Inspect connection nipples for fuel hoses and gaskets in filter housing.
B. Impurities in fuel.	Check that pump filter and fuel lines between tank and carburetor are not choked.
C. Condensate in fuel, causing frozen fuel lines, pump or tank (wintertime).	Check fuel-pump filter and fuel lines for presence of ice.
D. Leaky pump diaphragm and valves.	If necessary, drain tank and fill up with fresh fuel. Inspect pump diaphragm and valves, replacing as necessary. Some idea of diaphragm leakage can be got by examining oil and carbon deposits on spark plug in 2nd cylinder. Other methods, however, should be used for truly reliable testing. See Chapter 2. Engine, fuel system, Section 233.
FAULTY FUEL GAGE	
A. Fuel gage registers too low or too high.	Remove tank sender unit and adjust by carefully bending float arm.
B. Fuel gage works intermittently or not at all.	Fit a new gage or tank sender unit in order to localize the fault. Faulty part can either be replaced or submitted to local SAAB agent for repair.

SOURCE OF TROUBLE	REMEDY
EXHAUST SYSTEM	
LOSS OF PERFORMANCE	
A. Loss of performance due to restricted exhaust system.	Experience shows that rear muffler is most likely to be choked up. The second alternative is that the bore of the exhaust pipe has been reduced, for instance by distortion.
COOLING SYSTEM	
OVERHEATING	
A. See under Overheating in section on Trouble Shooting, Engine.	
LOW COOLANT TEMPERATURE	
A. Difficulty in maintaining sufficiently high coolant temperature (wintertime).	Check thermostat opening temperature, possibly by testing a new thermostat installed in the car. Inspect the air valve in water outlet pipe on cylinder head. To screen air flow, the following measures are recommended in the order given: closing radiator blind and screening front panel.
ELECTRICAL SYSTEM	
BATTERY RUN DOWN	
A. Fan belt slipping.	Adjust belt tension. See Chapter 3, Electrical System.
B. Battery cells dry.	Check fluid level in cells, and top up as necessary.
C. Faulty battery.	Check that specific gravity is same in all cells after charging.
D. Generator or relay giving insufficient current.	Carry out charging test. Check cable connections.
E. Short-circuit in starter switch.	Disassemble and inspect contacts.

SOURCE OF TROUBLE	REMEDY
DEFECTIVE LIGHTS	
A. Bulbs get burnt out. Charging voltage too high. Poor cable connections, leading to crystalization of bulb filaments.	Check charging settings of relay. Inspect all cable connections.
B. Weak headlamps.	Check bulbs, connections, reflectors, panel switch and dipper switch.
C. Stop lights or flashers, front and rear, not working.	Check lamp earth leads to fenders. Check bulbs and flasher relays.
For faults in ignition system, see under Trouble Shooting, Engine.	
CLUTCH	
CLUTCH SLIPS	
A. No clearance between release bearing — clutch.	Adjust release bearing clearance. The clearance should be 0.2 in. (5 mm) measured at the slave-cylinder.
B. Shaft for clutch release fork, piston in master or slave cylinder, or clutch pedal sticking.	Check and lubricate these parts to counteract sticking. Concerning lubrication, See Transmission.
C. Oil on clutch facing.	Remove inspection door. Check for leakage past clutch shaft seal. If leakage occurs, remove engine from car and disassemble clutch for cleaning and possible replacement of facing. Install new shaft seal.
D. Worn clutch facings.	Install new clutch facings. Check flywheel, pressure plate and clutch-spring tension.
E. Clutch pressure-plate springs defective (too weak).	Check pressure-plate springs. See Chapter 4, Clutch.
F. Defective or incorrectly adjusted pressure plate.	Inspect pressure plate and check adjustment. See Chapter 4, Clutch.

SOURCE OF TROUBLE	REMEDY
INCOMPLETE DISENGAGEMENT	
A. Too big clearance between release bearing — clutch.	Adjust release bearing clearance. The clearance should be (5 mm) 0.2 in. measured at the slave-cylinder.
B. Pressure-plate levers incorrectly adjusted.	Engine must be removed for checking and adjustment of pressure-plate levers. For correct adjustment, see Chapter 4, Clutch.
C. Skewy disc or facings too thick (after refacing).	Check disc for skewness. Ensure that correct facing is fitted.
D. Disc hub jamming on disc center.	Remove inspection door. Lubricate sparsely with a few drops of graphite oil. For perfect results, remove engine and lubricate shaft and hub with graphite grease.
E. Clutch shaft bushing at rear end of crankshaft damaged.	Remove engine. Trim bushing, or replace if necessary. Lubricate with graphite grease.
F. Defective tension pin holding clutch fork to release shaft, allowing movement to be effected with fork and shaft.	Disassemble transmission. Fit new tension pin, possibly also fork and shaft.
CLUTCH GRABS	
A. Oil on clutch facing.	Same as under "Clutch slips C".
B. Release shaft, clutch operating mechanism or clutch pedal sticking, thus releasing jerkily.	Same as under "Clutch slips B".
C. Faulty or incorrectly adjusted pressure plate.	Same as under "Clutch slips F".
RELEASE BEARING	
The release bearing, a grease-packed ball bearing, must always be removed when the transmission case is being cleaned. Otherwise, water, cleaning fluid or other extraneous matter may enter and damage the bearing so that noise develops.	
DEFECTIVE RELEASE BEARING	
A. A defective release bearing is generally responsible for noise incurred when clutch pedal is depressed.	Remove engine and replace bearing, treating it as an integral unit.

SOURCE OF TROUBLE	REMEDY
SAXOMAT CLUTCH	
Centrifugal clutch slips at full acceleration and not only immediately after changing gear.	
A. Linkage rod to servo-motor incorrectly adjusted.	Check that clearance exists between release bearing and thrust washer at engine speeds over 2,000 r.p.m.
B. Oil on clutch facings.	See Chapter 4, Saxomat Clutch. Remove inspection door. Check for leakage past clutch shaft seal. If leakage occurs, remove engine from car and disassemble clutch for cleaning and possible replacement of facing. Fit new shaft seal.
C. Clutch overheated or part of clutch assembly damaged.	Remove engine. Disassemble clutch, inspect parts and fit new ones as necessary.
CLUTCH SLIPS FOR TOO LONG AFTER CHANGING GEAR	
A. Reduction-valve adjusting screw too tight.	See adjustment of pilot valve, Chapter 4, Saxomat Clutch.
B. Bleeder-diaphragm adjusting screw too slack.	See adjustment of pilot valve, Chapter 4, Saxomat Clutch.
INCOMPLETE DISENGAGEMENT WHEN CAR IS STOPPED CAUSING TENDENCY TO CREEP FORWARDS	
A. Idling speed too high.	Adjust idling speed to about 800 r.p.m.
B. Centrifugal clutch incorrectly adjusted, or fatigued return springs.	Remove and inspect centrifugal clutch. If a fault is detected, the entire clutch must be renewed, as no adjustments can be made without special equipment.
C. Clutch disc hub sticks on clutch shaft.	Remove inspection door. Lubricate sparsely with graphite oil. For perfect results, remove engine and lubricate shaft and hub with graphite grease.
D. Clutch disc skewy, or facings distorted or damaged.	Remove engine and centrifugal clutch. Inspect facings and disc hub, and replace as necessary.

SOURCE OF TROUBLE	SOURCE OF TROUBLE
INCOMPLETE DISENGAGEMENT DURING GEAR SHIFTS IN MOTION	
A. Servo-motor linkage rod incorrectly adjusted.	Check that clearance exists between release bearing and thrust washer at engine speeds over 2,000 r.p.m. See Chapter 4, Saxomat Clutch.
B. Servo-motor diaphragm damaged.	Check servo-motor for quick action when shift-lever switch is closed. If action is sluggish and suction lines are satisfactory, diaphragm may be defective. Replace entire servo-motor assembly.
NO DISENGAGEMENT DURING GEAR SHIFTS IN MOTION	
A. Short-circuit in solenoid circuit. Fuse blown.	Check fuse and solenoid circuit.
B. Earth lead for gear-shift lever broken, possibly poor connection.	Check earth lead, and renew if necessary.
C. Excessive contact gap in shift-lever switch or corroded contacts.	Clean contacts in gear-shift lever and adjust gap to 0.006—0.008 in. (0.15—0.20 mm).
D. Restricted or leaky suction line.	Check suction lines for obstructions or damage.
E. Servo-motor damaged.	Check and adjust as under paragraph B of "Incomplete disengagement during gear shifts in motion" above.
F. Pilot-valve solenoid defective.	Install a new pilot-valve solenoid.
NO RE-ENGAGEMENT AFTER GEAR SHIFT IN MOTION	
A. Shift-lever switch not breaking.	Check contact gap and make sure that contacts are smooth and clean. Check that no burrs restrict gear-shift lever movement in sleeve nut.
B. Cable between solenoid and gear-shift lever earthed.	Check cable insulation for wear, e.g. at gear-shift lever.

SOURCE OF TROUBLE	REMEDY
CLUTCH GRABS	
A. Grease or oil splashes on clutch facings.	Remove inspection door. Check for leakage past clutch shaft seal. If leakage occurs, remove engine from car and disassemble clutch for cleaning and possible replacement of disc facings. Fit new clutch shaft seal.
B. Centrifugal clutch incorrectly adjusted.	Remove engine and disassemble centrifugal clutch for inspection. If a fault is detected, the entire clutch must be renewed, as no adjustments can be made without special equipment.
C. Pressure-plate or flywheel friction surfaces skewy or uneven.	Remove engine to permit inspection of clutch friction surfaces. Install new flywheel or centrifugal clutch as necessary. For latter, see B above.
TRANSMISSION	
OIL LEAKAGE	
Whenever oil leakage is detected, check bleeding through shifter shaft in transmission case cover. The outlet is in the shifter shaft between cover and shift-shaft universal joint. The simplest method of checking is as follows: remove transmission-case oil-level plug, inject compressed air into transmission case and feel with the hand to see that exhaust is escaping through the bleeder opening. If a restriction is suspected, remove the transmission-case cover for closer examination. Make sure that oil level is not too high.	
A. If leakage from clutch shaft seal is suspected, check after removal of inspection cover on clutch housing.	Remove engine to permit replacement of clutch shaft seal. In conjunction with this measure, disassemble and check clutch and clutch facings.
B. Oil leakage through seal for outgoing drive shaft.	Fit a new drive-shaft seal. Check that rubber on inner drive-shaft universal joint has not been damaged by oil.
C. Oil leakage at speedometer drive wire. If oil escapes at connection between outer wire and instrument, the probable cause is that the speedometer gear in the transmission case is feeding up oil.	Install new speedometer drive unit in transmission case. Clean wire and also instruments if necessary.
DIFFICULT TO SHIFT GEAR WHEN CAR IS STATIONARY	
A. Steering column stand incorrectly vertically adjusted, thus impeding longitudinal travel of gear-shift shaft.	Check that same amount of movement is obtained in all gear positions. If adjustment is required, back off 2 bolts retaining stand and adjust latter by moving towards steering wheel or towards dash panel.

SOURCE OF TROUBLE	REMEDY
DIFFICULT TO SHIFT GEAR IN MOTION	
A. Too timid gear-shifting movements causes scraping.	Shift gear firmly, but without using force.
B. Synchronizer rings worn or otherwise damaged.	Fit new rings. Light grinding with carborundum is recommended to give accurate matching of ring friction surfaces. After grinding, clean all affected parts meticulously.
C. Steering-column stand incorrectly vertically adjusted, thus impeding longitudinal travel of gearshift shaft.	Check that same amount of movement is obtained in all gear positions. If adjustment is required, back off 2 bolts retaining stand and adjust latter by moving towards steering wheel or towards dash panel.
D. Gear-shift forks bent, worn or otherwise defective.	Remove and disassemble transmission case for inspection and repair.
NOISE FROM TRANSMISSION CASE	
In trying to localize noise from the transmission case, concentrate in the first instance on drive shafts and related components. See Trouble Shooting, Front Axle and Suspension.	
A. Noise from differential assembly is generally characterized by lower note at light load.	Remove drive unit (engine and transmission assembly) and install new ring gear and pinion.
B. Noise from gears is characterized by a higher, strident tone when under load.	Elimination of noise necessitates replacement of gear set concerned. Judge each case according to amount of noise. No action required.
C. Rattle from transmission case when engine is idling and car is stationary. Emanates from intermediate gear when not under load.	Is insignificant to the function of the gear box. To eliminate the noise, the friction washer of the intermediate gear must be adjusted or replaced.

SOURCE OF TROUBLE	REMEDY
BRAKES	
Poor braking effect is usually due to either incorrect brake adjustment, air in the brake system, or worn brake linings. Always use genuine SAAB linings as replacements. If linings of a newer type are fitted on older cars, they must always be fitted on both front or rear wheels, as applicable. See also Chapter 5, Brakes.	
UNEVEN BRAKING	
A. Car swerves to one side when brakes are applied. Grease has leaked onto brake linings.	Disassemble brake drums and inspect linings. Install new linings and wheel-bearing seal, if necessary.
B. Brake drums unevenly worn on opposite sides.	Machine in pairs or replace worn or scored drum. See Chapter 5, Brakes, for machining of brake drums.
C. Car swerves to one side and brake-pedal engages too low down. One circuit is out of operation as a result of leakage.	Inspect brake lines, brake hoses and brake pistons for leaks and repair as necessary.
BRAKES DRAG	
A. Dragging brakes may be caused not only by excessively advanced brake shoes but also by jammed brake pistons.	Disassemble brake drum to allow inspection, and possible adjustment, of piston return.
B. Return hole in master cylinder not uncovered when brake pedal is released, due to incorrectly adjusted push-rod or swollen gaskets.	Check that clearance exists between push-rod and pedal. (Correct clearance is 0.024—0.047 in. /0.6—1.2 mm/, or 0.12—0.24 in. /3—6 mm/ at pedal tip.) If gaskets in master cylinder are suspected of being faulty, reject them and fit new ones.
C. Incorrect or inferior brake fluid in brake system.	Check condition of brake fluid. If at fault, flush system thoroughly with methylated spirit and install new rubber gaskets throughout.
D. Brake hoses choked, preventing return of oil after braking.	Check that brakes are released immediately when pedal is released.
E. Poor handbrake-wire return or sticky brake cylinders.	Check, clean and relubricate if necessary.

SOURCE OF TROUBLE	REMEDY
FRONT ASSEMBLY AND STEERING GEAR	
GREASE LEAKAGE AT FRONT-WHEEL HUB	
A. Bearing grease has oozed out into brake drum and damaged brake linings. Grease may also be visible on outside of brake drum and on rim through inspection hole in drum.	Remove wheel, brake drum and seal retainer. Install new seal and brake linings. (Check brake-drum sealing surface against seal).
PLAY IN WHEEL BEARINGS	
A. This is determined most easily if car is jacked up to relieve wheels from load. Noise, especially when cornering, abnormal tire wear and poor road holding may be caused by play in wheel bearings. Permissible play 0.08 in. (2 mm), measured at edge of rim.	Install new wheel bearing and the seal between wheel bearing and universal joint. See Chapter 6. When changing bearings, pack the new one with ball-bearing grease of good quality. Check rubber boot over outer universal joint.
PLAY IN DRIVE-SHAFT UNIVERSAL JOINTS	
A. Play in drive-shaft universal joints occurs very seldom. If it occurs, it may be betrayed by knocking in pace with shaft r.p.m. when car is freewheeling at low speeds. Same noise may also occur as the result of wear of ball and ball seat on inner or intermediate drive shafts.	Slight play in universal joints and drive shafts has no adverse effect on function, and consequently no direct action is called for. Inspection and possible renewal of rubber boots and grease in universal joints is nevertheless recommended. Noise can be eliminated only by replacement of damaged parts.
STIFF STEERING	
A. Steering gear adjustment tightened too hard.	See Chapter 6 for adjustment of radial rack clearance and axial pinion clearance.
B. Insufficient lubrication of or use of wrong lubricant for steering gear and/or ball joints.	Refill steering-gear and ball-joint grease cups. While lubricating, turn steering wheel to full lock in both directions.
C. Steer-column bushings are binding because of tension between bushings and column.	Relieve tension by adjusting steering-column bracket bolts.

SOURCE OF TROUBLE	REMEDY
KNOCKING OR RATTLE FROM STEERING	
A. Steering gear adjustment too slack.	See Chapter 6 for adjustment of steering gear.
B. Play in ball joints or tie-rod ends.	Check and adjust, or replace worn parts as necessary.
ABNORMAL KICKBACK IN STEERING WHEEL	
A. Poorly lubricated outer drive-shaft universal joints.	Disassemble joint for lubrication. Replace damaged or worn parts.
B. 1. Saab 95 and 96. Intermediate drive shaft rusted onto splines in yoke for inner universal joint.	Lubricate with oil can in lub.hole on yoke. (It may be necessary to disassemble the drive shaft on these models.) Always lubricate sparsely.
B. 2. Saab Sport. Poorly lubricated inner drive-shaft universal joints.	Disassemble joint for lubrication. Replace damaged or worn parts.
SUSPENSION	
REAR-END NOISE	
A. Damaged rear-wheel bearings may cause a scraping or rumbling noise at the rear end while the car is in motion.	Jack up rear end of car. A fault in a rear-wheel bearing can be localized by spinning one wheel at a time.
B. Squeaking or knocking at the rear end most likely originates from shock absorbers or bracket. (Saab 95)	To find out if noise is caused by shock absorbers, test new ones. At the same time, check shock-absorber rubber cushions.
C. Noise due to faults in rear-axle attachment to body.	Check bolts and bushings for rear-axle attachment at center bearing and side stays.
INCORRECT REAR-WHEEL ALIGNMENT	
A. Incorrect rear-wheel alignment may be due to a bent rear axle.	If an axle stub is bent or otherwise damaged, it may be replaced without changing the entire rear axle. If, however, the actual rear axle is bent, the entire unit should be replaced, since heating and realignment is not to be recommended.

SOURCE OF TROUBLE	REMEDY
FRONT-END NOISE	
A. Banging or tapping noise at the front end may be caused by springs when driving on cobbled roads or similar surfaces.	You can try to twist the spring a little, but the only certain remedy for this noise is to fit new springs.
TIRES UNEVENLY WORN	
A. Uneven tire wear is usually due to lack of balance in the wheels, either inherent in wheels and tires, or resulting from the adhesion of mud, etc. to the inside of the rims.	Shift wheels regularly, left front to left rear and right front to right rear, in view of the fact that non-driving wheels tend to get worn somewhat pittedly. Check wheel balance at regular intervals and adjust as necessary.
B. Worn tread centers or edges are usually the result of excessive or insufficient tire pressure.	Adjust tire inflation to recommended pressures, with due allowance for load carried.
C. Scraped-off, feathered or cross wear is caused by incorrect wheel alignment.	Check toe-in, caster, camber, king-pin inclination and turning angles.
D. Worn wheel bearings or tie-rod ends, possibly skew rims.	Check wheel bearings and steering assembly. Check rims for skewness.
WHEEL SHIMMY	
A. Unbalanced wheels.	Clean rims and rebalance wheels if necessary.
B. Poorly lubricated drive-shaft universal joints. Intermediate drive shaft rusted onto splines in yoke for inner universal joint.	See under Trouble Shooting: "Abnormal kickback in steering wheel".
CAR SWERVES TO ONE SIDE	
A. Tire pressure too low on one front wheel.	Check and adjust tire pressure.
B. Wrong camber adjustment.	Readjust camber. If driver is nearly always alone in car, compensation can be made by adjusting camber to 1/2° left side and 1° right side.
C. Rims and tires skew or out-of-round.	Check rims and tires.
D. Poorly lubricated drive-shaft universal joints and splines for intermediate drive shaft in yoke for inner universal joint.	See under Trouble Shooting: "Abnormal kickback in steering wheel".

CONTENTS

GENERAL HINTS

General

All shop personnel will be aware of the importance of tidiness and good order in the shop; similarly, every experienced mechanic realizes that certain parts of a car must be treated with care and protected from dirt and foreign matter while being serviced. For the new man, who may not be so familiar with the kind of work involved, the following hints may be of help:

1. Protect fenders and other painted areas with suitable covers while working with the car. It is easy to get grease stains or scratches on the paintwork, but it is far more difficult to remove them.
2. Protect the upholstery from oil, etc., by using protective covers.
3. Clean the car thoroughly under fenders and around the rear axle before starting work on hubs and axles. Apart from making work easier, this prevents dirt and grit from getting into bearings and other susceptible parts.
4. Before removing a spark plug, carefully clean the recess around its head.
5. One of the basic prerequisites of good service is the choice of a suitable place for each job. It would be most unsuitable, for instance, to dismantle an engine or a gearbox on or near a bench used for filing or similar abrasive operations.

Instructions for jacking-up the car

The construction of the car, with its self-supporting body, offers no natural lifting points at which to apply a jack, as on cars with a conventional chassis. Two special fittings are provided, one on each side, to take the jack included in the tool kit. They are intended for use when changing wheels, etc. The sills, to which the jack supports are welded, form a beam on either side and are strong enough to take an ordinary shop jack for lifting one side of the car. Under the front of the engine compartment floor, immediately behind the front muffler, a welded fitting provides a support for a shop jack. This is the best point at which to lift the front of the car in order to lubricate the ball joints. A similar jacking point is provided under the rear part of the car, where the floor is reinforced. This point is located on the center line of the car, immediately in front of the rear-axle tunnel. Most shop jacks feature a lifting head shaped like a low fork, and it is therefore advisable to place a wooden block of suitable size on this in order to avoid damaging the floor.

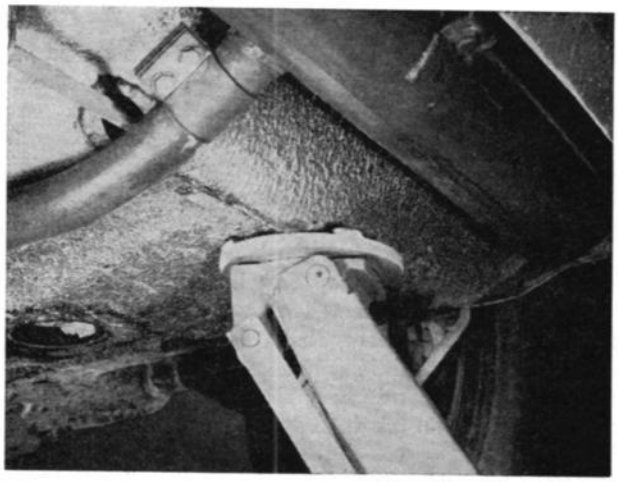
For certain jobs it is necessary to support the front or rear part of the car on trestles. Most of the stands usually available will be found suitable for the Saab. Make sure that the weight of the car is borne up on the strongest part of the sills, i.e. in the immediate vicinity of the wheel houses.

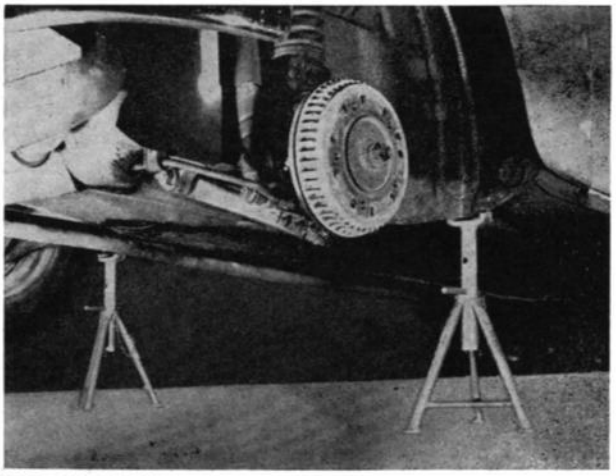
Thread system and wrench sizes

The thread system used in the Saab car is the UNC, i.e. UNIFIED COARSE THREADS, in which inches are the unit of measurement.

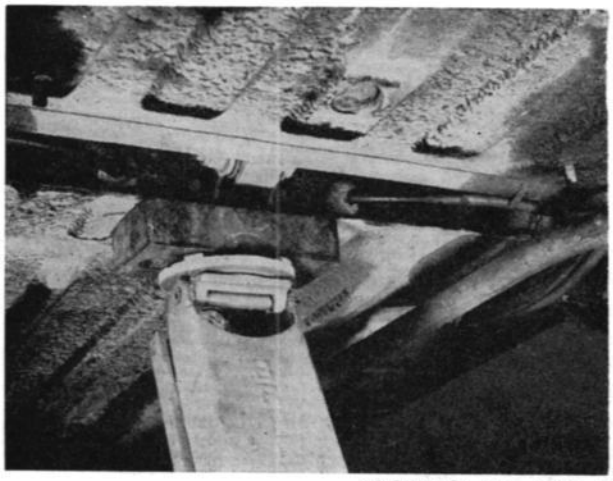
Wrench sizes for nuts and bolts are expressed in inches and the dimensions are the same as the designations of the tools. In a few cases, UNF, i.e. UNIFIED FINE, threads are used.

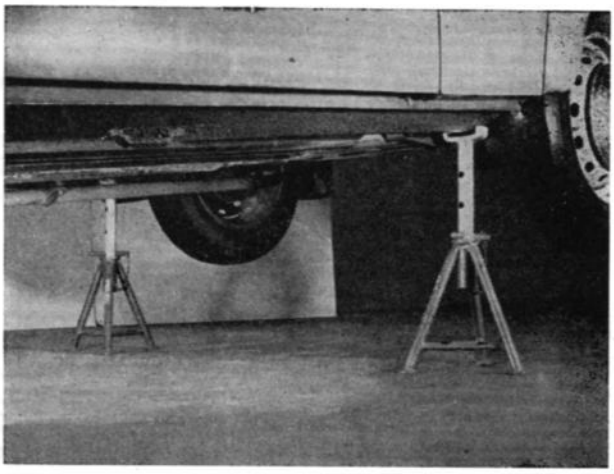
Exceptions to the thread system will be encountered in the case of components supplied by sub-suppliers, such as Bosch, S.U. and Solex, etc.



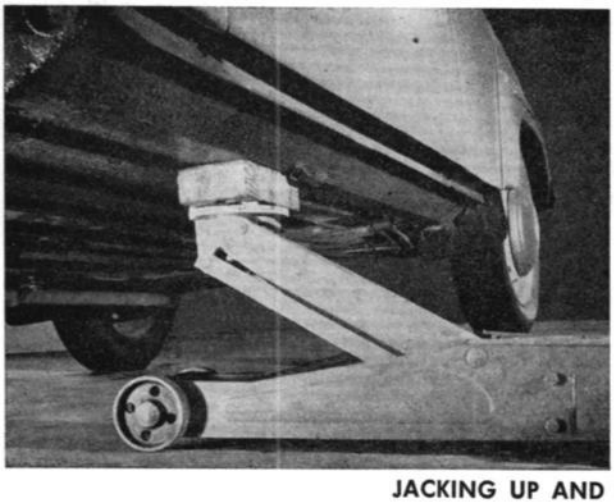


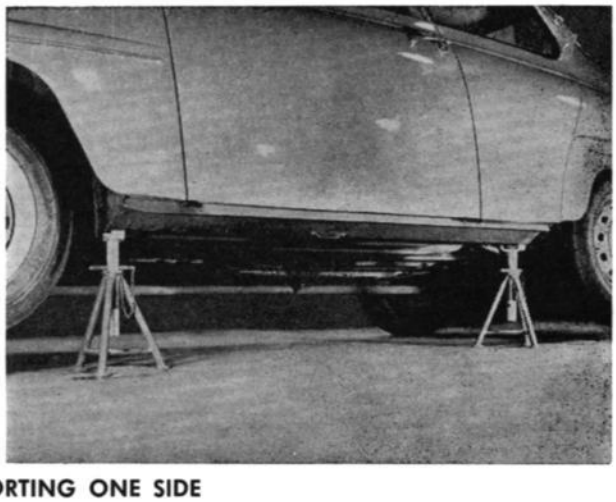
JACKING-UP AND SUPPORTING THE FRONT END





JACKING UP AND SUPPORTING THE REAR END





JACKING UP AND SUPPORTING ONE SIDE

SPECIAL TOOLS

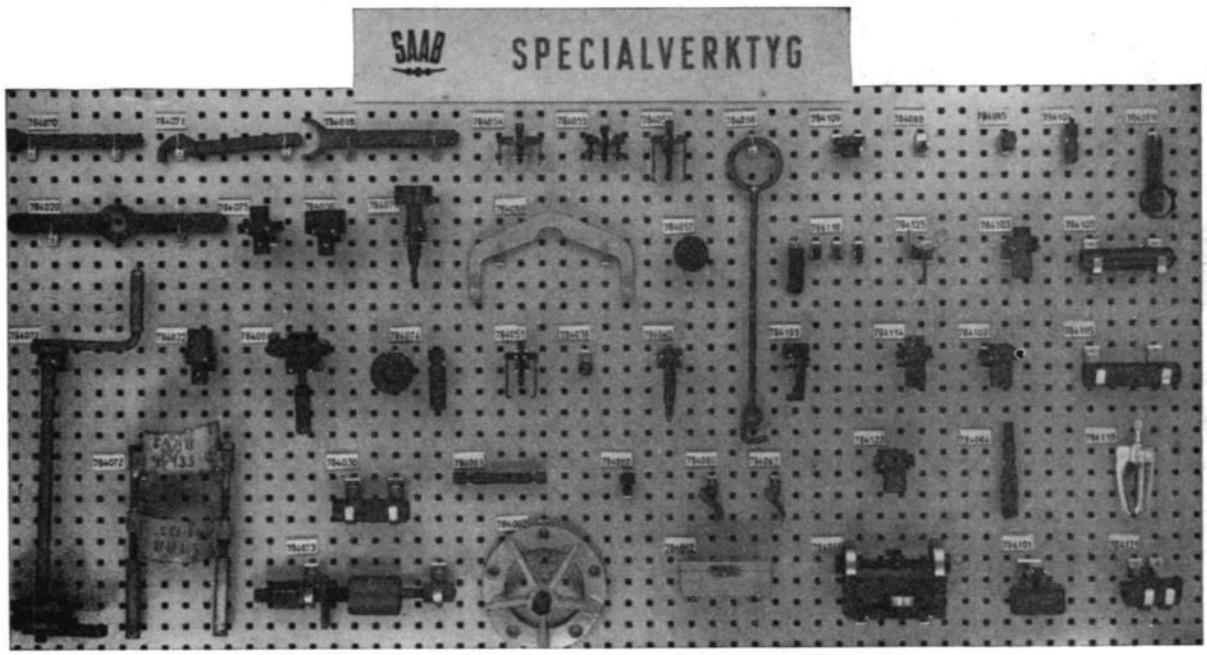
General

Special tools have been produced to meet specific requirements in repairing Saab cars. These tools are essential in that they cannot be replaced by the universal tools available through normal channels of supply.
In the following lists, the figure 1, 2 or 3 is noted against each special tool as an indication of its indispensability, tools marked "1" being the most indispensable. A six-figure part number is to be found on each tool, and should be quoted in orders and job descriptions.
The tools are also described in the Spare parts list.

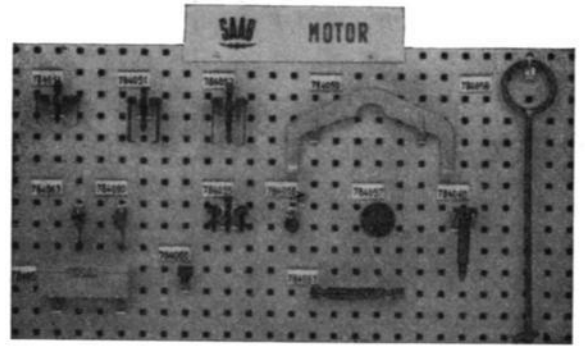
As the Saab 93, as well as the Saab 95, 96 and Saab Sport up to the 1964 model, is identical in many respects with the 1965 models of the Saab 95, 96 and Sport, the few tools intended specifically for the Saab 93 have been included in the lists in order to make them complete. These tools are placed separately in each group.

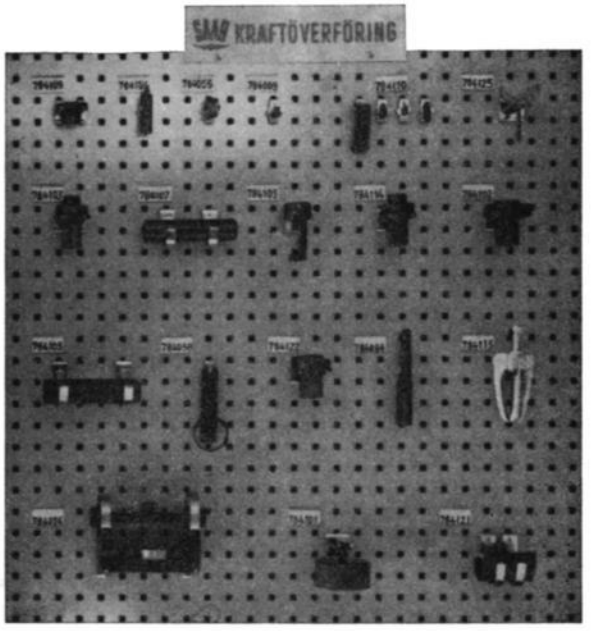
Tool storage

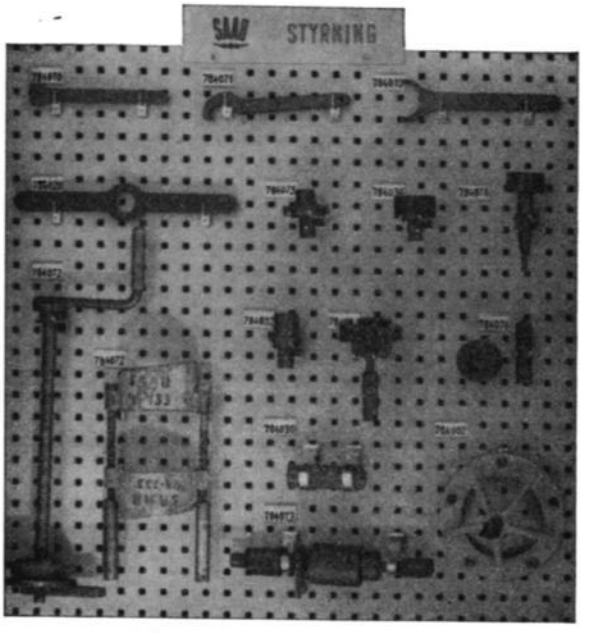
It is most important that the special tools be correctly stored for easy recognition and handy access. Examples of suitable tool boards are shown in the following illustrations.



COMPLETE TOOL KIT STORED ON DISPLAY BOARD

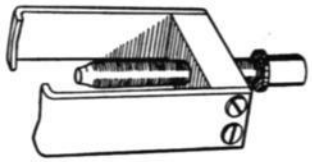
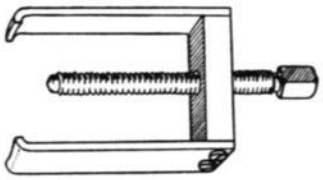
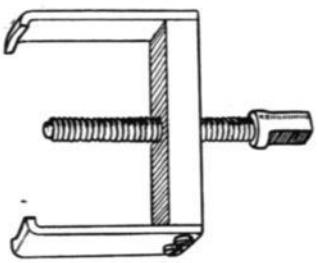
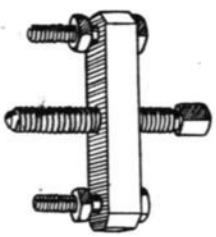
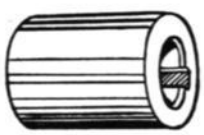
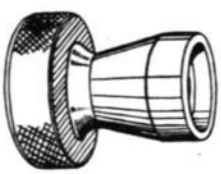
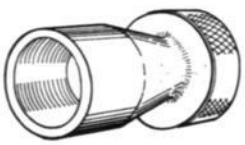






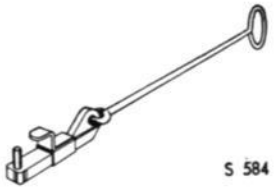
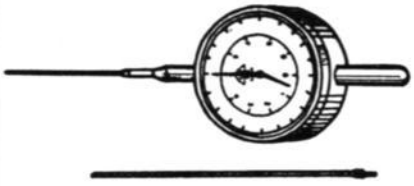
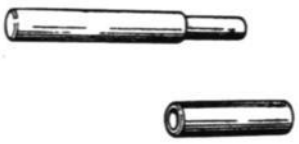
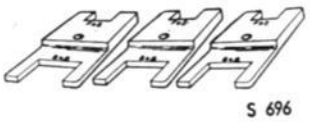
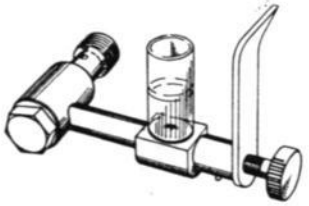
TOOLS ARRANGED IN GROUPS

Special tools – engine

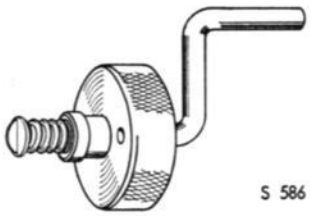
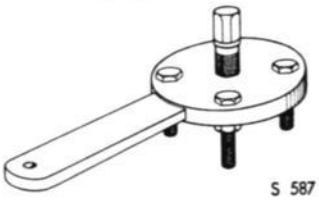
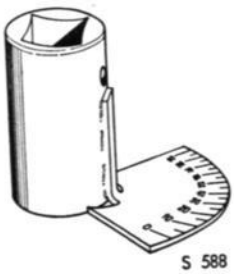
Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784051	Puller, pinion	1				
784052	Gripper for 784051	1				Spare part
784053	Puller, inner cover	1				
784054	Puller, outer cover	1				
784055	Puller, belt pulley	1				
784056	Installing sleeve, inner cover	1				
784057	Installing, sleeve, outer cover	1				
784127	Installing sleeve, outer cover	1				Saab Sport only

S 698

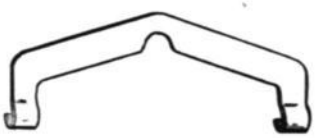
Special tools – engine (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784058	Lifting hook, engine and power unit	1			 S 584	
784060	Adapter, ignition indicator sleeve	1				
784062	Dial indicator (incl. two spare points)	1				
784040	Sleeve, ignition setting	1				
784061	Installing and removing tool, piston pin	1				
784064	Aligning arbor, clutch	1				
784209	Spacers, clutch arms (3)				 S 696	
784210	Level tube, float level		2		 S 637	Saab Sport only

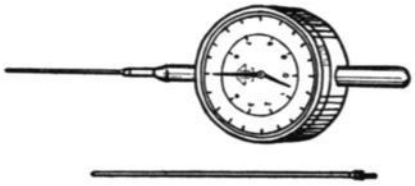
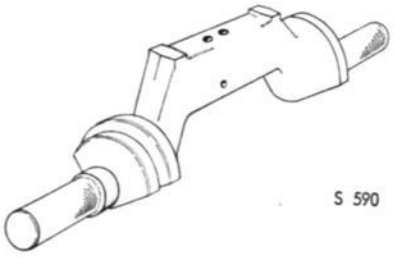
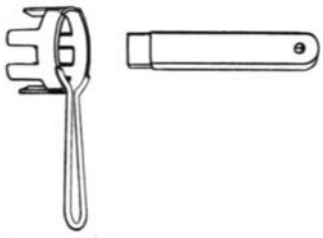
Special tools – engine (cont.)

Spare-part and Tool No	Description	Indispensability 1	2	3	Illustration	Remarks
784195	Crank, oil pump		2		 S 586	Saab 93 only
784135	Puller, water-pump ring	1			 S 587	
784203	Sleeve, angle tightening	1			 S 588	
784138	Installing and removing tool, water-pump bearing	1			 S 589	

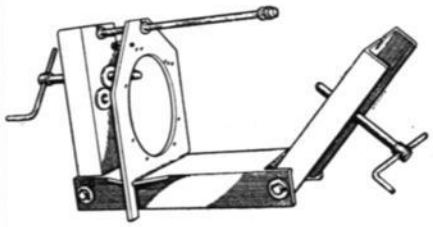
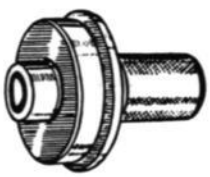
Special tools engine, older models

784059	Lifting hook, engine only	1				SAAB 93 and 96 up to model 1964 incl.
784131	Synchro-Test	1			 S 160	Older Saab Sport only

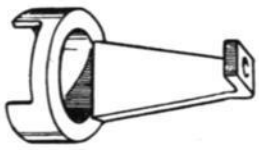
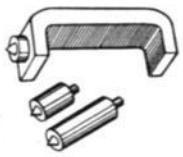
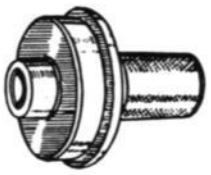
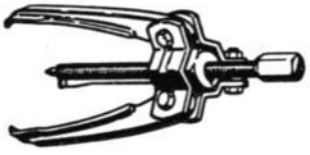
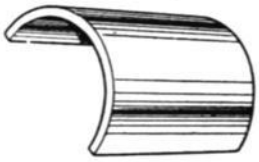
Special tools – transmission

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784062	Dial indicator (incl. two spare points)	1				Also listed under engine
784146	Measuring fixture, pinion adjustment		2		 S 590	
784068	Installing and removing tool, freewheel		2			
784069	Holders, poppet balls (2)		2			
784094	Wrench, intermediateshaft end nut		2		 S 277	

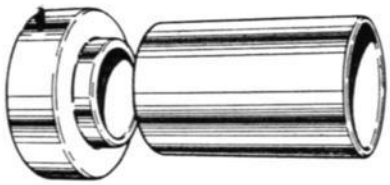
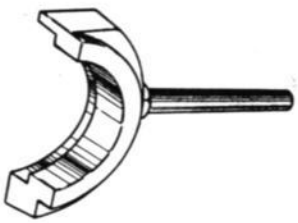
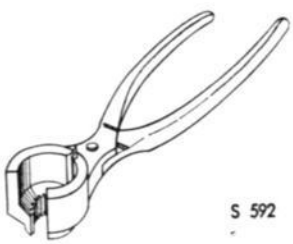
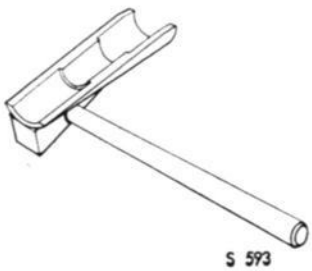
Special tools – transmission (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784100	Assembling and disassembling fixture, transmission case		2			
784097	Attacher, dial indicator					Spare parts to 784100
784085	Screw					
784118	Bushing					
784119	Nut					
784126	Supplementary kit for earlier fixture, which was designed for 3-speed transmission only					
784101	Puller, pinion-shaft bearing		2			
784102	Aligning arbor, pinion shaft		2			
784104	Driving-out arbor, primary shaft		2			
784106	Driving-on sleeve, pinion shaft		2			
784107	Driving-on sleeve, primary shaft		2			

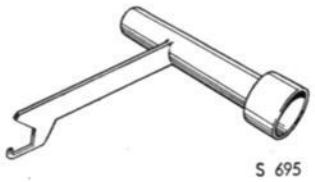
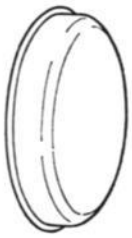
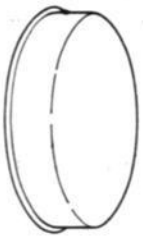
Special tools – transmission (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784108	Driving-on tool, intermediate-shaft gear		2			
784109	Installing tool, bearing		2			
784110	Arbor, intermediate shaft		2			
784111	Point, short, for 784110					Spare part
784112	Point, medium, for 784110					Spare part
784113	Point, long, for 784110					Spare part
784114	Aligning arbor, primary shaft		2			
784115	Puller, pinion-shaft bearing		2			4-speed transmission only
784121	Supporting tool		2			4-speed transmission only

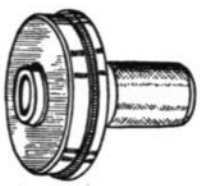
Special tools – transmission (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784122	Aligning arbor, pinion shaft		2			4-speed transmission only
784123	Supporting tool, gear		2			4-speed transmission only
784124	Locating key, intermediate shaft		2			4-speed transmission only
784125	Supporting tool, intermediate shaft		2			4-speed transmission only
784142	Driving-out arbor			3	 S 591	Only Sport
784161	Circlip pliers, outer universal joint	1			 S 592	
784202	Arbor, outer universal joint	1			 S 593	

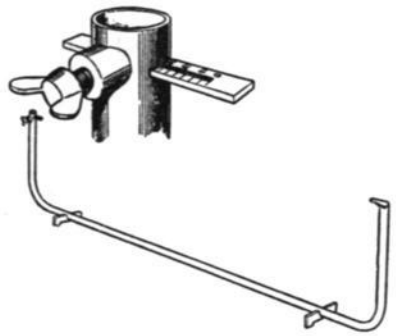
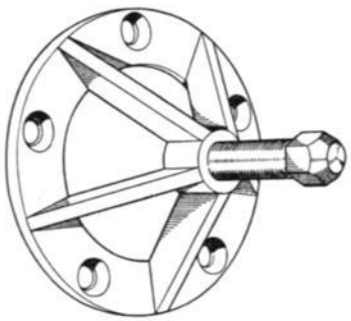
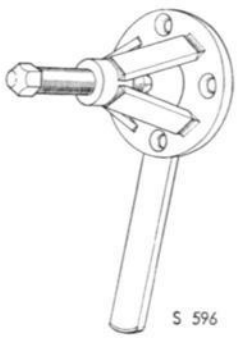
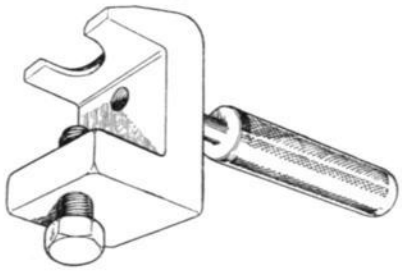
Special tools – transmsision (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784220	Removing and installing tool, clutch shaft seal		2		 S 695	
783846	Protective cover inner universal joints (required, 2)		2		 S 594	Only Sport
731762	Protective cover, bearing, inner drive shaft (required 2)		2		 S 595	Only Sport

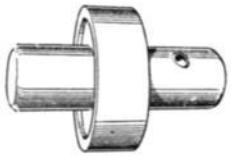
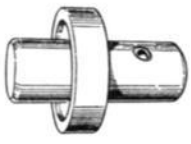
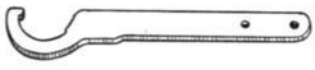
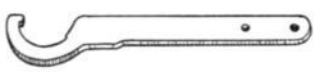
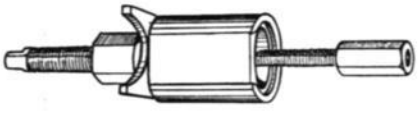
Special tools – transmission (earlier models)

784083	Removing tool, intermediate-shaft taper pin		2			Saab 93 Older Saab 96
784103	Aligning arbor, primary shaft (only for earlier 93 transmission cases, with bushing)		2			Saab 93 only

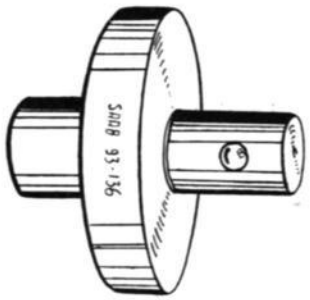
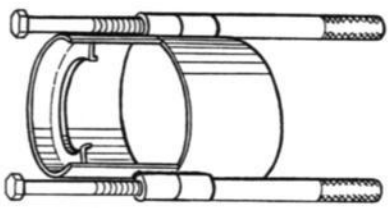
Special tools – chassis

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784001	Rule, toe-in measuring	1				Not necessary if other suitable equipment available
784002	Puller, wheel hub	1				
784178	Screw for 784002	1				Spare part
784201	Puller, wheel hub (Saab Sport)	1			 S 596	Only Sport
784178	Screw for 784201	1				Spare part
784004	Extractor, tie-rod end		2			
784018	Hook wrench, sealing-ring nut, rear wheel hub		2			

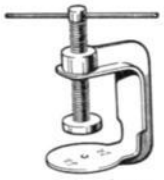
Special tools – chassis (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784020	Spanner, shaft-seal nut, front wheel hub	1				
784030	Shaft, driving tools		2			
784032	Installing tool, rear-axle ball bearing		2			
784033	Installing tool, rear-axle ball bearing		2			
784036	Installing sleeve, grease cup rear axle		2			
784071	Wrench, steering-gear bearing housing (2)	1			 	
784073	Removing and installing tool, bushing		2			

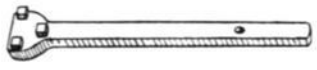
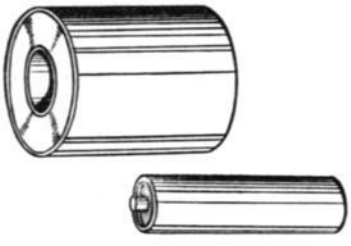
Special tools – chassis

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784075	Installing arbor, frontwheel ball bearing		2			
784076	Supporting arbor for bushing, rear-axle link		2			
784081	Compressor, coil spring	1				
784082	Removing and inserting clamp, coil spring	1				
784133	Pressing tool, upper rubber bushing, control arm		2		 S 394	
784134	Pressing tool, lower rubber bushing, control arm		2		 S 395	

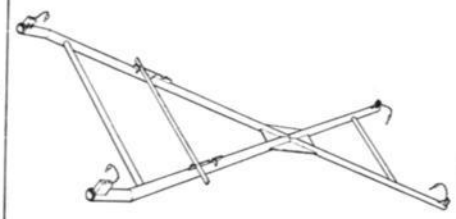
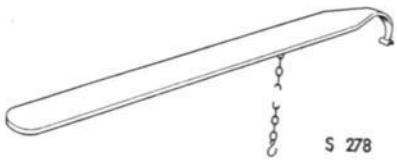
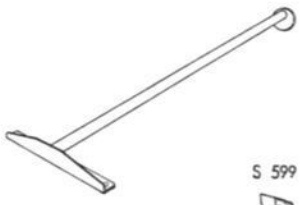
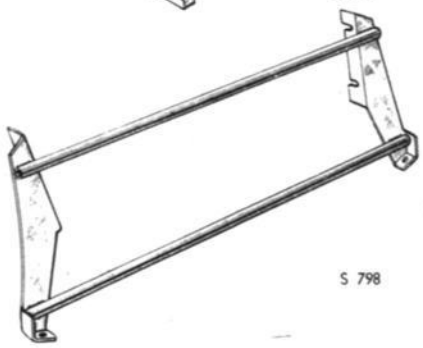
Special tools – chassis (cont.)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784132	Clamp, brake piston	1			 S 158	Saab Sport only
784199	Pliers, circlip, master cylinder		2		 S 597	

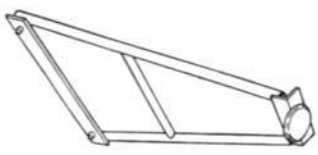
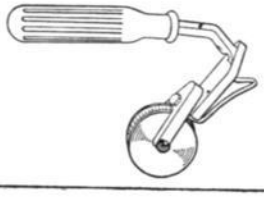
Special tools – chassis (earlier models)

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784070	Key, ball joint (earlier models only)		2			Earlier Saab 93 only
784074	Removing and installing tool, rear-axle link bushing (earlier model only)		2			Saab 93 only

Special tools – miscellaneous

Spare-part and Tool No.	Description	Indispensability 1	2	3	Illustration	Remarks
784077	Aligning tool, body, diagonal measurements			3		
784168	Support for 784077		2		 S 278	Spare part
784170	Locating pin for 784077					Spare part
784144	Modification kit for earlier aligning tool 784077					Spare part
784096	Tool for fitting of headlining			3	 S 599	
784143	Aligning tool, power-unit installation			3		
784145	Aligning tool, front wheelhouses			3	S 798	

Special tools – miscellaneous (cars of earlier models)

784078	Aligning tool, power-unit installation			3		SAAB 93 and older SAAB 96
784079	Installing tool, windshield moulding			3		Saab 93 only

GENERAL TOOLS

Hand tools

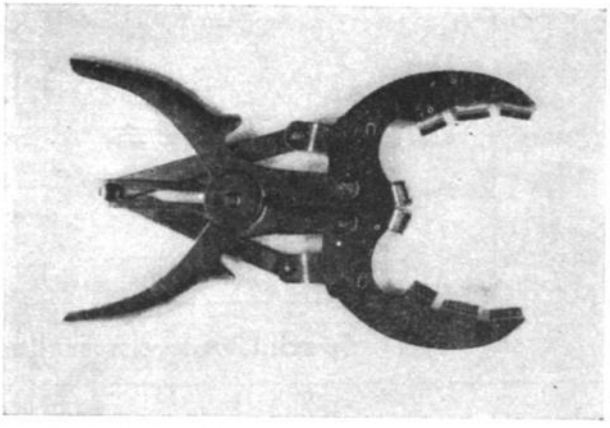
Hand tools are among the most important items of equipment in an automobile repair shop. It is highly important that an adequate range of suitable tools is available — and used.
Saab Service Information No. 20—2—134 contains a list of suitable tools to meet all requirements. The complete set of recommended tools can be seen in the adjacent illustration.

COMPLETE SET OF HAND TOOLS AND A PRACTICAL STORAGE UNIT

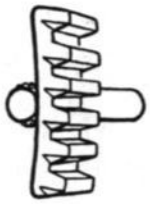
Other essential aids

This group includes tools and equipment which cannot be characterized as special tools but which, like hand tools, are obtainable through the normal channels of supply or can easily be made by the repair shop. Some of these items are indispensable, and even those which are not absolutely essential often considerably simplify repair jobs.

STROBOSCOPE, 12-VOLT
Used for ignition adjustment. Essential.



PISTONG-RING TOOL FOR 2.37—3.15 IN. (60—80 MM) PISTONG RINGS
Used to extract and fit piston rings. Essential.

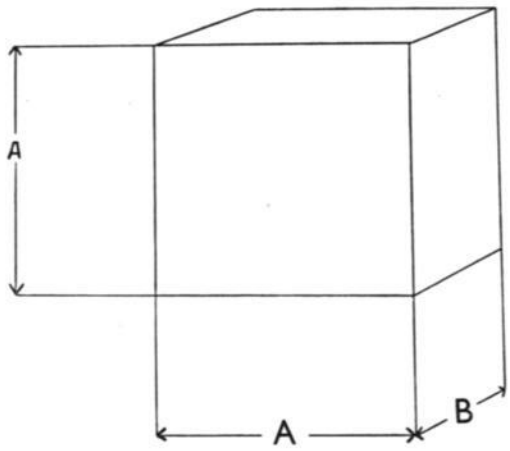


LOCKING SEGMENT FOR FLYWHEEL

Used in removal and installation of clutch, flywheel and belt pulley. Located beween flywheel ring gear and bolt hole in engine block. Can be made from part of a rejected flywheel ring gear.

AMP/SPLICE CRIMPING PLIERS

Used for crimping AMP terminals and splice fittings supplied for repairs and additions to electric wiring.



SUPPORT FOR TRANSMISSION CASE

Used when lifting out the engine, being placed under the transmission case. Made of hard wood.

A = 3½ in. (90 mm)
B = 2 in. (50 mm)

SERVICE INSPECTIONS

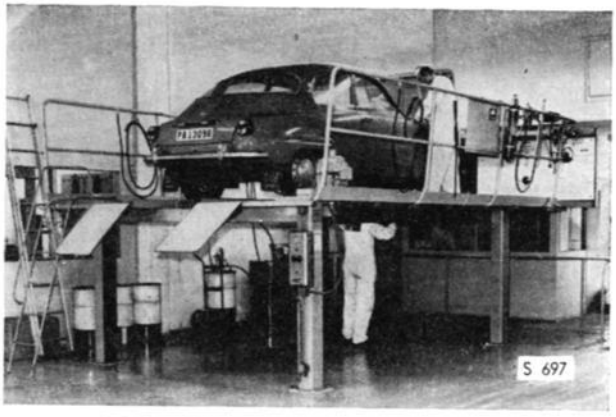
General

In order for the car-owner to enjoy trouble-free motoring at the lowest cost it is essential that the car receives the necessary care and attention.

The service book provided with every new car contains a number of vouchers, listing the jobs which are necessary in the first instance for the proper maintenance of the car. The first voucher is for the Delivery Service which is carried out before the car is handed over to the customer. The second voucher entitles the customer to a free service inspection after 1,200 miles (2,000 km). The remaining vouchers are for service inspections carried out at intervals of 6,000 miles (10,000 km) and for which fixed prices are charged.

Lubrication service and changing oil are included in the maintenance service, implying that the driver will have to do without his car for the shortest possible time, as servicing and lubrication are carried out simultaneously.

In order to carry out these service inspections efficiently, a special place in the workshop should be reserved for them. This part of the shop should be fitted with all necessary equipment for lifting the car, checking wheel alignment, lubrication, adjusting headlamps, etc.



FOUR-RUM ELEVATED SERVICE BAY

DELIVERY SERVICE INSPECTION

General

Before handing the car over to the customer, the dealer shall:

1. Check the gearbox oil level.
2. Check the coolant level.
3. Check the fan-belt tension.
4. Check the electrolyte level.
5. Check that the ignition-cable terminals make proper contact.
6. Tighten the cable terminals on battery, starter motor, relay and generator.
7. Check the fuel system for leaks.
8. Check the brake hoses and lines for leaks.
9. Saab Sport: Check the lubrication system for leaks and check the oil-warning system.
10. Check the brake fluid in the master cylinders for brakes and clutch, and top-up if necessary.
11. Check the function of lights, stop lights, direction-indicating flashers, warning lamps, windshield wipers, windshield washer, heater fan and horn.
12. Check the seat mountings and rails, adjusting if necessary.
13. Check the alignment of the headlamps.
14. Tighten the wheel bolts.
15. Adjust the tire pressure.
16. Check toe-in and adjust if necessary.
17. Tighten the stop nuts on the tie-rods.
18. Check the function of all locks and catches.
19. Check that the Owner's Manual, Service Book, tools and spare wheel are in place.
20. Wash and clean the car body and all chromium-plated parts.
21. Take the car out for a test run in order to check condition of brakes and clutch.
22. Check the idling speed, adjusting as necessary.

Free service inspection 1200 miles (2000 km)

After 1,200 miles (2,000 km), the following jobs must be done. This inspection is carried out at no charge to the customer.

1. Change the oil in the gearbox, 1 U.S. quart (1.4 liters) EP oil, SAE 80. Clean the magneto plug.
2. Check the rubber boots for outer drive shaft universal joints and steering gear, the rubber seals for ball joints and tie-rod ends, and, on the Saab Sport, the rubber boots for the inner drive shaft universal joints.
3. Grease the upper and lower ball joints on both sides, as well as the tie-rod ends, with SAAB Special Grease.
4. Tighten the engine bracket bolts, front and rear.
5. Check the exhaust system for leaks and tighten the bolts for clips and suspensions.
6. Tighten the brackets retaining the steering gear to the body (2 bolts on each side).
7. Grease the distributor gear with SAAB Special Grease.
8. Grease the steering gear with SAAB Special Grease. Note: Do this with the steering wheel turned to full left lock.
9. Check the coolant level and also the cooling system for leaks (hydrostatic test).
10. Check the fan-belt tension, and adjust if necessary.
11. Check the spark plugs and, if necessary, adjust the electrode gaps.
12. Check and, if necessary, adjust contact gap in the distributor.
13. Thoroughly clean and wipe dry the bakelite part of the ignition coil and the distributor cap both inside and outside. Check that the ignition-cable terminals make proper contact.
14. Check the ignition timing and adjust if necessary.
15. Tighten the fuel-pump flange bolts.
16. Tighten the flange bolts on the induction manifold and carburetor.
17. Check the fuel lines and hoses for leaks.
18. Check the electrolyte level in the battery.
19. Tighten the pulley nut on the crankshaft.
20. Saab Sport: Tighten the oil-pump flange bolts and the oil-hose connections. Check the lubrication system for leaks.
21. Tighten the exhaust-manifold flange bolts at the cylinder block and exhaust muffler.
22. Tighten the cylinder head bolts (Note! Angular tightening)
23. Tighten the engine side support.
24. Check the brake lines and hoses for leakage and condition.
25. Check the clutch system for leaks.
26. Check the brake fluid in the master cylinders for brakes and clutch, and top-up if necessary.
27. Check the clutch-pedal free movement and adjust if necessary.
28. Adjust the rear footbrake.
29. Check the handbrake and adjust if necessary.
30. Tighten the center bracket for the rear axle (4 bolts).
31. Tighten the side-link attachments to car body (2 bolts on each side).
32. Check the function of lights, stop lights, direction-indicating flashers, warning lamps, windshield wipers, heater fan and horn. On Saab Sport, also check oil-warning system and windshield washer.
33. Tighten door locks, striker plates and hinges, adjusting if necessary.
34. Adjust the tire pressure.
35. Check camber, caster and toe-in, adjusting if necessary.
36. Tighten the front control-arm body brackets (8 bolts on each side).
37. Take the car out for a test run in order to check condition of brakes and clutch.
38. Check the idling speed, adjusting as necessary.

Service inspection 6000 miles (10000 km)

At intervals of 6,000 miles (10,000 km), the following jobs must be done.

Service Inspection 6,000 miles (10,000 km).

1. Check the gearbox oil level.
2. Check the rubber boots for outer drive shaft universal joints and steering gear, the rubber seals for ball joints and tie-rod ends, and, on the Saab Sport, the rubber boots for the inner drive shaft universal joints.
3. Grease the upper and lower ball joints on both sides, as well as the tie-rod ends, with SAAB Special Grease.
4. Adjust the tire pressure.
5. Check toe-in and adjust if necessary.
6. Check the coolant level and also the cooling system for leaks.
7. Check the fan-belt tension and adjust if necessary.
8. Remove and clean the filter element in the air cleaner with a blast of compressed air.
9. Lubricate the throttle control and the splines of the inner drive shaft universal joints sparsely with oil.
10. Check the electrolyte level in the battery. Tighten the cable terminals and smear them with vaseline.
11. Check the spark plugs and, if necessary, adjust the electrode gaps. Spark plugs should be changed every 6,000 miles (10,000 km).
12. Adjust the distributor contact gap.
13. Grease the lub. felt pad in the distributor cam assembly with Bosch Ft 1 v 4 Special Lubricant. Oil the lub. felt pads under the distributor arm and the oil fitting on the outside of the distributor.
14. Thoroughly clean and wipe dry the bakelite part of the ignition coil and the distributor cap both inside and outside.
    Check that the ignition-cable terminals make proper contact.
15. Adjust the ignition timing.
16. Grease the distributor gear with SAAB Special Grease.
17. Grease the steering gear with SAAB Special Grease. Note: Do this with the steering wheel turned to full left lock.
18. Saab Sport: Check the lubrication system for leaks. Tighten the hose connections and the oil-pump flange bolts.
19. Check the brake fluid in the master cylinders for brakes and clutch, and top-up if necessary.
20. Adjust the clutch-pedal free movement.
21. Adjust the footbrake, rear.
22. Lubricate the handbrake joints with oil.
23. Check the function of lights, stop lights, direction-indicating flashers, warning lamps, windshield wipers, heater fan and horn. On Saab Sport, also check oil-warning system and windshield washer.
24. Check the alignment of the headlamps, adjusting if necessary.
25. Grease the door stops, window catches (on opening side windows) and striker plates sparsely with vaseline.
26. Oil the hinges of doors, trunk and hood as well as all locking mechanisms.
27. Take the car out for a test run in order to check condition of brakes and clutch.
28. Check the idling speed, adjusting as necessary.

Service inspection

12,000 miles (20,000 km)
24,000 miles (40,000 km)
36,000 miles (60,000 km)
48,000 miles (80,000 km)
60,000 miles (100,000 km)

1. Change the oil in the gearbox, 1 U.S. quart (1.4 liters) EP oil, SAE 80. Clean the magneto plug.
2. Check the rubber boots for outer drive shaft universal joints and steering gear, the rubber seals for ball joints and tie-rod ends, and, on the Saab Sport, the rubber boots for the inner drive shaft universal joints.
3. Check that the tie-rod ends are not worn (replace if necessary).
4. Grease the upper and lower ball joints on both sides, as well as the tie-rod ends, with SAAB Special Grease.
5. Check the condition of the exhaust system.
6. Check the coolant level, the cooling system for leaks (hydrostatic test) and the condition of the water hoses.
7. Check the fan-belt tension and adjust if necessary.
8. Change the filter element in the air cleaner.
9. Clean the carburetor float chamber, clean the jets and filter with a blast of compressed air and tighten nuts and bolts.
10. Clean the fuel-pump filter.
11. Check the fuel lines and hoses for leaks.
12. Lubricate the throttle control and the splines of the inner drive shaft sparsely with oil.
13. Check the electrolyte level in the battery. Tighten the cable terminals and smear them with vaseline.
14. Check the spark plugs and, if necessary, adjust the electrode gaps. Spark plugs should be changed every 6,000 miles (10,000 km).
15. Adjust the distributor contact gap, or change the breaker points if necessary.
16. Distributor: Grease the lub. felt pad in the distributor cam assembly with Bosch Ft 1 v 4 Special Lubricant. Oil the lub. felt pads under the distributor arm and the oil fitting on the outside of the distributor.
17. Thoroughly clean and wipe dry the bakelite part of the ignition coil and the distributor cap both inside and outside. Check that the ignition-cable terminals make proper contact.
18. Adjust the ignition timing.
19. Saab Sport: Unscrew the oil-tank drain plug and drain off any condensate.
20. Saab Sport: Check the lubrication system for leaks. Tighten the hose connections and oil-pump flange bolts.
21. Take off the wheels and check the thickness of the brake linings. In the case of the front brake drum, this can be done through the inspection holes, whereas the rear brake drum must be taken off. Change the brake linings at a thickness of 0.1 in. (2.5 mm) and the friction pads on the Saab Sport at a thickness of 0.06 in. (1.5 mm).
22. Brake system: Check the condition of brake hoses and lines. Check master cylinders, wheel cylinders and screw caps for leakage. (Fit new brake hoses, rubber gaskets and rubber seals, and change brake fluid, after about 36,000 miles (60,000 km) or 3 years, whichever comes first.)
23. Adjust the fottbrake, rear.
24. Adjust the handbrake.
25. Lubricate the handbrake joints with oil.
26. Saab 95: Check the fluid level in the rear shock absorbers.
27. Check the shock-absorber rubber bushings and replace if necessary.
28. Check the underbody coating. Discuss possible measures with the customer.
29. Check the clutch system for leaks.
30. Adjust the clutch-pedal free movement.
31. Check the brake fluid in the master cylinders for brakes and clutch, and top-up if necessary.
32. Grease the distributor gear with SAAB Special Grease.
33. Grease the steering gear with SAAB Special Grease. Note: Do this with the steering wheel turned to full left lock.
34. Check the function of lights, stop lights, direction-indicating flashers, warning lamps, windshield wipers, heater fan and horn. On Saab Sport, also check oil-warning system and windshield washer.
35. Check the alignment of the headlamps, adjusting if necessary.
36. Tighten door-lock striker plates and door hinges.
37. Grease the door stops, window catches (on opening side windows) and striker plates sparsely with vaseline.
38. Oil the hinges and locking mechanisms of doors, trunk and hood, and, as necessary, the pedals.
39. Check and, if necessary, adjust any slackness in the seat rails. Apply a little vaseline to the rails if necessary.
40. Adjust the tire pressure.
41. Check camber, caster and toe-in, adjusting as necessary.
42. Take the car out for a test run in order to check condition of brakes and clutch.
43. Check the idling speed, adjusting as necessary.

Service inspection:

18,000 miles (30,000 km)
30,000 miles (50,000 km)
42,000 miles (70,000 km)
54,000 miles (90,000 km)

1. Check the gearbox oil level.
2. Check the rubber boots for outer drive shaft universal joints and steering gear, the rubber seals for ball joints and tie-rod ends, and, on the Saab Sport, the rubber boots for the inner drive shaft universal joints. Defective boots or seals must be replaced.
3. Grease the upper and lower ball joints on both sides, as well as the tie-rod ends, with SAAB Special Grease.
4. Adjust the tire pressure.
5. Check toe-in and adjust if necessary.
6. Take off the wheels and check the thickness of the brake linings. In the case of the front brake drum, this can be done through the inspection holes, whereas the rear brake drum must be removed. Change the brake linings at a thickness of 0.1 in. (2.5 mm) and the friction pads on the Saab Sport at a thickness of 0.06 in. (1.5 mm).
7. Check the coolant level and also the cooling system for leaks.
8. Check the fan-belt tension and adjust if necessary.
9. Remove and clean the filter element in the air cleaner with a blast of compressed air.
10. Lubricate the throttle control and the splines of the inner drive shaft sparsely with oil.
11. Check the electrolyte level in the battery. Clean the cable terminals, tighten them and smear with vaseline.
12. Check the spark plugs and, if necessary, adjust the electrode gaps. Spark plugs should be changed every 6,000 miles (10,000 km).
13. Adjust the distributor contact gap.
14. Grease the lub. felt pad in the distributor cam assembly with Bosch Ft 1 v 4 Special Lubricant. Oil the lub. felt pads under the distributor arm and the oil fitting on the outside of the distributor.
15. Thoroughly clean and wipe dry the bakelite part of the ignition coil and the distributor cap both inside and outside.
    Check that the ignition-cable terminals make proper contact.
16. Adjust the ignition timing.
17. Grease the distributor gear with SAAB Special Grease.
18. Grease the steering gear with SAAB Special Grease. Note: Do this with the steering wheel turned to full left lock.
19. Check the brake fluid in the master cylinders for brake and clutch, and top-up if necessary.
20. Adjust the clutch-pedal free movement.
21. Adjust the footbrake, rear.
22. Lubricate the handbrake joints with oil.
23. Check the function of lights, stop lights, direction-indicating flashers, warning lamps, windshield wipers, heater fan and horn. On Saab Sport, also check oil-warning system and windshield washer.
24. Check the alignment of the headlamps, adjusting if necessary.
25. Grease the door stops, window catches (on opening side windows) and striker plates sparsely with vaseline.
26. Oil the hinges and locking mechanisms of doors, trunk and hood.
27. Take the car out for a test run in order to check condition of brakes and clutch.
28. Check the idling speed, adjusting as necessary.

LUBRICATION

General

Proper lubrication is vital to good car maintenance and must on no account be neglected. The car should be lubrication serviced at intervals of 6,000 miles (10,000 km) or at least twice a year, subject to the use of SAAB Special Chassis Grease and to a strict watch being kept on the condition of rubber boots and seals. Lubrication service is therefore included in the regular service inspections carried out at intervals of 6,000 miles (10,000 km), for which vouchers are provided in the Service Book.
The intention is for service inspections and lubrication to be carried out at the same time by an approved service shop, thus reducing to a minimum the time during which the owner must do without his car.

> Always use only SAAB Special Chassis Grease for greasing jobs.

It is available as a spare part under reference SAAB Special Chassis Grease. The grease is stocked both in a cartridge pack (length 9.33 in. or 237 mm, diameter 2.09 in. or 53 mm) for a manual grease gun and in drums. Various makes of manual grease gun designed to take these grease cartridges are available, e.g. "Tecalemite" model 2840-Ta, with hose 110 B.
If, for some particular reason, SAAB Special Chassis Grease is not used, lubrication must be carried out more frequently, i.e. at intervals of 3,000 miles (5,000 km). SAAB Special Chassis Grease must not be mixed with ordinary chassis grease, so that either the one or the other must be used.
In some types of lubricating plant, difficulty may be experienced in feeding the grease to the grease pump. In such cases, a feeder lid can be fitted to the drum. Suitable lids are obtainable from suppliers of lubricating equipment.
Cleanliness is a matter of the utmost importance during lubrication work, as it is during all work on the car, and great care must be taken to avoid leaving grease marks on bodywork or upholstery.

> Caution must be observed when using SAAB Special Chassis Grease, as if spilled it may, in some cases, damage the paintwork of the car.

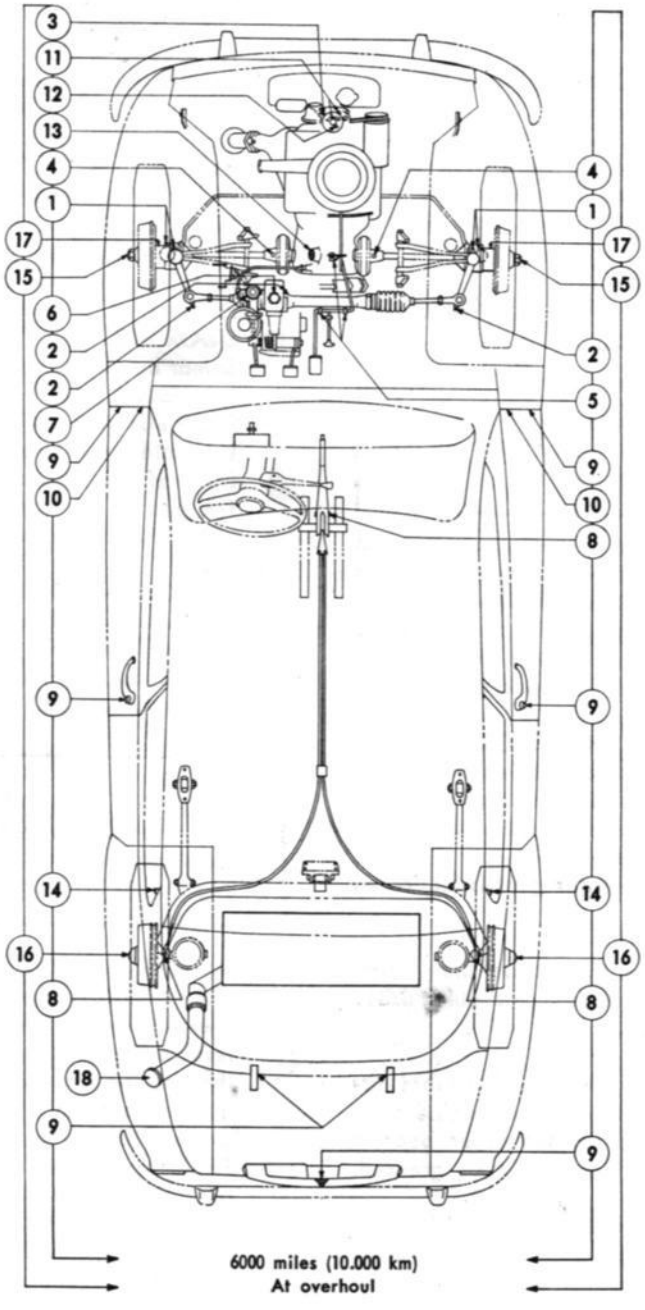
When lubricating the ball joints of the front assembly, the car should be jacked up to lift the wheels off the floor.

LUBRICATION TABLE

Lubrication intervals 6.000 miles (10.000 km) or twice a year

Index	Lubrication points	Number	Lubricant	Instructions
1	Upper & lower ball joints, L & R	4	SAAB Special Chassis grease	Grease gun.
2	Steering gear and drag rod ends	3	SAAB Special Chassis grease	Grease gun. Steering wheel turned fully to the left.
3	Distributor gear (not in the Saab Sport)	1	SAAB Special Chassis grease	Grease gun.
4	Inner drive shafts	2	SAE 40 Oil	Oil can. Oil sparingly.
5	Accelerator	4	SAE 40 Oil	Oil can
6	Hydraulic brake system	1	Brake fluid SAE 70 R 3	Check, intervals of max. 3 months*
7	Hydraulically operated clutch	1	Brake fluid SAE 70 R 3	Check, intervals of max. 3 months*
8	Handbrake links	3	SAE 40 Oil	Oil can
9	Hinges and locks	9	SAE 40 Oil	Oil can
10	Distributor shaft	2	Vaseline	Grease
11	Door stops	2	SAE 40 Oil	Oil can
12	Distributor cam	1	Bosch Ft 1 v 4	**Grease felt sparingly**
13	Gearbox	1	EP oil SAE 80 (3 US pints = 1.4 litre)	Check every 6.000 miles (10.000 km), change every 12.000 miles (20.000 km)
14	Latch, rear side window	2	Vaseline	Grease
15	Front wheel bearings	2	SAAB Special Chassis grease	Re-pack at overhaul
16	Rear wheel bearings	2	SAAB Special Chassis grease	Re pack at overhaul
17	Drive shaft, outer joint, L & R	2	SAAB Special Chassis grease	Re pack at overhaul
	Drive shaft inner joint, (Saab Sport only)	2	SAAB Special Chassis grease	Re-pack at overhaul
	Rear shock absorber, (station wagon only)	2	Shock absorber oil	Check 12.000 miles (20.000 km)
	Battery	1	Distilled water	Refill
	Radiator	1	Coolant	Check
	Tires	5		Check

* The brake fluid should be changed every 36.000 miles (60.000 km) or at intervals not exceeding 3 years.



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LUBRICATION CHART

Positions refer to the lubrication table on the preceeding page and the description on the following pages.

Lubrication interval: 6000 miles (10000 km) or at least twice a year

1. UPPER AND LOWER BALL JOINTS, LEFT AND RIGHT
   When lubricating the ball joints, the front of the car should be jacked up to lift the wheels off the floor. Turn each wheel outwards to provide easy access to ball joints and outer drive shaft universal joints.
2. STEERING GEAR AND TIE-RODS
   Avoid excessive lubrication of the steering gear.

> NOTE
>
> While greasing, turn the steering wheel to full left lock so that the grease penetrates also to the righthand part of the steering gear.

   Check that rubber boots are not abnormally swollen after lubrication and that they are free of defects likely to cause loss of grease. Defective parts must be renewed. The tie-rod grease nipples are more easily reached if the front part of the car is jacked up and the wheels turned full lock towards the opposite side.
3. DISTRIBUTOR GEAR (NOT SAAB SPORT)
   The grease nipple is located on the left side of the engine immediately behind the crankshaft pulley. Remove the old grease exuded through the plastic tube as fresh grease is injected.
   In the Saab Sport, the distributor gear is lubricated by the oil pump.
4. INNER DRIVE SHAFTS
   Lubricate the splines of the inner drive shafts sparsely through the holes provided in the outer driver of the inner universal joints.
5. THROTTLE CONTROL
   All bearings belonging to the throttle-control assembly are accessible from inside the engine compartment. If noise develops in the roller bearing under the accelerator the joint should be greased.
6. BRAKE SYSTEM
   The brake-fluid reservoir must always be kept well filled. Check the fluid level once every 3 months and after bleeding the hydraulic system. At the same time, check that the breather holes in the cover are not choked. Always use the grade of brake fluid recommended in the lubrication table.
7. HYDRAULIC CLUTCH OPERATION
   The reservoir must always be kept filled with brake fluid up to the mark on the outside of the reservoir. Check the fluid level at least once every three months.
8. HANDBRAKE JOINTS
   One joint inside each rear wheel backplate, as well as the ratchet mechanism and joints at the handbrake lever.
9. HINGES AND LOCKS
   The various lubrication points are: four door hinges, two door locks with striker plates and two hinges, one support and one lock for the luggage compartment lid. See Chapter 8. Striker plates should be treated with a lubricant that does not soil clothing. Door hinges are provided with special lubrication fittings, comprising a rubber plug with a through hole. To lubricate, press the oil can against the rubber plug.
10. DOOR STOPS
    Smear the door stops with a lubricant that does not soil clothing, for instance vaseline.
11. DISTRIBUTOR SHAFT
    Lubricate the shaft through the grease fitting on the front of the distributor housing. Also drench the felt pad in the upper end of the shaft under the distributor arm (which must be removed first) with oil.
12. BREAKER CAM ASSEMBLY
    Lubricate the breaker cam assembly by drenching the felt pad and greasing the actual cam. First remove the distributor cover, distributor arm and condensation trap.

> NOTE
>
> Avoid excessive lubrication of distributor parts, as grease on the breaker points causes burning of these.

13. TRANSMISSION CASE
    The transmission case and differential are filled and drained through the same openings. Check the oil level every 6,000 miles (10,000 km) by unscrewing the level-control plug and inserting a piece of wire in the opening. If the level is more than 0.2 in. (5 mm) below the plug opening, add oil until it flows through the level-control opening. Never mix two different sorts of oil. When about to change oil, run the engine for 15—20 minutes before draining off the dirty oil. Flush the transmission case and clean the magneto plug before filling with fresh oil until oil flows from the level opening. The transmission case and differential together hold about 3 U.S. pints (1.4 liters).
    Change the oil in the transmission case for the first time after 1,200 miles (2,000 km), and thereafter at intervals of 12,000 miles (20,000 km) or at least once every year. Use EP oil, SAE 80, all the year round.
14. WINDOW CATCHES (OPENING SIDE WINDOWS)
    Smear the joints of the catch mechanisms sparsely with vaseline.

In connection with reconditioning

When reconditioning, repack the following lubrication points with SAAB Special Chassis Grease:

15. Front wheel bearings.
16. Rear wheel bearings.
17a. Outer shaft universal joint.
17b. Inner shaft universal joint (Saab Sport only).

Rear shock absorbers, Saab 95

Open the filler plugs on the rear shock absorbers on the Saab 95 in order to check the fluid content and refill as necessary.

When refilling the fuel tank

FUEL

Regular grade gasoline with an octane number above about 85 is recommended for the Saab 95 and 96. No disadvantage is attached to the use of premium fuels for these models, but no appreciable gain will result. For the Saab Sport, a premium-grade gasoline with an octane number over about 95 must always be used.

Avoid the use of fuels blended with alcohol and benzole as, in certain combinations with oil, these may have a decidedly damaging effect on the engine.

OILS

Whenever possible, use the two-stroke oils recommended by SAAB for lubrication of the engine. If two-stroke oil is not available, normal four-stroke oils of Premium and Heavy Duty grades (ML, MM and MS ratings according to the new API system) can be used, provided that the viscosity is at least SAE 30.

Two main types of two-stroke oil are available on the market, viz. a thick oil with a viscosity of SAE 30—40 called "two-stroke oil" and a thinner type, which has been diluted with a thinning agent by the manufacturer and is called "self-mixing two-stroke oil".

SAAB 95/96

The engine of the Saab 95 and 96 is lubricated by oil mixed with the gasoline.

As self-mixing two-stroke oil is thinner than ordinary two-stroke oil it must be noted that the former oil requires a higher admixture percentage.

See Table.

NOTE!

Saab 95/96 winter and summer as well:
Saab Sport in summer:
If two-stroke oil is not available, e.g. when touring abroad, the normal four-stroke oils of Premium and HD types (ML, MM and MS) may also be used, provided the viscosity corresponds to at least SAE 30.

ADMIXTURE TABLE, SAAB 95 AND 96

Two-stroke oil SAE 30—40 or normal four-stroke oil of Premium or HD type, min. SAE 30	Self-mixing two-stroke oil
3 % = 1:33	4 % = 1:25

The fuel tank has a built-in mixer for the oil. When refilling the tank, pour the oil in first and fill with gasoline afterwards. At temperatures below = 23°F (—5°C) however, the mixer does not work satisfactorily, and at low temperatures the oil must therefore be diluted with an equal amount of gasoline before it is poured into the tank.

SAAB SPORT

The engine of the Saab Sport is lubricated separately, implying that the tank must be filled with gasoline only. Pour oil into the separate oil tank in the engine compartment. This tank holds about 0.8 U.S. gal. (3 liters), i.e. sufficient for at least 900 miles (1,500 km) under normal driving conditions.

The following oils are recommended:

Summertime: Two-stroke oil SAE 30—40 or self-mixing two-stroke oil

Wintertime: (at outdoor temperatures below 14°F or —10°C): Self-mixing two-stroke oil.

Note: If the lubrication system is to work satisfactorily when the car is left standing outdoors in the winter or is driven at temperatures below 14°F (—10°C), self-mixing two-stroke oil must be used. Ordinary two-stroke oil SAE 30—40 or Premium and Heavy Duty oils SAE 30—40 should therefore not be used during the winter.

IMPORTANT!

Multigrade oils with viscosity SAE 10 W-30 must not be used, neither for Saab 95/96, nor for Saab Sport.

Other attention

When refilling the fuel tank, the following points should also be checked regularly. Top up as required:

1. The brake-fluid level in the master cylinders for brakes and clutch.
2. The electrolyte level in the battery.
3. The coolant level in the radiator.
4. The tire pressure.

Other lubrication

Whenever necessary, also lubricate the following points:

1. Lubricate the seat rails with chassis grease if stiff. Wipe off all superfluous grease to avoid staining clothes and upholstery.
2. Lubricate the seat-back adjuster with SAE 40 oil.
3. Lubricate the felt bushing in the gear-shift shaft bearing moderately with paraffin oil whenever the bushing is removed.
4. Lubricate the gear-shift shaft bearing at the dash panel with SAE 40 oil.

Laying up

If the car is to be laid up for any length of time, e.g. during the winter months, it should first be lubrication serviced. To avoid corrosion and other internal damage to the engine, the car should be driven about 30—150 miles (50—250 km) on a fuel mixture to which 0.5 % Desolite K has been added. If necessary, drain the cooling system. Also remove the battery and store it at room temperature in well-charged condition.

WASHING AND POLISHING

General

Proper care and attention is necessary to retain the gloss, durability and protective properties of the enamel finish.

Washing

A new car should be washed frequently in order to harden the enamel, improve its toughness and retain its gloss more effectively. Use water only, as additives tend to dry out the enamel. If washing with water does not suffice, however, a weak soap solution (not more than 2 %) can be used, but great care must be taken to remove all traces of it from the car after washing. This is best done by the generous use of water and thorough sponging. Never wash the car in strong sunshine, and always dry the enamel with a clean chamois leather. If the car is left to dry naturally in the sun, lime in the water may cause patchiness.

Polishing

Generally speaking, synthetic enamels should never be polished until polishing is absolutely essential. In any event, the enamel must not be polished until it has hardened properly, which takes about 5 or 6 months. The purpose of polishing is to impart an attractive appearance to the enamel finish and to provide it with fats to prevent drying-out. Never use polish containing an abrasive on a new car. Treatment of this kind may possibly be necessary after a number of years in order to remove oxidation products and suchlike from the finish. Always clean the car thoroughly before undertaking any form of polishing, as otherwise the finish will get scratched.

Waxing

After polishing, the car can be waxed. As with polishing, a new car should not be waxed until at least 5—6 months after enameling. After rubbing in the wax on a small area at a time, rub the surface very thoroughly to remove all accumulations of wax.

UNTERBODY COATING AND RUST-PREVENTIVE TREATMENT

Touching-up of underseal

To retain the advantages afforded by underseal composition, the underbody, too, should be regularly inspected and the underseal touched up as necessary. Apart from protecting against corrosion, the underseal improves sound insulation. This protection is particularly important with regard to the fenders, which are continuously exposed to wear from a constant barrage of flying stones and gravel. Before covering worn or bare parts with fresh underseal composition, clean the metal thoroughly with a scraper and a steel-wire brush and then wash with gasoline or suchlike. Before applying fresh composition, coat the metal with a reputable make of rust inhibitive, and then apply an appropriately thick coating of composition before the rust inhibitive has dried. Excessive application will result in the composition running and it may even pull right away from the metal which it is intended to protect.

Naturally, new metal panels, such as fenders, must always be treated in a similar manner after fitting. If underseal is applied prior to spraying it is essential that all composition be washed off the surfaces which are to be enameled.

Rust-preventive treatment

It is a matter of common knowledge that all Saab cars are given an underbody coating before leaving the factory. This treatment affords good protection against corrosion.

Despite this, the spreading of salts, etc., on the roads involves a risk of corrosion, and we therefore recommend that the underbody of the car be inspected at least once a year. This is particularly important to car-owners residing in places where cars are especially subject to corrosive attacks.

Whenever necessary, the car should be entrusted to a reputable firm for rust-preventive treatment with an approved rust-inhibitive as described in the following.

Treatment with rust-inhibitives

In order to prevent corrosion, the body should be treated once a year with a reputable make of rust-inhibitive, proceeding in the manner prescribed by the manufacturer thereof. The parts of the Saab body requiring protection against corrosion are indicated in the following description.

SAAB 96 AND SPORT

To facilitate anti-corrosion treatment, the following parts should be removed from the car:

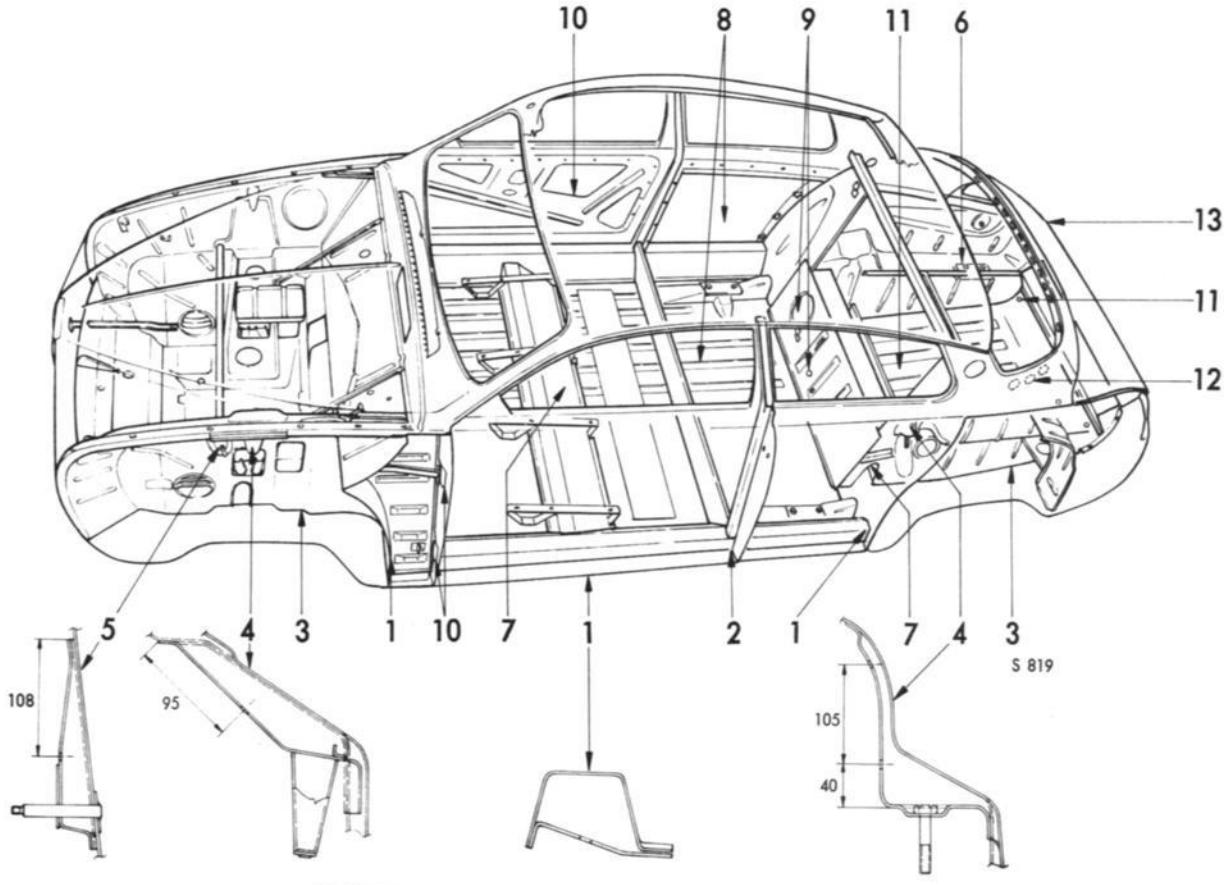
1. Wheels and hub caps.
2. Battery.
3. Door and side panel trims. Remember to refit the cardboard for water deflection in the doors.
4. Rear seat cushion and back.
5. Mats.
6. Spare wheel and tools. Trunk floor.
7. Scuff plates. The four covers must be sealed effectively when refitted.

Drilling of holes for spraying

Holes drilled for spraying must be 11 mm 0.43 in. or less. 11-mm holes can appropriately be plugged with plug No. 716306.

The following parts of the body are to be treated by spraying:

1. The insides of the scuff plates through the holes provided in the front and rear end, and through a hole drilled in the middle of the underside of the scuffs. See fig. This hole must be plugged.
2. The filler plate on the scuff plate at the rear door pillar, is to be folded out and sprayed inside.
3. The wheelhouses and the entire underside, all seams and joints. The insides of the front and rear fenders, especially the joints between the body and the fenders. Note! Cover the holes leading in to the engine compartment.
4. The front and rear spring supports through holes drilled as indicated in the sketch. The holes must be plugged.
5. The front shock-absorber bracket through holes drilled as indicated in the sketch. The holes must be plugged.
6. The muffler bracket on the rear, righthand wheel house. Spray thoroughly at point of attachment to wheel house.
7. The real-axle tunnel, especially round the rear-axle attachment to the body.
8. Brake and fuel pipes in channels on the floor, joints and seams on the inside of the floor. The space between the seat member and the floor as well as the rear side valances, especially the lower part.
9. The real axle tunnel through the two large openings and through hole drilled in the middle of the tunnel about 20 mm. (3/4 in.) from the foor. The hole must be plugged. See item 1.
10. Spray with reduced pressure inside the doors and on the hinges. Spray towards the door bottoms. Don't spray the lock mechanism.
11. The space around the fuel tank and the spare wheel compartment. The rear crossmember in the spare wheel compartment through the two holes provided.



RUSTPREVENTING TREATMENT SAAB 96 AND SPORT

Positions refer to the text on this and the preceeding page.

12. The ventilation duct through the holes from the luggage compartment and through the drain holes provided under the rear fenders. (Not later cars of the 1965-model where an altered draining is introduced.) Make sure that the drain holes are not clogged by the rustpreventive. (Not valid for later cars of the 1965-model.)
13. The luggage compartment door between the inner and outer panels (sparingly). The insides of the bumbers. Don't spray on the paintwork.

The following details are to be treated by brushing:

Battery ledge, hub caps and moulding.

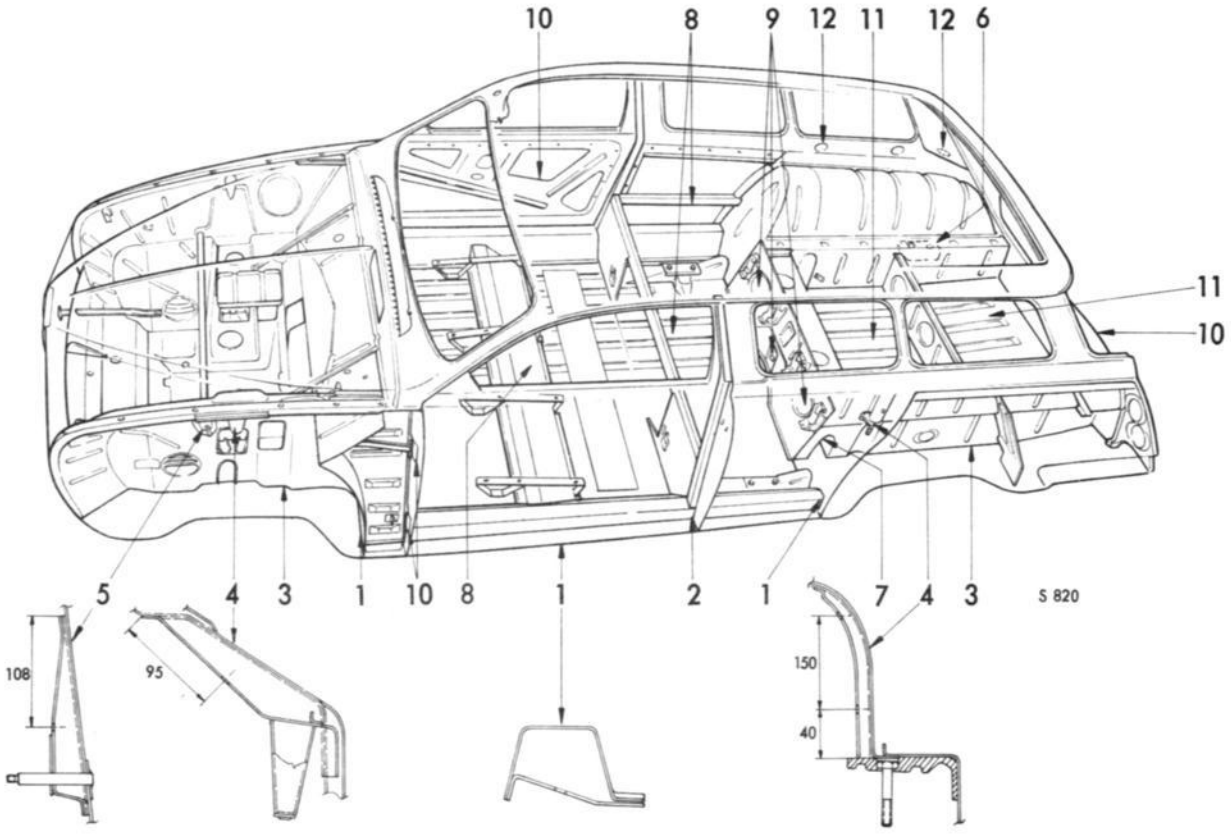
SAAB 95

To facilitate anti-corrosion treatment, the following parts should be removed from the car:

1. Wheels and hub caps.
2. Battery.
3. Door and side panel trims. Remember to refit the cardboard for water deflection in the doors.
4. Rear seat cushion and back.
5. Mats.
6. Spare wheel and tools. Trunk floor.
7. Scuff plates. The four covers must be sealed effectively when refitted.

Drilling of holes for spraying

Holes drilled for spraying must be 11 mm 0.43 in. or less. 11-mm holes can appropriately be plugged with plug No. 716306.



RUSTPREVENTING TREATMENT SAAB 95

Positions refer to the text below.

The following ports of the body are to be treated by spraying:

1. The insides of the scuff plates through the holes provided in the front and rear end, and through a hole drilled in the middle of the underside of the scuffs. See fig. This hole must be plugged.
2. The filler plate on the scuff plate at the rear door pillar, is to be folded out and sprayed inside.
3. The wheelhouses and the entire underside, all seams and joints. The insides of the front and rear fenders, especially the joints between the body and the fenders. Note! Cover the holes leading in to the engine compartment.
4. The front and rear spring supports through holes drilled as indicated in the sketch. The holes must be plugged.
5. The front shock-absorber bracket through holes drilled as indicated in the sketch. The holes must be plugged.
6. The muffler bracket on the rear, righthand wheel house. Spray thoroughly at point of attachment to wheel house.
7. The rear-axle tunnel, especially round the rear-axle attachment to the body.
8. Brake and fuel pipes in channels on the floor, joints and seams on the inside of the floor. The space between the seat member and the floor as well as the rear side valances, especially the lower parts.
9. The rear axle tunnel through the two large openings and through hole drilled in the middle of the tunnel about 20 mm. (3/4 in.) from the floor. The hole must be plugged. See item 1.
10. Spray with reduced pressure inside the doors and on the hinges. Spray towards the door bottoms. Don't spray the lock mechanism.
11. The space between the fuel tank, and the foot-space floor all joints and seams.
12. The vent duct, through the round holes provided under the rear side windows. Through the round vent holes in the gusset plate at the rear side wall partly straight rearwards out into the fins, partly upwards towards the roof. Upwards to be sprayed with reduced pressure in order not to damage the headlining.

The following details are to be treated by brushing:

Battery ledge, hub caps and mouldings.

CONTENTS

DESCRIPTION

Engine, Saab 95 and 96 models

The Saab engine is a three-cylinder, liquid-cooled two-stroke engine with crankcase scavenging, piston-guided ports and cylinder scavenging on the Schnürle principle. The engine is lubricated by oil mixed with the fuel.

The Saab 95 and 96 models are fitted with an identical 850-cc engine.

The cylinder block and lower half of the crankcase are made of cast iron and machined to match. In order to ensure that these parts are mated, the crankcase number is punched into both on either side of the joint, at the right rear of the engine.

The cylinder head is made of a light alloy.

The crankshaft is built up as an extremely sturdy fabricated unit, comprising six crank webs and seven crank pins assembled by press fit. This allows the use of single ball bearings and double roller bearings as main and connecting-rod bearings respectively. The crankshaft is carried in four main bearings and is fitted with a torsional vibration damper.

Seals of piston-ring type are to be found between the three crankcase compartments and the flywheel end of the motor. Each seal consists essentially of two piston rings seated in grooves and acts as a labyrinth seal. At the front end of the engine, the crankcase is sealed by rubber gaskets on the two covers of the distributor-gear housing. A sectioned engine is shown in the illustration below.

As reconditioning of the crankshaft involves the use of special tools and necessitates very great precision, this task should be entrusted to the makers.

The connecting rods are drop-forged and hardened. The piston pin is carried in a needle bearing at the small end of the connecting rod, while the big end is designed so that its internally ground surface forms the outer race in the connecting-rod bearing.

The connecting rods are piston-guided.

The engine is fitted with Ringstreifen pistons with rings of chromed steel.

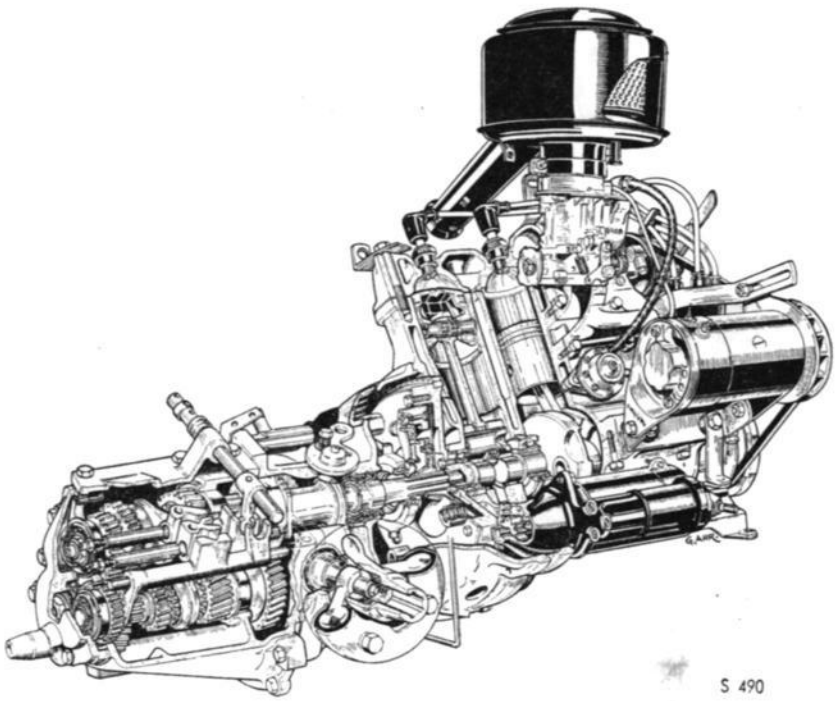
Engine, Saab Sport

The engine in the Saab Sport car is a three-cylinder, liquid-cooled two-stroke with crankcase scavenging, piston-guided scavenging times and cylinder scavenging on the Schnürle principle. The enginge has separate lubrication, which implies that oil is distributed by an oil pump from a separate oil tank direct to cylinders and bearings. The cubic capacity of the engine is 850 cc., i. e. the same as the Saab 95 and 96 models. The bore and stroke are also the same as in these models.

The cylinder block and lower half of the crankcase are made of cast iron. The cylinder-block casting houses steel pipes which conduct lubricating oil to the three cylinders and the four main bearings.

The cylinder head with the upper coolant outlet is made of a light alloy.

The crankshaft is built up as an extremely sturdy fabricated unit, comprising six crank webs and seven crank pins, assembled by press fit. This allows the use of single ball bearings and double roller bearings as main and crank bearings respectively. The crankshaft is carried in four main bearings and is fitted with a torsional vibra-



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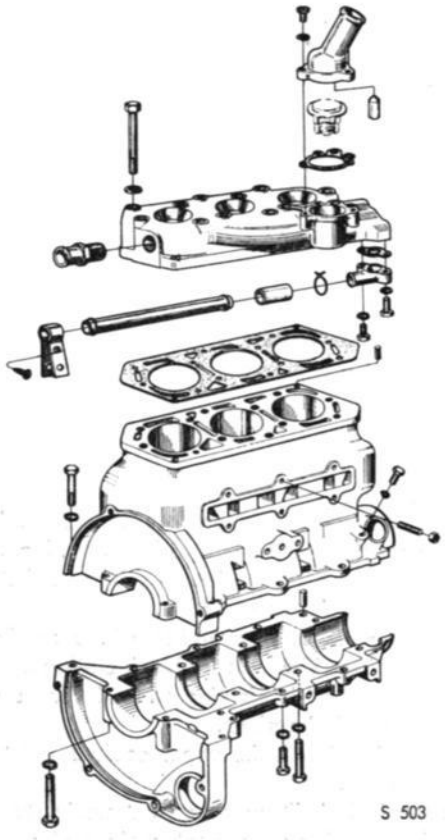
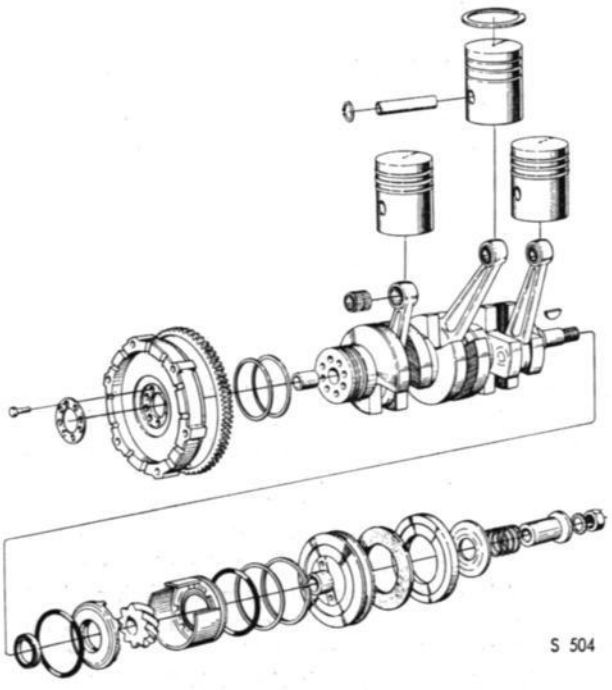
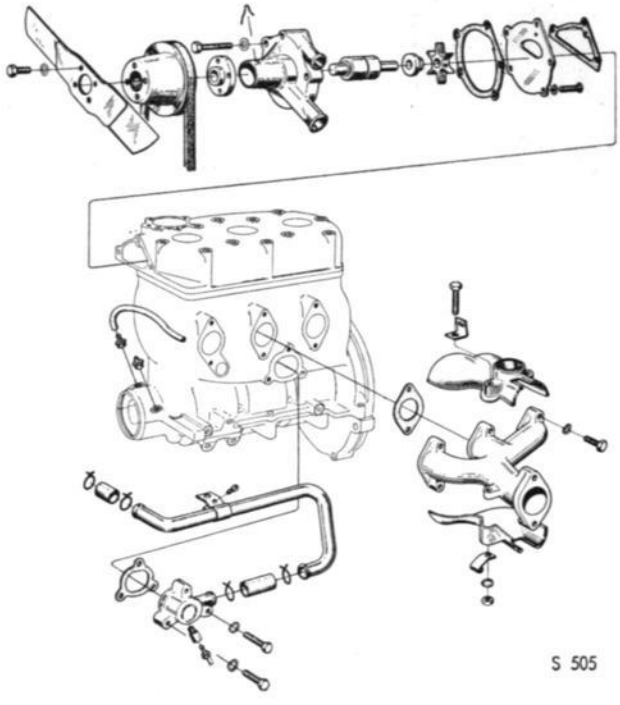
POWER UNIT, SAAB 95 AND 96, CUT-AWAY VIEW



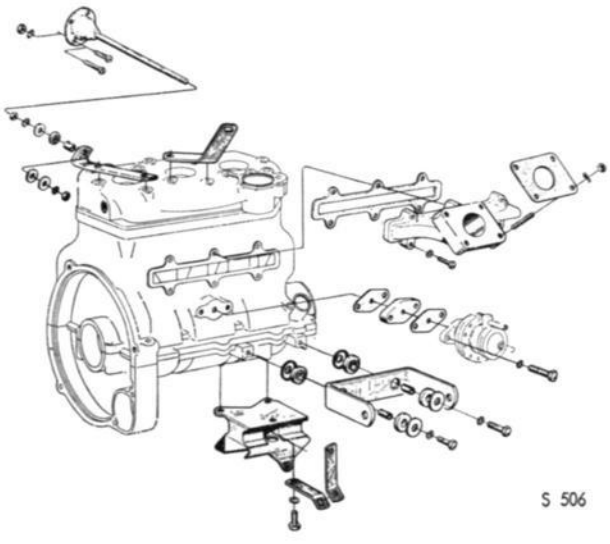
ENGINE BODY WITH CYLINDER HEAD



CRANKSHAFT WITH PISTONS



WATER PUMP AND CONNECTING PARTS, LEFT



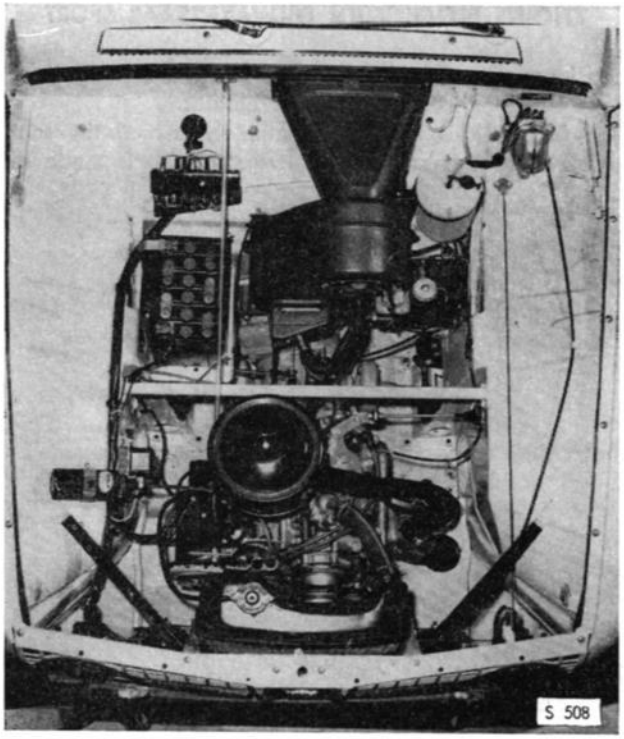
CONNECTING PARTS, RIGHT

tion damper. The distributor drive pinion is located at the front end of the crankshaft. The pinion is fitted with a slip clutch which functions if the oil pump happens to jam or if the lubricating oil is too thick. The crank webs are round, giving higher crankcase compression than in the Saab 95 and 96 models. Seals of piston-ring type are used to seal off the three crankcase compartments from one another at the crankshaft and outwards. Each seal comprises two piston rings seated in grooves. The actual piston ring does not rotate and works, in principle, as a labyrinth seal.

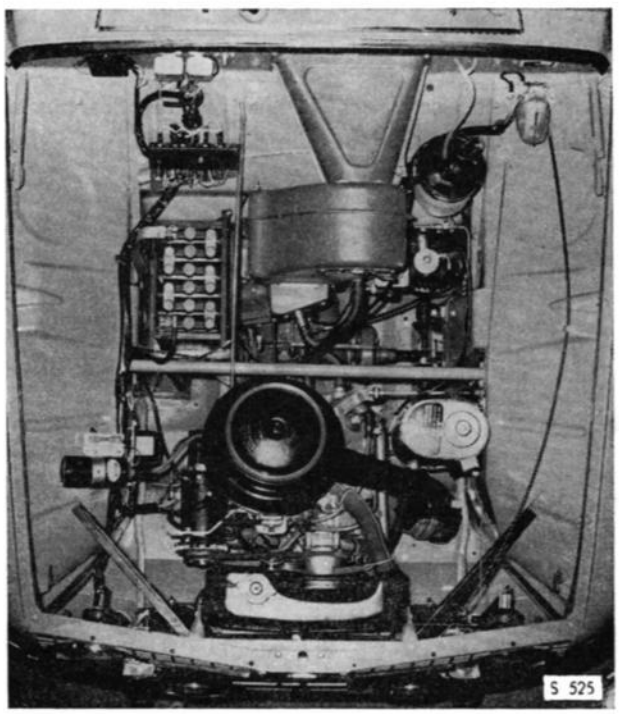
The connecting rods are drop-forged and hardened. Their ground surfaces form direct races for the connecting-rod bearings and piston-pin bearings. The connecting-rod bearing comprises double rows of rollers which are guided by a roller cage, while the piston-pin bearing is of the needle type. The connecting rods are piston-guided, implying that they are guided axially in the piston, while they have a big clearance between the crank webs in the connecting-rod bearing.

As reconditioning of the crankshaft involves the use of special tools and necessitates very great precision, this task should be entrusted to the makers.

The thick-bottomed pistons are of all-aluminium type. They are fitted with two compression rings and an oil-wiper.



ENGINE IN CAR, SAAB 95 AND 96



ENGINE IN CAR, SAAB SPORT

Lubricating system

The engines of Saab 95 and 96 models are lubricated by oil mixed with the gasoline.

In the Saab Sport, the moving parts of the engine are lubricated with clean oil, which is pumped out to all cylinders and main bearings through oilways in the engine block from a special oil tank. From the main bearings, the lubricating oil is forced on to the connecting-rod bearings, and then splash-lubricates the cylinder walls. The oil tank, located to the left of the engine, holds about 0.8 U.S. gal. (3 liters) — enough for 1000—1200 miles (1500—2000 km). A level-indicator pipe on the outside of the tank shows how much oil is left, and a warning lamp on the instrument panel lights up if the oil supply is interrupted for any reason whatsoever.

The oil pump is driven by the distributor drive pinion on the crankshaft. The speed is reduced substantially by planetary gearing inside the pump housing. When the pump is working, the cylinder and piston rotate slowly, while the piston travels to and fro in the cylinder.

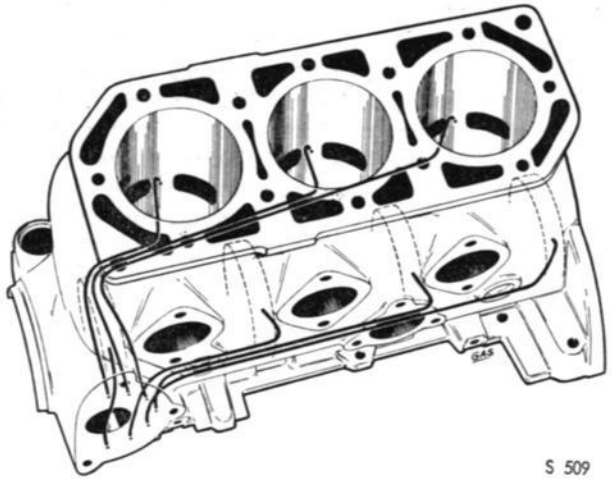
The piston derives its motion from a cam. As the cylinder goes round, the oilways to the seven lubrication points are uncovered one by one.

The oilways in the engine block and the pump meet at the pump sealing surface against the engine block, sealing being effected with a gasket.

In addition to the seven lubrication points in the engine block, the ignition distributor gear is lubricated by the oil which first lubricates the planetary gear and the pump shaft.

A monitor for keeping a check on the oil supply is fitted to the pump. It consists essentially of a spring-loaded plunger, actuated by the oil pressure and wired to a relay and a warning lamp on the instrument panel. When the engine is at a standstill, or if the oil pressure falls below a certain minimum, the incoming pump lead from the relay is earthed continuously, and the warning lamp on the instrument panel lights up. The lamp is off when the oil supply is normal.

The oil pumps are sealed and must not be opened. Consequently, a damaged pump must be replaced in its entirety. An exchange system is operative for this unit, on condition that the pump seal is unbroken. The only servicing which is permitted on this pump is changing the contact device for the oil monitor and changing the pump pinion.



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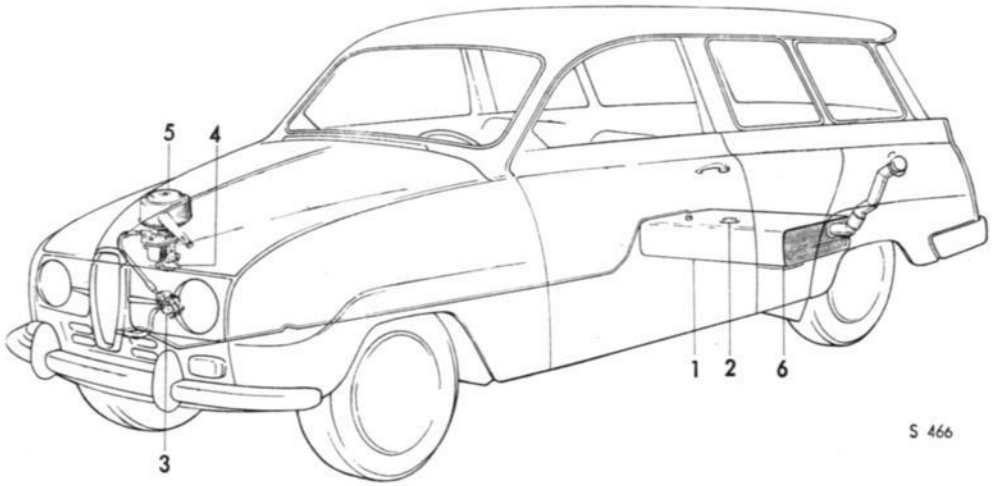
ENGINE BLOCK WITH OILWAYS, SAAB SPORT

Fuel system

The fuel system comprises the fuel tank, fuel line, pump, fuel hose and carburetor with air cleaner. Fuel filters are incorporated both in the fuel pump and at the fuel-hose banjo connection at the carburetor.

The fuel tank is located immediately behind the rear axle, where it is secured by two straps. It is made of



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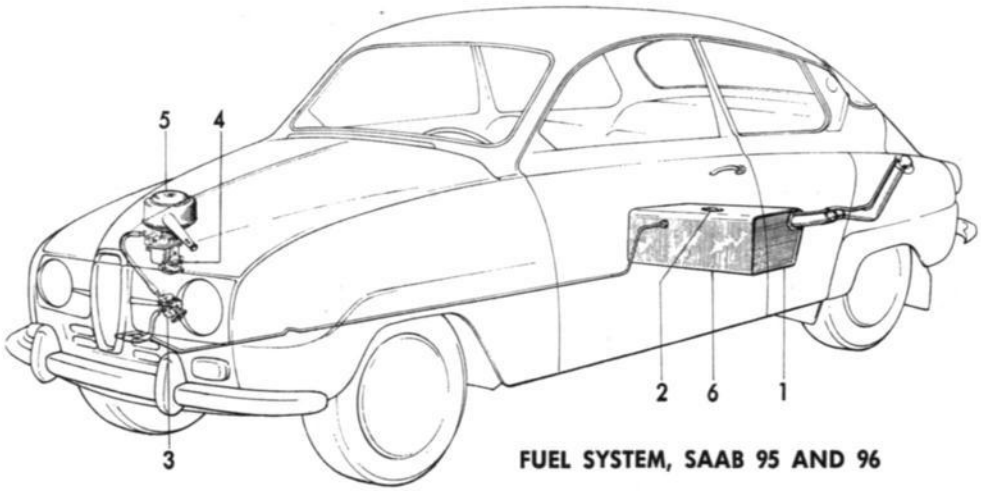


FUEL SYSTEM, SAAB 95 AND 96

1. Fuel tank
2. Fuel tank guage
3. Fuel pump
4. Carburetor
5. Suction silencer with filter element
6. Drain plug (accesible from beneath the car)

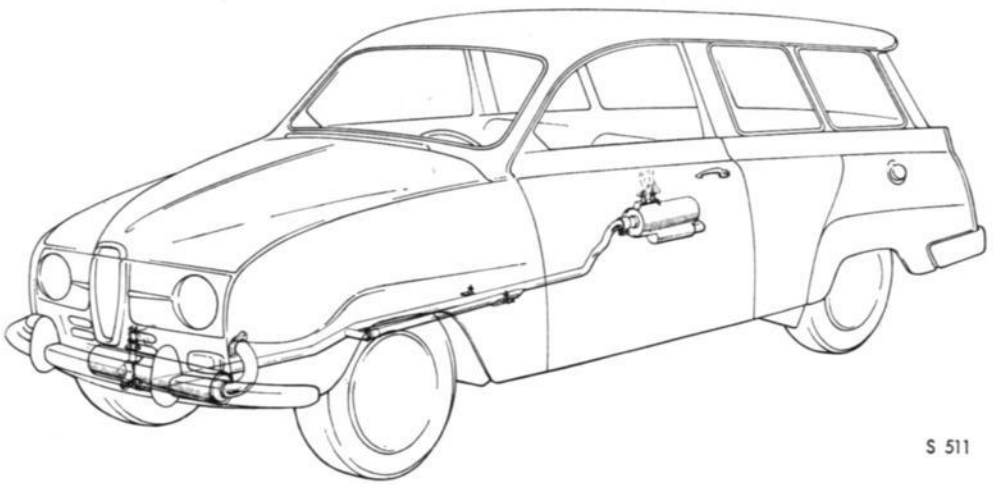
lead-plated steel, and features a surge baffle and a built-in mixer device. A non-return valve is fitted at the point where the filler pipe enters the tank, and serves to prevent fuel from splashing out through the filler pipe while the car is being driven. The fuel line is connected to a nipple, located in a retaining plate soldered to the tank.

The length of the suction pipe inside the tank is adapted so as to ensure that small particles of foreign matter in the fuel will remain at the bottom of the tank. A drain plug, accessible from under the car, facilitates emptying. Mounted in the top of the tank is the electric sender for the fuel gage.

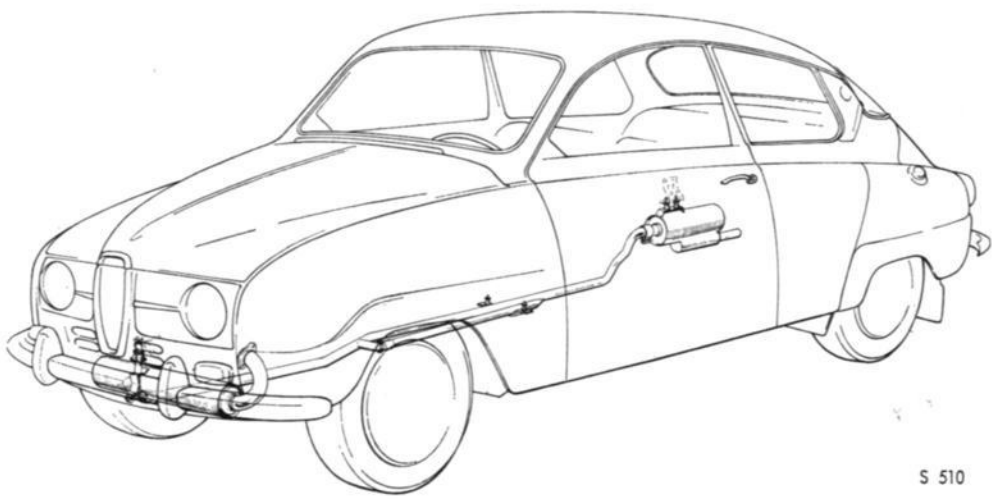
The fuel line, which runs along one of the floor pan channels to the front right wheel house, consists of Bundy tube (copper-plated steel tubing).

The diaphragm-type fuel pump is mounted on the crankcase of the engine. The pressure variations in the crankcase affect the diaphragm, causing the pump to supply fuel to the carburetor. The fuel pump is fitted with a filter which must be cleaned every 12000 miles (20.000 km). Saab 95 and 96 features a single down-draught carburetor, fitted with a filter in the supply line banjo union. The carburetor is a Solex 40 BI or Zenith 34 VNN carburetor. The Saab Sport is equipped with a Solex 34 W tripple carburetor.

The carburetor is fitted with an air cleaner with a replaceable paper filter. A removable preheater pipe is fitted between the air cleaner and the exhaust manifold.



S 511



S 510

EXHAUST SYSTEM, SAAB 95 AND 96

Exhaust system

The engine exhaust system comprises the exhaust manifold, the front and rear mufflers and the exhaust pipe, arranged as illustrated.

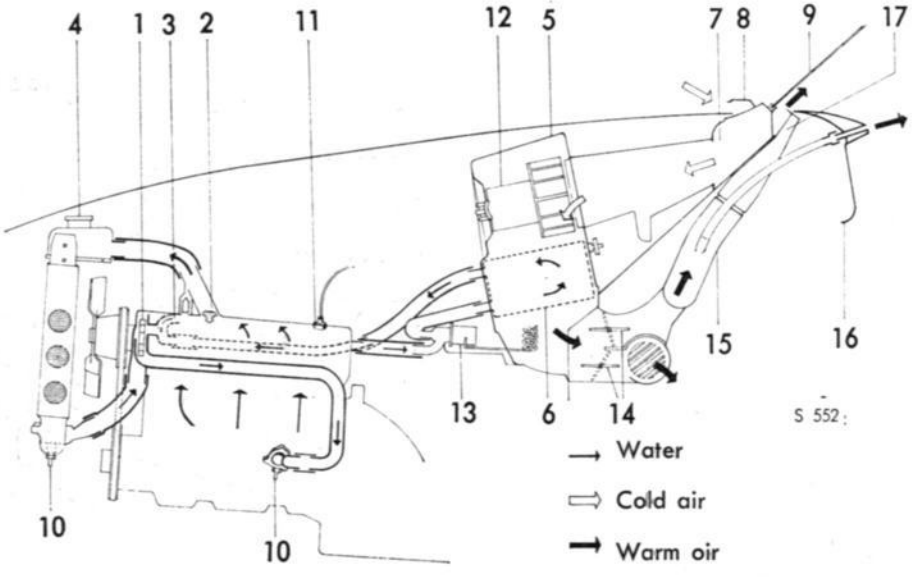
The exhaust manifold, which collects the gases expelled from the cylinders, is fitted to the cylinder block, three asbestos gaskets being used to ensure the necessary seal between these two units. The flange of the front muffler connection pipe and the manifold are connected with a gasket between them.

The front muffler is located under the front engine com-

partment floor behind the front lower panel. It incorporates a number of internal baffles and tubes, comprising an integral welded unit.
The rear muffler is located behind the right rear wheel and is carried in rubber bushings on a bracket welded to the wall of the wheel house. This muffler is also a welded unit, incorporating the tail pipe which discharges the exhaust gases below the rear bumper.
The exhaust pipe which unites the front and rear mufflers is inserted in and clamped to the two muffler pipe connections. These connections are slit to ensure a tight fit when the clamps are tightened.
The exhaust pipe clamp under the floor carries rubber bushings, their purpose being to reduce pipe vibration and to prevent the transference of such vibration to the body panels.
The exhaust pipe is fitted with a pressure-equalizing expansion pipe.
The Saab Sport car has twin exhaust pipes.

Cooling system

The engine is liquid-cooled. The cooling system comprises the engine water jacket, radiator, pump, thermostat and hoses. In addition, the system incorporates an engine driven fan which draws air through the system. The fresh-air heater for the driver-and-passenger compartment is directly connected to the cooling system. The radiator consists of an upper and a lower water tank, interconnected by means of a tube-type cooling core.
The radiator is fitted with a pressure cap, enabling the coolant temperature to be maintained at around 200°F (95°C) without appreciable loss of water from the system.
The water pump, of centrifugal type, is located on the front part of the engine and coupled to the fan. The pump and fan are vee-belt driven by the engine.
The flap-type thermostat, frequently termed a wax element thermostat, commences opening at a temperature of about 178°F (81°C). On the inlet side of the thermostat there is a connection for the by-pass line through which the water flows until the thermostat opens. In order to bleed the system when filling, a special float valve is placed at the thermostat. The by-pass line, together with the fresh-air heater element, is connected in parallel with the radiator.
The cooling fan is located behind the radiator and is driven together with the water pump by a vee-belt on the crankshaft.



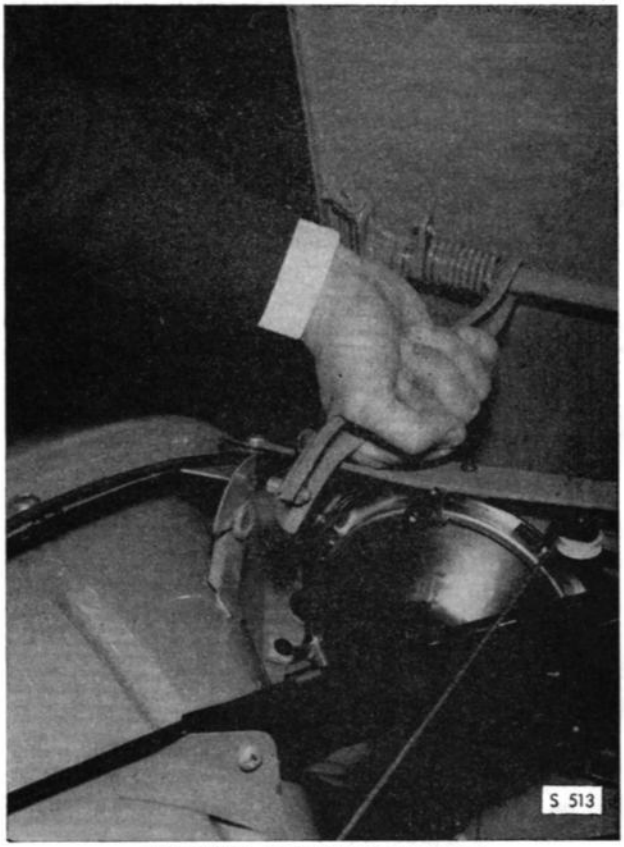
COOLING SYSTEM AND FRESH-AIR HEATER

1. Water pump
2. Thermostat
3. By-pass
4. Radiator
5. Fan housing
6. Heat exchanger
7. Collector box
8. Fresh-air intake
9. Windshield
10. Drain cocks
11. Thermometer bulb
12. Fan motor
13. Thermostat valve
14. Air distributor
15. Defroster hose
16. Instrument panel
17. Defroster jet

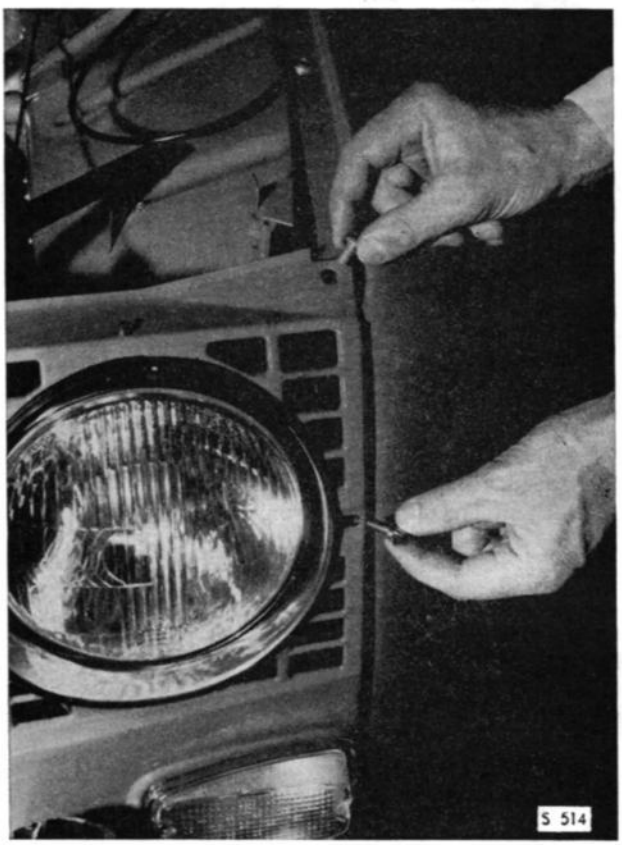
REMOVAL AND INSTALLATION

Removal of engine

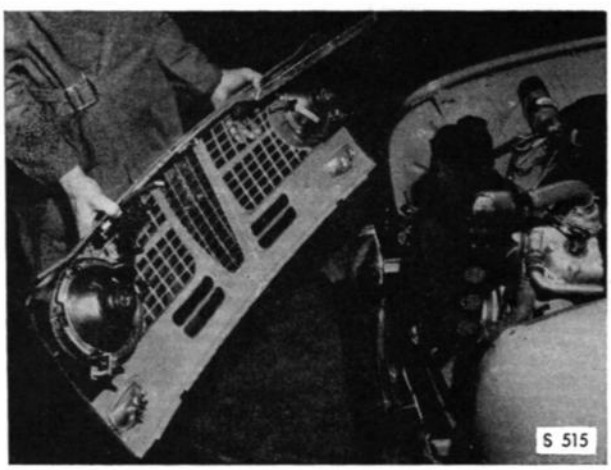
1. Disconnect the battery earth cable at the battery.
2. Remove the hood. To do this, open the hood wide and then grip the hinge stay, bending it slightly inwards to release the pin on one side. The assistant holding the hood on the other side helps to lift it off.
3. Drain the cooling system.
4. Disconnect the headlamp and direction-indicating flasher cables.
5. Disconnect the cord from the radiator blind and the hood lock mechanism.
6. Back off the four screws for the front ponel and detach the two radiator supports from the body plate. Remove the clamping straps from the radiator.
7. Lift off the front panel, taking great care to avoid damaging the paintwork by knocking against the overriders.
8. Disconnect the upper and lower coolant hoses from the engine.
9. Back off and remove the two lower radiator retaining screws and remove the radiator.
10. Disconnect the distributor primary cable, the ignition coil cable and the generator cables. Detach the ventilation hose from the distributor cover.
11. Remove the air cleaner and preheater pipe.
12. Disconnect the fuel line from the pump.
13. Disconnect the cold start control and the throttle linkage rubber bellows from the carburetor.
14. Disconnect the two heat-exchanger hoses and the temperature gage sender unit from the engine block.
15. Disconnect the engine side stay.



REMOVAL OF ENGINE HOOD



REMOVAL OF FASTENING SCREWS, FRONT PLATE

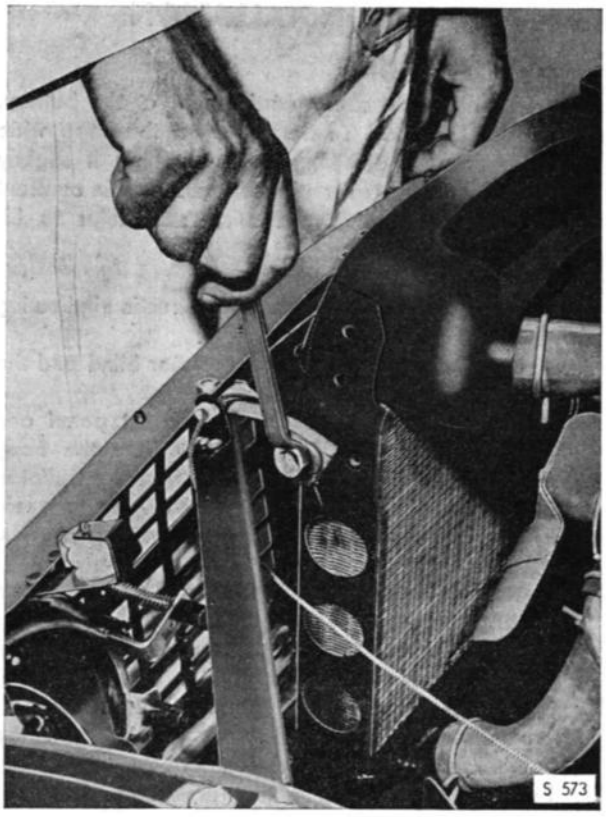


REMOVAL OF FRONT PANEL

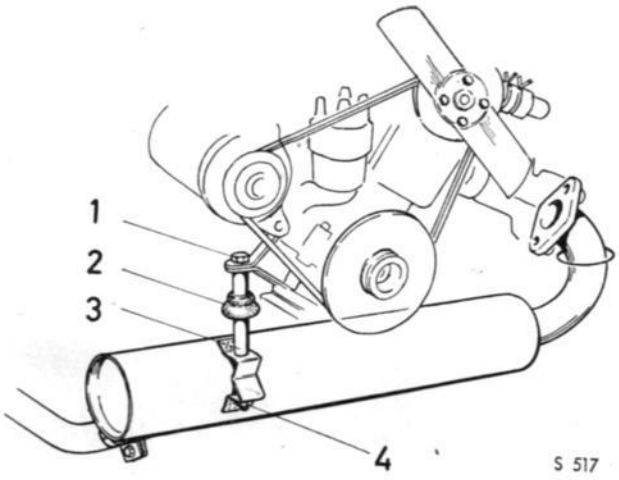
16. On Saab Sport cars: disconnect the oil pressure monitor line and the hose from the oil pump. Bend the hose upwards and tie in this position to prevent escape of oil. Cover the connections to prevent foreign matter from entering the oil pump or hose.
17. Back off and remove the two muffler flange bolts on the exhaust manifold and slacken the exhaust pipe clamp.
18. Back off the muffler retaining nut and tie the muffler in position to avoid damaging the exhaust pipe.
19. Disconnect the front engine supports from the body. The six bolts are accessible from under the engine compartment floor.
20. Lift the engine slightly with lifting hook 784058 and block up the gearcase with a 3 1/2" (90 mm) wooden block. See illustration.
21. Back off and remove both starter retaining bolts and place the starter on the engine compartment floor. There is no need to disconnect the cables.
22. Back off and remove the screws used to hold the engine to the gearcase and pull the engine out, taking care not to damage the clutch shaft.

Installation of engine

1. Lift the engine and lower it into the car, using lifting hook 784058 (see illustration). Check that the splines on the clutch shaft are undamaged and smear them with a little grease.
2. Bolt the engine to the gearcase and reconnect the engine earth cable.
3. Refit the starter.
4. Remove the block from under the gearcase and lower the assembly.
5. Refit the front engine supports to the body and the side stay to the engine. Make sure that the engine is not laterally constrained.
6. Refit the muffler by securing it to the exhaust manifold and muffler bracket. Note: Do not tighten the bracket nut.
7. Tighten the flange bolts, the bracket nut and the exhaust pipe clamp in the said order.
8. On Saab Sport cars, reconnect the hose to the oil pump and the cable to the oil monitor on the pump. Turn the pump shaft round about 100 times by hand, using tool 784195 or a screwdriver. (See lubricating system.)
9. Reconnect the heat-exchanger hoses and the water temperature gage sender unit.

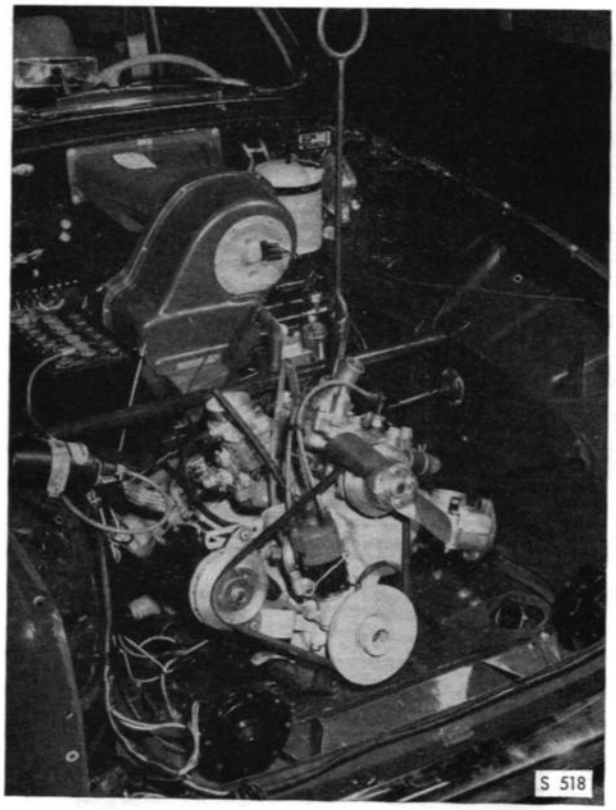


REMOVAL OF RADIATOR



FRONT MUFFLER SUPPORT

1. Bolt
2. Rubber grommet
3. Spacer sleeve
4. Nut and spring washer

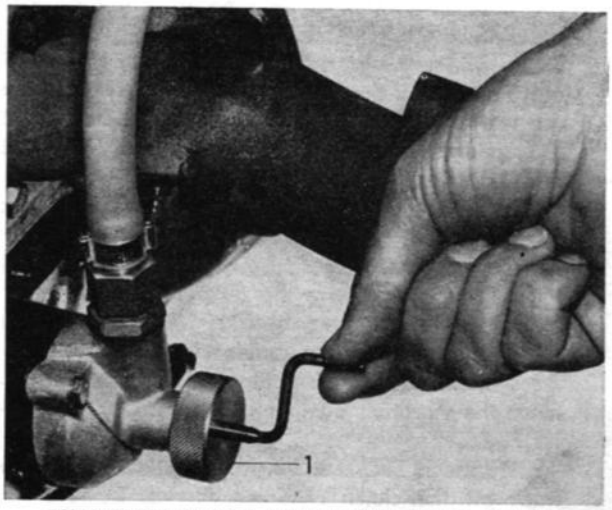


REMOVAL AND INSTALLATION OF ENGINE

10. Reconnect the throttle and cold-start controls.
11. Refit the air cleaner and preheater pipe and reconnect the fuel hose.
12. Reconnect the distributor and generator cables. Refit the distributor ventilation hose.
13. Refit the radiator and the upper and lower coolant hoses.
14. Replace the front lower panel, taking care to avoid damaging the paintwork against the overriders.
15. Remount the upper radiator clamping strap and the two radiator stays.
16. Refit the radiator blind cord and the hood lock mechanism.
17. Reconnect the headlamp and direction-indicating flasher cables.
18. Refill the cooling system.
19. Refit the hood.
20. Reconnect the battery earth cable.
21. Check the clutch pedal play and adjust if necessary.
22. Adjust the ignition setting as described in chapter 3.
23. Test the engine.

NOTE

The oil-pump shaft must be turned round about 100 times after reconnecting the hose from the tank every time the oil pump or engine of a Saab Sport car has been removed. This ensures that the oil pump and oilways will be filled with oil before the engine is started. The pump shaft must be rotated manually, as rotation faster than about 60 r/m would result in damage to the oil pump.



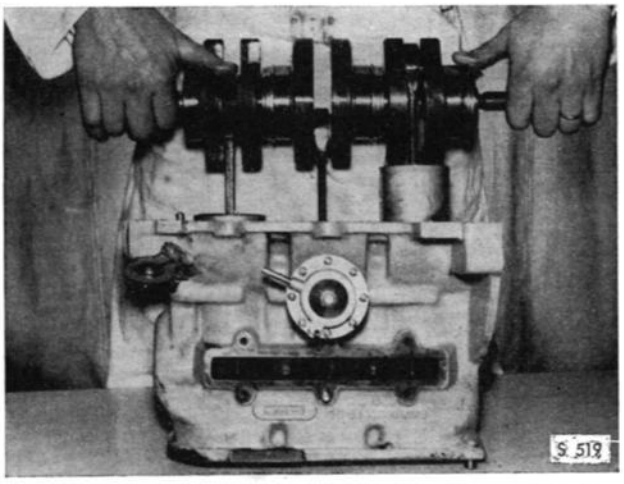
TURNING THE OIL PUMP WITH TOOL 784195

1. Tool 784195

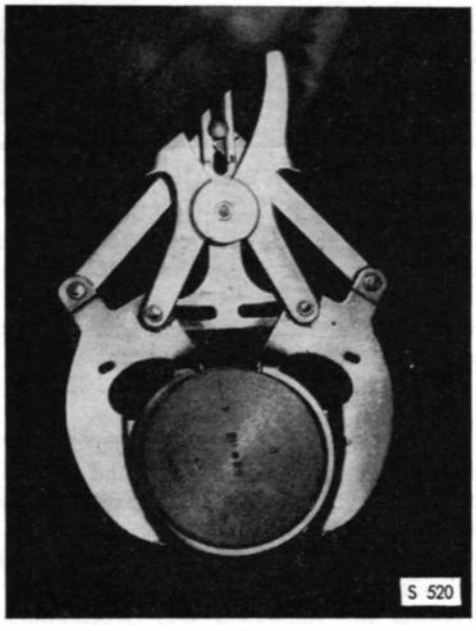
DISASSEMBLY AND REASSEMBLY

Disassembly of engine

1. Clean the engine externally.
2. Remove the fan belt and the generator.
3. Remove the induction manifold complete with carburetor, the fuel hose and the vacuum hose.
4. Detach the fuel pump from the engine block.
5. Remove the exhaust manifold.
6. Detach the hose connection from the engine inlet pipe and possibly the inlet pipe from the engine block.
7. Back off the cylinder-head bolts and remove the cylinder head. Take away the gasket. Possibly detach the heat exchanger return pipe from the cylinder head and the engine inlet pipe from the pump.
8. If the water pump and thermostat are to be removed, take off the fan and the pulley. Then detach the water pump from the cylinder head. Disconnect the upper outlet pipe and put aside the thermostat and the valve.
9. Back off the distributor clamping screw and remove the distributor.
10. On Saab Sport cars: back off the oil-pump retaining screws and remove the oil pump.
11. Turn the engine over, upside down. Make sure that the bench is clean and perfectly flat.
12. Back off the crankshaft pulley retaining nut and remove the vibration damper and the pulley. Use puller 784055.
13. Insert spacers 784209 under the clutch levers and then back off the clutch retaining screws. Remove the clutch.
14. Release the lock washer and back off the flywheel retaining bolts. Remove the flywheel.
15. Remove the engine supports from the lower crankcase half.
16. Back off the bolts, and lift off the lower crankcase half.
17. Lift out the crankshaft with pistons. Take great care to avoid bending the connecting rods or damaging the pistons. Removal is simplified by inserting the clutch centering tool 784064 in the flywheel end and screwing tool 784057 to the stub at the other end of the crankshaft. See illustration.
18. Take off the outer cover of the distributor gear housing and put it aside together with the retaining ring and shims.
19. SAAB 95 AND 96 MODELS: Remove the distributor pinion with puller 784051 and then remove the inner cover together with the O-ring.
    SAAB SPORT CAR: Remove the distributor pinion together with the fiber washer. Remove and put aside the two slip-clutch pins and springs.
20. Remove the piston retaining rings and drive the piston pins out with tool 784061. Proceed with great care, and hold up firmly with one hand to avoid bending the connecting rods or damaging the pistons. Put aside the needle bearings.



REMOVAL AND INSTALLATION OF CRANKSHAFT



REMOVAL AND INSTALLATION OF PISTON RINGS

Reassembly of engine

Examine and clean all parts of the engine, replacing damaged parts and preferably all gaskets. A new cylinder head gasket must always be fitted, regardless of the condition of the old one. For torque settings, see Section O. For reconditioning and inspection of engine parts, reference should be made to the appropriate sections, where descriptions of the work involved will be found.

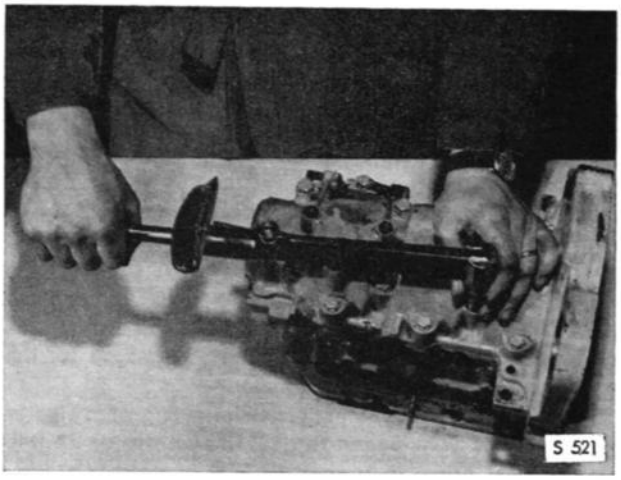
1. Measure the cylinders and pistons to check that clearances are correct. For classification of new pistons where necessary, see Section 212.
2. Check the needle bearing classifications, or fit new needle bearings if the crankshaft or pistons have been replaced. See Section 212.
3. Refit the piston rings, using piston-ring tongs.

> NOTE
>
> In Saab Sport engines, the lower piston ring is an oil wiper and is thinner than the other ones.

4. Refit the pistons to the connecting rods. Use tool 784061 for this purpose, first applying guide pin to locate the needle bearing. Then fit the piston pin with the driver and secure with the retaining rings.

> NOTE
>
> Insert the pistons with the arrow pointing forwards (towards the ignition end).

5. On the Saab Sport car, check that the crankshaft sealing ring is fitted at the ignition end. If it has been removed, make sure when reassembling that the "piston rings" are located with the openings displaced 180° from one another.
6. Apply the Woodruff key to the ignition end of the crankshaft.
7. Insert tool 784057 in the front end of the crankshaft and pass the centering tool 784064 into the crankshaft bushing. Locate the piston ring gaps opposite the locking pins on the pistons and lower the crankshaft with pistons into the engine block. The middle piston must be lowered first, see illustration. Oil the pistons and cylinder bores before reassembling and be careful not to damage either the pistons or the rings. In Saab 95/96 engines, make sure that the sealing rings at the flywheel end are located vertically and displaced 180°.



TORQUING THE CRANKCASE BOLTS

8. Remove the two tools.
9. In Saab Sport engines, refit the two slip-clutch springs and pins in the ignition end of the crankshaft and then refit the distributor pinion so that the pointed pin enters the notch in the pinion. Refit the distributor pinon fiber washer. Oil all parts before refitting.
10. Refit the lower crankcase half, tightening the bolts consecutively with the following torques: 18 ft-lb (2.5 kgm) for 5/16" bolts and 29 ft-lb (4 kgm) for 3/8" bolts.

> NOTE
>
> No sealing paste or gasket may be used in the joint between the engine block and the lower crankcase half. Check that the surfaces are clean and undamaged, and smear with motor oil.

11. SAAB 95/96: Refit the inner cover of the distributor gear housing with O-ring and shaft seals. Use tool 784056 to avoid damaging the shaft seals. Locate the cover with the cut-away opening opposite the hole for the distributor.
    Refit the distributor pinion with the chamfered side inwards.
    SAAB SPORT: Check that the ignition distributor pinion is correctly located with the pointed pin in the groove. Remember to re-insert the fiber washer.

12. Refit the outer cover with O-ring and shaft seal. Apply tool 784057 (784127 when working with the Saab Sport engine) to the crankshaft stub and press the cover home by screwing in the tool.
13. Insert shims outside of cover and fit the retaining ring, making sure that it is fully pressed down into its groove.
14. Unscrew the tool between a quarter and half a turn and check that the shims are hard up against the retaining ring. If they are not, remove the retaining ring and insert more shims.
15. When the fit is satisfactory, displace the ends of the retaining ring so that they enter the groove for the puller. Then remove the puller.
16. Refit the flywheel, using a new retaining ring. Tighten the bolts with a hex torque wrench set at 22 ft-lb (3 kgm) and secure them.

NOTE

Special bolts are used for the flywheel.

17. Insert the clutch plate and refit the clutch. Make sure that all three spacers 784209 are properly positioned. Center the clutch plate with arbor 784064, while tightening the bolts successively. Having done so, remove the arbor and the spacers.

IMPORTANT

Certain flywheels and clutches are paint-marked to ensure clutch balance.
These part must be fitted so that the marks are displaced 180° from each other.

18. Refit the pulley and vibration damper. Fit a new retaining ring under the nut and tighten with a torque of 36 ft-lb (5 kgm).
19. On Saab Sport engines, refit the oil pump and its gasket.
20. Refit the engine supports.
21. Turn the engine over and clean the cylinder head and cylinder block joint surfaces.
22. Refit the lower water inlet neck and pipe. Coat both sides of the gasket with sealing paste.
23. Check that the contact surfaces are dry, and then refit the cylinder head gasket, making sure that the broad part of the folded-on lining is turned against the cylinder head.

IMPORTANT

The cylinder head gasket must be dry when fitted. It must not be coated with oil, sealing paste, etc., in any circumstances.

24. Refit the cylinder head and tighten the bolts successively with a torque wrench. See Section 211 for tightening sequence and recommended torque.
25. Refit the water pump, pulley and fan. Reconnect the hose for the engine inlet pipe.

NOTE

The fan must be installed so that the concave part of the blades is turned backwards.

26. Refit the thermostat, the valve and the upper outlet pipe. Refit the heat-exchanger return pipe.
27. Refit the induction manifold and carburetor.
28. SAAB SPORT: Pour 1.7 U.S. fl. oz. (0.5 dl) of motor oil into the distributor gear housing through the hole for the distributor.

NOTE

Whenever a Saab Sport engine has been dismantled, 1.7 U.S. fl. oz. (0.5 dl) of motor oil must always be poured into the distributor gear housing. When the car is being driven, the oil level is then kept constant by direct lubrication from the oil pump.

29. Refit the distributor, See Section 3.
30. Refit the generator and fan belt, and adjust the belt tension.
31. Refit the exhaust manifold and gaskets.

CYLINDER HEAD

General

The engine must be allowed to cool before the cylinder head is removed, to avoid the risk of distorting the head. Check the planeness of the cylinder head, and correct with a face plate covered with fine emery paper. This kind of planing is usually fully adequate, and machining should be avoided, as this increases compression and may cause trouble in the form of knocking. If major defects are found, a new cylinder head should be fitted. Clean the threads of the spark-plug sockets with a threading tap (M18×1.5 mm). Carbon deposits in the lower part of the threads can cause thread damage when a new plug is fitted. Such damage, however, is not irreparable: a Heli-Coil thread insert may be used. This also applies to the threads for the temperature gage sender unit and to the retaining bolts for the fan shaft bearing stand.

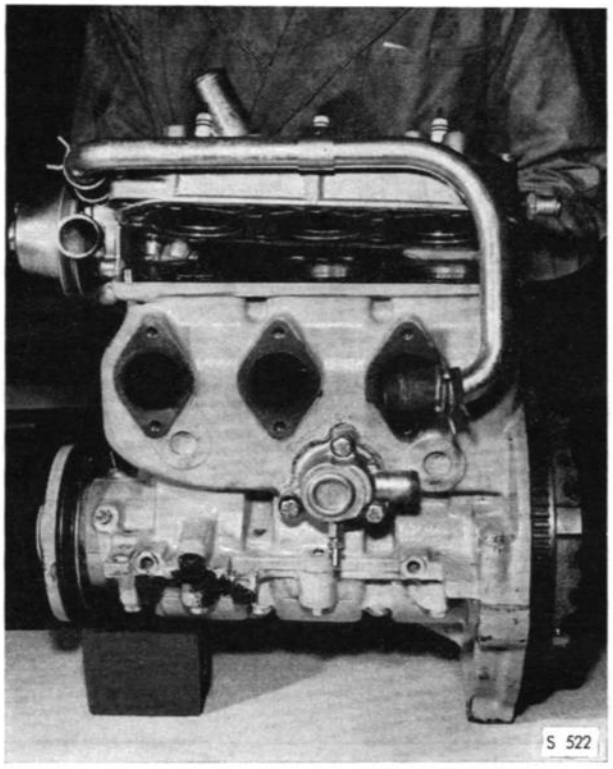
Disassembly

If only the cylinder head is to be removed, proceed as follows:

1. Drain the cooling system and allow the engine to cool (below 86°F or 30°C).
2. Remove the air cleaner and preheater.
3. Back off the generator adjusting and retaining bolts and lift off the fan belt.
4. Disconnect the two coolant hoses, the pump hose connections for the engine inlet pipe and the heat-exchanger return pipe.
5. Disconnect the cables from the spark plugs.
6. Unscrew the temperature gage sender unit.
7. Back off the cylinder-head bolts successively. Remove the bolts and twist the engine side-stay bracket aside.
8. Remove the cylinder head and gasket.

> NOTE
>
> Occasionally, it may prove difficult to remove the cylinder head. If so, slacken the bolts a few turns, and disconnect the ignition cables from the spark plugs. Then crank the engine by means of the starter, whereupon the compression will loosen the cylinder head.

9. Dry off any drops of water in the cylinders and cover them with a clean cloth.
10. If necessary, remove the spark plugs and water pump, as well as the outlet pipe and thermostat and the heat-exchanger return pipe.



DISASSEMBLY OF CYLINDER HEAD

Reassembly

Reassemble the cylinder head in the reverse order, paying particular attention to the following points:
Before fitting the cylinder head, clean the contact surfaces of the head and the engine block carefully and check that they are perfectly plane. If coolant has entered the crankcase in consequence of a leaky cylinder head gasket, crank the engine, first by hand and then with the starter, while blowing compressed air and thin oil through the carburetor. Any coolant present will then escape through the overflow ports, and at the same time the engine parts will be oiled.

The cylinder head gasket to be used is black in color, and has linings around the cylinders only. The material of which the gasket is made is reinforced with metal gauze. This gasket must not be coated with sealing paste or similar compounds. Both the gasket itself and the contact surfaces must be dry when the gasket is fitted. Center the gasket and the cylinder head carefully against the engine block. Mount the gasket with the broad side of the folded-on metal lining facing the cylinder head.

Before fitting the cylinder head bolts, clean the threads with a steel brush and smear them sparsely with oil or graphite grease. The tightening to be made in two rounds, first a comparatively light torque of 3 kgm (approx. 22 ft.-lb.), then retighten to an angle of 90°. For that purpose, use a special tool 784203 on which the torque angle can be read. See fig.

In both cases, tightening sequence in accordance with figure. After warming up the engine, let it cool to approx. 86°F (30°C) before retightening. The retightening to be made with the special tool 784203, the bolts — without having been loosened — to be tightened to 20°, sequense as described above.

Another, similar retightening to be made at a mileage of 1200 miles (2000 km).

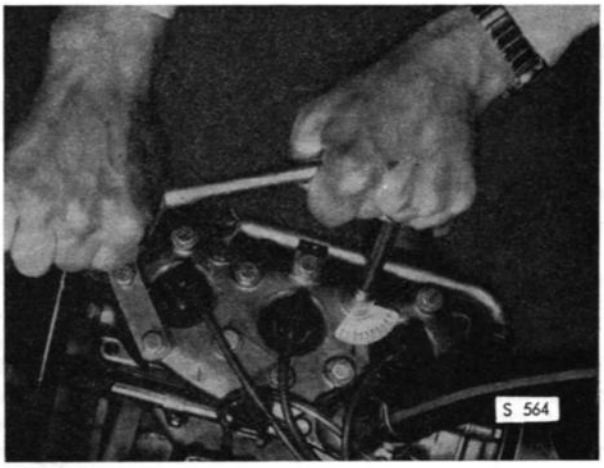
IMPORTANT

The cylinder head gasket must not be coated with sealing compound — is to be fitted dry.

When fitting, first tighten the cylinder head bolts to 22 fr.-lb. (3 kgm) torque, then tighten them 90° (1/4 of a turn).

Two more tightenings shall be made:

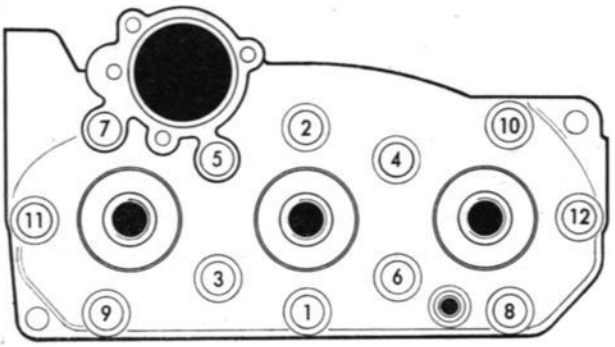
1. After road-testing the car, tighten 20°, cold engine.
2. At a mileage of 1200 milees (2000 km) tighten a further 20°, cold engine.



ANGLE TIGHTENING THE CYLINDER HEAD BOLTS WITH SPECIAL TOOL 784203

NOTE

First make a scribed mark on the cylinder head opposite the figure 0 on the protractor and then tighten through the prescribed angle.



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TIGHTENING SEQUENCE, CYLINDER HEAD BOLTS

CYLINDER BLOCK

General

The cylinder block and the crankcase are machined to match, and it is therefore impossible to replace only one or the other of these components. The crankcase number is punched on both sides of the dividing plane at the right rear of the engine.

Apart from the engine number, which is punched immediately below the cylinder head joint on the righthand side of the engine, the bore class of the various cylinders is punched on the lefthand side of the cylinder block. See illustration. For cylinder classification, see the section on pistons.

Disassembly and Reassembly of engine block

For disassembly and reassembly, follow the description, section 210. Also observe the following points.

When the crankcase is fitted to the block, the mating surfaces must be perfectly clean. No form whatsoever of gasket or sealing paste may be used on any account. The sealing surfaces are merely to be lightly oiled. Note that there are two different types of bolts and that the tightening torques for these are not the same. Tighten the thick bolts first, and then the slender ones. Begin with the bolts in the middle, and then continue tightening alternately out towards both sides. NOTE: Don't forget to fit and tighten the rearmost bolts located on the flywheel side of the block.

Honing

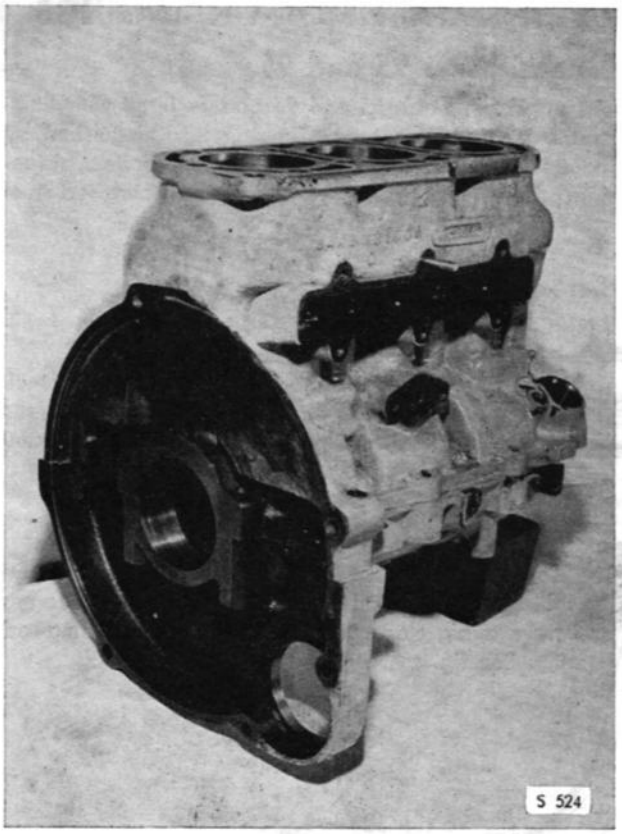
When pistons are changed because of noise (due to excessive piston clearance), it is often necessary to hone the cylinder bores in order to remove rims and scores, if any, as well as to match the clearance to the piston class which is to be used. If, however, pistons are changed after a relatively short mileage, honing of the bores will not be necessary. After long mileages, on the other hand, it is always necessary to remove the rim at T. D. C.

Reboring

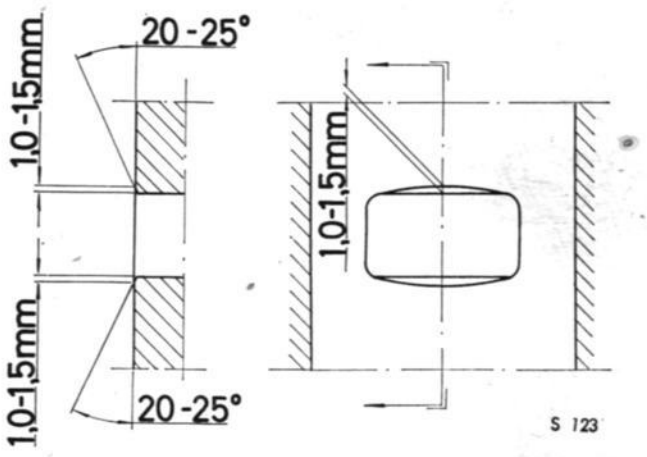
If reboring proves necessary, select a suitable oversize in view of the extent of the damage. The ports must always be burred so that a chamfer as indicated in the figure below is formed. Otherwise, piston ring fracture may occur. This burring can be done with a scraper or with a rotary grinder.

NOTE

If is of the utmost importance that all grinding dust, etc., is removed after machining of the cylinder bores. The best way of doing this is to wash both block and crankcase in a degreasing tank.



CYLINDER BLOCK AND CRANKCASE LOWER HALF



ROUNDING-OFF PORTS

CHECKING THE OILWAYS, SAAB SPORT

The engine-block casting includes seven steel pipes which lead oil from the oil pump on to the main bearings and cylinders.

If you have reason to suspect that impurities have entered the oilways, check by passing a piece of nylon thread about 0.04 in. (1 mm) thick (fishing line type) through the oilway. If the oilway is blocked, it can be cleaned with a piece of music wire, 0.02 in. (0.5 mm) thick. It is particularly important that the oilways be checked after reboring of the cylinder block.

PISTONS AND PISTON-PIN BEARINGS

Pistons, Saab 95 and 96

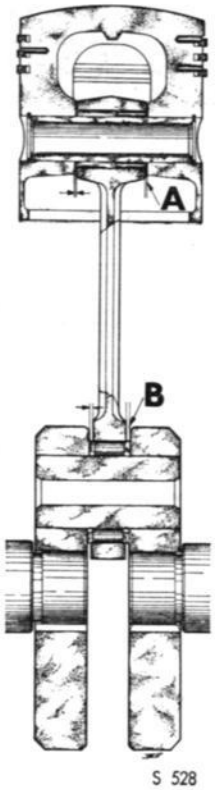
The engine in Saab 95 and 96 cars is fitted with Ringstreifen pistons. This type of piston is distinguished by the steel ring which is cast-in below the bottom piston-ring groove. All piston rings are of hard chromed steel and have the same thickness.

Pistons, Saab Sport

The pistons in the Saab 96 Sport engine are of all-aluminium type and have very thick skirts.
The three piston rings are made of hard chromed steel. The bottom ring is thinner than the other two and serves as an oil wiper. The oil wiper is bevelled at the top and has a sharp bottom edge.

Connecting-rod guidance

The connecting rods are of piston-guided type, implying that they are guided axially at the piston-pin bearing and have a big clearance down at the connecting-rod bearing. See fig.



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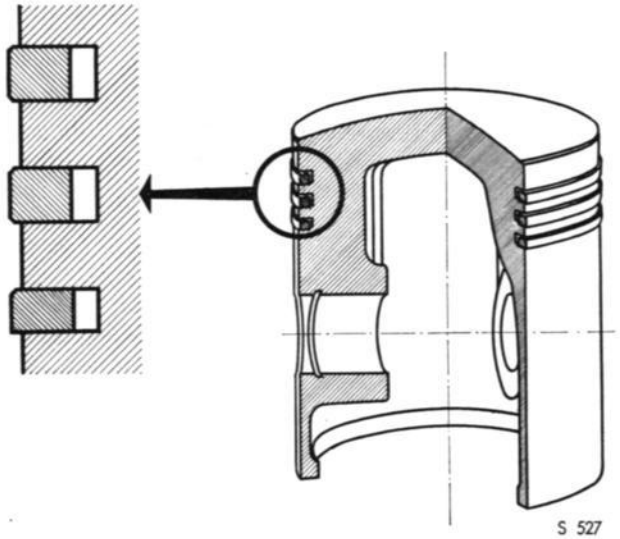
CONNECTING ROD GUIDANCE

A. Guidance at the piston
B. Big clearance at the connecting-rod bearing



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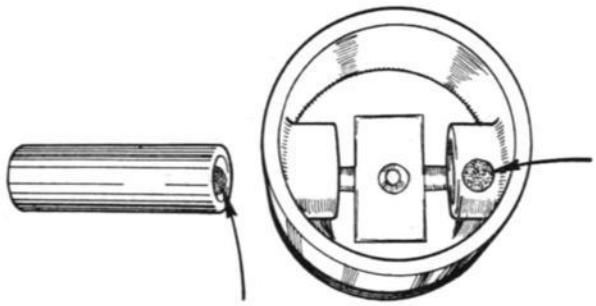
PISTON WITH PISTON RINGS



COLOR MARKING OF PISTON AND PISTON PIN

Disassembly and reassembly of pistons

For disassembly and reassembly, follow the instructions in Section 210, paying particular attention to the following points.
Pistons and piston pins are paint-marked in different colors to facilitate correct pairing. See illustration. When changing pistons, for instance, using a complete piston assembly comprising piston, pin and rings, take care not to intermix the piston pins and be sure to fit each pin to the piston for which it is intended.
This is naturally equally important in work which does not involve replacement of pistons. If, moreover, pins and pistons are mixed up, it will be difficult to obtain the former needle-bearing fit.
A red-marked piston must be fitted with a red-marked piston pin. A blue-marked piston must be fitted with a blue-marked piston pin. Red-marked parts have the biggest diameter.

When fitting piston, pin and needle bearing to the connecting rod, use guide pin 784061. See illustration. When fitting the pin, hold the piston firmly with the hand to avoid distorting the connecting rod.

NOTE

Fit the piston with the mark → F facing the front! Don't forget to fit piston pin retaining rings.

PISTON-PIN BEARING

The piston-pin bearing is a needle bearing. To meet the demand for an accurate fit, a series of 9 bearings is available. The markings of these bearings are indicated in the table below.

Marking of needle bearings

−9	−7	−5	−3	−1		+1	+3	+5	+7
more play ←									→ less play

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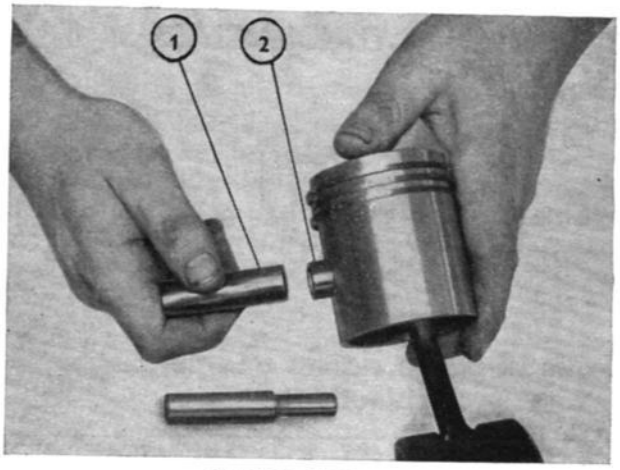
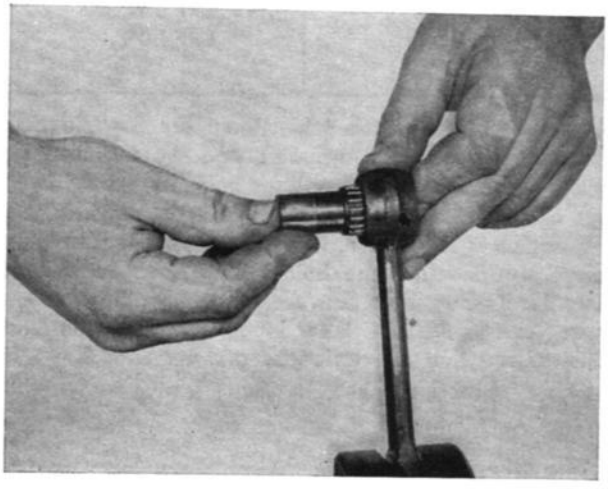
MARKING OF NEEDLE BEARING

The basic diameter of the needles is 0.07847 in. (2.000 mm), and the marking indicates the deviation from this value in thousandths of a millimeter. The bearing marked −9 thus has the smallest needles, while the biggest needles are fitted in the bearing marked +7. Bearings with the + (plus) sign are a kind of oversized bearings and are normally used only on replacement crankshafts. When reconditioning piston-pin bearings, both piston pin and needle bearings should be replaced.
Before reassembling the piston, the piston pin must be matched with a needle bearing to give the correct fit in the connecting rod. There should be practically no play, although it should not be necessary to force the piston pin into the needle bearing when the latter is fitted in the connecting rod. See illustration.



PISTON ASSEMBLY

1. Piston pin
2. Guide pin



TRYING OUT NEEDLE BEARING

CAUTION

Light thumb pressure is the maximum permissible pressure when fitting needle bearings.
The piston pin should be readily rotatable between two fingers and should be virtually free of play.

NOTE

New needle bearings must always be classified when changing pistons or crankshaft.

PISTON AND CYLINDER CLASSES

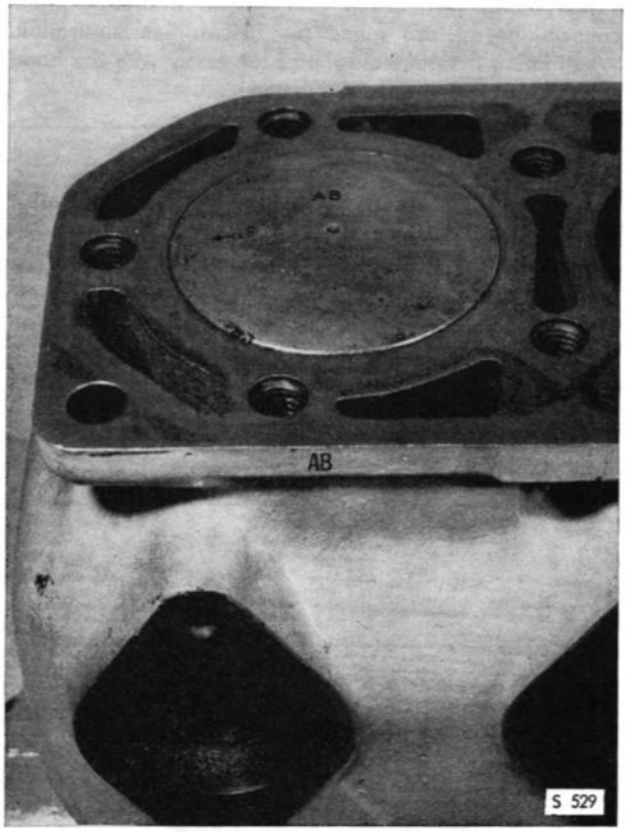
General

The markings on the cylinder block (see fig.) indicate the cylinder class of the various bores. This marking makes it possible to decide which pistons are to be fitted and to make sure that they are in stock before the job is started. The choice of piston class on the basis of the markings on the cylinder block is made from the following table.

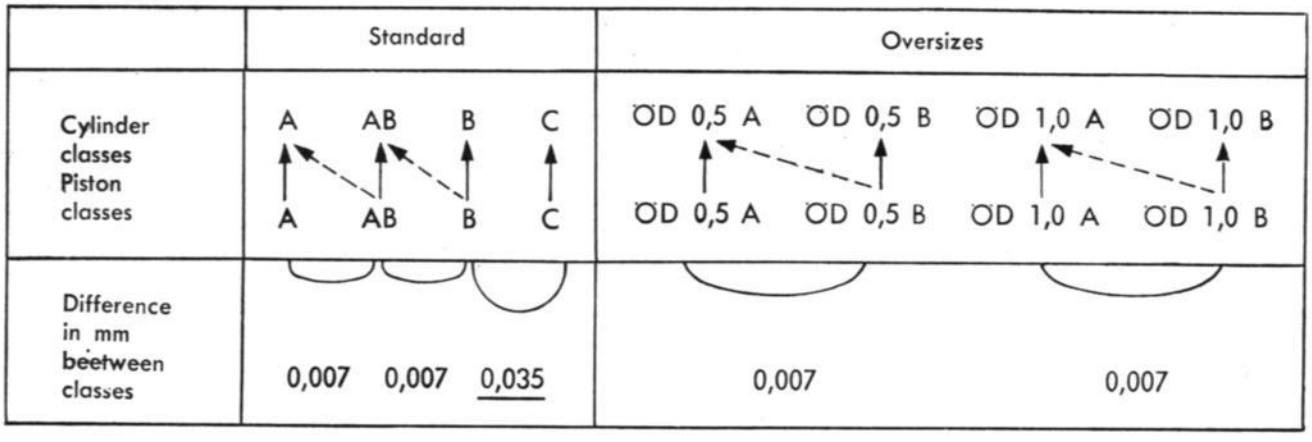
Table of piston classes and permissible assembly combinations

Standard classes	Oversize classes
Cylinder bore and piston marking	Cylinder bore and piston marking
A	ÖD 0,5 A
AB	ÖD 0,5 B
B	ÖD 1,0 A
C	ÖD 1,0 B

As shown in the above table, there are four standard classes of pistons and cylinders, and two oversizes, 0.5 mm and 1.0 mm, with two classes each. Piston and cylinder class must normally agree. However, provided that the engine is run-in, i. e. the cylinder face is worn-in, a bigger piston class can be fitted in Saab 95 and 96 engines. Bear in mind, however, that the difference between classes B and C is far bigger than between other classes, and that no deviations are permitted.



MARKING OF BLOCK AND PISTON



Normal fitting of piston for Saab 95, 96 and Saab Sport.

On a worn-in engine (over 2000 miles (3000 km)) this fitting of piston is permitted for Saab 95 and 96.

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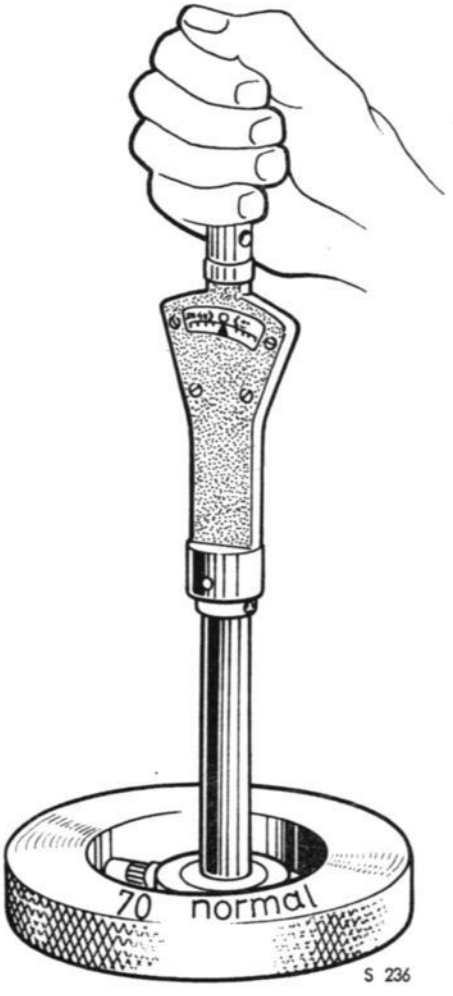
Measuring cylinder bores

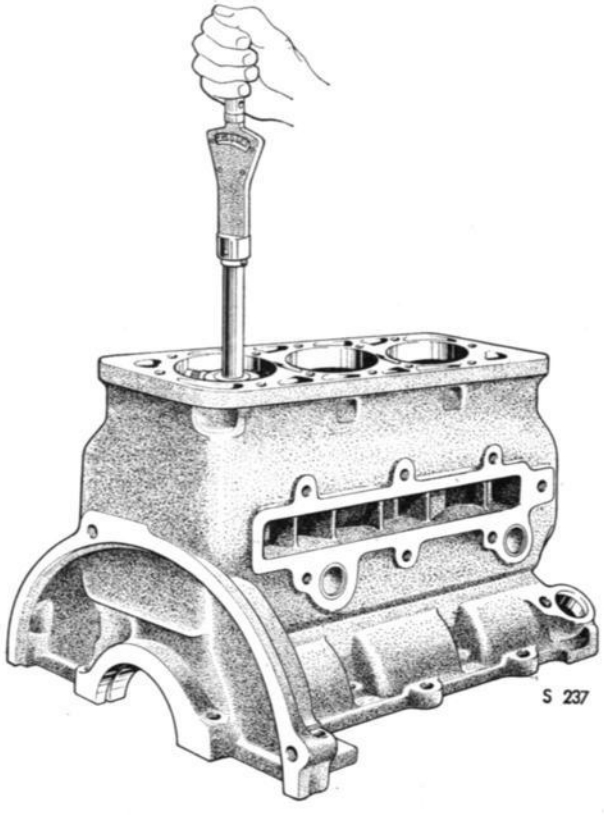
If the cylinder bore has been damaged as a result of piston scoring or ring fracture, or if excessive wear is measured, the bore must be machined. Use a cylinder bore checking gage to measure the bore. Normally, the bores are worn most at the upper part and therefore get tapered and also become out-of-round. To get a complete picture of the appearance of the cylinder, it is necessary to measure at several points, both crosswise and lengthwise. Comparison of maximum and minimum measurements indicates the extent of the wear. To ascertain the amount of true wear, however, the checking gage must be zeroed with the aid of a standard gage or a micrometer set at the dimensions of the cylinder class concerned. (See Section O.) When carrying out such checks, set the micrometer at the dimension for the lower tolerance limit.

Measure the bore with a checking gage as described in the following.

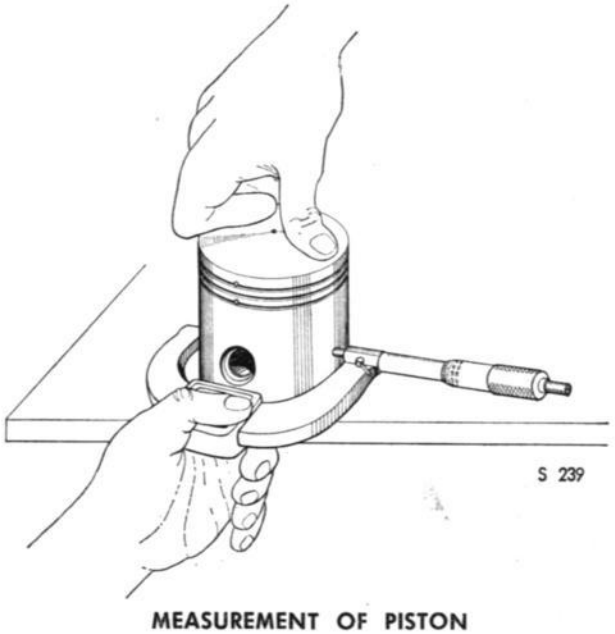
1. Zero the checking gage with the aid of a standard gage or a micrometer.
2. Clean the bore thoroughly.
3. Using the checking gage, note deviations from normal bore dimensions. (See Section 0 for normal figures.) Check out-of-roundness by measuring the bore in both the crosswise and the lengthwise direction of the block. Check taperage by measuring the bore at two points, viz. 0.39 in. (10 mm) and 1.97 in. (50 mm) from the upper edge.



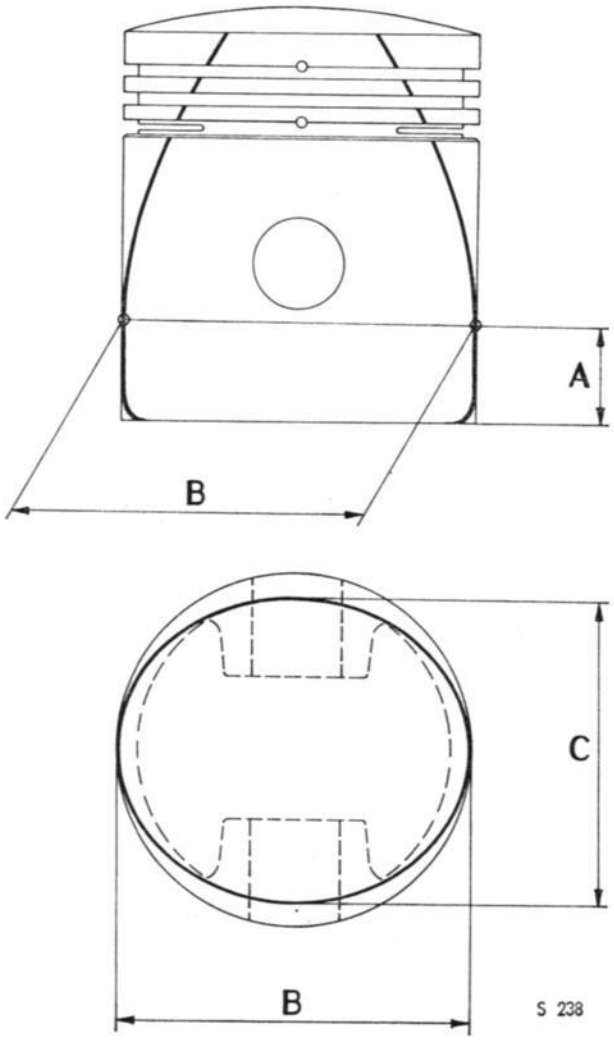
ZEROING THE CHECKING GAUGE



MEASURING THE CYLINDER BORE



MEASUREMENT OF PISTON



PISTON TAPERAGE AND OUT-OF-ROUNDNESS

A= Distance from piston skirt bottom. For Saab 95 and 96 0.8 in. (20 mm), for Saab Sport 0.6 in. (15 mm).
B= Diameter at right-angles to piston pin (classification diameter).
C= Diameter parallel with piston pin.

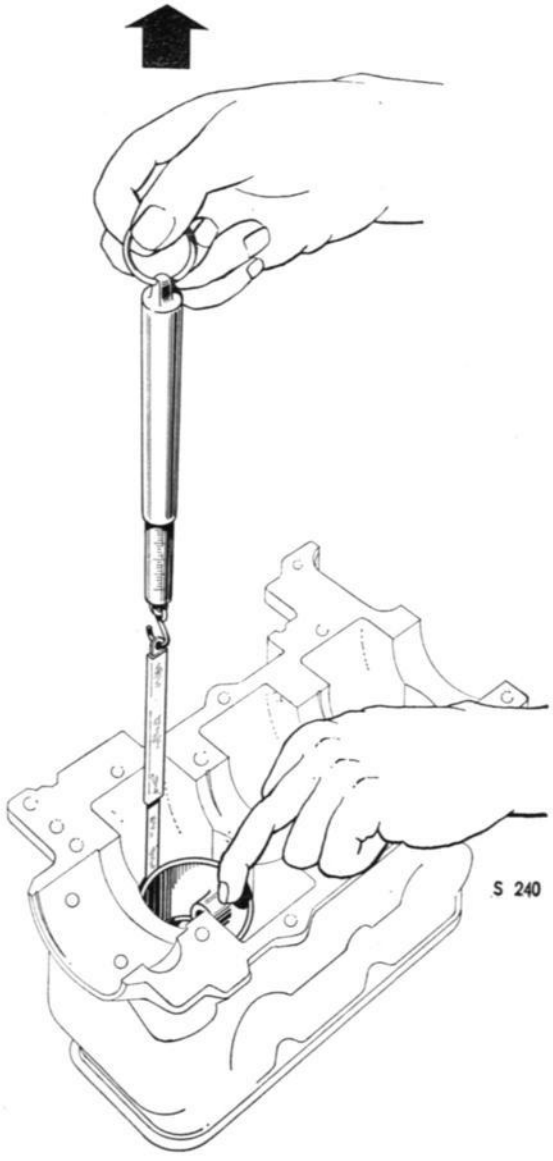
Measuring pistons

Measure the piston diameter with a micrometer 0.8 in. (20 mm) (0.6 in. = 15 mm in the case of Saab Sport) from the skirt bottom and at right-angles to the pin. Check out-of-roundness by measuring the piston parallel with and at right-angles to the pin.

Checking piston clearance

If equipment for measuring pistons and cylinders is not available, pistons can be fitted into cylinder bores, in case of emergency, with the aid of a feeler gage (width 1/2 in. =12.7 mm, length approx. 8 in.=200 mm) and a spring balance graduated to 1000 grams (2.2 lb). The procedure is as follows:

Clean the bore and apply a little thin oil. Place an 0.002 in. (0.05 mm) feeler gage, for instance, along the bore compression-side, and insert the piston into the bore from the crankcase side, after having removed the piston rings. Measure the clearance at right-angles to the piston pin. Now withdraw the feeler gage from the bore



CHECKING PISTON CLEARANCE

with the aid of the spring balance and note the amount of pull (the sliding friction), which should be between 600 and 1000 grams (1 lb. 5 oz. — 2 lb. 3 oz.).

If the value recorded falls short of that stipulated above, try pistons one class bigger, and if the value is bigger try one smaller class of pistons, continuing to check until the spring balance shows the correct amount of pull.

The amount of pull should be checked for different piston depths.

NOTE

The feeler gage must be 0.5 in. (12.7 mm) wide.
The feeler gage must be pulled with a force of 600—1000 grams (1 lb. 5 oz. — 2 lb. 3 oz.).
The cylinder bore must be lightly oiled and the piston rings removed.
If these requirements are satisfied, the thickness of the feeler gage corresponds roughly to the piston clearance.

DISTRIBUTOR DRIVE AND VIBRATION DAMPER SAAB 95 AND 96

General

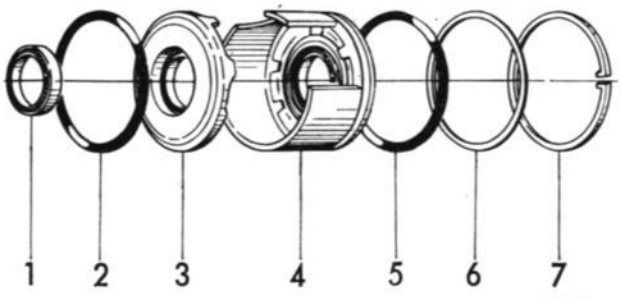
The distributor gear housing consists of an extension to the crankcase at the front end of the engine. It is lubricated with chassis grease and is a completely sealed compartment, demarcated by double seals at the back (towards the crankcase) and a single sealing ring at the front, where the pulley is fitted. See illustration. The distributor drive pinion is located between the inner and outer sealing covers. When the distributor drive pinion on the crankshaft is changed, the engaging gearwheel on the distributor must also be replaced. See Section 3.

If grease is ejected from the distributor gear through the vent hose, or if compressed air from the crankcase leaks out at the pulley, one or more of these seals is damaged and must be replaced.

A retainer ring with shims under it is used to hold the covers in place. The shims are available in two thicknesses, viz. 0.012 and 0.02 in. (0.3 and 0.5 mm). It is important that the retainer ring is correctly located in its groove and that the shimming is properly done. Excessively hard shimming may cause the retainer ring to work loose, while slack shimming may result in noise.

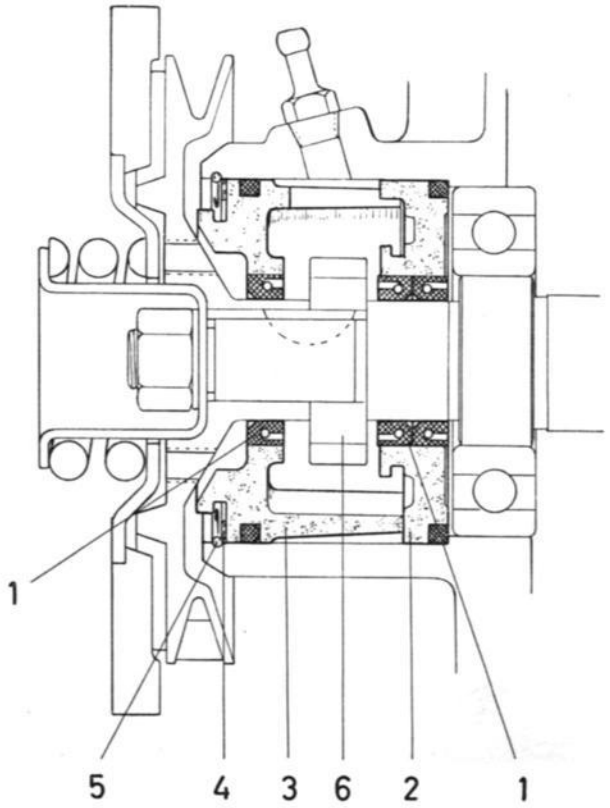
The pulley is mounted on the crankshaft stub with a Woodruff key. On the pulley is a rubber disc, against which the vibration damper is pressed by a stout spiral spring. The vibration damper is thus free to move in the rubber and counteracts the torsional vibrations of the crankshaft.

The spring and sleeve for the vibration damper are made to match, and consequently both parts must be replaced whenever renewal is necessary.



SEALS IN DISTRIBUTOR GEAR HOUSING

1. Sealing ring
2. O-ring
3. Inner cover with sealing ring and O-ring
4. Outer cover with sealing ring and O-ring
5. O-ring
6. Shims
7. Retainer ring

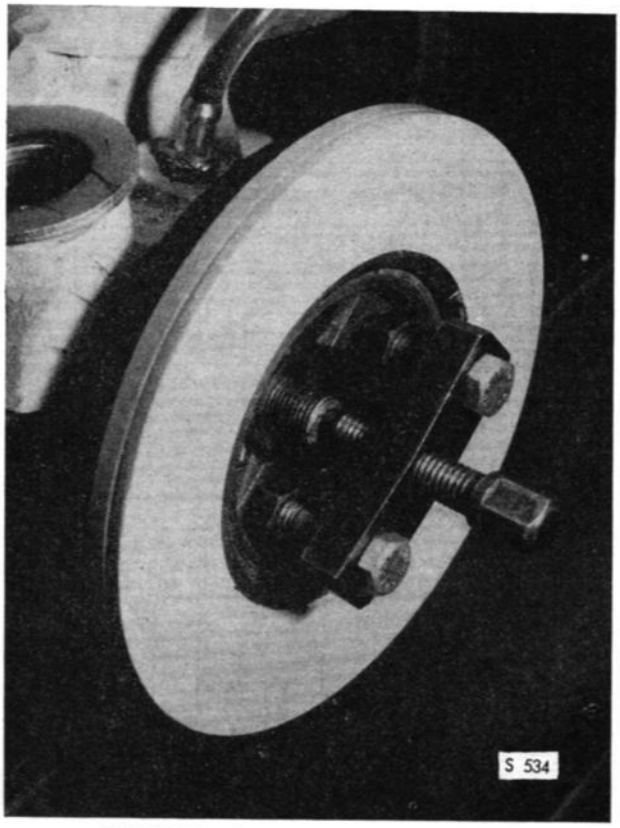


DISTRIBUTOR DRIVE WITH SEALS AND PULLEY WITH VIBRATION DAMPER

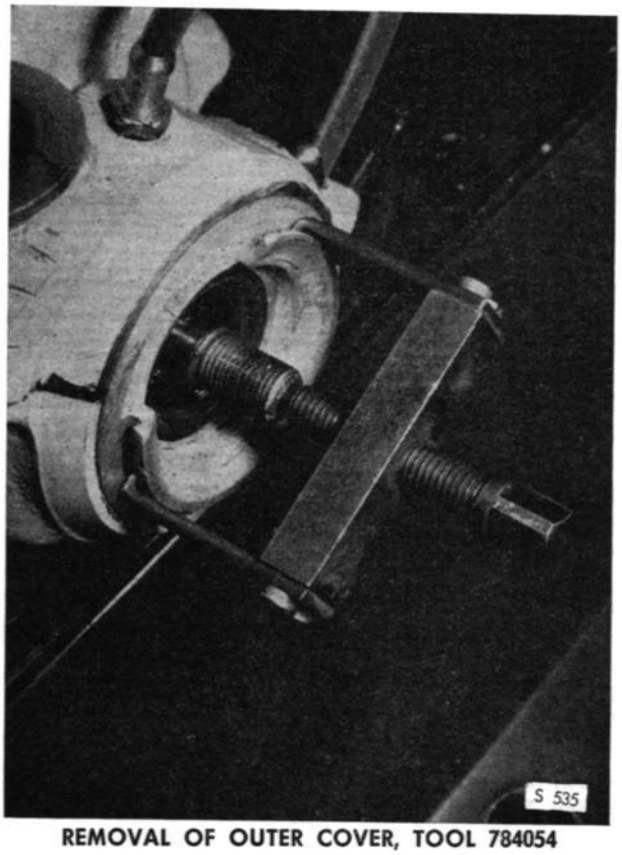
1. Sealing ring
2. Inner cover
3. Outer cover
4. Shims
5. Retainer ring
6. Distributor drive pinion

DISASSEMBLY

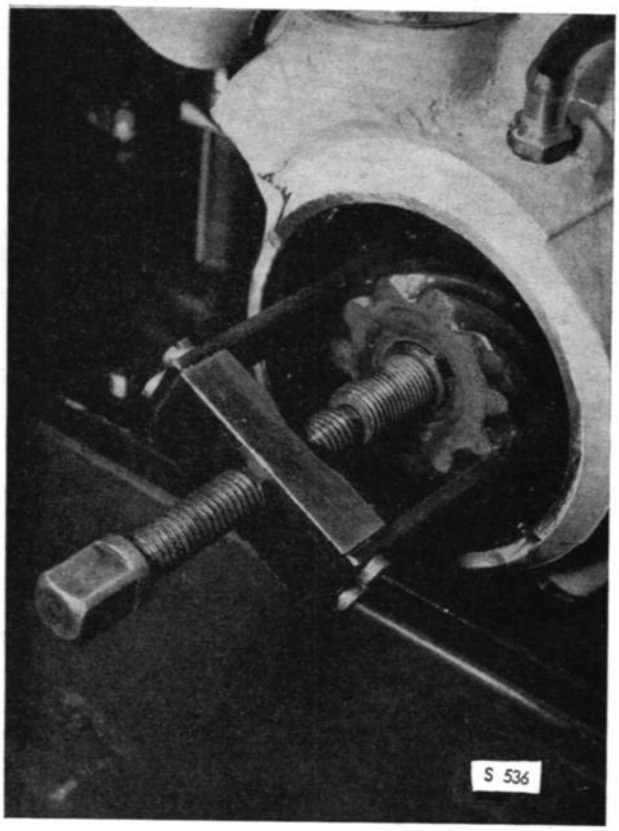
1. Disconnect battery earth cable.
2. Remove hood, front lower panel and radiator.
3. Detach generator and remove fan belt.
4. Back off nut retaining crankshaft pulley. Remove pulley and vibration damper, using puller 784055 if necessary.
5. Back off distributor clamping screw and pull slightly up.
6. Remove retainer ring and shims from outer cover of distributor gear housing.
7. Remove outer cover, using puller 784054. See fig.
8. Remove distributor drive pinion with puller 784051.
9. Remove Woodruff key if necessary.
10. Extract inner cover with sealing rings and O-ring, using tool 784053.



REMOVAL OF PULLEY, TOOL 784055



REMOVAL OF OUTER COVER, TOOL 784054



REMOVAL OF DISTRIBUTOR DRIVE PINION, TOOL 784051

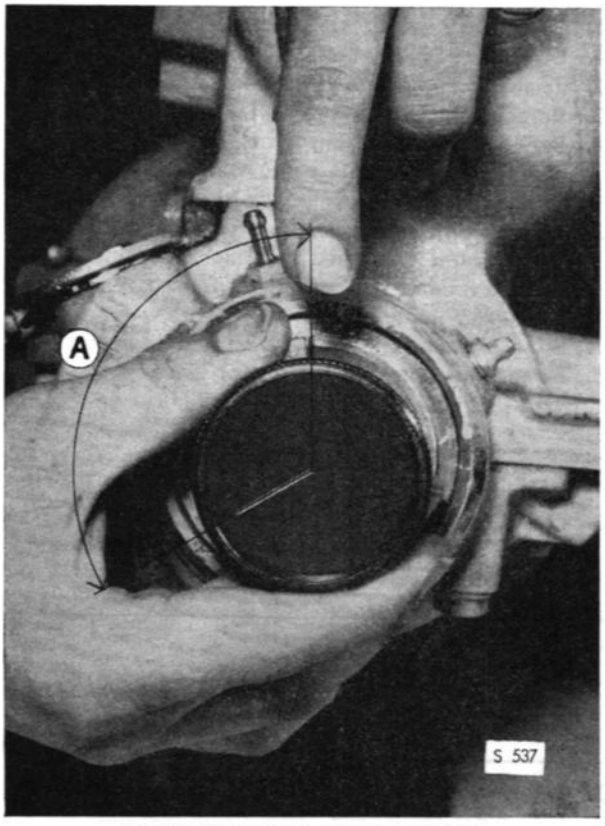
Reassembly

1. Refit sealing rings in inner cover, with sealing lugs turned away from each other, see fig.
2. Fit assembly tool 784056 on crankshaft, with the big end of the tool inwards.
3. Grease inner cover, sealing rings and O-ring, and fit in place, making sure that notch in cover coincides with hole for distributor.
4. Remove assembly tool 784056.

NOTE

Always use assembly tool 784056 when fitting inner cover — otherwise sealing rings may be damaged. Remember to use correct torque — 36 ft-lb (5 kgm) when fitting vibration damper. Insert the distributor drive pinion with chamfer facing inwards.

5. Refit Woodruff key and distributor drive pinion with chamfer facing inwards.
6. Refit outer cover with sealing ring and O-ring so that marking on cover agrees with that on engine block. See fig.
7. Press outer cover into position by advancing tool 784057 onto crankshaft stub.
8. Insert a suitable combination of shims between retainer-ring groove and cover.



SHIMMING THE OUTER COVER
A = 1/4—1/3 TURN

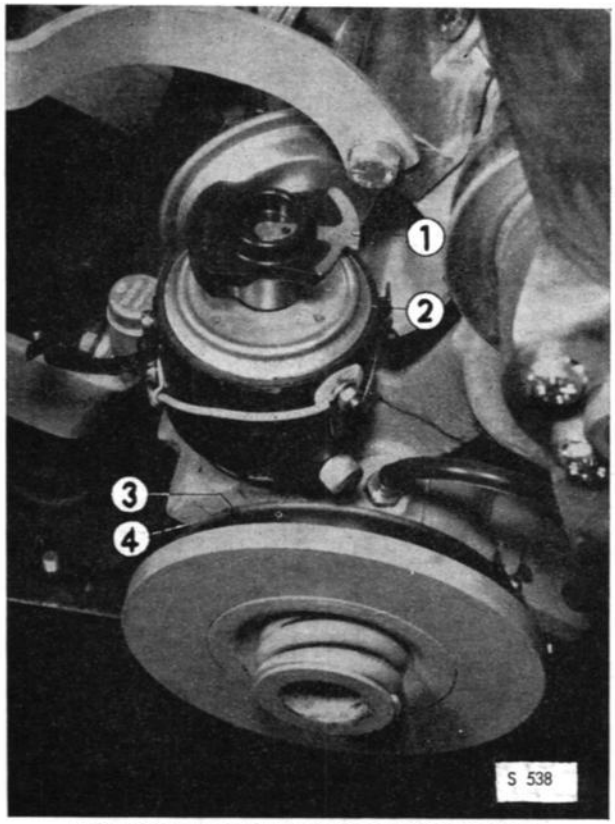
9. Refit retainer ring, making sure that it enters its groove.
10. Back off tool until you notice distinctly that shims begin to press against retainer ring. This occurs when tool has been backed off between 1/4 and 1/3 turn. A mark is provided on the tool to facilitate checking.
11. Displace retainer-ring ends so that they come inside groove for puller and remove tool from crankshaft.
12. Refit crankshaft pulley.
13. Refit vibration damper. Fit a new star washer under nut. Tighten with a torque of 36 ft-lb (5 kgm).
14. Refit distributor. See Chapter 3.
15. Refit fan belt and secure generator.
16 Refit radiator, front lower panel and hood.
17. Reconnect battery earth cable.
18. Check functions of lamps and horn.
19. Grease distributor gear until grease oozes out through evacuation hose.
20. Test engine.

SAAB SPORT

General

The distributor gear housing consists of an extension to the crankcase at the front end of the engine. It is a completely sealed-off compartment, demarcated by the crankshaft seal at the crankcase and by a sealing ring at the front where the pulley is fitted. See fig.

The distributor drive pinion, which also drives the oil pump, is fitted with a slip clutch which functions if the oil pump seizes for any reason whatsoever or if the lubricating oil is too thick.

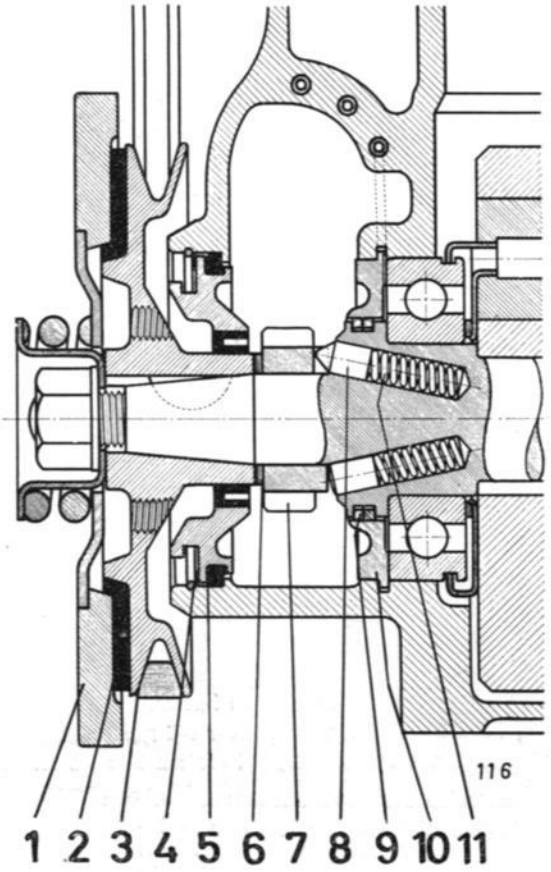


BASIC SETTING OF THE IGNITION TIMING
The marks 1 and 2 should be exactly opposite each other at the same time as the marks 3 and 4 coincides.

The slip clutch comprises two spring-loaded pins which rest against the inner side of the pinion. One of these pins — the pegging pin — is pointed, and fits into a notch in the pinion, thus locking it in relation to the crankshaft. On the outer side, between the pinion and the pulley hub, is a friction disc, towards which the pinion is pressed by the spring force acting on the pins. If the pump seizes, the pegging pin is unable to retain the pinion. Consequently, the pinion will stand still (slip) in relation to the crankshaft and the engine will be unable to start. If the pump seizes while the car is being driven, the engine will stall on account of faulty ignition timing.

When the fault has been remedied, crank the shaft round by hand, braking the distributor rotor meanwhile. The pinion will then take up its proper position in relation to the crankshaft, since there is only one notch in it for the pegging pin.

The distributor drive pinion must be lubricated with oil. Whenever the engine has been disassembled, pour 1.7 U.S. fl. oz. (0.5 dl) of motor oil into the distributor gear housing so that the correct oil level is obtained. The lower part of the distributor drive pinion must dip down into the oil. While driving, only small quantities of oil are admitted to compensate for leakage. The oil is supplied through the oil pump shaft bearing and excess oil passes the crankshaft sealing rings and lubricates the front main bearings etc.



PUMP AND DISTRIBUTOR DRIVE WITH VIBRATION DAMPER

1. Vibration damper
2. Rubber ring
3. Pulley
4. Retainer ring and shims
5. Outer cover and seals
6. Friction disc
7. Distributor drive pinion
8. Pegging pin
9. Piston-ring seal
10. Inner cover
11. Spring

The pulley is mounted on the crankshaft stub with a Woodruff key. On the pulley is a rubber disc, against which the vibration damper is pressed by a stout spiral spring. The vibration damper is thus free to move in the rubber and counteracts the torsional vibrations of the crankshaft.

The pulley sealing ring is located in a cover which is also sealed by means of an O-ring against the engine block. The cover is held in place by a retainer ring with shims under it. The shims are available in two thicknesses, viz. 0.012 and 0.02 in. (0.3 and 0.5 mm). It is important that the retainer ring is correctly located in its groove and that the shimming is properly done. Excessively hard shimming may cause the retainer ring to work loose, resulting in noise and oil leakage. Slack shimming may also result in oil leakage.

Disassembly of distributor drive pinion

1. Disconnect battery earth cable.
2. Remove hood, front lower panel and radiator.
3. Detach generator and remove fan belt.
4. Back off nut retaining crankshaft pulley. Remove vibration damper and pulley, using puller 784055 for latter.
5. Back off distributor clamping screw and pull distributor up. There is no need to detach the oil pump.
6. Remove retainer ring and shims from cover of distributor gear housing.
7. Remove cover, using puller 784054 if necessary.
8. Remove friction disc, distributor drive pinion, pegging pins and springs.

Reassembly of distributor drive pinion

1. Refit pegging pins and springs.
2. Refit distributor drive pinion with groove facing inwards. Turn pinion so that pegging pin engages with groove.

> NOTE
>
> The distributor drive pinion must turn easily on the crankshaft. Oil pinion lightly before reassembling.

3. Refit friction disc and possibly Woodruff key.
4. Refit outer cover with sealing ring and O-ring.
5. Press outer cover into position by advancing tool 784127 on to crankshaft stub.
6. Insert a suitable combination of shims between retainer-ring groove and cover.
7. Refit retainer ring, making sure that it enters its groove.
8. Back off tool until you notice distinctly that shims begin to press against retainer ring. This occurs when tool has been backed off between 1/4 and 1/3 turn. A mark is provided on the tool to facilitate checking. If this does not coincide, retainer ring must be removed and shims combination changed.
9. Displace retainer-ring ends so that they come inside groove for puller and remove tool from crankshaft.
10. Refit crankshaft pulley.
11. Refit vibration damper. Fit a new star washer under nut. Tighten with a torque of 36 ft-lb (5 kgm).
12. Pour 1.7 U.S. fl.oz. (0.5 dl) of motor oil into distributor gear housing.

> NOTE
>
> Whenever the distributor gear housing has been disassembled, 1.7 U.S. fl.oz. (0.5 dl) of motor oil must always be poured into it before the distributor is refitted.

13. Refit distributor. See Chapter 3.
14. Refit fan belt and secure generator.
15. Refit radiator, front panel and hood.
16. Reconnect battery earth cable.
17. Check functions of lamps and horn.
18. Test engine.

CRANKSHAFT

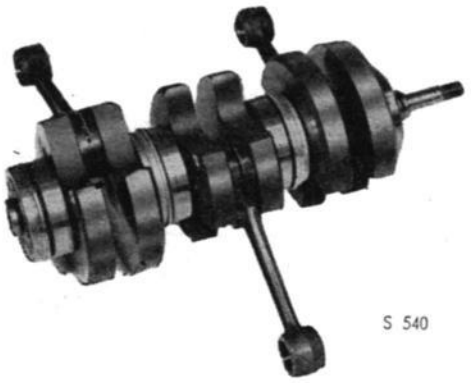
General

The Saab 95/96 engine is lubricated by oil mixed with the fuel, whereas the Saab Sport car has separate lubrication. For this reason, the crankshaft are of different patterns. See fig. The crankshafts in the Saab Sport engine has filled webs in order to provide higher scavenging pressure.

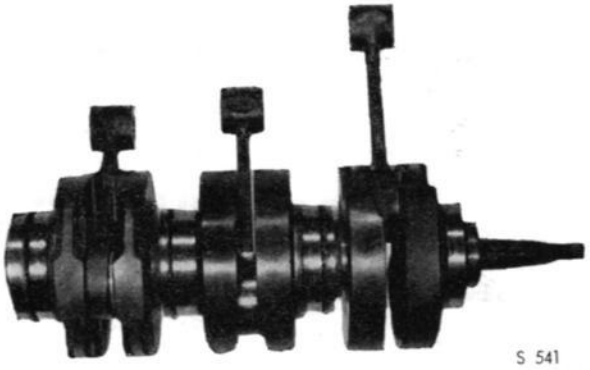
Lubrication of the crankshaft in the Saab Sport engine is effected by the oil being led through oilways in the engine block to the grooves for the sealing rings of the main bearings. The oil is then led through the main bearings, is caught up by an oil collector and passed out to the crank pins and connecting rod bearings — see fig.

The crankshaft is an integral press-fitted assembly, which makes it impossible to change component parts. If damage occurs, the entire shaft must be replaced, and an exchange system operates for this part.

The connecting rods for both types of crankshaft are axially piston-guided, which means that there is ample clearance for the connecting rods between the crank webs. The main bearings on an unassembled crankshaft have more clearance than ordinary ball bearings. In the assembled state, the clearance will be slightly reduced, since the outer ring is pressed together by the engine block and crankcase lower half.



CRANKSHAFT 95 AND 96



CRANKSHAFT SAAB SPORT

Replacement of crankshaft

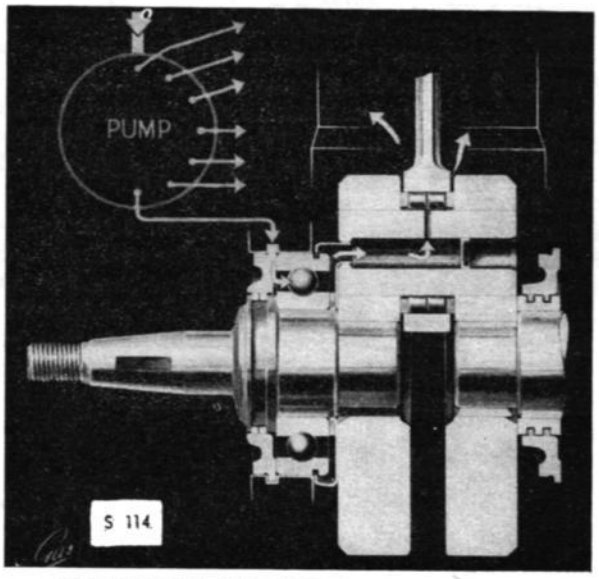
For disassembly and reassembly of the crankshaft, see section 210.

Main and connecting-rod bearings are extremely sensitive to dirt, and great pains must be taken to protect the crankshaft when it has been disassembled.

Before replacing the crankshaft, make sure that the bearing seats are clean. Fit the sealing rings in the flywheel end in Saab 95/96 engines so that the gaps are located vertically and displaced 180° from each other.

In the Saab Sport engine, the ring which holds the sealing rings at the distributor gear is detachable. When the crankshaft is assembled, make sure that this ring is in place. When putting on the ring, check that the ends of the sealing rings are displaced 180° from each other.

> NOTE
>
> Always handle the crankshaft with great care, to avoid bending the connecting rods and so as not to spoil the alignment.



CRANKSHAFT LUBRICATION SAAB SPORT

Replacement of main bearings

On the crankshaft for Saab 95/96 engines it is possible to replace the front main bearing at the distributor drive gear.

If other parts are damaged, the entire crankshaft must be replaced. An exchange system operates in respect of this part.

To replace the front main bearing, withdraw the crankshaft from the engine and remove the bearing, using a puller which is applied on the ball bearing inner race. When fitting the new bearing, utilize the threaded stub and nut on the crankshaft by inserting a tube sleeve and spacing washers under the nut and forcing the bearing into place bit by bit.

IMPORTANT

Do not force the bearing into place with an arbor press, since this might spoil the crankshaft alignment. Main bearings are specially made with a specific clearance, and only genuine Saab spare parts may be used.
N. B. Do not use the standard SKF bearing with the same designation.

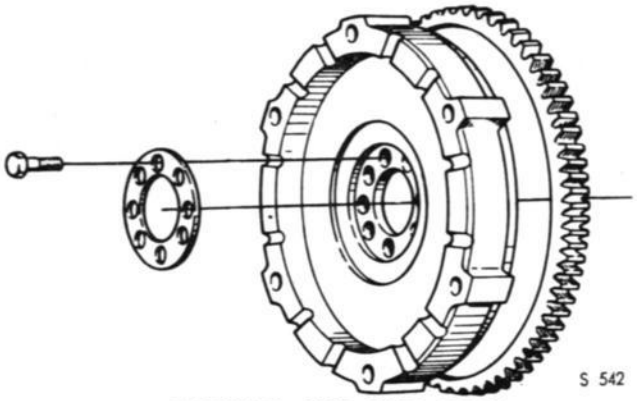
Replacement of clutch shaft bushing

If cleaning reveals that the bushing is damaged, or checking that play is excessive, it must be replaced. Since this play has a great effect on the life of the clutch shaft seal, it is not allowed to exceed 0.0015 in. (0.04 mm).
When removing the worn bushing, use a 5/8 in. (16 mm) screw tap and a steel ball. When the tap has bottomed against the steel ball, continued turning will gradually drive the bushing out.

FLYWHEEL

Replacement of ring gear

To replace the flywheel ring gear, lift the engine out of the car and remove the flywheel. Note that the rear main bearing is exposed through the bolt holes when the flywheel bolts have been removed. Take great pains to prevent foreign matter from entering the bearing. Remove the worn ring gear by drilling a 3/16" (5 mm) hole through the gear from the back and then splitting it with a cold chisel.
Before it can be fitted, the new ring gear must be heated to about 390°F (200°C). The heat must be applied evenly over the entire ring gear and not at different points. After heating, place the ring gear on the flywheel with the chamfer on the teeth facing upwards. Make sure that the ring gear is firmly seated on the flywheel. Do not strike the heated ring gear with a hammer.



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FLYWHEEL AND RING GEAR

Machining of flywheel

This job may be necessary if the flywheel clutch is burnt or scored. It is permissible to turn off 0.02 in. (0.5 mm). Deeper scoring will entail replacement of the flywheel.

NOTE

In principle, all machining of the flywheel requires corresponding machining of the clutch disc facing to preserve the correct relationship between clutch and flywheel.

Reassembly of flywheel

It should be noted that the flywheel bolts are of special material, and that standard bolts must not be used.
When reassembling the flywheel, always use a new retaining washer. Don't forget to tighten the bolts with a torque wrench set at 22 ft-lb (3 kgm).
After reassembly, smear the ring gear teeth with grease (Bosch grease Ft 1 v 13).

OIL PUMP SAAB SPORT

General

The distributor drive pinion is fitted with a slip clutch to protect the oil pump if the lubricating oil becomes too viscous, e.g. due to cold weather. See Section 215. The speed is reduced substantially by planetary gearing inside the pump housing.

There are two different makes of oil pumps, but the working principle is the same for both. The oil pumps are sealed and must not be opened. Consequently, a damaged pump must be replaced in its entirety. An exchange system operates in respect of this unit, on condition that the seal is unbroken. The only servicing which is permitted is changing the contact device for the oil monitor and changing the pump pinion.

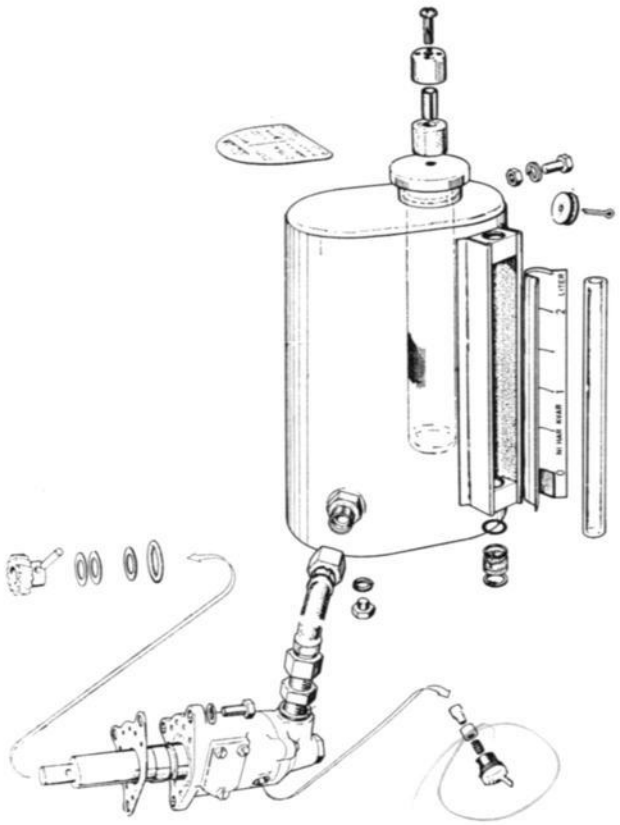
Replacement of oil pump or pump pinion

Disassembly

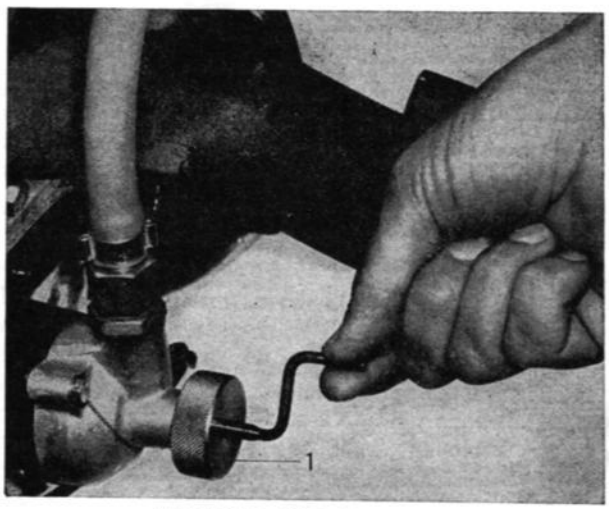
1. Disconnect battery earth cable.
2. Remove nipple for oil hose at pump and secure hose to oil tank to prevent oil from escaping. Cover connections over to prevent entry of foreign matter.
3. Detach cable connection from oil monitor.
4. Back off three pump retaining screws.
5. Pull pump out.
6. If pump pinion is to be replaced:
   File off and drive out pin for pump pinion, taking care not to damage shaft or pump. Cover oilways in flange to protect them from dirt and dust.
7. Pull pinion off.

Reassembly

1. Refit pinion on shaft. Before driving pin in permanently, adjust axial clearance with shims to 0.004—0.008 in. (0.1—0.2 mm). Take care not to damage the pump or the shaft when riveting pin. Rivet-head height may not exceed 0.02 in. (0.5 mm).
2. Bolt pump onto cylinder block, using a new, lightly oiled flange gasket. Do not use sealing paste, since this could block the oilways.
3. Reconnect the oil hose and cable to oil monitor.
4. Remove the metal or plastic plug located in middle of upper part of pump. See fig.
5. Turn the pump shaft round about 100 times by hand, using tool 784195 or a screwdriver. The shaft can be turned in one direction only, and is blocked in the other direction.



OILTANK AND PUMP (MAKE ASSA)



TURNING THE OIL PUMP
1. Tool 784195

NOTE

Whenever the oil pump or the engine has been removed, and after reconnection of the hose from the oil tank, the pump shaft must be cranked about 100 turns by hand.

CAUTION

If the pump shaft is made to rotate faster than about 60 r/m, the pump will be damaged. Never use an electric drill or similar tool.

6. Refit the plug over the pump shaft.
7. Reconnect the battery earth cable.
8. Check functions of lamps and horn.
9. Test engine.

NOTE

If the engine is taken out of the car and is in such a position when the oil pump is removed that the lubricating oil in the distributor gear housing runs out, pour 1.7 U.S. fl.oz. (0.5 dl) of fresh oil into the housing before reassembling the pump or distributor.

OIL MONITOR

General

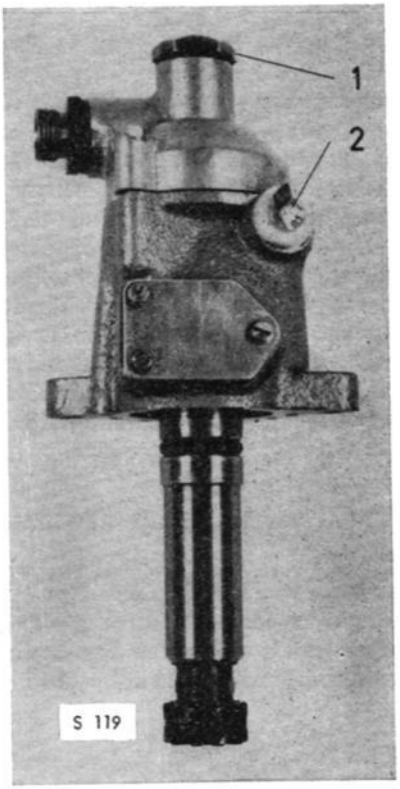
The oil monitor for the pump (see fig.) lights a warning lamp on the instrument panel if there is no, or too little, oil pressure. The impulse from the oil monitor is transmitted to the warning lamp via a relay. For wiring diagram, see Chapter 3.

Disassembly and reassembly of oil monitor

1. Pull off the cable to the oil monitor and back off the upper part of the contact device. Put aside the gasket.
2. Remove the spring, contact sleeve and piston, see fig. Pull the piston out carefully with a pair of pliers.
3. An insulating plastic cap is pressed onto one end of the piston. This cap must be rejected if removed. Take great care not to damage the surface of the piston.
4. When reassembling, make sure that the piston slides easily in the cylinder. Check that the contact sleeve is correctly fitted. See fig.

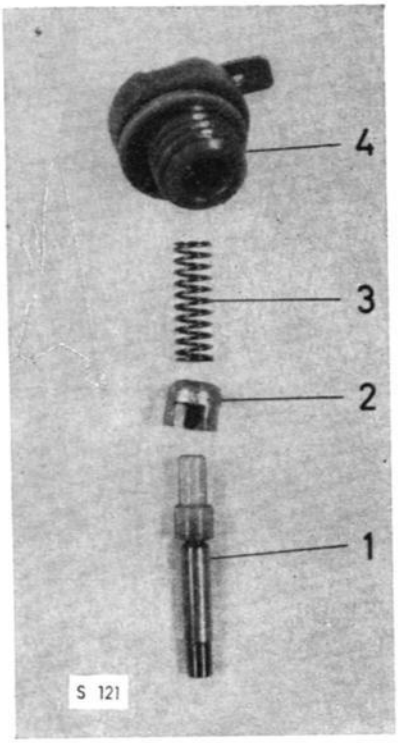
NOTE

The piston fitting in the cylinder is extremely accurate. Consequently, the utmost care must be taken to prevent foreign matter from entering when disassembling and reassembling. Piston and cylinder are mated and thus the piston cannot be renewed separately.



OIL PUMP

1. Plug for pump shaft
2. Oil monitor



OIL MONITOR

1. Piston
2. Contact sleeve
3. Spring
4. Nipple

Checking the oil monitor

If the warning lamp on the instrument panel lights while the car is being driven, or if it fails to go out within 1 1/2 minutes after starting, stop the engine immediately and investigate as follows.

1. Check that there is oil in the tank.
2. Check that the cable between the relay and the oil monitor is unbroken, and that it is not short-circuited and in contact with the engine block.
3. To check the oil monitor, proceed as follows:
   a) Disconnect the cable from the oil monitor.
   b) Connect a test lamp between the positive terminal of the battery and the oil monitor.

> CAUTION
>
> The test-lamp wattage must not be more than 5 Watts — otherwise, the oil monitor may get damaged.

   c) Remove the metal or plastic plug located in the middle of the upper part of the pump.
   d) Crank the pump shaft by hand, using a screwdriver or tool 784195. If the test lamp winks synchronously with the revolution speed, then the oil monitor works and the oil supply is satisfactory. In this case, there is probably something wrong with the relay.
   e) If the test lamp glows constantly or remains out all the time instead of winking, remove and inspect the oil monitor. The fault may be that the piston is jammed in the cylinder, or that the contact sleeve is caught up in some position.

Checking the oil supply

1. Check the level in the oil tank.
2. Back off the pump flange bolts and check that the oil supply is functioning by watching to see that oil appears through the fixing flange holes. Turn the pump shaft round with a screwdriver inserted through the hole in the upper part of the pump. If the pump pinion is turned instead, it will take much longer for oil to appear because of the big gear ratio. If the oil supply fails despite it being possible to turn the pump shaft round, the pump must be replaced.

Checking the pump drive

If the oil pump seizes, or if oil with too high a viscosity is used in cold weather, the distributor drive pinion on the crankshaft slips. This results in faulty ignition timing and the engine stops. See Section 215. If thick oil has caused the trouble, take the car into a heated garage and change oil, filling up with the appropriate grade. When the oil pump has reached room temperature, the distributor drive pinion should automatically take up its correct position when you attempt to start the engine. If not, remove the distributor cap and turn the crankshaft round by hand, while using the other hand to brake the distributor lever. The slip clutch pegging pin will then slide into position in the distributor drive pinion groove. Further turning of the crankshaft (clockwise as viewed from the front) should involve turning of the distributor lever also. If this remains still, the pump has presumably seized. Check this by detaching the pump and ascertaining if the pump shaft can easily be turned.

Checking the oil warning system

For checking the oil warning system, the relay and the warning lamp, see Chapter 3.

OIL TANK

General

The oil tank is fitted with a removable filter under the filler cap. The outlet pipe is located slightly above the bottom to prevent any condensation water and foreign matter from entering the lubrication system. A drain plug with gasket is provided in the bottom of the tank.

Cleaning the oil tank

Any condensed water and foreign matter accumulated at the bottom of the tank must be removed once a year. To do this, remove the drain plug and drain off the oil. Then refill the oil tank.

SOLEX CARBURETOR, SAAB 96

General

The Solex down-draught carburetor for Saab 95 and 96 is of type 40 BI. It is fitted with a special cold-starting device, by means of which an engine started from cold is supplied with a richer fuel mixture than normal. The fuel-air ratio is determined by starting air jet 8 and fuel jet 9. The device is switched in with a control on the instrument panel. When the cold-starting device is in action, the throttle should be fully closed, as otherwise it will completely or partly counteract the function of the starting device.

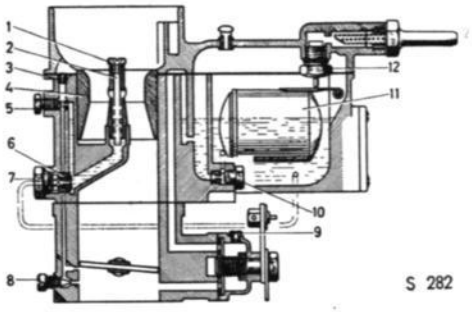
The high-speed system comprises the main jet 4, the emulsion jet 1 and the emulsion tube 2. Correct combination of these parts gives the right carburetor compensation.

Idling is regulated by means of the air jet 2, the fuel jet 3 and the volume control screw 5. A richer mixture is obtained by screwing out the volume control screw.

The design of the carburetor permits access to all the jets, except the idling air jet, without disassembling the carburetor.

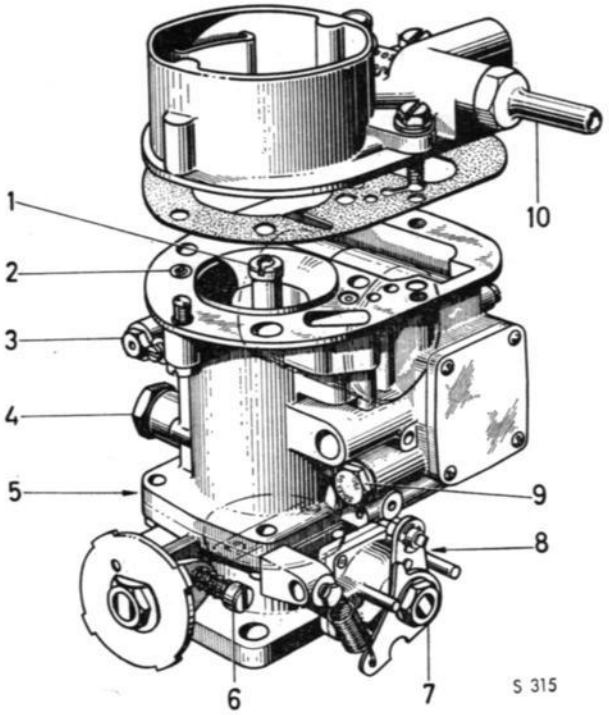
Disassembly and reassembly

1. Remove the air cleaner.
2. Disconnect the fuel hose from the pump.
3. Disconnect the cold-start control from the carburetor.
4. Remove the rubber boot from the plate on the throttle spindle.
5. Remove the induction manifold, together with the carburetor, from the engine block. If necessary, detach the carburetor from the induction manifold.
6. Clean the carburetor externally.
7. Remove the float chamber cover.
8. Check the needle valve and gasket.
9. Check the float lever and spindle.
10. Weigh the float to check that it is not leaking.
11. Check the main jet, the idling jet and the emulsion jet.
12. Check the slide of the cold-starting device for surface wear. Check the starting air jet and starting fuel jet, as well as the lever positions (return motion).
13. Check the throttle spindle for wear.
14. Reassemble the carburetor after having cleaned all parts.
15. Refit the carburetor on the induction manifold and then refix the latter to the engine block.
16. Reconnect the controls and start the engine.
17. Check the float level if necessary.
18. Refit the air cleaner. When the engine has warmed up, adjust the idling speed.



SOLEX 40 BI CARBURETOR SECTIONED

1. Emulsion tube jet
2. Emulsion tube
3. Idling air jet
4. Choke tube
5. Idling fuel jet
6. Main jet
7. Jet carrier
8. Adjusting screw, idling mixture
9. Starter air jet
10. Starter fuel jet
11. Float
12. Needle valve



SOLEX 40 BI, CARBURETOR

1. Emulsion tube jet
2. Idling air jet
3. Idling fuel jet
4. Main jet carrier
5. Adjusting screw, idling mixture
6. Adjusting screw, idling speed
7. Cold-starting device
8. Starter air jet
9. Starter fuel jet
10. Union and filter

Idling adjustment

Adjust the engine idling speed while the engine is warm.

1. Allow the engine to idle.
2. Adjust the idling speed to about 600—750 r.p.m. with the slow-running adjustment screw 6.
3. Adjust the volume-control screw 5 to give the highest idling speed.
4. Readjust the slow-running adjustment screw 6 until a suitable idling speed, i.e. 600—750 r.p.m., is obtained. Then recheck the position of the volume-control screw 5 as above.

Repeat this procedure until the correct idling speed is obtained. It is better to screw in the volume-control screw too far than too little.

Adjustment of float level

Adjust the float level after the carburetor has been installed in the car.

1. Allow the engine to idle.
2. Switch off the ignition, without touching the accelerator.
3. Remove the air cleaner.
4. Detach the fuel hose from the carburetor. This must be done in order to prevent the fuel pump from filling the float chamber with fuel when the float chamber cover is removed.
5. Back off the float chamber cover screws and lift off the cover.
6. Measure the float level with a caliper gage — see fig. The distance between the top of the float chamber and the fuel level should be 0.8±0.04 in. (21± 1 mm). If the engine is hard to start when warm, the float level may be lowered to 0.87 in. (22 mm).
7. Raise the float level by filing down the fiber washer under the needle valve, or lower it by inserting an extra washer.
8. After having made the adjustment, recheck the level to make sure that the required result is obtained.

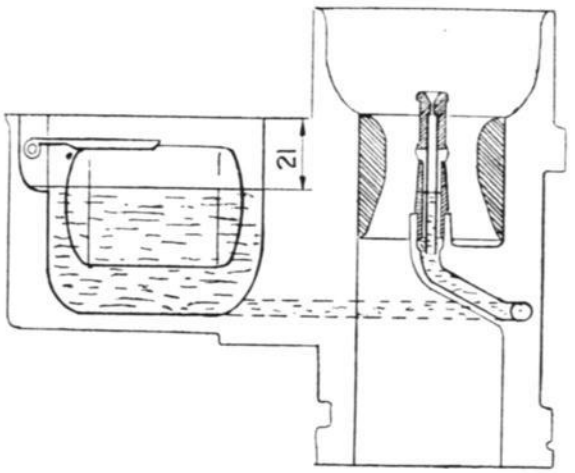
Cleaning the carburetor

It is not necessary to remove the carburetor for cleaning.

1. Remove the air cleaner.
2. Detach the fuel hose from the carburetor.
3. Clean the filter in the carburetor banjo union.
4. Back off the four screws in the float chamber cover and lift off the cover. Collect the gasket.
5. Clean the needle valve.
6. Remove the screw which forms the float lever spindle and lift out the float.
7. Remove the main jet 4.
8. Remove the idling jet 3.
9. Remove the starting jet 9.
   All these jets are readily accessible from outside.
10. Blow the float chamber, passages and jets clean.
11. Reassemble the carburetor, proceeding in the reverse order. Make sure that the gasket under the float chamber cover is flawless.

NOTE

It is advisable to clean the fuel pump filter at the same time.



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CHECKING THE FLOAT LEVEL

ZENITH CARBURETOR, SAAB 95 AND 96

General

Certain series of cars are fitted with Zenith 34 VNN carburetors. The main difference between this type of carburetor and the Solex unit otherwise fitted is that they feature a choke of strangler-flap type instead of the cold-starting device.

Pulling out the choke control closes the spring-loaded strangler flap. At the same time, a linkage rod opens the throttle flap, thereby automatically ensuring a sufficiently high idling speed. It is thus unnecessary to depress the accelerator when starting the engine with the choke. In the beginning, however, the strangler flap may be closed, but the choke control should be pushed in as the engine temperature increases.

Disassembly and reassembly of carburetor

1. Remove the induction muffler.
2. Disconnect the fuel hose at the pump.
3. Release the choke control.
4. Remove the rubber boot from the throttle spindle plate.
5. Back off and remove the nuts retaining the carburetor to the induction manifold and take off the carburetor.
6. Clean the carburetor externally.
7. Back off and remove the four bolts retaining the float chamber and remove the latter. Before lowering the float chamber, pull it out a little sidways in order to free the emulsion orifice.
8. Check the condition of the needle valve and its gasket.
9. Examine the float lever and its spindle.
10. Weigh the float to check that it does not leak.
11. Back off the two screws retaining the emulsion block and remove the latter from the float chamber.
12. Remove all the jets.
13. Remove the strangler flap and its spindle.
14. Back off the stop screw 10 and remove the choke tube.
15. Check that all the gaskets are flawless and blow all the passages clean.
16. Reassemble the carburetor and adjust the fast idling speed.
17. Refit the carburetor in the car. Allow the engine to warm up and adjust the idling speed.

Fast-idle adjustment

The carburetor fast-idling device is adjusted as follows:

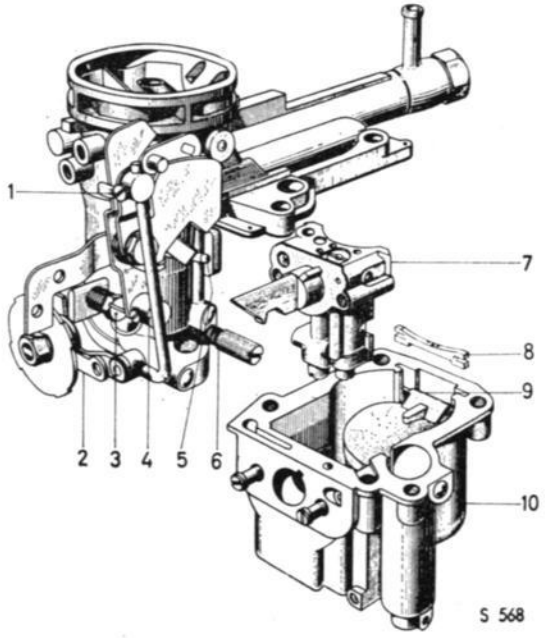
1. Back off the stop screw 1 and open the throttle flap 0.043 in. (1.1 mm). To do this, insert a piece of wire with a diameter of 0.043 in. (1.1 mm) between the throttle flap and the body.
2. Close the strangler flap completely and then check that the lever 2 of the throttle control rests against the appropriate projection on the throttle control.
3. Tighten stop screw 1 in this position and then remove the wire from the throttle flap.

Idling adjustment

Adjust the engine idling speed while the engine is warm.

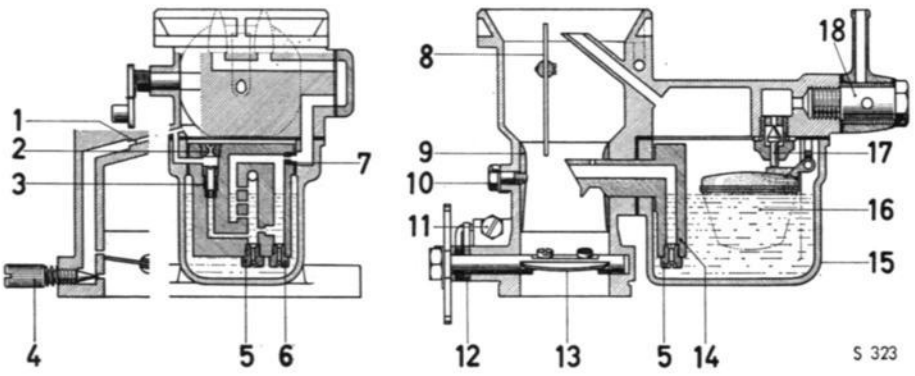
1. Allow the engine to idle.
2. Adjust the idling speed to about 600—750 r.p.m. with the slow-running adjustment screw 3.
3. Adjust the volume-control screw 6 to give the highest idling speed.
4. Readjust the slow-running adjustment screw 3 until a suitable idling speed, i.e. 600—750 r.p.m., is obtained. Then recheck the position of the volume-control screw 6 as above.

Repeat this procedure until the correct idling speed is obtained. It is better to screw in the volume-control screw too far than too little.



ZENITH 34 VNN, CARBURETOR

1. Stop screw, throttle/strangler link
2. Throttle-control lever
3. Adjusting screw, idling
4. Choke-control holder
5. Vacuum connection for distributor
6. Air-regulating screw, idling mixture
7. Emulsion block
8. Float carrier
9. Float
10. Float chamber



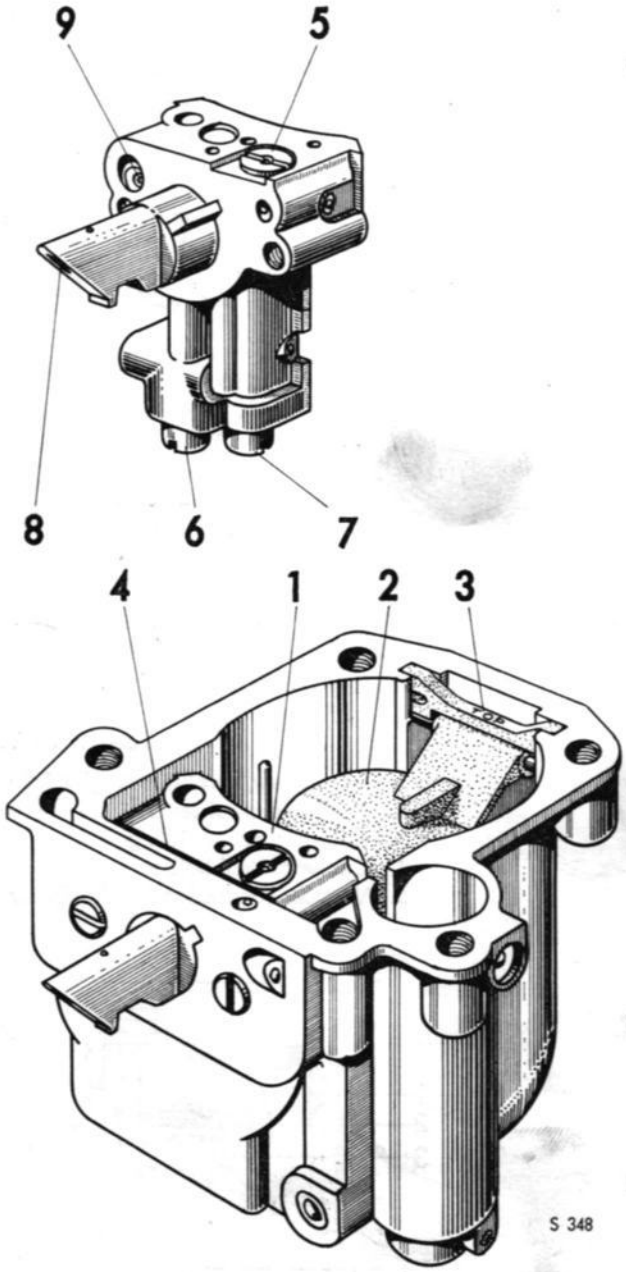
ZENITH 34 VNN, CARBURETOR, SECTIONED

1. Idling duct
2. Idling air jet
3. Idling fuel jet
4. Air-regulating screw, idling mixture
5. Main jet
6. Compensating jet
7. Main air jet
8. Strangler flap
9. Choke ring
10. Stop screw, choke ring
11. Adjusting screw, idling
12. Throttle-control lever
13. Throttle flap
14. Emulsion block
15. Float chamber
16. Float
17. Needle valve
18. Fuel filter

Float level

The float level is determined by the washer under the needle valve. The correct float level is obtained by using a washer with a thickness of 0.12 in. (3 mm). To check the level, the float chamber must be removed as described in the following:

1. Allow the engine to idle and then switch off the ignition without touching the throttle.
2. Remove the fuel line completely from the carburetor in order to prevent flooding from the pump.
3. Remove the air filter.
4. Back off the float-chamber retaining screws and lift the chamber out, taking care not to spill any of the fuel it contains.
5. Measure the distance from the upper edge of the float chamber to the fuel while holding the chamber in the horizontal position. When the float is in place, this distance should be 1.0 in. (25.5 mm), and 1.18 in. (30 mm) without the float.
6. To lower the float level, fit an additional gasket under the float valve. To raise the level, file down the existing gasket.
7. After adjusting, recheck the level.



FLOAT CHAMBER AND EMULSION BLOCK ZENITH 34 VNN CARBURETOR

1. Emulsion block
2. Float
3. Float carrier
4. Gasket
5. Idling air jet
6. Main jet
7. Compensating jet
8. Emulsion block orifice
8. Main air jet (emulsion jet)

SOLEX CARBURETOR, SAAB SPORT

General

The carburetor installation comprises three downdraught Solex 34 W units, mounted on a common throttle body. Through the throttle body runs a common spindle to which the three throttle flaps are attached. Each cylinder is in communication with its own carburetor through separate passages in the induction pipe. Balance between the carburetors is ensured by the provision of a narrow communicating passage, cast in the induction pipe, which interconnects these passages. The carburetors have jet combinations for four different systems, viz. high-speed, low-speed, idling and cold-starting systems. These provide the engine with the appropriate fuel/air mixture to suit different loads and temperature conditions.

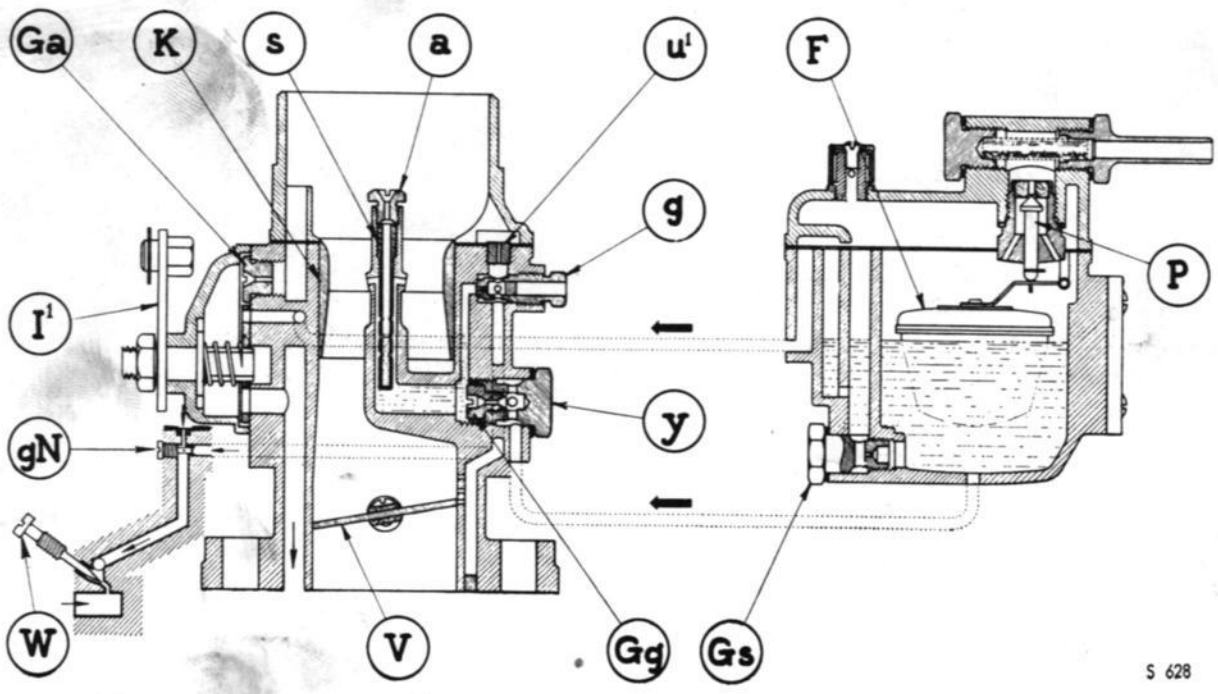
The high-speed system comprises the choke tube K, the main jet Gg with its calibrated holder Y marked "A", the emulsion jet a and the emulsion tube s which combine to ensure that the carburetor gives the right fuel/air mixture within the high-speed range.

The low-speed system comprises the fuel jet g, the air jet u^1, which is not removable, and three passages drilled in the carburetor body immediately over the throttle butterfly.

The idling system consists of the fuel jet gN and an idling jet, which is not removable, and the air-regulating screw W for the fuel/air mixture which is located on the induction pipe. Fuel and air first pass through their separate jets, whereupon they are mixed and carried through passages to a collecting passage in the induction pipe. The fuel/air mixture then passes the adjustable air-regulating screw W and is led out into the balancing passage. Here, the fuel/air mixture is mixed with the induction air and distributed to the different cylinders.

The idling speed is adjusted by means of the screw on the throttle spindle and the air-regulating screw W.

Only the middle carburetor has a cold-starting device. Through a special passage, this communicates with the balancing passage in the induction pipe, where the fuel/air mixture from the cold-starting device is distributed to the cylinders. The cold-starting device comprises the fuel jet Gs, the air jet Ga and a slide valve for regulating the volume of the fuel/air mixture. The slide valve has two positions — half open and wide open. The latter position is spring-loaded for automatic return to the half-open position. The throttle flap must not be opened while the cold-starting device is being used, since this would put the device out of action.



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SOLEX 34 W CARBURETOR

a	Emulsion jet
F	Float
Ga	Starter air jet
Gg	Main jet
Gs	Starter fuel jet
g	Low-speed jet
gN	Idling fuel jet
K	Choke tube
1^1	Lever for cold-starting device
P	Float valve
s	Emulsion tube
u^1	Air jet
V	Throttle flap
W	Air-regulating screw for fuel air mixture
Y	Holder "A" for main jet

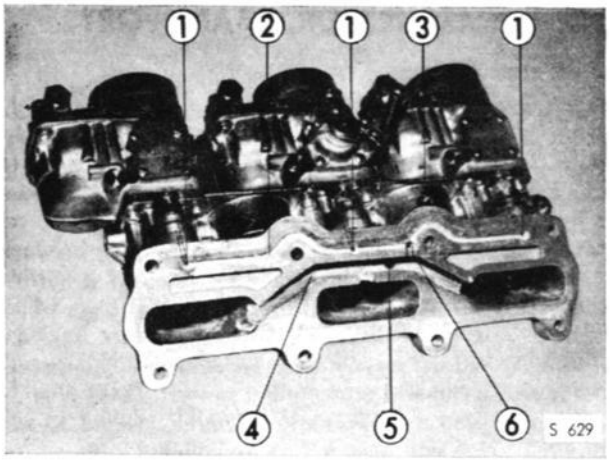
The carburetors are provided with a filter for bleeding the float. This filter consist of a metal casing, held with a screw, and an insert of metal gauze. The insert is accessible after removal of the screw and the casing.
The filter should be examined and cleaned in conjunction with changing the filter insert in the air cleaner.

Disassembly and reassembly

1. Remove the air cleaner.
2. Disconnect the fuel line from the pump.
3. Detach the rubber bolt from the throttle-spindle plate.
4. Remove the cold-starting control and the fuel hoses.
5. Remove carburetor with induction manifold.
6. Remove the throttle-body assembly with carburetors from the induction manifold.
7. Cover over the inlets in the induction manifold to prevent the entry of foreign matter into the engine.
8. Clean the carburetors externally and detach them from the throttle-body assembly. Remove the gaskets.
9. Remove the lid of the float chamber and examine the retaining spring between the needle valve and the float arm as well as the needle valve and its gasket.
10. Check the float lever and bearing and make sure that the float does not leak.
11. Clean the bleed filter in the lid of the float chamber.
12. Check the main jet, low-speed jet, idling jet, emulsion jet and emulsion tube.
13. Check the slide of the cold-starting device for face wear. Check the fuel and air jets as well as the lever return.
14. Check the throttle spindle for wear.
15. After having cleaned all parts and passages, reassemble the carburetors.

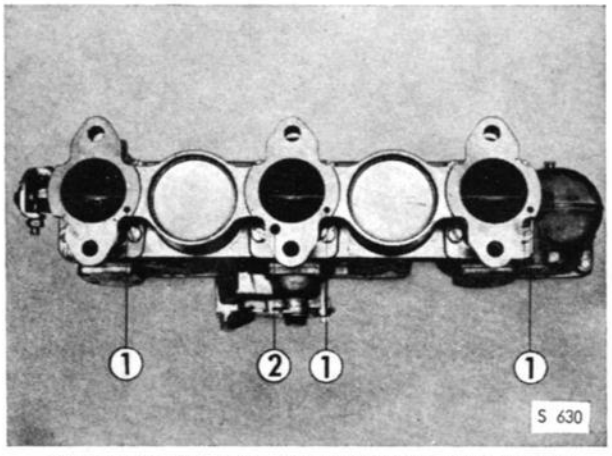
> NOTE
>
> When refitting the lid of the float chamber, make sure that the bearing pin for the float enters both grooves in the float chamber, as otherwise the pin will get bent and the float will get caught up. Check also that the needle-valve retaining spring is connected to the float.

16. Refit the carburetors to the throttle-body assembly. Use new gaskets.
17. Refit the throttle-body assembly with the carburetors on the induction manifold (use new gaskets) and connect the unit to the engine.
18. Refit the air cleaner, fuel hoses and cold-starting device. Switch on the engine and allow it to warm up before adjusting the idling speed.



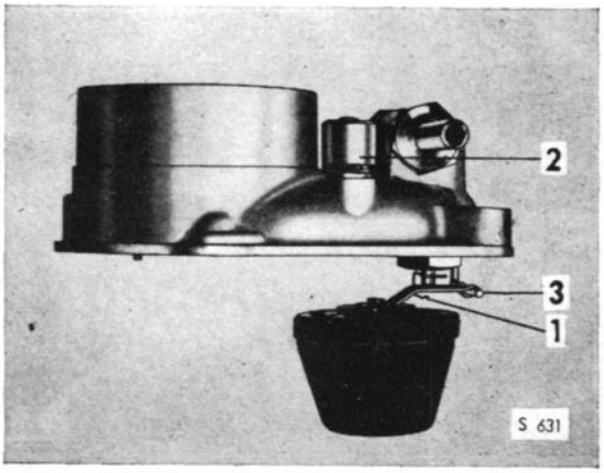
CARBURETORS AND INDUCTION MANIFOLD

1. Fuel/air mixture from carburetor idling system
2. Collection passage
3. Air-regulating screw
4. Balancing passage
5. From cold-starting device
6. Outlet for idling fuel/air mixture



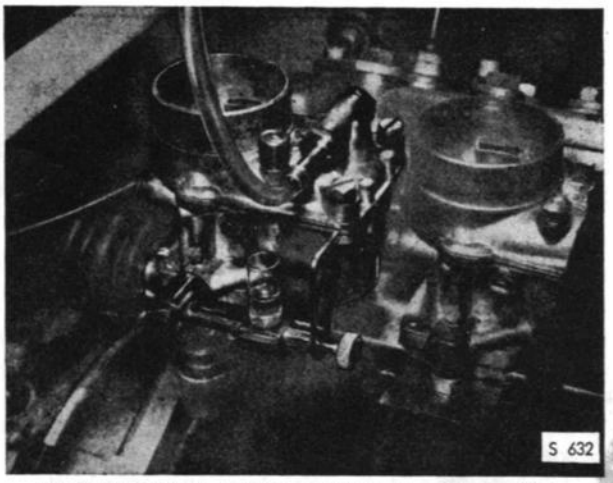
CARBURETORS AND TROTTLE-BODY ASSEMBLY

1. Passage for idling fuel/air mixture to induction manifold.
2. Passage for fuel/air mixture from cold-starting device to induction manifold.



FLOAT CHAMBER COVER

1. Spring for needle valve
2. Bleeding filter
3. Float bearing



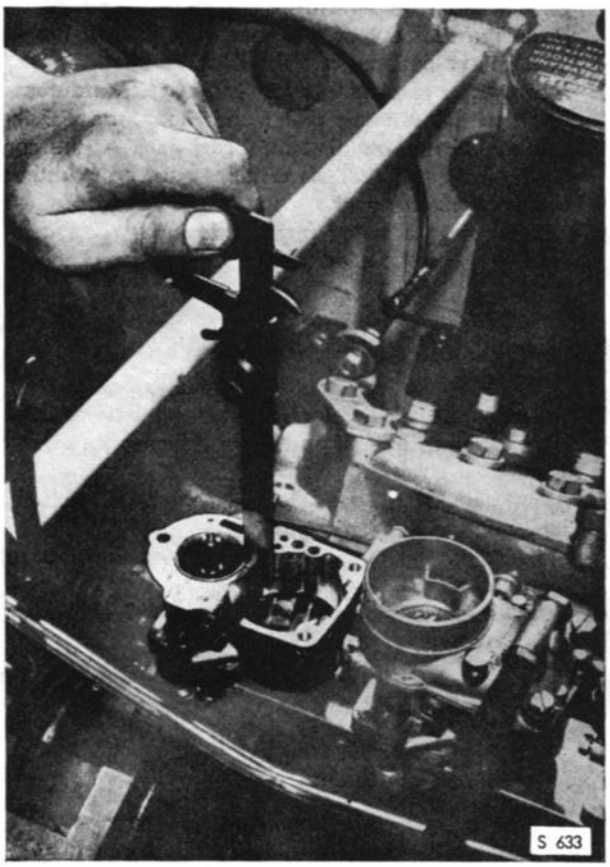
MEASUREMENT OF FLOAT LEVEL WITH LEVEL TUBE 784210

Adjustment of float level

Measuring with a level tube

The float level must be adjusted with the carburetors fitted in the car. This adjustment should preferably be carried out with the aid of the level tube, tool No. 784210, as described in the following:

1. Remove the air cleaner and fuel hoses from the carburetors.
2. Unscrew the main-jet holder and connect the level tube, tool No. 784210, to the carburetor with the index in the dividing plane of the float chamber.
3. Connect a hose between the leakage hole in the level tube and a receiver and open the valve wide.
4. Connect a plastic hose, 5 ft (1500 mm) long, with a funnel to the fuel inlet on the carburetor.
5. Hold the hose upright and pour fuel into the funnel until a 5 ft. (1500 mm) column of fuel is obtained above the carburetor.
6. Read off the fuel level on the level tube of the measuring tool. The level should be between the two graduations.
7. If adjustment is called for, file down or replace the washer under the float valve and then recheck the level. The float arm must not be bent.



MEASUREMENT OF FLOAT LEVEL WITH A VERNIER GAUGE

NOTE

When refitting the lid of the float chamber, be careful not to distort the float bearing pin. The bearing must lie in the two grooves in the float chamber.

Measuring the float level with a vernier gauge

If measuring tool No. 784210 it not available, the float level can nevertheless be measured in an acceptable manner by the following procedure:

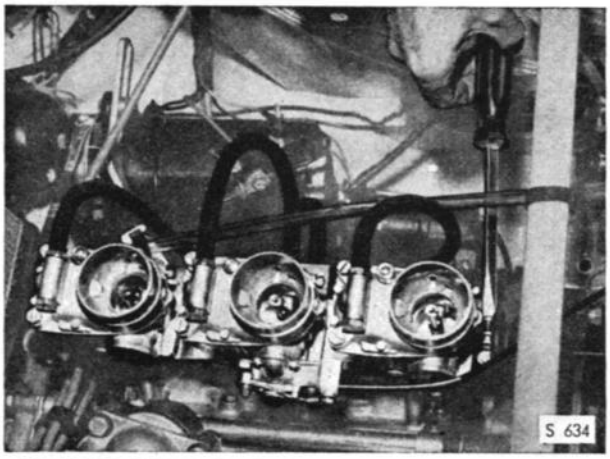
1. Remove the air cleaner and the fuel hoses to the carburetors.
2. Connect hose, 5 ft. (1500 mm) long, with a funnel to the fuel inlet on the carburetor.
3. Hold the hose upright and pour fuel into the funnel until a 5 ft. (1500 mm) column of fuel is obtained above the carburetor. Shake the engine slightly to prevent the needle valve from getting caught up.
4. Drain the fuel out of the hose and remove the lid of the float chamber and the float.
5. Measure the level with a vernier gauge. The distance between the dividing plane and the surface of the fuel should be 0.98±0.04 in. (25±1 mm). As the carburetors are inclined, the distance must be measured at the carburetor neck.
6. If adjustment is called for, file down or remove the washer under the needle valve and then recheck the level.

Idling adjustment, Solex 34 W

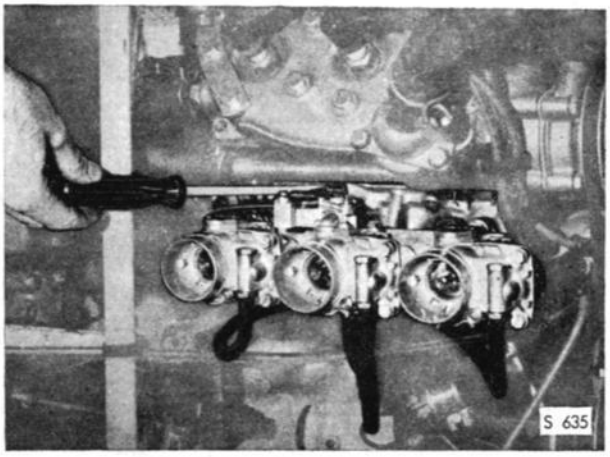
Adjust the engine idling speed while the engine is warm.

1. Allow the engine to idle.
2. Adjust the idling speed to about 600—750 r.p.m. with the slow-running adjustment screw.
3. Adjust the volume-control screw on the induction pipe to give the highest idling speed.
4. Readjust the slow-running adjustment screw until a suitable idling speed, i.e. 600—750 r.p.m., is obtained. The recheck the position of the volume-control screw as above.

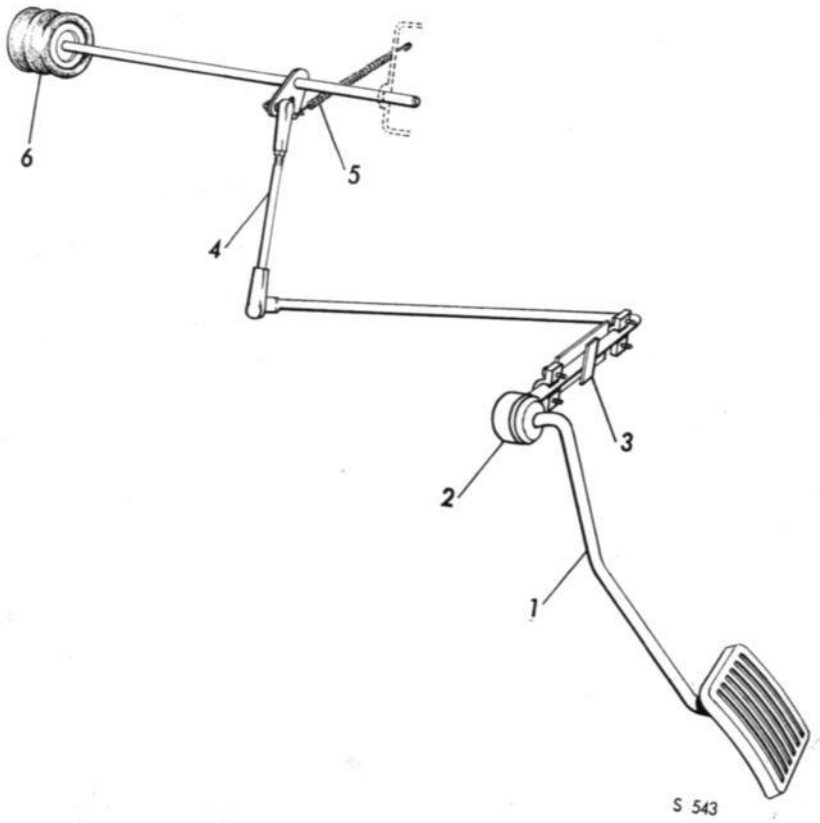
Repeat this procedure until the correct idling speed is obtained. It is better to screw in the volume-control screw too far than too little.



SETTING THE IDLING SPEED WITH THE TROTTLE AXLE SCREW



SETTING THE IDLING SPEED WITH THE AIR-REGULATING SCREW



ACCELERATOR CONTROL

1. Accelerator pedal
2. Rubber sealing
3. Blade spring
4. Ball joint link
5. Return spring
6. Rubber bellow

ACCELERATOR

Removal

1. Detach the pedal from the lever by driving out the rivet.
2. Unhook the return spring. See fig.
3. Disconnect the ball-joint link from the lever.
4. Back off the screws for the two lever bearings and collect the leaf spring.
5. Remove the rubber seal from the dash panel and take out the lever with the seal facing forwards.
6. Remove the rubber seal from the lever.
7. Ease the rubber boot off the plate on the carburetor throttle spindle.
8. Pull the shaft forwards out of its bearings.

Reassembly

Change all worn or damaged parts.

1. Refit the shaft in its bearings on the heater shroud, and reconnect the shaft, together with the rubber boot, to the carburetor.
2. Ease the rubber seal onto the lever and pass this through the dash panel from the front. Don't forget the leaf spring.
3. Reconnect the ball-joint link between the lever and the shaft.
4. Hook the return spring onto the shaft.
5. Refit the pedal to the lever.
6. Check that depression of the accelerator pedal gives full deflection of the throttle spindle.

Checking and adjustment

The distance between the pedal footplate and the toeboard should be about 2 in. (50 mm) and can be adjusted by means of the ball-joint link. This part comprises a rod with ball joints threaded on both ends and locked with nuts — see fig. If the accelerator pedal needs raising, increase the length of the ball-joint link. Check that depression of the accelerator pedal causes the carburetor throttle to open wide.

If the lever is distorted, so that adjustment of the length of the link is not sufficient for correct pedal adjustment, it will have to be realigned. In doing this, be careful not to strain the lever bearings. Afterwards, make a final adjustment with the ball-joint link.

A leaf spring between the lever and the dash panel prevents bearing rattle — see fig. Lubricate the accelerator bearings and joints with oil.

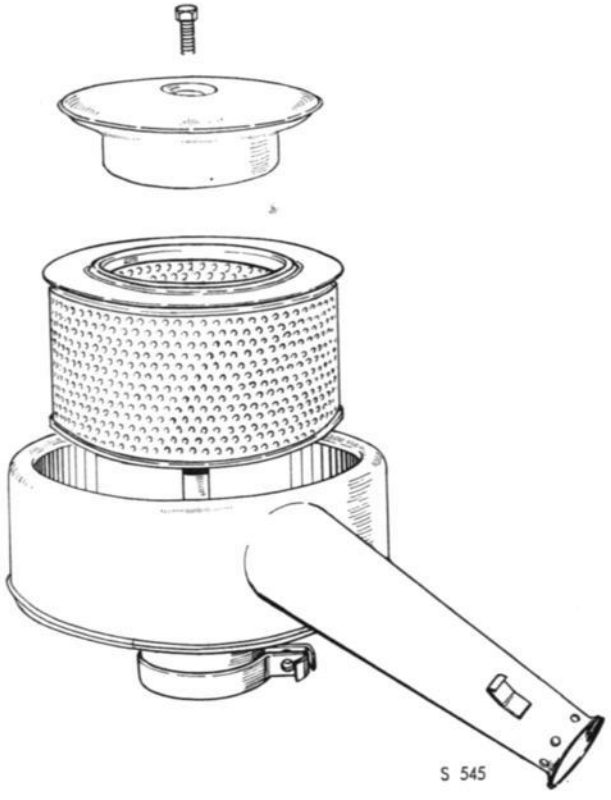
AIR CLEANER

General

The air cleaner serves a twofold purpose: it not only filters the incoming air, but also serves as a muffler to reduce the noise caused by the air when it enters the carburetor.

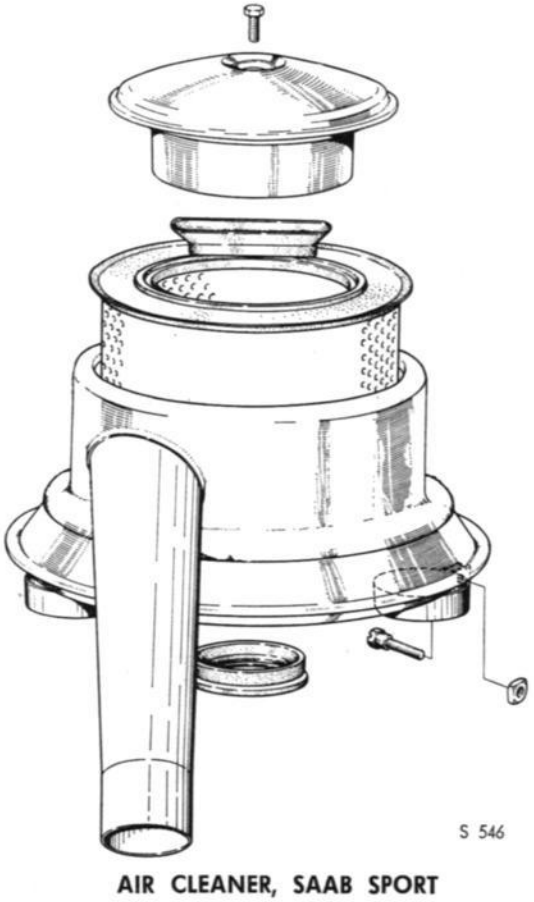
Filter insert

The air cleaner is fitted with a replaceable filter insert, which should be changed at intervals of 18000 miles (30000 km) or every other year. The filter insert must be protected from moisture and should never be washed or oiled. On the other hand, it may occasionally be necessary to wipe the filter housing and cover clean, taking great care to prevent dirt and dust from falling down into the carburetor. If compressed air is used to blow the filter insert clean, direct the blast carefully from the inside of the filter.



S 545

AIR CLEANER, SAAB 95 AND 96



S 546

AIR CLEANER, SAAB SPORT

Preheater

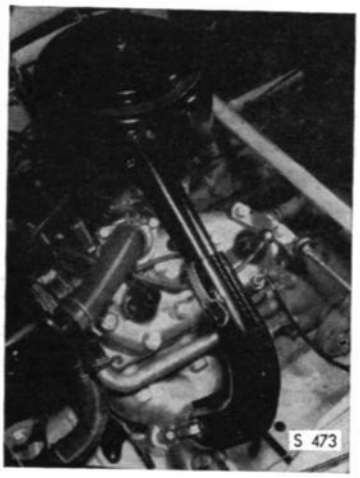
In combination with the air cleaner and exhaust manifold is a device which preheats the induction air. Its task is to prevent ice formation in the carburetor, which may occur in weather conditions with ambient temperatures of between 25° and 60°F (—5 and +15°C) and a relative humidity of more than 55%.

Icing in the carburetor is indicated by engine failure at slow running speeds, increased fuel consumption and — in the worst case — a serious drop in performance level.

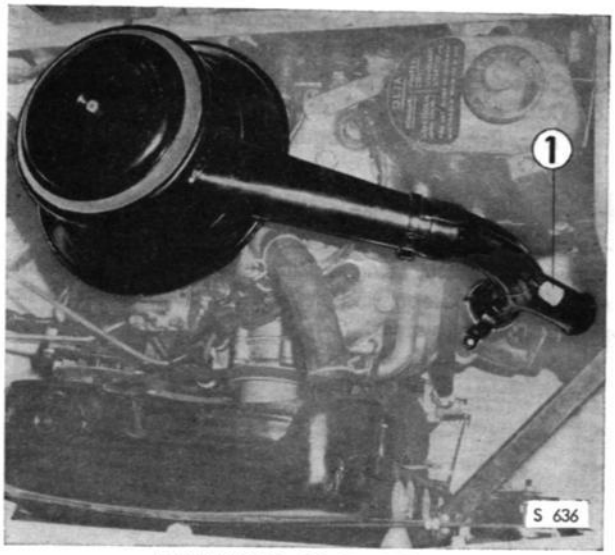
The preheater device can be disconnected by removal of the preheater pipe on the Saab 95 and 96 and by throwing a switch on the preheater pipe on the Saab Sport.

IMPORTANT

The preheater device must not be disconnected except in extremely hot climates or in long periods of very hot weather. Otherwise, there is a risk of icing in the carburetor.



PREHEATER, SAAB 95 AND 96



PREHEATER, SAAB SPORT

1. Control for setting

FUEL PUMP AND FILTER

General

The diaphragm-type fuel pump is mounted on the engine crankcase. The pressure variations in the crankcase actuate the diaphragm, causing the pump to feed fuel to the carburetor.

Cleaning the filter

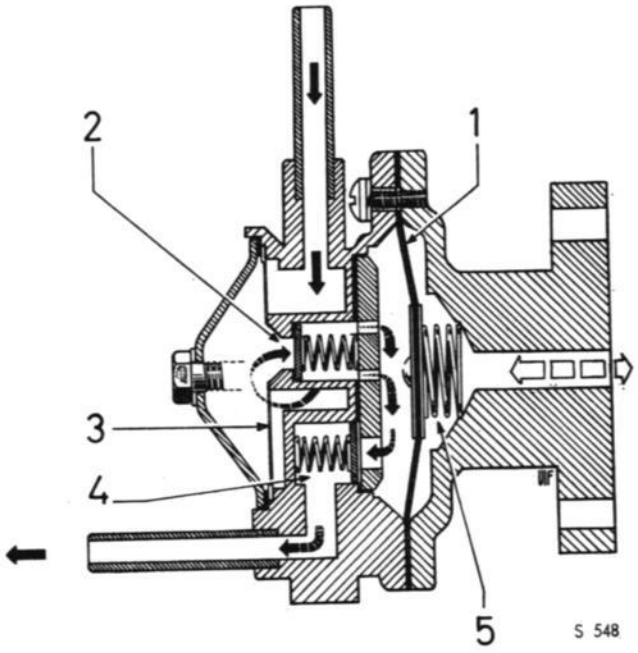
Back off the screw on the top of the pump and remove the cover together with its gasket. Clean the filter. This should be done every 12000 miles (20000 km).
When reassembling, make sure that the filter and gasket are flawless.

Diassembly

1. Detach the pump from the engine block if required.
2. Mark out the relative positions of the pump halves.
3. Back off the bolts holding the two pump halves together and separate the halves, thus revealing the diaphragm and the compression spring.
4. If the valves are to be changed, back off the three bolts holding the valve plate.
5. Collect the gasket, valve discs and valve springs.
6. Back off the screw holding the cover on top of the filter. Remove filter together with its gasket.

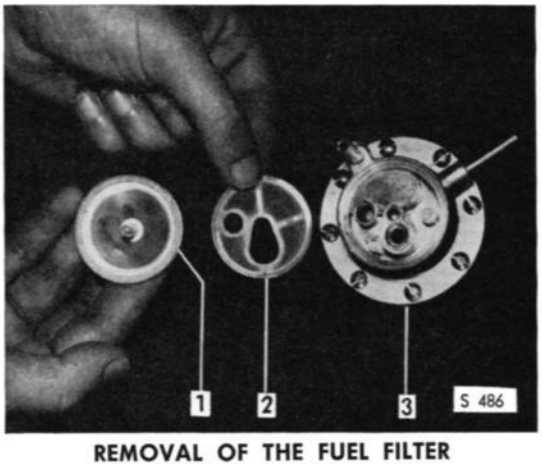
Inspection and cleaning

Check the sealing surfaces of the pump. Correct planeness, if necessary, using a face plate covered with fine emery paper. Clean and inspect all parts. Replace the diaphragm and valves.



FUEL PUMP, SECTIONED

1. Diaphragm
2. Inlet valve
3. Filter
4. Outlet valve
5. Diaphragm



REMOVAL OF THE FUEL FILTER

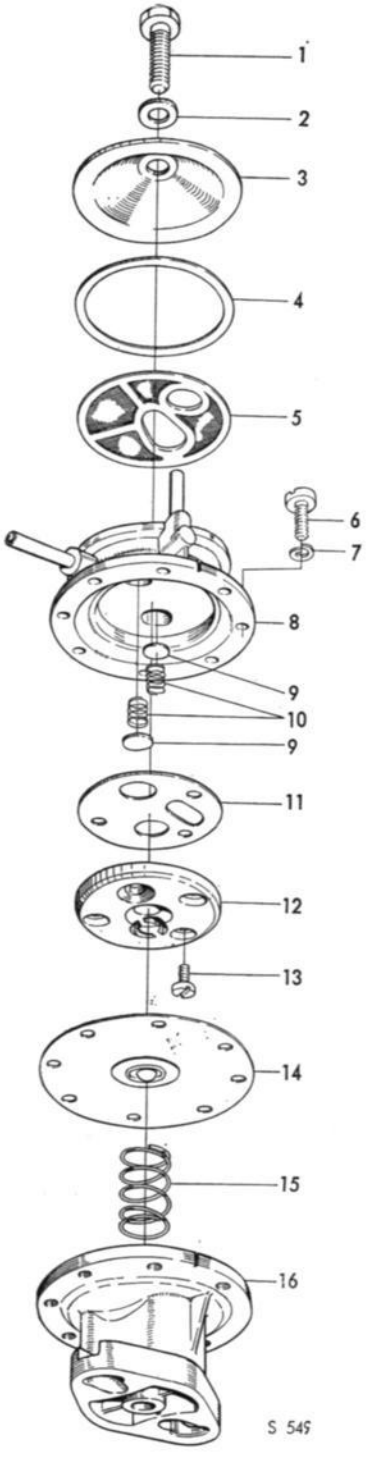
1. Cover with gasket
2. Filter
3. Fuel pump

Reassembly

1. Mount the valve springs, with the small diameter turned towards the guide pin.
2. Put on the valve discs, with the rubber-lined side facing the valve seat. Refit the gasket and valve plate. Secure the bolts with center pops.
3. Refit the pump spring and diaphragm. Locate the diaphragm with the rivet head towards the valve plate.
4. Place the pump halves together in the marked positions and tighten the bolts.
5. Secure the pump to the engine block, remembering to fit a thick fiber washer with a gasket on either side between these two units.

Checking the fuel pump

1. Pull off the fuel hose at the carburetor and connect it to a manometer (fuel-pressure tester).
2. Disconnect the cable at the connection marked "—" on the ignition coil.
3. Run the starter, without depressing the accelerator.
4. Read off the pressure on the manometer. The pressure should be 2.8—3.5 p.s.i. (0.2—0.25 kg/cm²), and must not fall appreciably when you stop running the starter.



FUEL PUMP

1. Screw
2. Washer
3. Cover
4. Gasket
5. Filter
6. Screw
7. Washer
8. Upper part, pump housing
9. Valve
10. Valve spring
11. Gasket
12. Valve plate
13. Screw
14. Diaphragm
15. Diaphragm spring
16. Lower part, pump housing

FUEL TANK WITH FITTINGS AND FUEL LINE

FUEL TANK

Disassembly

1. Remove the drain plug, accessible from under the car, and empty the tank.
2. Remove the rear seat cushion and backrest.
3. Saab 95: Remove the sheathing over the tank by unhooking the two spiral fasteners.
   Saab 96: Lift out the spare wheel and remove the front part of the trunk floor.
4. Disconnect the tank earth wire from the body and detach the cables from the fuel gage sender unit.
5. Detach the fuel line from the tank.
6. Disconnect the two tank retaining straps. On the Saab 96, the nuts for these straps are accessible through holes in the rear sloping panel.
7. Jack up the car and undo the clips for the venting and filler tubes under the rear fender.
8. Raise the right side of the tank and remove the tank in an upwards and rearwards direction.
9. Collect the rubber seal in the wheel house wall.

Reassembly

1. Refit the rubber seal on the venting and filler tubes. This seal should be provided with a leather thong or suchlike in its groove to facilitate fitting.
2. Make sure that the tank retaining straps are correctly located. Cover the top of the tank filler connection and the hole for the fuel gage sender unit with masking tape.
3. Pass the tank filler connection and the ends of the leather thong through the hole in the wheel house wall and place the tank in position.
4. Refit the rubber seal in the wheel house wall by drawing out the previously inserted leather thong from the groove.
5. Remove the masking tape, rejoin the venting and filler tubes and replace the clamps.
6. Refit the wheel and lower the car.
7. Reattach the fuel line to the tank and then tighten the tank retaining straps.
8. Reconnect the tank earth wire to the body and the cables to the fuel gage sender unit.
9. If the fuel gage sender unit has been removed, coat its gasket with sealing paste such as Permatex before refitting.
10. Refit the trunk floor or sheathing, as applicable. Replace seats and cushions.

Fuel line

To replace the fuel line, the power unit must be lifted out of the car. Joins in the line should be made with great care and only if absolutely essential. In no circumstances may joins in the line be made inside the passenger compartment.

Removal of fuel line

1. Remove the hood, the front panel and the horn.
2. Take the seats, cushions and mats out of the car.
3. Remove the front part of the trunk floor.
4. Disconnect the fuel line from the tank and pump, and bend open all clips and floor brackets. Collect all rubber cushions from around the line inside the car.
5. Cut the fuel line off about 6—8 in. (15—20 cm) behind the supporting beam for the rear seat cushion and collect the rear part of the line.
6. Pull the fuel line out in the forwards direction through the engine compartment.

Installation of fuel line

1. Refix the rear nut for the fuel line and cover the opening with masking tape.
2. Blow the fuel line floor channel clean, and adjust floor brackets and clips as necessary to ensure that the line runs clear.
3. Insert the fuel line from the front through the hole in the dash panel.
4. Bend the rear section of the fuel line to the same shape as the cut-off part.
5. Tear off the masking tape and reconnect the fuel line to the fuel tank and pump.
6. Fit the rubber cushions round the fuel line and the rubber seal in the dash panel. Then bend down all clips and floor brackets.
7. Refit the trunk floor, mats, seats and cushions.
8. Refit the front panel, the horn and the hood.

Cleaning the fuel system

If impurities are found in the fuel tank, both tank and line must be cleaned. This can be done by emptying the tank and flushing it out with pure gasoline or spirit. Make sure that the tank is horizontal, so that the impurities and foreign matter do not collect at one corner. To flush the system more thoroughly, remove the fuel gage sender unit and direct the stream of liquid through the hole towards different parts of the tank. An extremely dirty tank should be removed for cleaning. Disconnect the fuel line from the tank and the pump and blow it clean with compressed air. Remove and clean the fuel filters in the fuel pump and carburetor. Lift off the carburetor cover, take out the float and the main jet and blow clean with compressed air.

FRONT MUFFLER

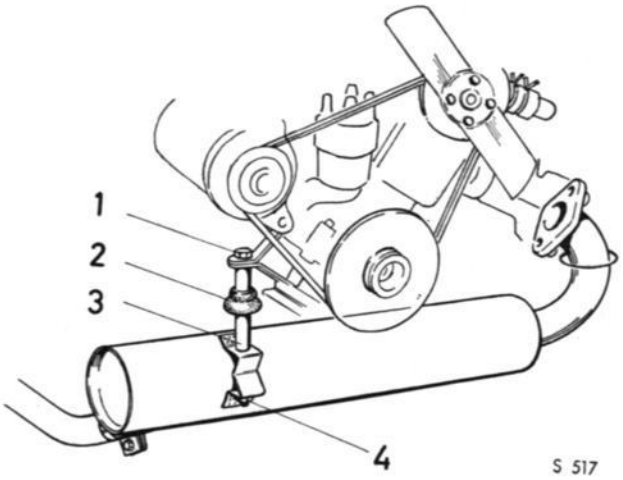
Removal

Jack up the front or rear part of the car, as appropriate, before starting work.

1. Unfasten the exhaust pipe connection clamp.
2. Back off and remove the bolts holding the muffler connection pipe to the exhaust manifold and remove the gasket.
3. Back off and remove the muffler hanging bolt and lower the muffler to below the front panel.
4. Separate the exhaust pipe from the muffler.
5. Remove the muffler.

Installation

1. Insert the muffler connection pipe and its connection flange through the hole in the engine compartment floor.
2. Pass the muffler outlet connection onto the exhaust pipe. Don't forget the clamp.
3. Fit the retaining screw and secure the muffler without tightening.
4. Insert a new gasket between the muffler connection pipe and the exhaust manifold and tighten up the connection.
5. Tighten the hanging bolt finally. Check that the muffler is located parallel with the front panel, so that the distance between these two parts is exactly the same all along the muffler. Also check the distance between the muffler and the engine compartment floor.
6. Tighten the clamp holding the exhaust pipe to the muffler.
7. Start the engine and check for leaks.



S 517

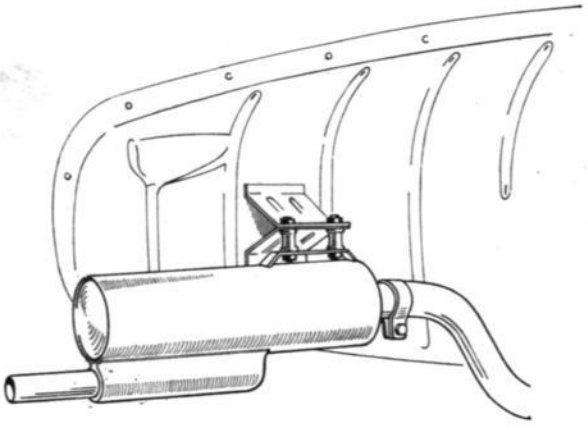
FRONT MUFFLER

1. Bolt
2. Rubber sealing
3. Spacer tube
4. Nut and spring washer

REAR MUFFLER

Removal

1. Take off the right rear wheel and unfasten the exhaust pipe clamp.
2. Back off the two upper nuts by means of which the muffler is suspended.
3. Detach the muffler from the exhaust pipe and remove the muffler.



REAR MUFFLER

S 550

Installation

1. Pass the muffler onto the exhaust pipe. Don't forget the clamp.
2. Fit the muffler to the bracket on the wheel house wall.
3. Tighten the clamp at the exhaust pipe connection to the muffler.
4. Start the engine and check for leaks.
5. Remount the rear wheel.

Repairs

The front muffler is seldom choked with carbon or other foreign matter as it is located close to the engine, where the temperature inside the muffler is rather high. The rear muffler, on the other hand, may become choked with carbon in certain circumstances. Carbon deposits will be thickest during the cold part of the year, and when the car is driven at low speed in high gear. The muffler, like the exhaust pipe, can be burnt clean. Any cracks in the mufflers can be repaired by welding.

Changing the front muffler connection Flange

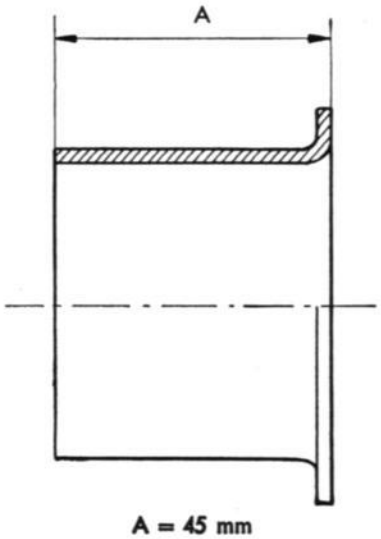
If the flange on the front muffler connection pipe is damaged, it is advisable to fit a new connection flange (available as a spare part). To do this, proceed as follows:

1. Remove the connection flange and cut the muffler connection pipe to a suitable length.
2. Tack weld the new flange.
3. Check that the pipe can be fitted to the exhaust manifold without any stress. Adjust the pipe so that it fits well.
4. Remove the muffler and weld finally. Make sure that no large blobs are left inside the pipe.
5. Refit the muffler.

Sealing between mufflers and exhaust pipe Cracks

In the event of leakage at the connection between the exhaust pipe and the front muffler or between the exhaust pipe and the rear muffler, carry out the following measures:

1. Undo the clamp — see fig.
2. Push the exhaust pipe into the muffler pipe connection.
3. Check that the exhaust pipe is not out of true, which would cause stresses at the connections.



A = 45 mm

CONNECTION FLANGE FOR THE FRONT MUFFLERS INLET PIPE

4. Secure the clamp by tightening its bolt and nut. If these measures prove inadequate, check the alignment of the pipe and straighten if necessary.

Cracked exhaust pipes or mufflers must be replaced or repaired by welding. Make sure that there are no residual stresses or permanent distortions in these parts after welding.

EXHAUST MANIFOLD

Seal between exhaust manifold and engine block

In the event of leakage between the exhaust manifold and the engine block, tighten the bolts. If this doesn't help, new gaskets must be fitted. Tighten the bolts carefully to avoid damaging the exhaust manifold, which is made of cast-iron.

Seal between exhaust manifold and front Muffler connection pipe

In the event of leakage between the exhaust manifold and the front muffler connection pipe, proceed as follows:

1. Back off the retaining bolt used to hold the muffler to the engine.
2. Tighten the nuts on the flange bolts joining the exhaust manifold and the muffler connection pipe. Take care not to tighten the bolts excessively, thus avoiding cracking of the (cast-iron) flange on the exhaust manifold.
3. If the leakage cannot be stopped by this means, a new gasket must be fitted. Check also that there are no cracks in the flange of the muffler connection pipe.
4. Retighten the retaining bolt.

NOTE

It is important for the muffler retaining bolt to be slackened during this work. Otherwise, the flange on the muffler connection pipe may be damaged when the nuts are tightened.

EXHAUST PIPE

Removal

Jack up the right side of the car before starting work.

1. Take off the right rear wheel and release the clamp joining the exhaust pipe to the rear muffler.
2. Back off and remove the upper nuts with which the rear muffler is suspended, and pull the muffler off the exhaust pipe.
3. Undo the clamp joining the exhaust pipe to the front muffler.
4. Back off and remove the nuts with which the exhaust pipe is secured under the floor.
5. Pull the exhaust pipe off the front muffler.

Reassembly

Reassembly of the exhaust pipe takes place in the reverse order to removal.

Make sure that the exhaust pipe is properly fitted in the muffler pipe connections, thus ensuring effective sealing when the clamps are tightened and precluding tension in the rubber cushions at the floor plate. If the exhaust pipe is mounted under tension, vibrations may easily develop in the body of the car.

Decarbonization and repair

After 12000—15000 miles (20000—25000 km) or so, the exhaust pipe is generally so choked that a considerable amount of power is consumed merely to discharge the exhaust gases. The exhaust pipe must then be decarbonized. This can be done in different ways, but in principle it should be done so that the carbon is made to burn while being blown out with compressed air. Burning of soot requires considerable heating of the exhaust pipe, and care must be taken to avoid distortion.

Normally, however, it is advisable to fit a new exhaust pipe, as the old is generally weakened by this time through corrosion and the impact of thrown-up gravel, etc.

Rubber cushions, exhaust pipe and rear muffler

This work is facilitated if the right side of the car is jacked up and the right rear wheel removed.

Removal

1. Separate the exhaust pipe rubber cushions from the floor. The two nuts can be reached from inside the car if the rear mat is folded back out of the way.
2. Back off and remove the nuts holding the rubber cushions to the exhaust pipe.
3. Back off and remove the upper nuts holding the rear muffler rubber cushions to the bracket on the wall of the wheel house.
4. Back off and remove the nuts holding the rubber cushions to the muffler. It may possibly be necessary also to remove the muffler.

Reassembly

1. Fit the exhaust pipe rubber cushions under the floor.
2. Screw the rubber cushions onto the rear muffler.
3. Refit the muffler, together with the rubber cushions, to the bracket on the wall of the wheel house.
4. Secure the exhaust pipe over the rubber cushions in the floor. Make sure that it is not under tension.

RADIATOR AND CONNECTIONS

Removal of radiator

Always take care when working with the radiator in order to avoid damage and leaks.

1. Remove the hood.
2. Drain off the water.
3. Remove the blind cord.
4. Disconnect the water hoses.
5. Back off the upper and lower radiator retaining screws.
6. Lift out the radiator.

Installation of radiator

1. Replace the radiator in position and screw in the upper and lower retaining screws.
2. Reconnect the hoses. Be sure to stretch them properly in order to avoid kinks. Refit the clamps.
3. Refill the radiator with water.
4. Refit the blind cord.
5. Remount the hood.

Pressure testing the cooling system for leaks

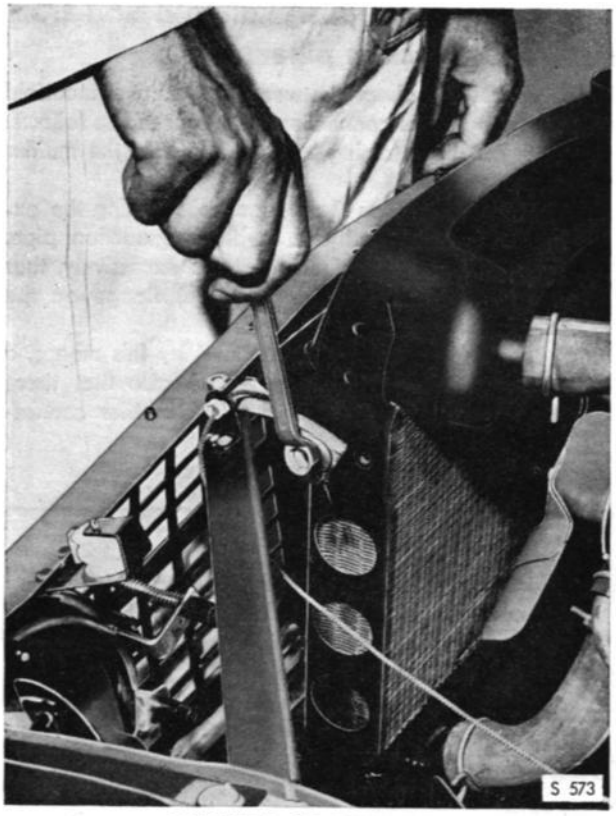
It is often difficult to discover leakage in the cooling system, as the pressure in the system reaches its full value only while the car is being driven. One good method is to put the system under pressure with the aid of a pressure tester, whereupon the radiator, hoses and seals can be checked. The maximum permissible pressure is 14 psi (1 kg/cm²).

The opening pressure of the pressure cap can also be checked with the pressure tester. It should open at a pressure of 3.5—4.2 psi (0.25—0.30 kg/cm²) above atmospheric.

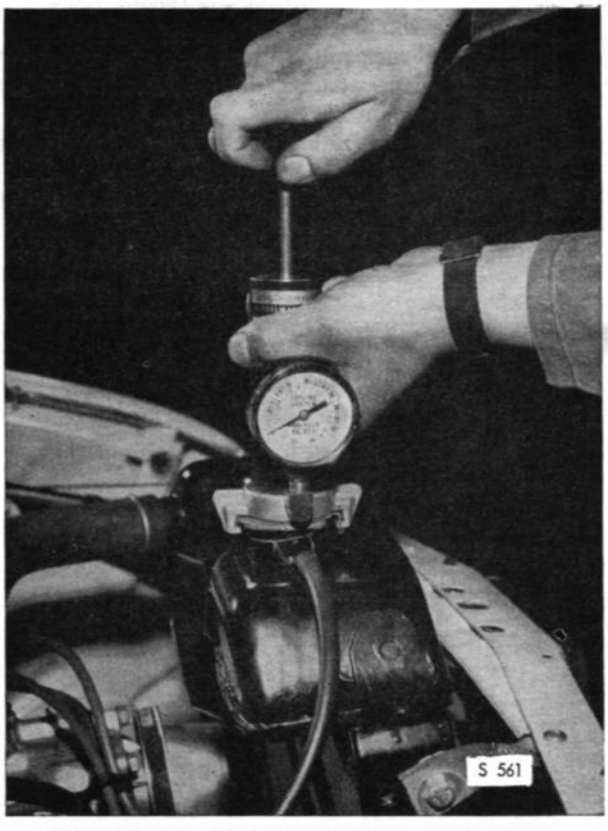
Testing the radiator for leaks

If the radiator is removed it can be tested for leaks by sealing the pipe connections, submerging it in water and testing with compressed air at max. 14 psi (1 atmos.).

A leaky radiator can be repaired by soldering. Patent sealers which are added to the cooling water should be used only in emergencies. These compounds can choke jackets and pipes and impede circulation. The cells of the radiator core may at times be so clogged up with dust, smashed insects, etc., that the air flow is reduced. The core must then be washed and blown clear with compressed air.



REMOVAL OF RADIATOR

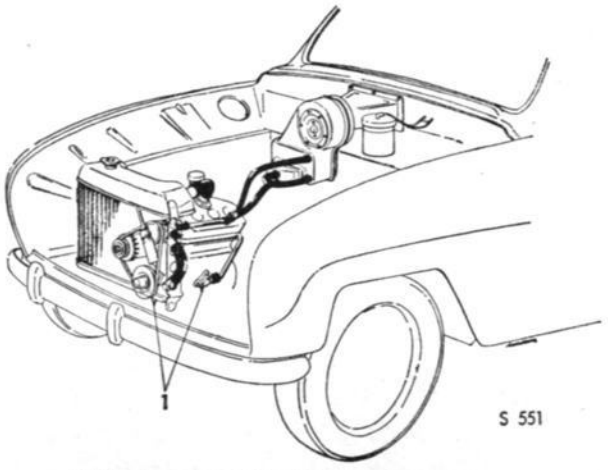


TESTING THE COOLING SYSTEM FOR LEAKS

Cleaning the cooling system

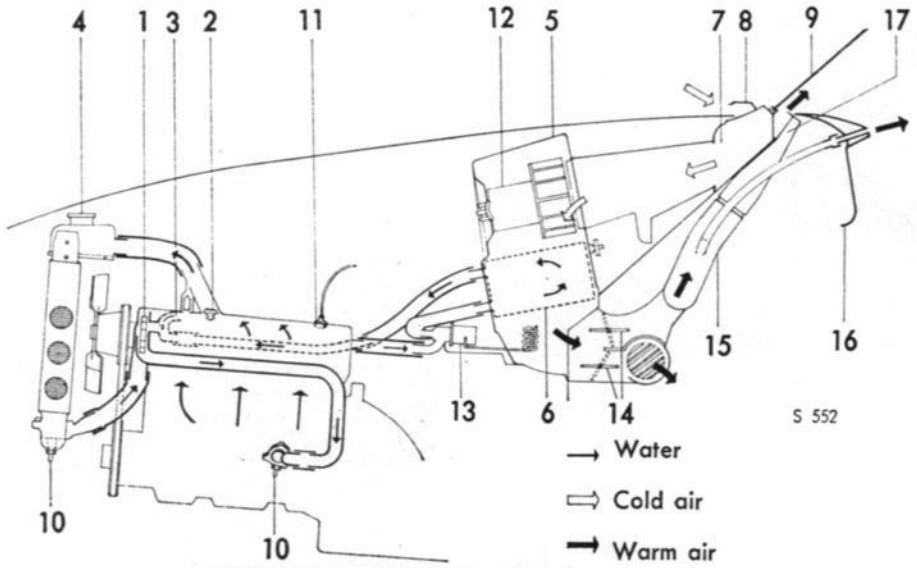
The cooling water should be drained twice a year, once in the spring and once in the fall. The system should then be cleaned thoroughly before it is refilled.

1. Drain off the water.
2. Flush the system with clean water.
3. Fill the system with clean water to which a suitable commercial solvent has been added. Follow the solvent manufacturer's instructions.
4. Shield the radiator and run the engine until warm.
5. Stop the engine and, after waiting a few minutes, drain off the water.
6. Flush the system again with clean water, treating the engine jacket and radiator separately. This time, flush against the normal direction of coolant flow, i.e. flush the engine jacket from the cylinder head and downwards, and the radiator through the lower connection pipe and upwards.
   Before flushing the system this time, back off the upper water neck and remove the thermostat.
7. Flush the heater element, also against the normal direction of circulation.
8. Check the function of the tap in the line to the heater element.
9. Refit the thermostat, water neck and hoses. Test the system for leaks. When cleaning the cooling system, also check that the radiator overflow pipe is not choked up with foreign matter. If the cleaning method described does not suffice to clear all deposits from the radiator, take the radiator out of the car and send it to a specialist.



THE COOLING SYSTEM DRAINING TAPS

1. Draining taps



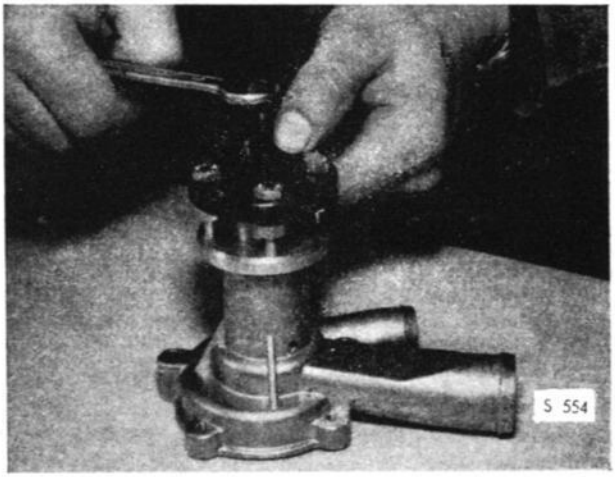
COOLING SYSTEM AND FRESH-AIR HEATER

1. Coolant pump
2. Thermostat
3. By-pass line
4. Radiotor
5. Fan housing
6. Heater element
7. Collector box
8. Fresh-air inlet
9. Windshield
10. Draining taps
11. Temparature-gage sender unit
12. Fan motor
13. Thermostat valve
14. Distributor damper
15. Defroster hose
16. Instrument panel
17. Defroster jet

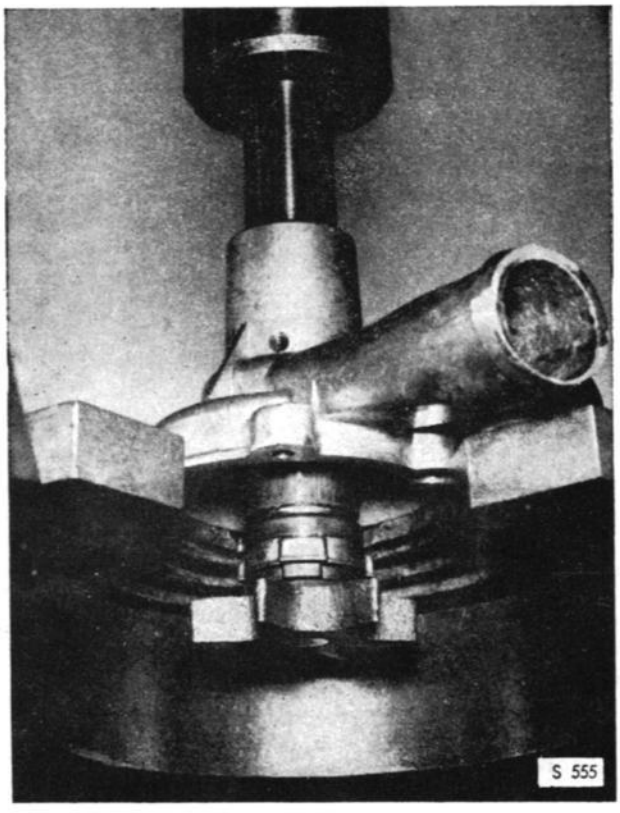
WATER PUMP AND FAN

Removal of pump

1. Drain off the cooling water.
2. Take off the fan and the pulley.
3. Take away the pump retaining bolts and remove the water hoses.
4. Remove the pump.



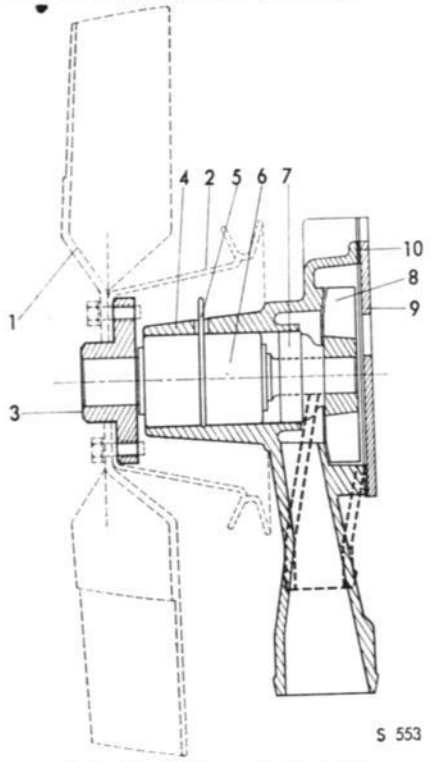
REMOVAL OF HUB WITH TOOL 784135



PRESSING OUT THE AXLE WITH TOOL 784138

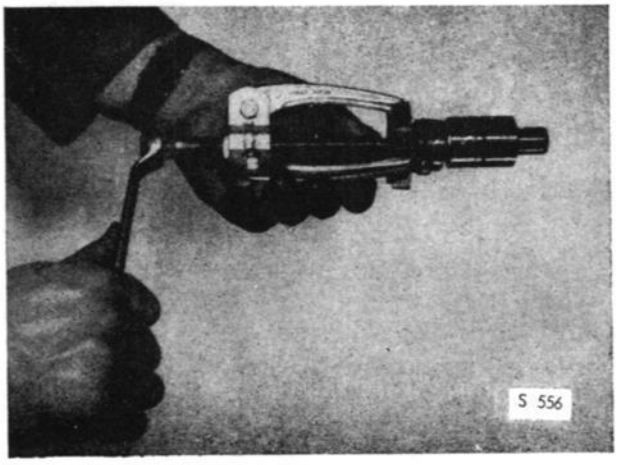
Disassembly of pump

1. Remove the pump housing end plate and take out the gasket.
2. Pull out the pump shaft retainer spring.
3. Attach puller 784135 to the hub and pull off the hub — see fig.
4. Place the pump, appropriately supported, in an arbor press. Apply arbor 784138 and press out the bearing against the outer ball race of the shaft together with shaft, seal and impeller.
5. Pull off the impeller, using puller 784115. The seal can then be removed from the shaft.



WATER PUMP, SECTIONED

1. Fan
2. Pulley
3. Hub
4. Pump housing
5. Lock spring
6. Pumpshaft with bearing
7. Sealing
8. Impeller
9. Pump housing end plate
10. Gasket



PULLING OFF THE IMPELLER WITH TOOL 784115

Inspection

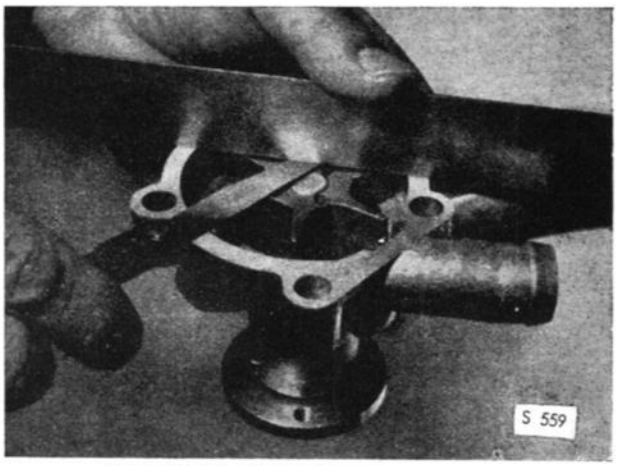
Before reassembling, carefully inspect all parts. The sealing surface of the impeller must be smooth and unscratched. A face plate covered with fine emery paper can be used to remove small scratches. In case of more serious damage, however, a new impeller must be fitted. The shaft and bearing cannot be taken apart and must not be washed or heated, as the bearing, which must run easily and without jerking, is permanently lubricated. If the pump has been repaired, a new seal must be fitted. Check also that the pump housing is undamaged.

Reassembly of pump

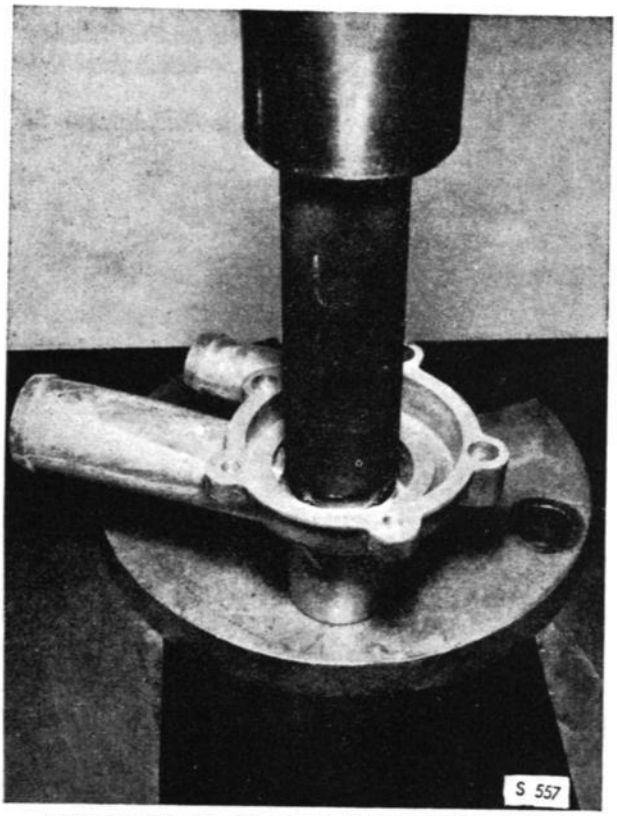
1. Fit the pump seal in the housing, using arbor 784030.
2. Place the pump housing with the sealing surface against a plane base and press the pump shaft in with the aid of arbor 784138 in a press. Turn the thick end of the shaft outwards and locate the shaft so that the grooves for the retainer spring match on shaft and housing.
3. Refit the retainer spring.
4. Press the impeller on, using the back of arbor 784138. The plane of the impeller surface must be flush with the stub, but not more than 0.016 in. (0.4 mm) under the sealing surface of the pump housing — see fig.

NOTE

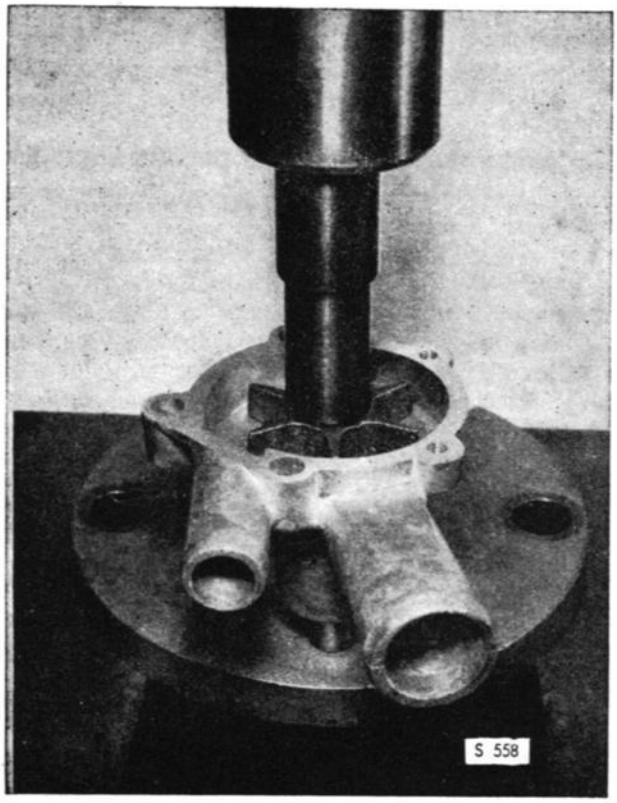
Do not use grease or oil on the face of the sealing ring, as this can lead to abnormally high wear.



CHECKING THE IMPELLER POSITION



INSTALLATION OF SEAL WITH TOOL 784030



PRESSING IN THE IMPELLER WITH TOOL 784138

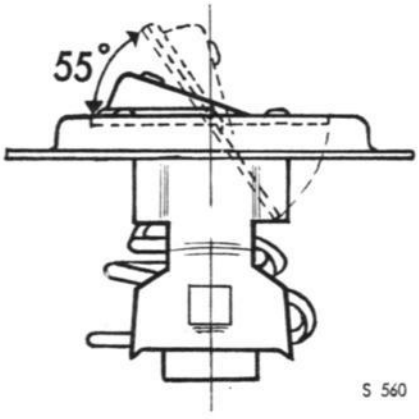
5. Turn the pump over and place a suitable support, i. e. a nut or the like, against the impeller stub. Press on the pulley so that the face of the hub is flush with the stub.
6. Make sure that the pump can be turned round without excessive resistance.
7. Refit the gasket and the pump end plate. Coat both sides of the gasket with sealing paste.

Reassembly of pump

1. Fit the pump on the engine.
2. Reconnect the water hoses.
3. Refit the pulley and the fan.

> NOTE
>
> Fit the pump with the concave side facing rearwards towards the pump housing.

4. Refill the cooling system with cooling water and check the pump connections and hose connections for leaks.



THERMOSTAT

THERMOSTAT

General

The engine temperature is regulated by a thermostat mounted in the cylinder head behind the water pump. The flap-type thermostat is commonly referred to as a wax thermostat. It starts opening at 178°F (81°C) and is fully open at 197°F (92°C).

There should be a minimum of trickle through the thermostat when it is closed. The maximum permissible trickle is 0.4 U.S. gal. (1,5 liters) per minute at a pressure of 20 p.s.i. (1.4 kg/cm²) above atmospheric.

Checking the opening temperature

To check the function and opening temperature of the thermostat, proceed as follows:

1. Suspend the thermostat in a water-filled vessel so that it does not touch the bottom.
2. Heat the vessel over a hotplate, keeping a constant check on the temperature and observing the thermostat flap.
3. The thermostat must not begin to open before the temperature has risen to 178°F (81°C) and should be fully open (flap angle 55°) at 197°F (92°C).
4. If the thermostat is defective, a new one must be fitted.

CONTENTS

ELECTRICAL SYSTEM

Description

The electrical system work on 12 volts and comprises the following units:
Battery, starter, generator, voltage regulator, ignition distributor, ignition coil, spark plugs, road lights and interior lighting, flasher-type direction indicators, windshield wipers, horns, fan motor, stop-light switch and cable harnesses as well as wiring, switches and fuses. On the Saab Sport, there is also a compensating resistance for the ignition coil, an electrical temperature transmitter unit, manoeuvre realy and dipping relay, oil-warning relay for control of the lubrication system, and also electrical windshield washer.

Battery

The 12-volt, 6-cell lead battery has a capacity of 33 amp-hours (Ah). It is placed on a ledge on the righthand wheel house. The negative cable is earthed to the body.

Generator

The generator is connected to a voltage and current regulator of variode type and supplies a continuous current of max. 300 watts. A warning lamp on the instrument panel shows if the generator is charging the battery.

Starter

The starter has a rated output of 0.5 h.p. The pinion is engaged by means of a solenoid switch that is turned on with the ignition key.

Ignition system

The engine is equipped with coil ignition which, apart from the battery, comprises an ignition coil and a distributor which, on the Saab 95 and 96, has a combined centrifugal vacuum governor. The centrifugal governor regulates ignition advance in two stages.
The Saab Sport has a single-stage, centrifugal governor only.
The ignition is switched on with the ignition key.
For hard driving, the Saab Sport should be fitted with special spark plugs of type "Surface gap" — Champion UK-16 V plugs. These are particularly suitable for two-stroke engines with heavy loads and have a low working temperature, which prevents trouble in the form of pre-ignition. The spark plugs require a high ignition voltage. This is provided by a special ignition coil with a compensating resistance. For normal driving, Champion UK-7 (UK-162) spark plugs with a side electrode are used. No other types of spark plugs may be fitted.

Lighting

The road lights comprise the headlamps, direction indicators, parking lights, number-plate light and tail lights, including parking lights, stop lights and direction indicators. In addition, the Saab Sport car is equipped with long-range and fog lights and with back-up lights. The latter are switched on automatically when the reverse gear is engaged.
The headlamp inserts can easily be adjusted both vertically and laterally. They are switched on and off with a pull switch on the steering column stand. The headlamps are dipped with a dipper switch by the left foot, except in the Saab Sport, where the beam is dipped with the lever for the direction indicator switch via a dipper relay.
A warning lamp on the instrument panel glows when the headlamps are on high beam.
The parking lights are always on together with the headlamps, regardless of whether these are dipped or not.

Miscellaneous electrical equipment

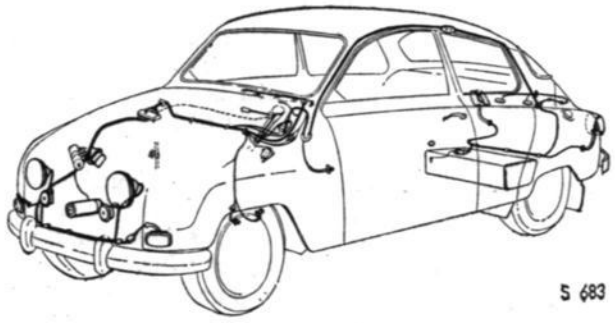
The interior lighting consists of a ceiling lamp operated by a switch on the lamp itself and by door switches.
The direction indicators are operated by means of an automatically returning switch located under the steering wheel. On the Saab Sport, Saab 95 and 96 a dipper switch is also provided at this point. A green warning lamp on the instrument panel indicates when the flashers are operating.
The horns are operated with a horn ring on the steering wheel, and emit a dual-tone signal composed of harmonised high and low notes.
The windshield wipers are driven by a motor via twin linkages and are turned off and on with a switch on the instrument panel. This switch is combined with the windshield washer control. The washer is of mechanical type on the Saab 95 and 96 and of electrical type on the Saab Sport.

Wiring and fuses

The various wires from battery or generator to the different current consumers are gathered into harnesses which are arranged in certain groups. The individual wires are color-marked for ready identification in the harnesses.
The wiring connections consist of non-soldered AMP connectors.
Fuses are provided to protect wiring, etc., from abnormally high current intensities (due to short circuits, for instance) and to reduce fire hazards. The fuses are grouped in a fuse board, located on the dash panel on the right of the engine compartment. Two additional fuses are provided to accommodate subsequent accessories. The fuses are dimensioned to withstand a continuous current intensity of 8 amps.

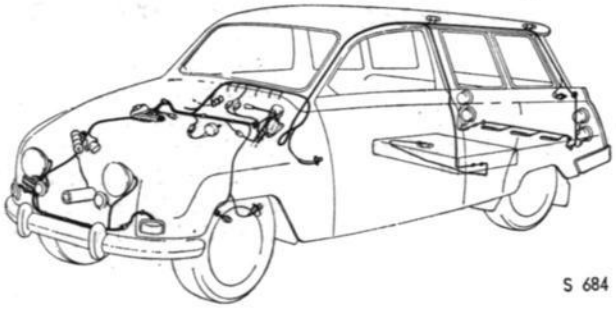
Oil warning relay, Saab Sport

A warning lamp on the instrument panel glows if the oil pressure fails in the oil pump. The pump is equipped with an oil monitor, actuated by the oil pressure. It consists of a contact which closes and opens once for every revolution of the pump. The task of the oil warning relay is to translate these closures and openings so that the warning lamp is normally out all the time. If, on the other hand, the oil pressure fails, the contact on the oil monitor remains closed and the warning lamp glows.



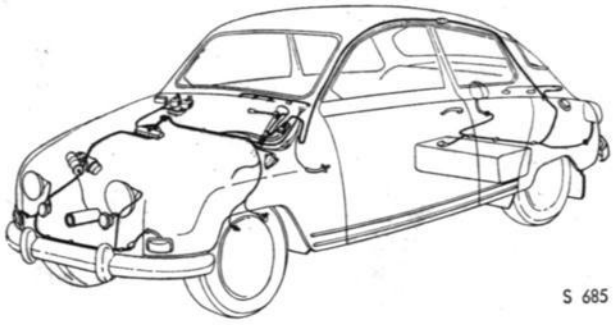
S 683

ELECTRICAL SYSTEM SAAB 96
PERSPECTIVE SKETCH



S 684

ELECTRICAL SYSTEM SAAB 95
PERSPECTIVE SKETCH



S 685

ELECTRICAL SYSTEM SAAB SPORT
PERSPECTIVE SKETCH

BATTERY

General

The battery is a 12-volt lead accumulator with 6 cells, the working voltage per cell being roughly 2 volts. The electrolyte is dilute sulfuric acid with a spec. gravity of 1.28 at 68°F (20°C) when the battery is fully charged. The battery has a capacity of 33 amp-hours (Ah), which means that it can supply a current of 1.7 amps for 20 hours at a temperature of 68°F (20°C). The positive pole of the battery is connected to the starter and other consumer units, while the negative pole is earthed through the chassis.

Removal and installation

To remove the battery from the car, first disconnect the negative cable, in order to prevent shorting, and then the positive cable.
Having done this, back off the two wing nuts on the holder and lift the battery out.
Before reinstalling, make sure that the outside of the battery is clean and that posts and terminals are also clean, thus ensuring good contact. When the battery is in place again, coat the posts and terminals with acid-free vaseline.

Battery maintenance

The condition of the battery determines the ease of starting, and regular testing and attention is therefore essential. Negligence in this respect may cause starting difficulties, particularly in the winter, when starting loads are higher and battery capacity lower because of the low temperature. An insufficiently charged battery is liable to freeze.

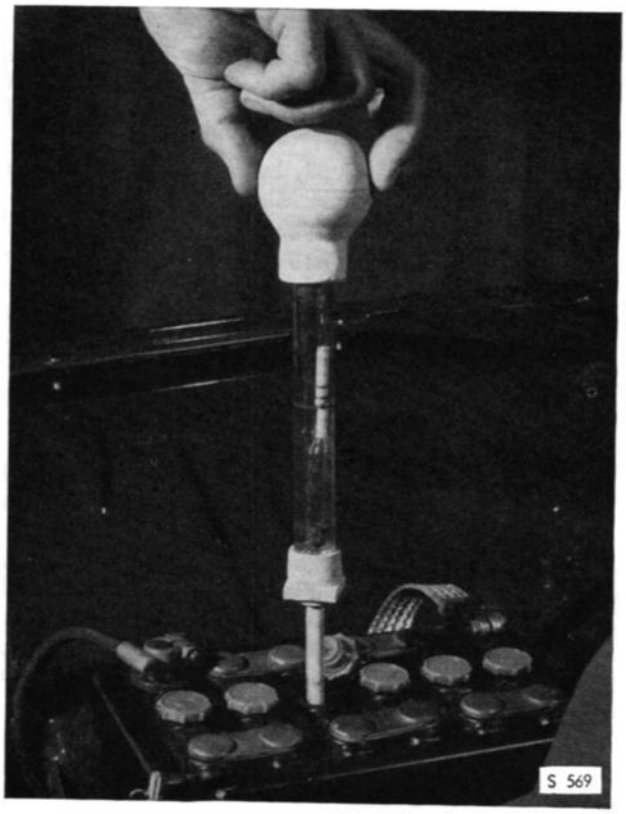
Electrolyte level

Evaporation and decomposition of electrolyte water will cause the level to decrease gradually. Top up, using distilled water only, until the electrolyte level is approx. 0.4 in. (10 mm) above the plates.
Sulfuric acid may be added only to compensate for leakage or to refill the battery if it has been emptied. The specific gravity must be checked whenever sulfuric acid has been refilled.

Specific gravity of electrolyte

The specific gravity of the electrolyte can be checked with a syringe-type hydrometer. The result of the test indicates the charging condition of the battery. See table below.

Charging condition	Spec. gravity of electrolyte
Fully charged	approx. 1.28
Half charged	approx. 1.21
Discharged	approx. 1.12



CHECKING THE BATTERY WITH A SYRINGE

Cell voltage

A more accurate test of the state of the battery is made by using a cell tester, which consists of a voltmeter and a resistance, connected in parallel, giving a load of 80—100 amps.

Each cell is tested individually by placing the tips of the cell tester against the cell terminals.

The indicated voltage should not fall below 1.6 V after 10—15 sec. discharge. A bigger voltage drop is a sign of a defective or discharged cell.

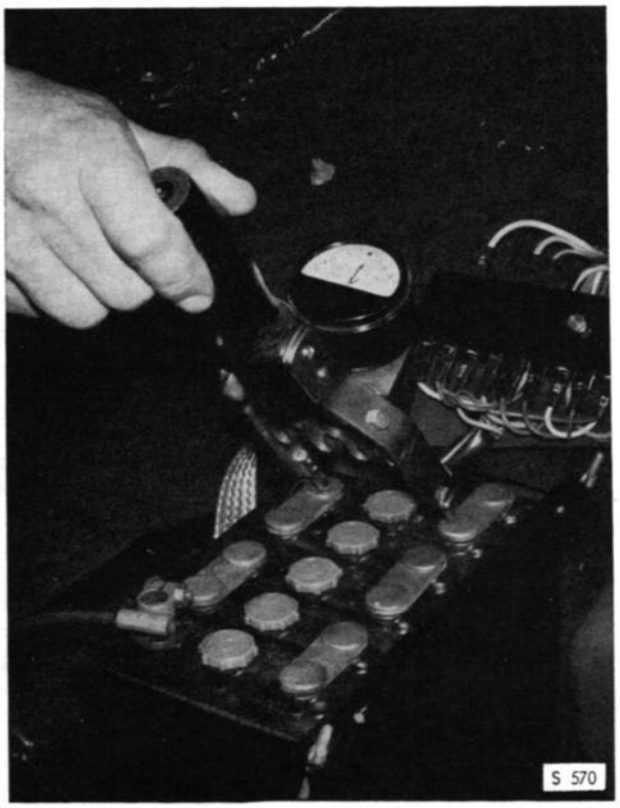
The normal no-load cell voltage is 2 volts, and the difference in voltage between any two cells should not exceed 0.2 volts.

Charging

The charging rate must be adapted to the capacity of the battery and should not exceed 2.5 amps in the case of a 33 Ah battery.

The battery is fully charged when the cell voltage amounts to 2.5—2.7 volts without load and has remained constant for the last three hours of charging.

Decomposition of water causes the electrolyte to boil, and in view of this the plugs should be unscrewed while the battery is being charged.



CHECKING THE BATTERY WITH A CELL TESTER

GENERATOR

General

During driving, the generator supplies the current required by the various consumer units and also charges the battery.

The generator pulley is finned to induce a current of air through the generator, thus dispelling the heat developed there, while it is running. The cooling air is drawn in through an opening in the commutator end frame and is expelled through openings in the drive end frame. The generators for the Saab 95, 96 and Sport have identical electrical data, but are provided with different retaining lugs for the different models.

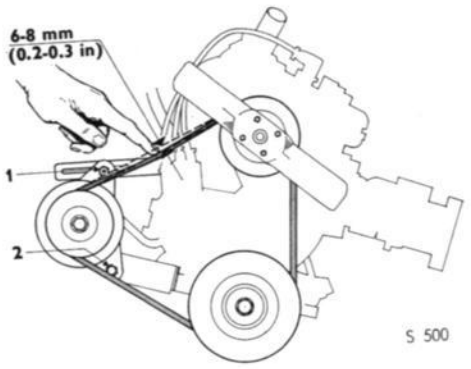
Removal and installation of generator

To remove and refit the generator, proceed as follows:

1. Disconnect the battery negative cable.
2. Disconnect the generator cables, retaining and adjusting bolts and take off the fan belt.
3. Lift out the generator.
4. Refit the generator in the reverse sequence.
5. Adjust the fan-belt tension so that the belt can be pressed down 0.24—0.32 in. (6—8 mm) with the finger — see fig.

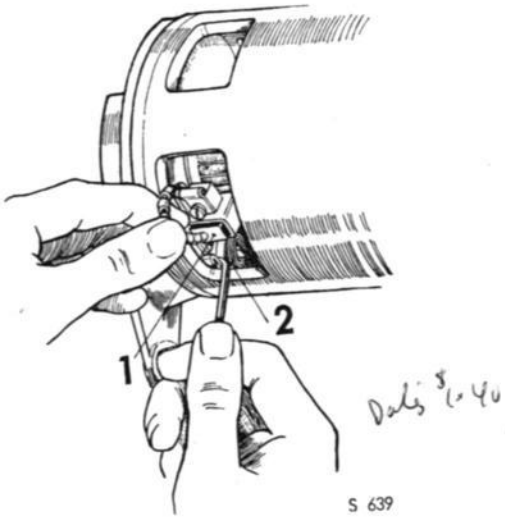
Disassembly and reassembly

1. Remove the commutator cover band and take the carbon brushes out of their holders.
2. Back off the two through bolts and carefully tap the drive end frame (8), releasing it together with the attached armature and pulley.
3. Remove the generator belt pulley from the armature and remove the key.
4. Detach the front end frame from the armature by slackening the two screws at the hub.
5. Detach the commutator end frame (1) by backing off the contact screw at the hub.
6. Remove the ball bearings from the armature.
7. Clean all parts thoroughly with white spirit, etc., and blow with compressed air. The armature windings and field cores should be blown clean and not washed.
8. Check all parts and renew worn ones.
   Ball bearings should have only negligible play and should run quietly — check this after cleaning and blowing. When reassembling, pack the bearings with Bosch special grease Ft 1 V 22.
9. Reassemble in the reverse sequence, making sure that all wires are firmly secured and that spring washers are fitted under screws and bolts.
   The armature should have a slight axial play to relieve the ball bearings of side loads.



ADJUSTMENT OF FANBELT TENSION

1. Adjusting screw
2. Retaining screw



REMOVAL OF CARBON BRUSHES

1. Carbon brush
2. Brush spring

Maintenance and inspection of generator

Carbon brushes

The generator brushes and commutator should be checked after about 18000 miles (30000 km). The procedure is as follows:

1. First disconnect the battery negative cable. Then detach the cables connected to DF and D+.
2. Remove the cover band over the commutator.

> IMPORTANT
>
> Always disconnect the cables before removing the cover band.

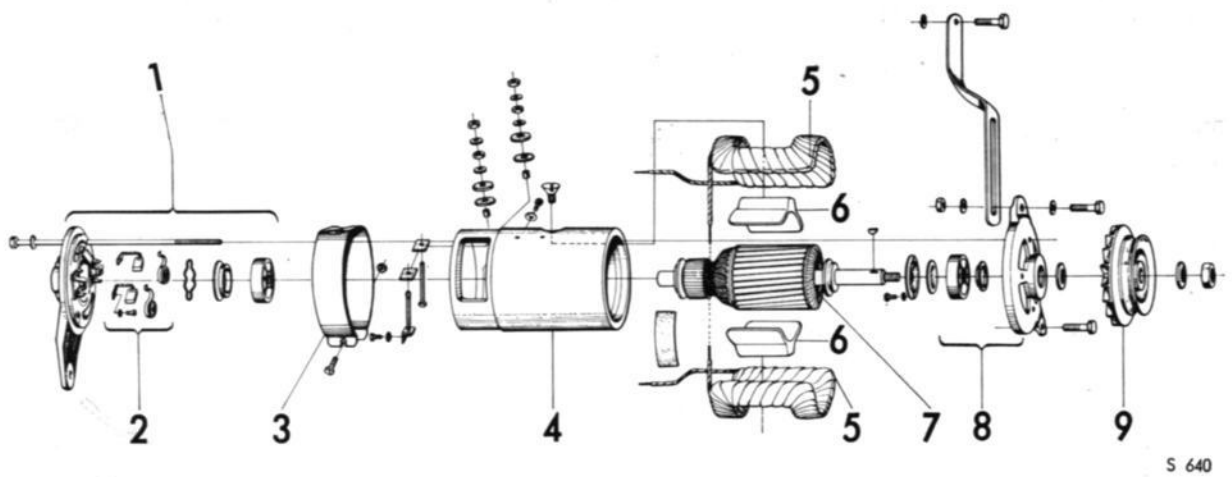
3. Lift the brush springs with a hook as illustrated, and check that the carbon brushes slide freely in their holders.
4. If a carbon brush tends to sieze in its holder, lift it out and wipe both brush and holder clean with a cloth moistened with white spirit. Do not wipe the contact surfaces of the brush.
5. After cleaning the carbon brush, refit it in exactly the same position as before so that it rests against the commutator in the same way.
6. If a carbon brush is defective or so worn that the brush spring rests against the stop a new brush must be fitted. Always use genuine Bosch carbon brushes.
7. When inserting the carbon brush, take care to prevent the spring from striking too hard against the brush, as such treatment could easily damage it.
8. Replace the cover band, taking care to avoid contact with terminals DF and D+.
9. Reconnect the cables to DF and D+, taking care not to confuse them. Reconnect the battery negative cable.

Commutator

The commutator should present a dark gray, smooth, sliding contact surface to the carbon brushes, absolutely free of oil and grease. If the commutator is dirty, clean it with a cloth moistened with white spirit, drying carefully afterwards. A commutator which has become scored or out-of-round through wear must be turned, slotted and polished by a specialist shop. Emery paper or a file must not on any account be used to trim a commutator. A moderately dirty commutator can be trimmed (with the generator in the car) with a suitably shaped piece of pumice stone which is pressed lightly against it while the generator is working.

Testing the generator

Check the voltage by connecting a voltmeter between D+ and D— after having connected DF to the chassis — see wiring diagram for the voltage regulator, page 322—1. At max 2050 r/m the voltage should be 12 volts. Check the current intensity with an ammeter connected in series with a variable rheostat (approx. 1 ohm) between D+ and D—. Increase the engine speed to max. 3150 r/m and adjust the voltage to 12 volts. The current intensity should not now be less than 17 amps.

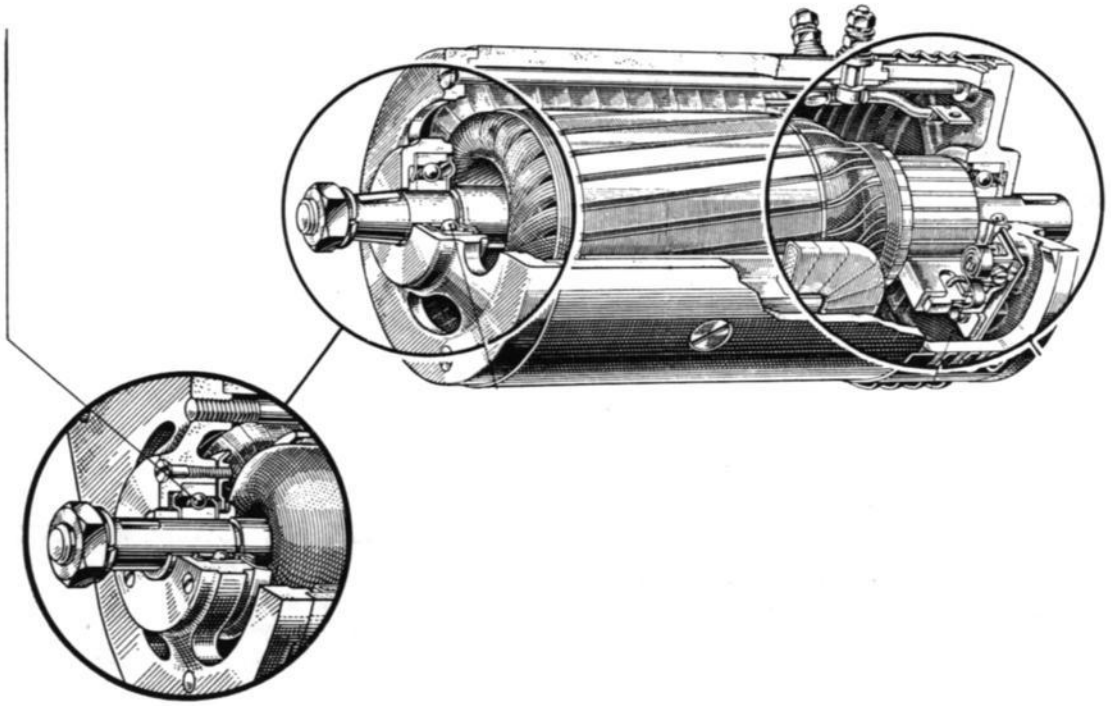


S 640

GENERATOR

1. Comutator frame with bearing
2. Carbon brushes with springs
3. Cover band
4. Coil housing
5. Field winding
6. Terminals
7. Armature
8. Drive end frame
9. Belt pulley

PACK BOTH BALL BEARINGS WITH BOSCH Ft 1 v 22



NOTE

Keep commutator and carbon brushes free from grease and oil. Do not lubricate commutator bearings excessively, thus avoiding risk of grease spreading onto commutator. Smear bright parts and joints with Bosch O1 41 v 2.

VOLTAGE REGULATOR

General

The voltage regulator serves to keep the generator voltage constant within narrow limits, regardless of the generator speed and of the consumer equipment switched on at the time. The regulator also has to prevent overcharging of the battery and to limit the current take-off so that the maximum permissible generator load is not exceeded, since this could result in burnt armature and field windings. To prevent the battery from being discharged through the generator when charging ceases, the regulator incorporates a reverse-current relay which interrupts the charging circuit when the reverse current has reached a certain voltage.

Function

The voltage regulator is of the variode type, implying that it is fitted with a regulating element of semiconductive material, called variode by Bosch. This variode senses the temperature variations arising in the cable on account of the intensity of the charging current and the ambient temperature.

Regulation of the generator is achieved by variation of the current through field winding 1. This is done in three stages at contact 4 of the regulator armature and at contacts 3 and 5.

Stage 1. Field winding earthed, armature 6 in upper position.

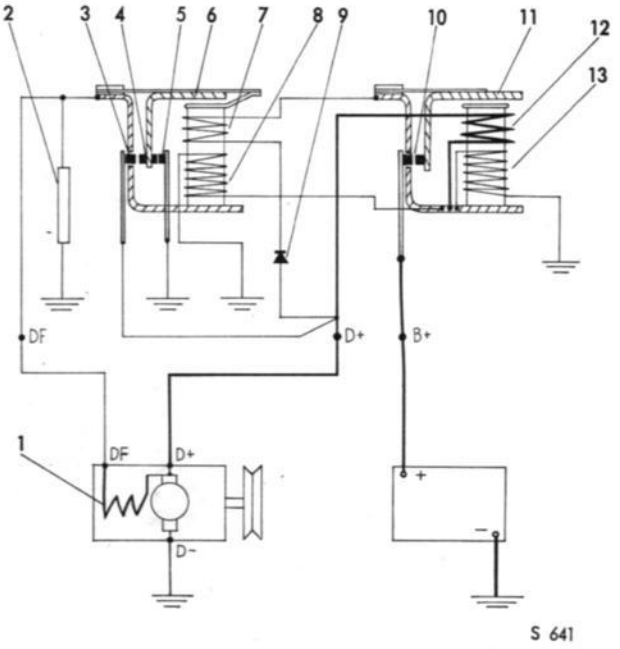
Stage 2. Field winding earthed through resistor 2, armature 6 in middle position.

Stage 3. Field winding shorted with part of the D+ cable, armature 6 in lower position.

Contact 4 will stand vibrating in one of the outer positions, depending partly on the voltage via battery and connected consumer units, partly on the intensity of the extracted current and partly on the speed of the generator, all of which factors influence the force acting on the regulator armature 6, on which the contact is located. The charging rate can be adjusted by changing the spring force on the armature 6 — more force gives a bigger charge and vice versa.

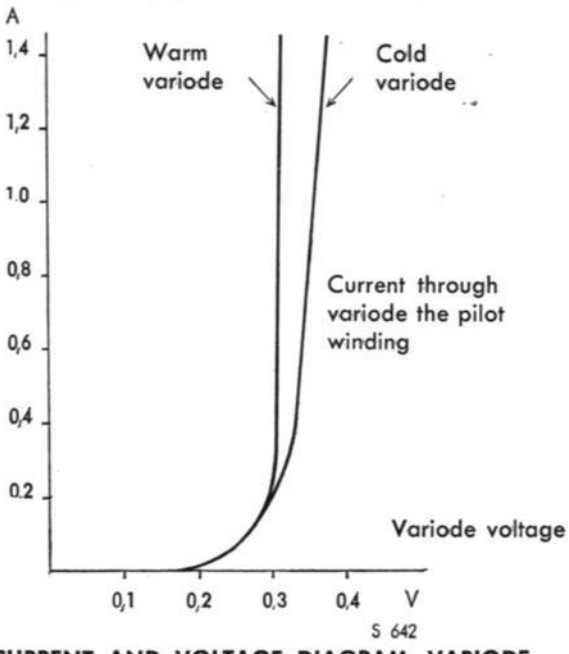
The variode 9 and its pilot winding 7 are connected in parellel with part of the D+ cable from the generator. The connection points are located inside the regulator casing.

The voltage over the variode and pilot winding will thus be the same as that between the connection points on the D+ cable. The resistance between the coupling points, temperature dependence disregarded, is constant and the voltage is influenced only by the intensity of the generator current which is taken out at B+.



WIRING DIAGRAM, VOLTAGE REGULATOR WITH VARIODE

1. Field winding, generator
2. Resistor for field winding
3. Contact through which the field-winding can be shorted
4. Contact, armature, regulator relay
5. Contact throught which the field-winding can be earthed
6. Armature, regulator relay
7. The variode pilot winding
8. Voltage winding, regulator relay
9. Variode
10. Contacts, reverse current relay
11. Armature, reverse current relay
12. Current winding, reverse current relay
13. Voltage winding, reverse current relay



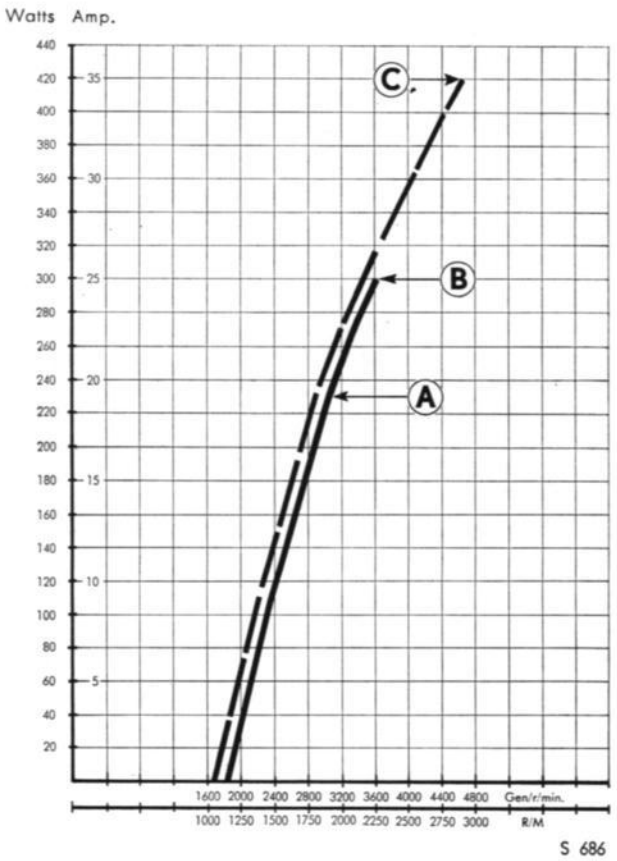
CURRENT AND VOLTAGE DIAGRAM, VARIODE

The variode acts as a voltage-actuated and to some extent temperature-influenced current valve, and this feature is utilized in the voltage regulator. A cold variode needs a higher voltage than a warm one, as in illustrated in the diagram on page 322-1.

When the voltage of the charging current is not high enough to open the variode, the regulator is not actuated by the pilot winding, and voltage regulation is achieved with voltage winding 8 only.

If the charging current increases so much that the voltage across the variode becomes high enough to open it, part of the charging current will pass through the pilot winding, whereupon armature 6 will be attracted by the regulator coil and the field winding will be shorted through contact 3: the charging current undergoes a marked decrease. As a result, the voltage through the variode, the pilot winding and the regulator coil decreases, whereupon the armature returns, the current in the field winding increases again, thus providing a bigger charging current, and the entire cycle is repeated. The variode thus acts as a current-limiting organ in the regulator.

As may be seen from the diagram on page 322-1, a higher voltage is required to open a cold variode. This implies that charging current will be higher when the regulator is cold (immediately after starting).



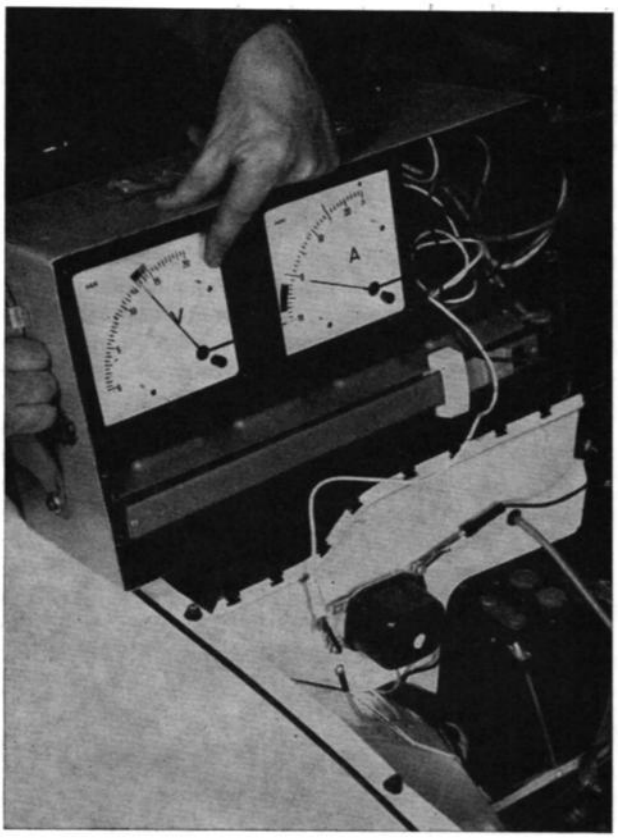
LOADING DIAGRAM GENERATOR

A = All installed consumers 230 W
B = Max. 300 W, warm generator after 30 min.
C = Max. 420 W, cold generator
Ratio generator: Engine = 1:1.6
1000 engine r/m = 1.5 m.p.h. (25.1 km/h) in 4th gear

Testing the charging circuit

It is a fairly simple matter to check and test the generator and voltage regulator if a suitable voltmeter and ammeter instrument is available, for instance one which combines an 0—20 volt moving-coil voltmeter with a 10—0—50 amp. moving-coil ammeter. The checks which are most important and which should be carried out first of all when a fault is suspected are testing the generator no-load voltage as per B below and the load voltage as per C below. If the figures obtained are not satisfactory, the voltage regulator or generator must be renewed or else repaired by a specialist shop.

A. The easiest way to check the closing voltage of the voltage regulator is to connect a voltmeter to the chassis and the D+ terminal on the voltage regulator. Allow the engine to idle and switch the parking lights on in order to provide a suitable load. Increase the engine speed very slowly, watching the voltmeter meanwhile. At the instant of closing, the voltmeter reading decreases slightly, only to increase again as the engine speed continues to rise. The voltage immediately prior to this decrease is the closing voltage and should be between 12.3 and 13.3 volts.



TESTING THE NO-LOAD VOLTAGE

B. To test the no-load voltage, disconnect the cable attached to terminal B+ on the voltage regulator, taking care not to let it touch other metal parts, which would short-circuit the battery. (The battery negative cable should be detached while the B+ cable is being disconnected).
Connect a voltmeter between earth and B+ on the voltage regulator. Increase the engine speed to a generator speed corresponding to 5000 r/m. Now read off the no-load voltage on the voltmeter: it should be 13.8—14.8 volts at 68°F (+20° C).

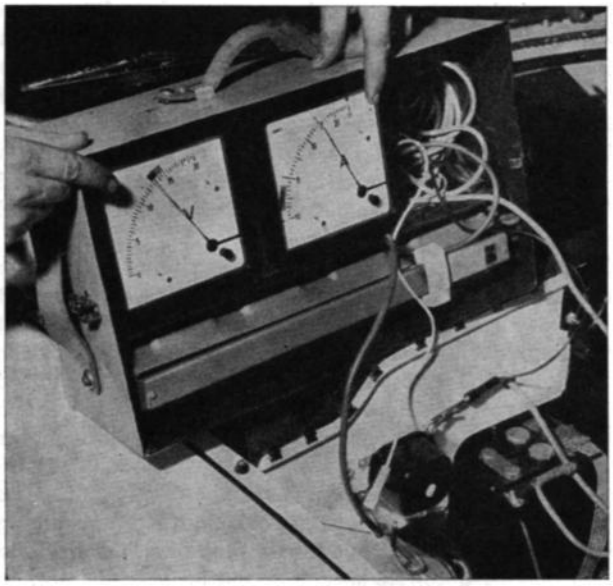
CAUTION

Do not allow the disconnected cable to touch metal parts, since this would lead to shorting.

NOTE

The test must be completed within less than 30 seconds, as the test figures given apply only to a cold voltage regulator.

C. To test the load voltage, connect a resistance in series with an ammeter between the chassis and B+ on the voltage regulator, in order to apply a suitable load. Note that the cable at B+ must be disconnected, and take care to prevent it from touching metal parts, since this would cause a short circuit. Adjust the resistance so that the current intensity is 25 amps at a generator speed of 5000 r/m. Connect the voltmeter between B+ on the voltage regulator and earth, and note the reading when the generator speed is 5000 r/m. The voltage should be 13.4—14.3 volts.



TESTING THE LOAD VOLTAGE

NOTE

The test must be completed within less than 30 seconds for the given test figures to apply.

D. To test the voltage regulator reverse-current relay, disconnect the cable at B+ on the voltage regulator and connect an ammeter between this cable and B+. Increase the engine speed to turn the generator faster than the closing rate, which is about 2050 r/m. Reduce speed slowly to idling r/m, whereupon the ammeter pointer will move from charge through zero to discharge. The reverse current is equivalent to the maximum ammeter discharge reading and should be 2.0—7.5 amps.

CAUTION

During the test, the generator must not be run at a higher speed than 3150 r/m, as beyond this point the voltage will be excessive and may damage the generator.

NOTE

If, during normal running, there is any connection between DF on the generator and other metal parts, the charging voltage will be abnormally high. This would result in burnt-out lamps, hot battery and ruining of the voltage regulator.

STARTER

General

The starter is an electric motor which, at the instant of starting, turns the engine flywheel through the intermediary of a pinion and a ring gear. The starter pinion can slide on the armature shaft and is made to mesh with the ring gear by an operating solenoid, which subsequently actuates a switch, closing the circuit to the starter. As soon as the engine has started, the pinion will be driven by the flywheel ring gear. It is then released from the armature shaft by a freewheel mechanism, but remains in mesh with the ring gear as long as the operating solenoid is kept activated by means of the ignition key. The pinion is returned by a spring as soon as the current for the operating solenoid is cut off with the ignition key.

Removal of starter

1. Disconnect the battery negative cable.
2. Disconnect the starter cables.
3. Back off the nuts on the two bolts which hold the starter to the crankcase lower half. Use a short, open-ended 1/2-in. wrench with two similar ends, one at 15° and the other at 60° in relation to the bar.
4. Pull the starter back until clear and then lift it out of the engine compartment.

Installation of starter

1. Push the starter into place and secure it with the two bolts.
2. Reconnect the electric cables to the starter switch.
3. Reconnect the battery negative cable.

> CAUTION
>
> Take care to avoid shorting between the cover band and carbon-brush cables or shoes.

Disassembly and reassembly of starter with operating solenoid

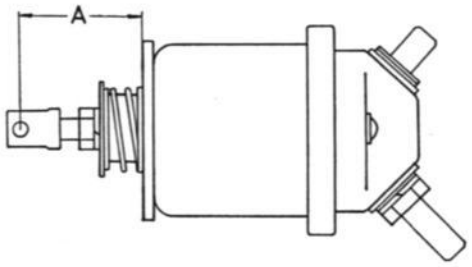
Disassembly

1. Remove the cover band.
2. Lift the brush springs and hook them out.
3. If the commutator end frame is to be removed, disconnect the carbon-brush cables and the field-winding cables.
4. Separate the operating solenoid from the pinion housing by removing the three retaining bolts and jumper bar from the solenoid. Lift the solenoid out upwards and outwards.
5. Remove the operating solenoid lever by withdrawing its pivot pin.
6. Back off and remove the two through bolts which hold the three parts of the starter assembly together.
7. Divide the starter assembly at the rear end frame and remove the armature together with its pinion. Collect the brake washers sited on the commutator, and the adjustment washers at the pinion.
8. Remove the starter pinion from the armature by pressing the locating collar in with a sleeve arbor and then removing the spring from within the locating ring.
9. Blow the parts clean with compressed air and wash in white spirit. Bearing bushes, starter pinion and winding must be protected from white spirit or other grease solvents.

Reassembly

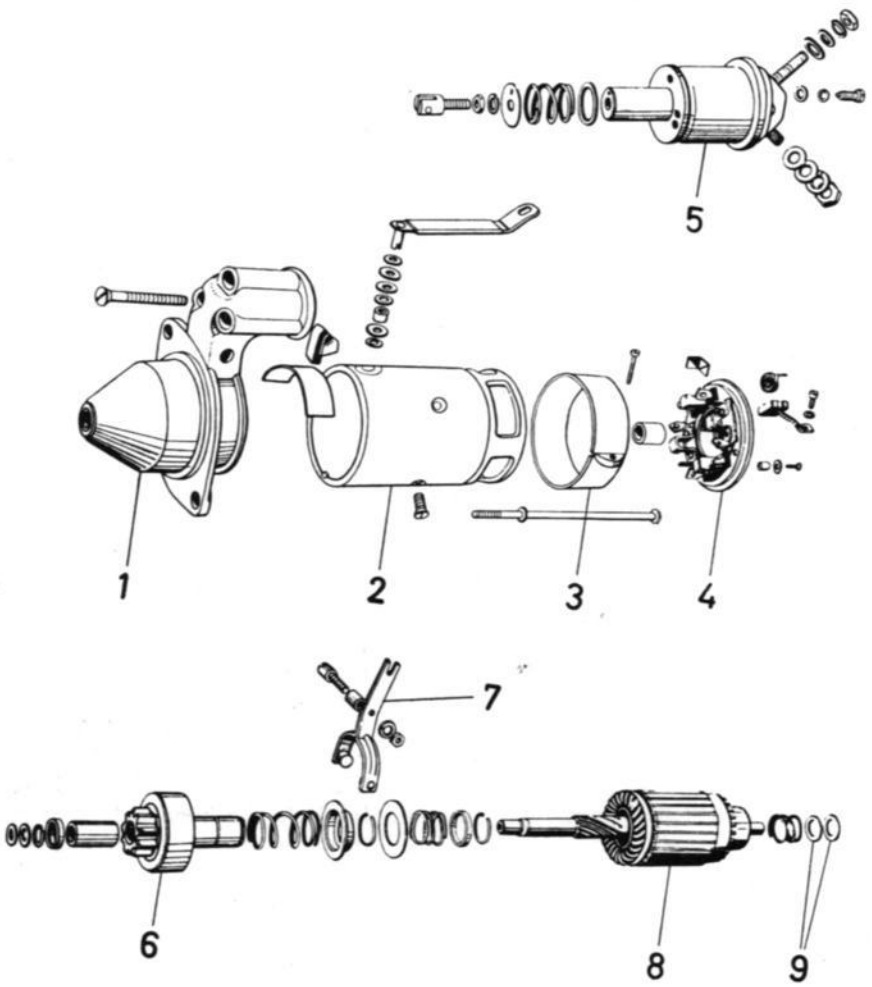
After renewing all damaged or worn parts, reassemble as follows:

1. Relocate the starter pinion on the armature shaft and secure with spring and locating ring. Lubricate the pinion, the shaft and the locating collar with Bosch special grease.
2. Insert the adjustment washers in the pinion housing, and then put in the solenoid lever and refit the armature.
3. Refit the lever pivot pin.
4. Refit the armature brake washers at the commutator, remembering to place an insulating washer between the two steel washers. Lubricate with Bosch special grease.
5. If the commutator end frame has been removed, reattach it to the starter housing. Connect the cables from the carbon brushes and field windings.
6. Lubricate the bearing brushes sparcely with oil. Reassemble the armature, pinion housing and starter housing, together with the end frame, and tighten the two through bolts.



ADJUSTMENT OF OPERATING SOLENOID IRON CORE FULLY PULLED

Dim. A 29.0±0.1 mm (1.142±0.004 in.)



STARTER WITH OPERATING SOLENOID

1. Pinion housing
2. Starter housing
3. Cover band
4. Commutator end frame
5. Operating solenoid
6. Starter pinion
7. Solenoid lever
8. Armature
9. Armature brake washers

NOTE

The armature must have an axial clearance of 0.004—0.012 in. (0.1—0.3 mm). This is adjusted with shims at the pinion housing. If new bearing bushes are to be fitted, soak in warm oil for an hour before inserting them.

7. Refit the operating solenoid and connect the jumper bar to the terminal screw.
8. Refit the carbon brushes and cover band.

CAUTION

Take care to avoid shorting between the cover band and carbon-brush cables or shoes.

Maintenance and inspection of starter

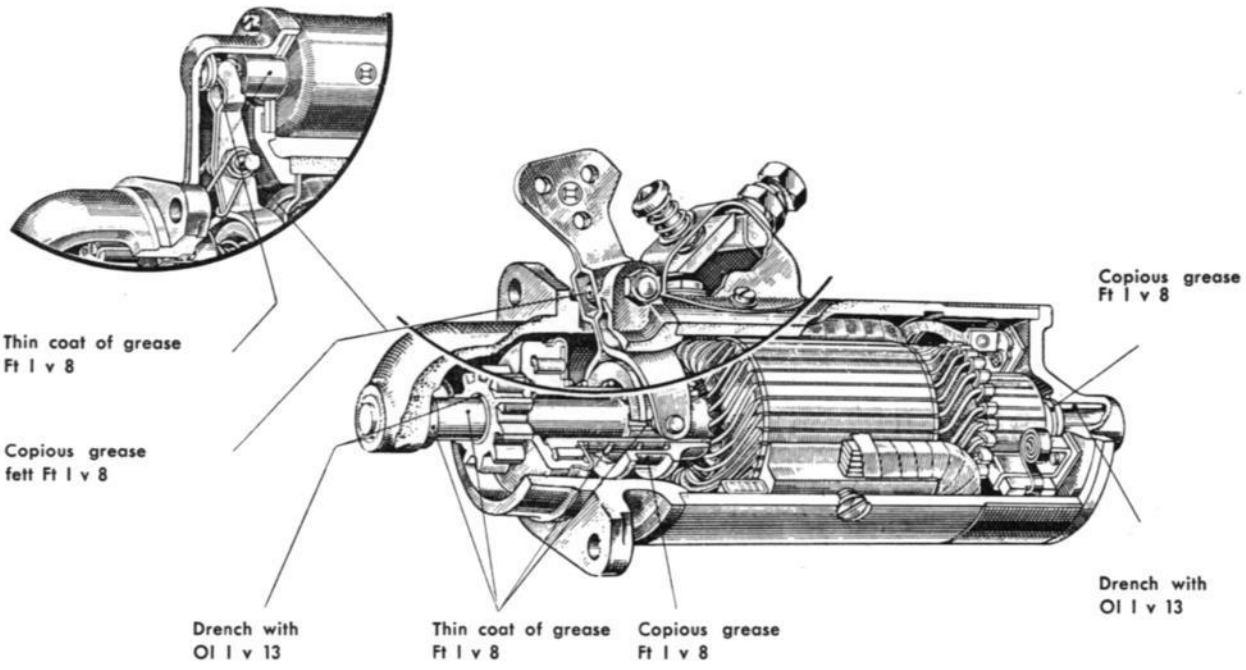
Carbon brushes and commutator

1. Remove the cover band and check that the carbon brushes can move freely in their holders. If the brushes tend to seize, clean them, and the holders, with a cloth moistened with white spirit. Do not rub the contact surfaces of the carbon brushes.
2. Damaged or worn carbon brushes must be renewed, as must weak or overstretched springs.
3. If the commutator is oily or dirty, clean it with a cloth moistened with white spirit, drying thoroughly afterwards. A commutator which has become scored or out-of-round must be detached from the armature and sent to a specialist shop for turning, slotting and polishing. Emery paper or a file must not on any account be used to trim a commutator.

Operating solenoid

The operating solenoid has two windings, a powerful attraction winding and a weaker hold winding. If the hold winding is defective, the operating solenoid will repeatedly switch on and off when starting is attempted. In such cases, a new solenoid must be fitted. It is essential for the cable connections to give good contact, as otherwise starting will be impossible.

The distance between the pin for the lever and the operating- solenoid retaining flange (see fig.) must be set in accordance with the table below when the core is fully pulled in.



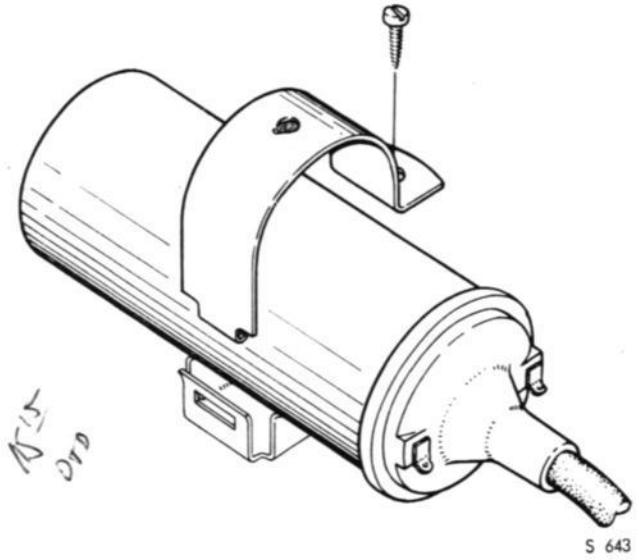
NOTE

Keep commutator and carbon brushes free from grease and oil. Smear bright parts and joints with oil, 01 41 v 2. Seal joints with compound, Bosch Kk 1 v 1.

During inspection, or if the motor has been removed for service, smear flywheel ring gear with grease Ft 1 v 13.

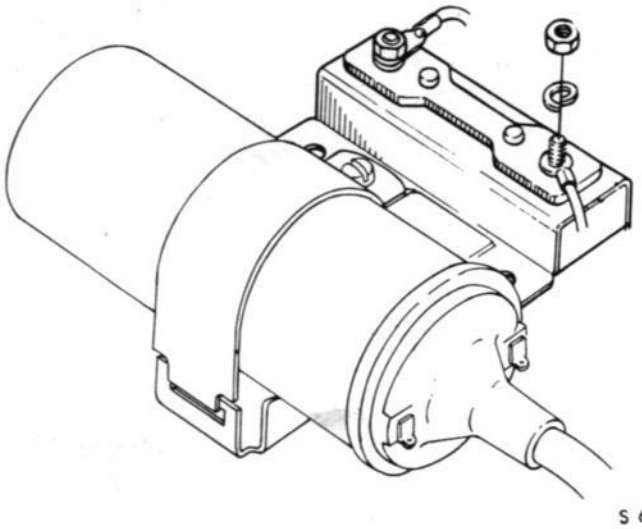
IGNITION SYSTEM
Ignition coil
General

Two different types of ignition coil are used, both of Bosch make. One of these is of standard design and is used in the Saab 95 and 96. The other is a high-output coil and is used in the Saab Sport. This latter type requires a compensating resistance in order to prevent damage to the coil when the engine is running at low speeds or when the ignition is switched on with a stationary engine.
The ignition coil is located on the righthand wheelbase.



S 643

IGNITION COIL, SAAB 95 AND 96



S 644

IGNITION COIL WITH COMPENSATING RESISTANCE, SAAB SPORT

DISTRIBUTOR

General

The following types of distributor are available:

Bosch designation	Ignition governor	Intended for
JF3 (R) (VJ3 BR11T)	Centrifugal	Saab Sport
JFU3 (R) (VJU3 BR2T)	Vacuum + centrifugal	Saab 95 and Saab 96

Designations in bracket are earlier ones.

The difference between these distributors is that the ignition governors are not alike. JFU3 (R), a vacuum distributor, is connected to a vacuum take-off on the carburetor. When setting the ignition with a stroboscope, the vacuum governor must always be disconnected by removing the hose from the distributor. Both distributors are equipped with positive ventilation, which means that air from the fresh-air box is forced through the distributor, whereupon the overpressure of the air prevents dirt and water from entering the distributor and causing disturbances.

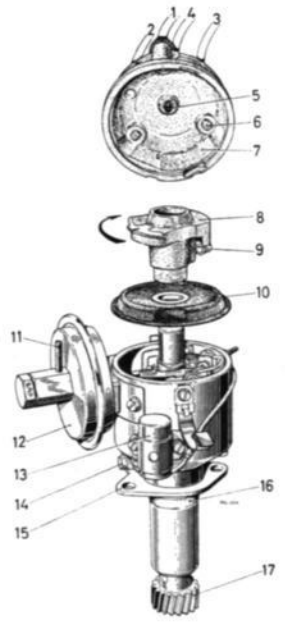
> IMPORTANT
>
> It is extremely important for satisfactory functioning that the ventilation hose does not hang down at any point — it should fall towards the distributor without being bent or creased. Also make sure that the ventilating holes in the bottom of the distributor are not clogged with dirt.

Removal

1. Disconnect the battery earth cable and the distributor low-tension cable.
2. Remove the distributor cover and, if applicable, detach the hose at the vacuum chamber.
3. Back off the locking screw 15 — see fig. — on the retaining plate under the distributor. In the case of distributor JFU3 (R), the generator stay at the generator must also be disconnected and folded back upwards.
4. Pull the distributor up out of the engine.
5. Disconnect the ignition cables from the distributor cover.

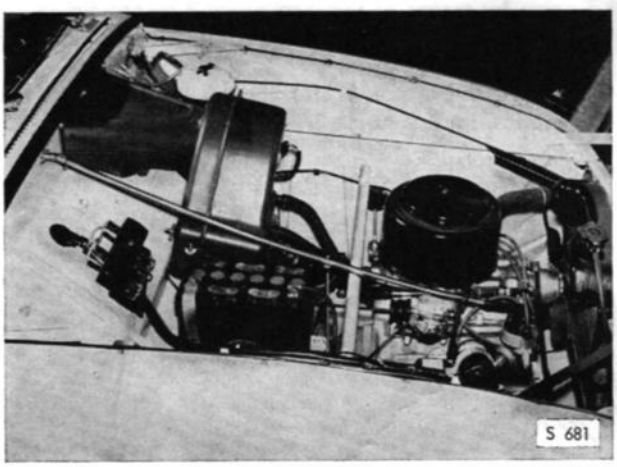
Installation

1. Remove the spark plugs and turn the crankshaft so that the mark on the pulley faces the centermost mark on the engine block.
2. a) Distributor JF3 (R).
   Place the distributor in the engine so that the lubricating nipple points forward simultaneously the marks on the distributor rotor and the distributor housing should coinside.



DISTRIBUTOR

1. Ignition cable to 1st cylinder
2. Ignition cable to 2nd cylinder
3. Ignition cable to 3rd cylinder
4. Low-tension cable
5. Centre brush
6. Contact
7. Cap
8. Rotor
9. Lock screw with spring washer
10. Protector cover
11. Vacuum hose connection
12. Vacuum tank
13. Capacitor
14. Lock screw
15. Retaining plate
16. O-ring
17. Gear



POSITIVE VENTILATION

b) Distributor JFU3 (R).
Place the distributor in the engine so that the vacuum chamber faces rearwards with a clearance of about 0.4—0.6 in. (10—15 mm) in relation to the engine block. At the same time, the marks on the rotor and distributor housing must coincide.
Screw on the generator stay and tighten the fan belt.

3. Reconnect the distributor low-tension cable and the battery earth cable.
4. Put on the distributor cover. The ignition cable for the 2nd cylinder is to be fitted in the socket opposite the distributor rotor when the mark on the pulley faces the centermost, or possibly the upper, mark on the engine block. The two remaining ignition cables are to be fitted clockwise, that for the 3rd cylinder first and for the first cylinder afterwards.
5. Adjust the ignition (see timing) and, if applicable, reconnect the hose to the vacuum chamber.

IMPORTANT

When assembling the distributor, make sure that:

a) The mark on the pulley coincides with the centermost mark on the engine block,
b) The marks on the rotor and distributor housing coincide, and
c) Distributor JFU3 (R) is positioned with the vacuum chamber rearwards and distributor JF3(R) with the lubrication nipple pointing forward.

NOTE

Check that the distance between ignition cables and the flange of the induction pipe is at least 0.4 in. (10 mm) for JF3 (R).

Disassembly of distributor JF3 (R) (VJ3 BR11T)

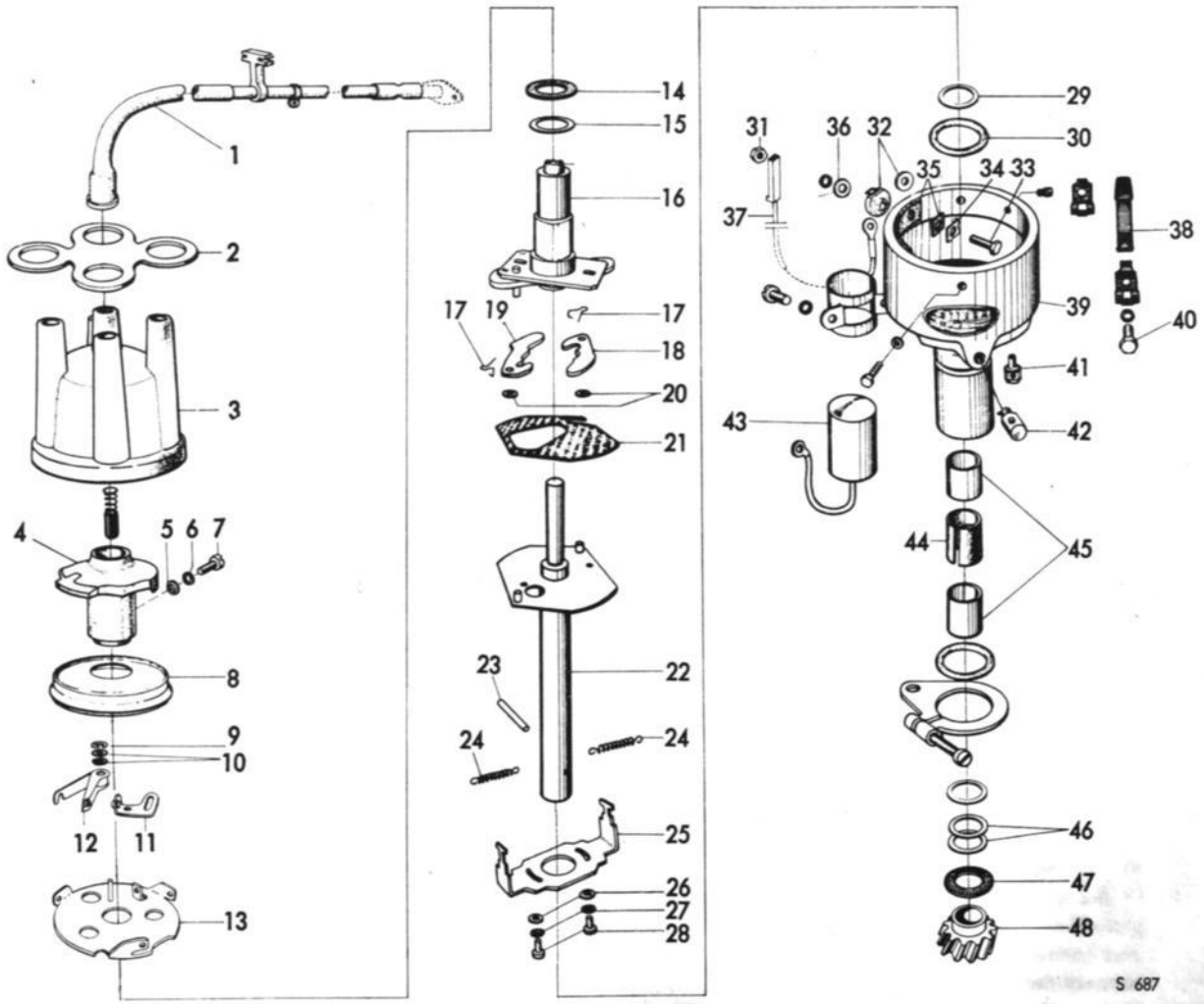
Clean the distributor thoroughly before dismantling it.

1. Remove the rotor 4, which is secured to the breaker cam by means of the stop screw 7 — see fig.
2. Lift off the condensation trap 8 over the breaker mechanism.
3. Back off the nut 31 for the capacitor cable and the low-tension cable 37.
4. Remove the retaining clip 9 and lift up the breaker arm 12.
5. Remove the screw 33, together with the contact washer 34, insulating washer and insulating strip 35. Collect the insulating washers 32.
6. Back off and remove the three screws 40 which hold the breaker plate 13. Two of these screws also hold the retaining springs 38.
7. Collect the retaining springs and lift up the breaker plate 13.
8. File off and drive out the riveted slotted pin 23 which holds the distributor pinion 48 to the shaft 22. Take care not to damage the distributor shaft.
9. Lift out the distributor shaft together with the automatic ignition governor. Collect washers 29 and 30, as well as any shims 46.
10. Unhook the two springs 24 from the spring holder 25 and lift off the breaker cam 16. Collect the spacers 15 and the fiber washer 14.
11. Unhook the springs from the breaker cam. If necessary, bend the spring holders down carefully.
12. Remove the retaining clip 17 and lift off the governor weights 18 and 19. Collect the fiber washers 20 from under the weights.
13. Remove the fiber plate 21.
Note the screws 28 under the distributor shaft plate. If these screws are slackened, the spring holder 25 can be turned to adjust the tension of the governor springs. This tension is correctly set from the start and should not be altered.
14. Remove the capacitor 43 from the distributor housing.
15. Remove the O-ring from the distributor housing.
16. If the bushings in the distributor housing are worn and need to be renewed, press or drive them out. Remove the lub. felt pad from between the bushings first.

Reassembly of distributor JF3 (R) (VJ3 BR11T)

Before commencing reassembly, clean and inspect all parts and obtain replacements for any worn or defective ones.

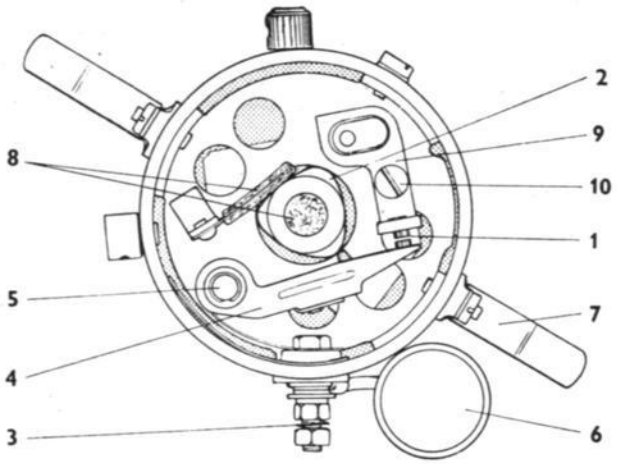
1. If new bushings are to be fitted, press them into the distributor housing and fit the lub. felt pad between them.
2. Screw the capacitor to the distributor housing.
3. Fit a new O-ring.



DISTRIBUTOR JF3 (R) (VJ3 BR11T)

1. Ventilation hose
2. Retainer, ventilation hose
3. Distributor cap
4. Distributor arm (rotor)
5. Washer
6. Spring washer
7. Screw, distributor arm
8. Condensation shield
9. Locking spring
10. Shim
11. Contact plate
12. Breaker arm
13. Contact breake plate
14. Fiber washer
15. Shim
16. Breaker arm
17. Locking spring
18. Fly weight
19. Fly weight
20. Fiber washer
21. Fiber plate
22. Distributor shaft
23. Slotted pin
24. Spring
25. Clamp
26. Washer
27. Spring washer
28. Screw
29. Shim
30. Fiber washer
31. Nut for contact screw
32. Insulating washer
33. Contact screw
34. Contact washer
35. Insulating washer
36. Washer
37. Low- tension cable
38. Retaining spring
39. Distributor housing
40. Screw, retaining spring
41. Bleeding nipple
42. Lubricator
43. Capacitor
44. Felt bushing
45. Bushing
46. Shim
47. Fiber washer
48. Distributor pinion

4. Place the fiber plate 21 on the distributor shaft steel plate, positioning it so that its oblong cut-out comes over the round hole in the steel plate.
5. Place the fiber washers 20 on the stubs of the governor weights and smear a little grease onto the stubs. Bear in mind that grease must always be applied sparingly to bearings and sliding surfaces in the distributor. For grease recommendations, see 342—13.
6. Put the smaller governor weight on the stub nearest the hole in the steel plate.
7. Put on the other governor weight and secure both weights with the retaining clips 17.
8. Hook both governor springs 24 onto the holders on the breaker cam 16 and bend the holders down to prevent loosening of the springs during continued assembly.
9. Grease the distributor shaft and then locate the breaker cam on it. Make sure that the pins on the bottom of the breaker cam enter the grooves in the governor weights.
10. Hook the governor springs onto the two outer spring holders 25.
11. Check that the ignition advance functions satisfactorily by turning the breaker cam clockwise.
12. Mount the spacers 29, followed by the fiber washer 30, on the distributor shaft.
13. Grease the shaft and slide it into the distributor housing.
14. Fit the breaker plate 13 into the distributor housing and secure the retaining springs 38 with the screws 40.
15. Fit the screw 33 for the low-tension connection, together with the contact washer, insulating washers and connector for the low- tension cable 37, and reconnect the capacitor.
16. Grease the pin and refit the breaker arm. Insert washers as necessary to adjust axial play and height in relation to the breaker contact. Then secure with the retaining clip and tighten the nut 31 for the screw 33.
17. Fit the distributor pinion to the shaft, after having adjusted the axial play of the latter with the shims 46. The permissible play is 0.004—0.008 in. (0.1—0.2 mm). When driving in and riveting the slotted pin, take care not to damage the distributor shaft, the shaft bearing or the pinion. N.B. The slotted pin must be riveted with great care. The height of the rivet head may not exceed 0.02 in. (0.5 mm).
18. Adjust the gap between the points, which should be 0.012—0.016 in. (0.3—0.4 mm). If the gap is adjusted with a dwell- angle tester, the dwell angle should be 80—84°.
19. Refit the condensation trap over the breaker mechanism.
20. Screw on the rotor.



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BREAKER POINTS, DISTRIBUTOR JF3 (R) (VJ3 BR11T)

1. Breaker points
2. Breaker cam
3. Connection for low-tension cable
4. Breaker- arm
5. Breaker arm shaft
6. Capacitor
7. Retainer spring
8. Lubricating felt
9. Bracket with stationary point
10. Lock screw for stationary point

Changing breaker points and gap adjustment, JFR (R) (VJ3 BR11T)

This job can be done with the distributor in the car, but is greatly simplified if the distributor is removed.

1. Unfasten and remove the distributor cover.
2. Remove the rotor which is secured to the breaker camshaft by means of a stop screw — see fig.
3. Remove the protective cover.
4. Back off the nuts for the screw for the low-tension cable.
5. Remove the spring from the shaft and lift out the the breaker arm.
6. Back off the screw 10 and remove the contact retainer together with the stationary breaker contact.
7. Fit a new stationary breaker contact.

8. Grease the pivot and refit the breaker arm. Use washers to adjust the axial play and the height in relation to the breaker contact. Secure with the retaining clip and tighten the nut for the low-tension connection.
9. Adjust the gap, which should be 0.012—0.016 in. (0.3—0.4 mm).
   If the gap is adjusted with a dwell-angle tester, the dwell angle should be 80—84°.

IMPORTANT

Always fit a new spring washer in order to prevent the rotor locking screw from working loose.

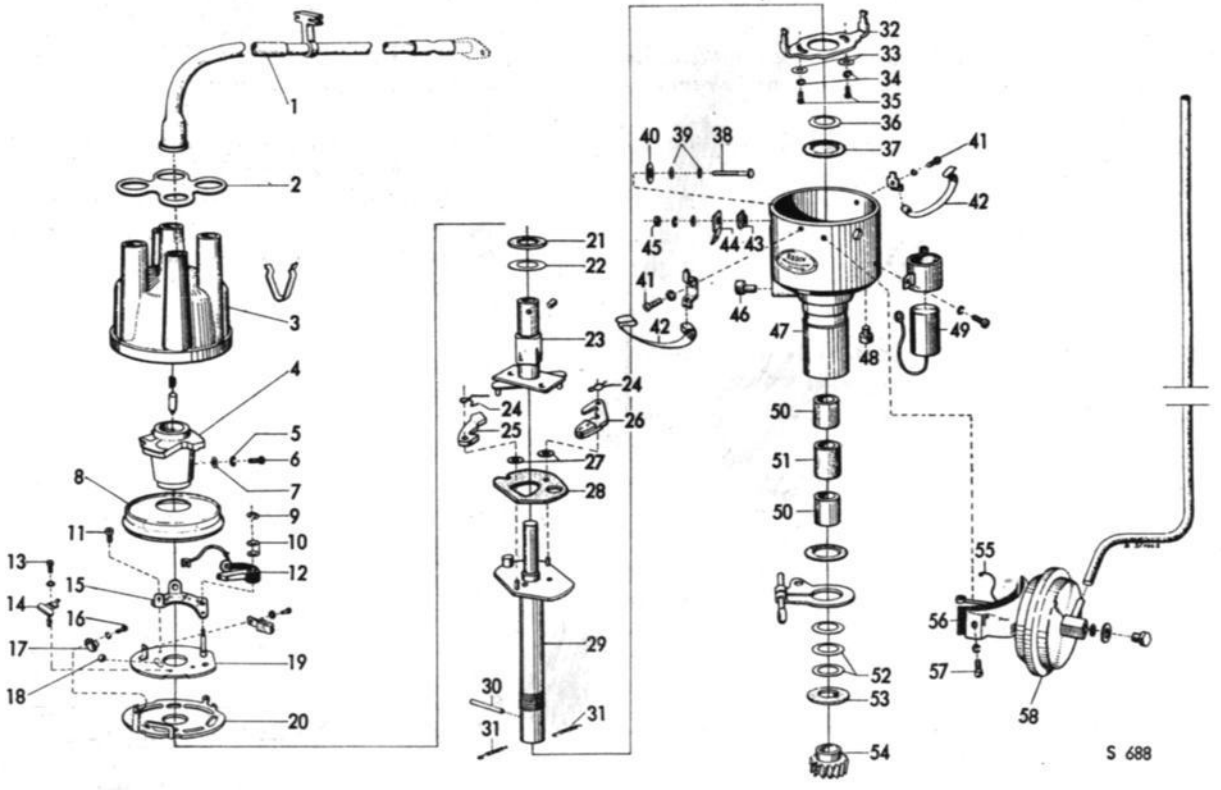
10. Refit the condensation trap over the breaker mechanism. See fig.
11. Screw on the rotor.
12. Check the ignition setting. See "Ignition setting".
13. Clean and inspect the distributor cover, ignition cables, spark plugs and rubber caps on the ignition cables at the distributor and ignition coil.
14. Put on the distributor cover.

Disassembly of distributor JFU3 (R) (VJU3 BR2T)

1. Back off and remove the stop screw 6 and remove the rotor 4.
2. Lift off the condensation trap 8 over the breaker mechanism.
3. Slacken the nut 45 for the capacitor cable and remove the washers, connector, insulating washers and the screw 38.
4. Remove the retaining clip 9, push the leaf spring out and lift up the breaker arm. N.B. Collect the spacers on the breaker arm pivot.
5. Back off the screw 13 and remove the pivot 14.
6. Remove the vacuum chamber together with its spacer by backing off the screws 57.
7. Slacken the screws 41 for the stationaty plate 20, which also secure the holders for the retaining springs 42.
8. Collect the retaining springs and lift up the plate.
9. Back off the screw 16 and remove the ball holder 17.
10. Lift the moving breaker plate off from the stationary plate.
11. File off and drive out the riveted pin 30 which holds the distributor pinion 54 to the shaft 29. Take care not to damage the distributor shaft.
12. Lift out the distributor shaft together with the automatic ignition governor. Collect washers 36 and 37, as well as any shims 53.
13. Unhook the two springs 31 from the spring holder 32 and lift off the breaker cam 23. Collect the spacers 22 and the fiber washer 21.
14. Unhook the springs from the breaker cam.
15. Remove the retaining clips 24 and lift off the governor weights 25 and 26. Collect the fiber washers 27 from under the weights.
16. Remove the fiber plate 28.
    Note the screws 35 under the distributor shaft plate. If the screws are slackened, the spring holder 32 can be turned, so that the tension of the governor springs can be adjusted. This tension is correctly set from the start and should not be altered.
17. Remove the capacitor 49 from the distributor housing.
18. Remove the O-ring from the distributor housing.
19. If the bushings in the distributor housing are worn and need to be renewed, press or drive them out. Remove the lub. felt pad from between the bushings first.

Reassembly of distributor JFU3 (R) (VJU3 BR2T)

1. If new bushings are to be fitted, press them into the distributor housing. Don't forget to insert the lub. felt pad between the bushings.
2. Screw the capacitor to the distributor housing.
3. Fit a new O-ring.
4. Place the fiber plate 28 on the distributor shaft steel plate, positioning it so that its oblong cut-out comes over the round hole in the steel plate.
5. Place the fiber washers 27 on the stubs of the gover-or weights and smear a little grease onto the stubs. Bear in mind that grease must always be applied sparingly to bearings and sliding surfaces in the distributor. For grease recommendations, see the chapter entitled "Lubrication and Service".
6. Place the smaller of the two governor weights 25 on the stub nearest the hole in the steel plate. Note that the governor weights must be mounted with their slide projections turned downwards facing the fiber plate.
7. Put on the second governor weight and secure both weights with the retaining clips 24.
8. Hook the governor springs 31 onto the holders on the breaker cam 23.
9. Place the breaker cam on the shaft, after having greased the latter. Make sure that the pins on the bottom of the breaker cam enter the grooves in the governor weights.
10. Hook the governor springs onto the two outer spring holders 32.
11. Check that the ignition advance functions satisfactorily by turning the breaker cam clockwise.
12. Mount the spacers 36, followed by the fiber washer 37, on the distributor shaft. Note! Place these items between the plate for the governor weights and the distributor housing.



DISTRIBUTOR JFU3 (R) VJU3 BR2T

1. Ventilation hose
2. Retainer, ventilation hose
3. Distributor cap
4. Distributor arm (rotor)
5. Spring washer
6. Screw, distributor arm
7. Washer
8. Condensation trap
9. Locking spring
10. Shim
11. Screw, breaker contact
12. Breaker arm
13. Screw for pivot
14. Pivot
15. Contact-breaker plate
16. Screw for ball retainer
17. Ball retainer
18. Ball
19. Self-adjusting breaker plate
20. Stationary breaker plate
21. Fiber washer
22. Shim
23. Breaker cam
24. Locking spring
25. Fly weight
26. Fly weight
27. Fiber washer
28. Fiber plate
29. Distributor shaft
30. Pin
31. Regulator spring
32. Clamp
33. Washer
34. Spring washer
35. Screw for clamp
36. Shim
37. Fiber washer
38. Contact screw
39. Contact washer
40. Fiber washer
41. Screw, retaining spring
42. Retaining spring
43. Insulating washer
44. Connection
45. Nut, contact screw
46. Lubricator
47. Distributor housing
48. Bleeder nipple
49. Capacitor
50. Bushing
51. Felt bushing
52. Shim
53. Fiber washer
54. Distributor pinion
55. Earthing connection, vacuum chamber
56. Sealing strip
57. Screw, vacuum chamber
58. Vacuum chamber

13. Grease the shaft and slide it into the distributor housing.
14. Grease the sliding surfaces and fit the moving breaker plate on the stationary plate.
15. Fit and secure the ball holder 17 with the screw 16. Before tightening the screw, press the support down so that sufficient tension is obtained on the breaker plate.
16. Fit the stationary plate 20 in the distributor housing so that the pin for the breaker arm comes on the opposite side in relation to the hole for the low-tension connection.
17. Refit the two retaining springs 42 and tighten the two screws 41 holding the plate and the spring holders.

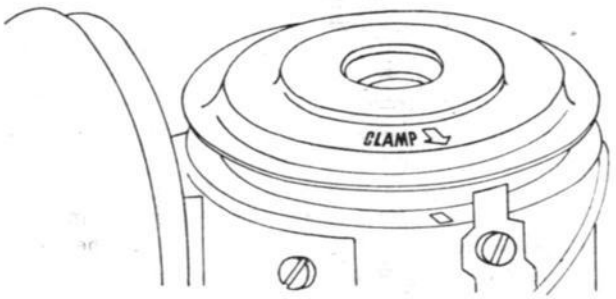
NOTE

The retaining-spring holder that is integral with the guide lip for the distributor cover must be located by the mark in the housing — see fig.

18. Grease the pin and refit the breaker arm. Insert washers as necessary to adjust axial play and height in relation to the breaker contact. Then secure with the retaining clip.
19. Refit the screw 38 for the low-tension connection, with fiber washers, steel washers and connection, and connect the cables from the breaker arm and the capacitor.
20. Check the setting of the vacuum-chamber control arm and attach the vacuum chamber together with its spacer to the distributor housing. See fig.
21. Connect the vacuum-chamber pull rod to the breaker plate with pivot 14 and the screw 13. Don't forget to attach the vacuum-chamber earth connection to the screw.
22. Fit the distributor pinion to the shaft, after having adjusted the axial play of the latter with shims 52. The permissible axial play is 0.004—0.008 in. (0.1—0.2 mm). When driving in and riveting the slotted pin, be careful not to damage the distributor shaft, the shaft bearing or the pinion. N.B. The slotted pin must be riveted with the utmost care. The height of the rivet head may not exceed 0.02 in. (0.5 mm).
23. Adjust the gap between the points by applying a screwdriver between two lugs on the breaker plate and the corresponding groove in the contact holder. The gap should be 0.012—0.016 in. (0.3—0.4 mm). If the gap is adjusted with a dwell-angle tester, the dwell angle should be 80—84°.
24. Put on the condensation trap so that the arrow points towards the mark on the distributor housing — see fig.
25. Screw on the rotor.

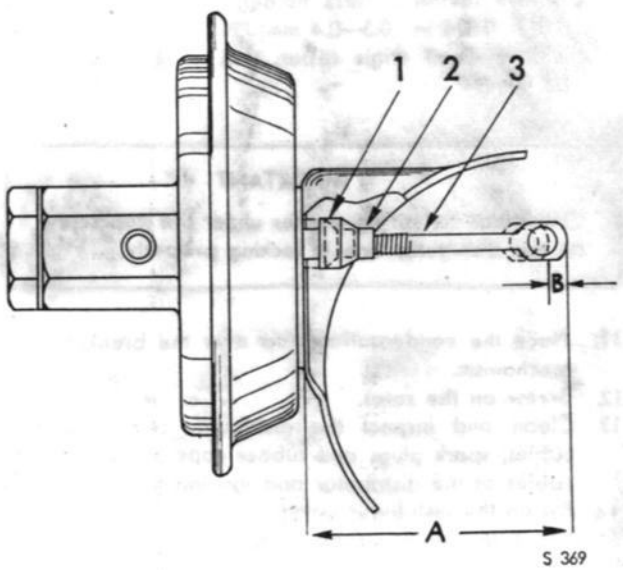
IMPORTANT

Make sure that the spring washer under the stop screw on the distributor arm locks the screw effectively.



S 723

LOCATION OF CONDENSATION TRAP, DISTRIBUTOR JFU3 (R) (VJU3 BR2T)



S 369

VACUUM CHAMBER. CHECKING THE LENGTH OF THE CONTROL ARM

To adjust the length, hold nut 1 and slacken the locking nut 2. Then screw the control arm in or out until the correct length is obtained. Lock the arm in this position with the nut.

Dim A = 1.68 ± 0.08 in. (42.8 ± 0.2 mm)
B = Stroke 0.137 ± 0.059 in. (3.5 ± 0.15 mm)

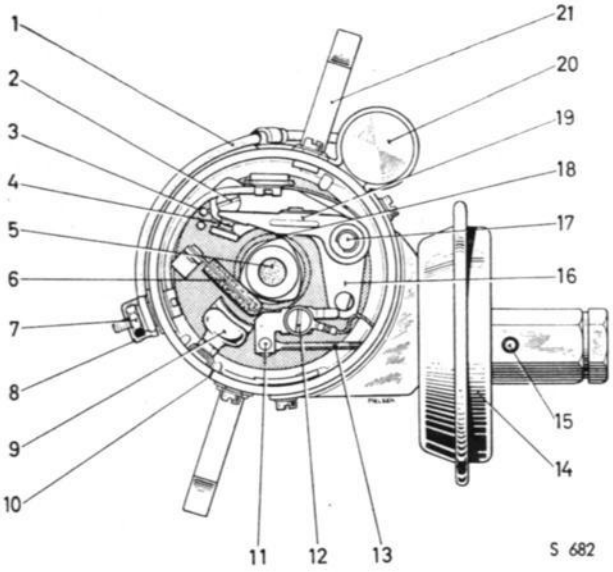
Changing breaker points, and gap adjustment, JFU3 (R) (VJU3 BR2T)

This job can be done with the distributor in the car, but is greatly simplified if the distributor is removed.

1. Unfasten and remove the distributor cover.
2. Remove the rotor which is secured to the breaker camshaft by means of a stop screw.
3. Remove the condensation trap.
4. Back off the nut for the low-tension cable connection and remove the connection for the breaker arm.
5. Remove the retaining clip and press the leaf spring out of its seat. Then lift up the breaker arm and collect the spacers.
6. Remove the screw 2 and slacken screw 12 a few turns. Lift up the contact holder together with the stationary breaker contact.
7. Fit a new stationary breaker contact.
8. Grease the pivot and fit a new breaker arm. Use washers to adjust the axial play and the height in relation to the breaker contact and then secure with the retaining clip.
9. Make sure that the breaker arm slides into its holder and connect the cable to the low-tension connection, tightening the nut afterwards.
10. Adjust the gap, by applying a screwdriver between two lugs on the breaker plate and the corresponding groove in the contact holder. The gap should be 0.012—0.016 in. (0.3—0.4 mm). If the gap is adjusted with a dwell angle tester, the dwell ange should be 80—84°.

> IMPORTANT
>
> Check that the spring washer under the stop screw on the distributor arm is locking properly.

11. Place the condensation trap over the breaker mechanism.
12. Screw on the rotor.
13. Clean and inspect the distributor cover, ignition cables, spark plugs and rubber caps on the ignition cables at the distributor and ignition coil.
14. Put on the distributor cover.
15. Check the ignition setting. See "Ignition setting".



BREAKER JOINTS, DISTRIBUTOR JFU3 (R) (VJU3 BR2T)

1. Capacitor cable.
2. Locking screw.
3. Adjusting lug for breaker points.
4. Breaker points.
5 & 6. Lubricating felt pads.
7. Low-tension cable terminal.
8. Lubricator.
9. Bearing.
10. Ignition setting mark.
11. Pivot.
12. Earth screw.
13. Control stay.
14. Vacuum chamber.
15. Vaccum-hose connection.
16. Stationary breaker contact.
17. Stub.
18. Fiber lip.
19. Breaker arm.
20. Capacitor.
21. Retaining spring.

Ignition timing

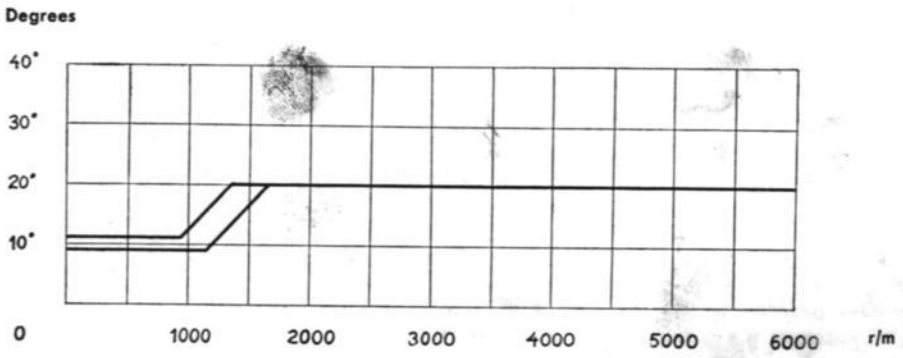
Ignition timing is regulated either by a centrifugal governor JF3 (R) or by a centrifugal governor in combination with a vacuum governor JFU3 (R). The timing can be checked in a distributor tester with the aid of the table below. Centrifugal and vacuum regulation of the timing must be checked separately.

The function of the vacuum governor can be roughly checked in the car as follows: after adjusting the ignition setting with a stroboscope, allow the engine to run at about 3000 r/m. When the vacuum hose is reconnected to the distributor, the ignition position should advance a further 10° in relation to the original ignition position. This corresponds roughly to 0.43 in. (11 mm) on the pulley.

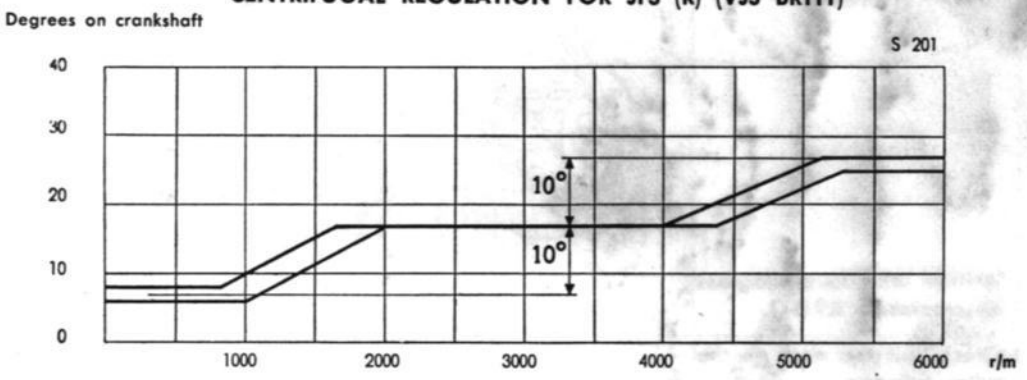
Distributor settings when testing in a synkograph

Type of distributor Model	Dwell angle°	Contact pressure ing.	Centrifugal advance in degrees at engine distributor speed in r/m						Vacuum advance	
			Advance range°	Begins	5°	10°	15°	Ends	Begins	Ends 8.5—11.5°
JF3 (R) (VJ3 BR11T)	80—84°	400—530	10	800—1300	1100—1450	1450—1850		1450—1850	120*—140 mmHg	140—160 mmHg
JFU3 (R) (VJU3 BR2T)	80—84°	400—530	17—21	900—1300	1200—1600	1400—4700	4600—5300	5300—6000		

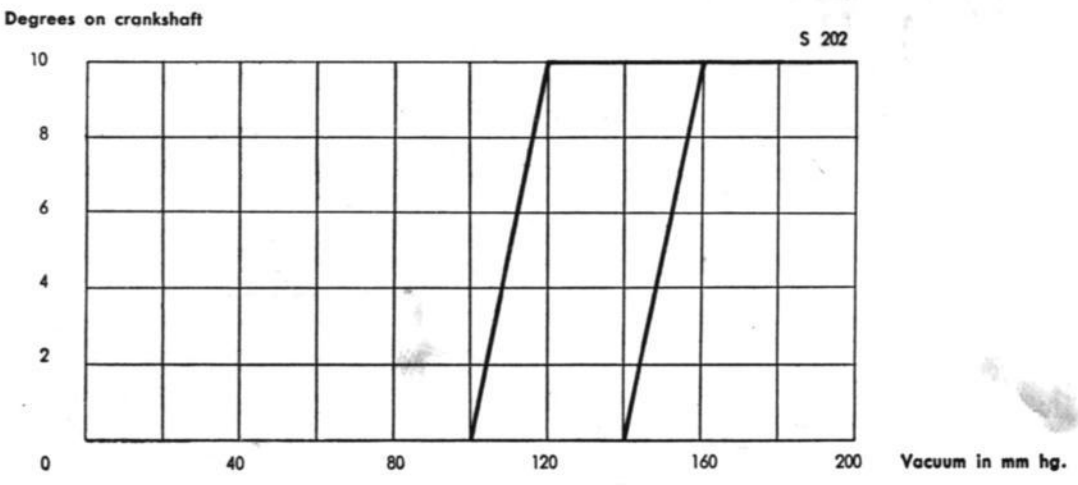
* Return shall be completed before 100 mm (3.94 in.) Hg



CENTRIFUGAL REGULATION FOR JF3 (R) (VJ3 BR11T)

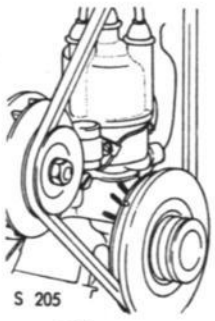
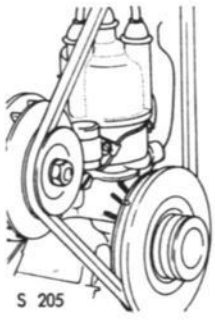
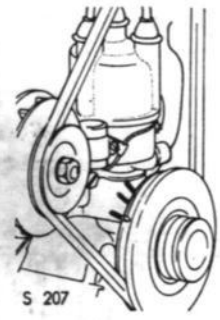
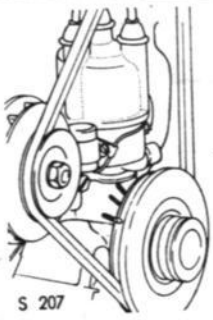
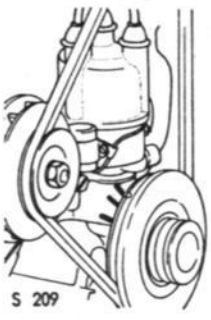
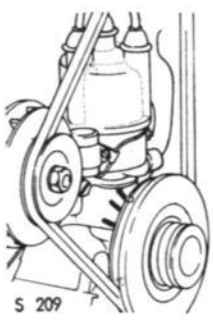


CENTRIFUGAL REGULATION FOR JFU3 (R) (VJU3 BR2T)



VACUUM REGULATION FOR JFU3 (R) (VJU3 BR2T)

Ignition settings

Distributor Bosch designation	JF3 (R) (VJ3 BR11T)	JFU3 (R) (VJU3 BR2T)
Model	Saab Sport	Saab 95 Saab 96
Ignition timing	Centrifugal regulation	Centrifugal and vacuum regulation
Breaker gap	0.12—0.016 in. (0.3—0.4 mm)	0.012—0.016 in. (0.3—0.4 mm)
Dwell angle	80—84°	80—84°
Basic setting of ignition with the aid of a test lamp, stationary engine Ignition position in degrees on crankshaft B.T.D.C.	 S 205 10°	 S 205 7°
Stroboscope setting of ignition at approx. 3000 r/m Ignition position in degrees on crankshaft B.T.D.C.	 S 207 20°	 S 207 17° Note: with disconnected vacuum hose
Check that the mark on the pulley talleys The piston in the 2nd cylinder must be at U.D.C.	 S 209	 S 209

IGNITION SETTING

General

The order of firing is 1, 2, 3, when 1 is the rear cylinder. The ignition setting is always done on the 2nd cylinder (the middle cylinder).

The ignition position should be checked and adjusted with the aid of a stroboscope at an engine speed of about 3000 r/m. This is a more reliable and better method than adjusting with a stationary engine, using a test lamp.

At the front end of the engine there is one mark on the pulley and three on the engine block. These marks are utilized as follows:

a) When the mark on the pulley coincides with the u p p e r mark on the engine block the 2nd piston should be at U.D.C. This upper mark is utilized when checking that the pulley mark is in the correct position, and when remarking the pulley after fitting a new crankshaft or pulley.

b) When the mark on the pulley coincides with the m i d d l e mark on the engine block it shows the basic ignition setting for the 2nd cylinder. It is used when adjusting the ignition setting on a stationary engine with the aid of a test lamp and when fitting the distributor.

c) When the mark on the pulley coincides with the l o w e r mark on the engine block, this shows the ignition position for the 2nd cylinder at an engine speed of approx. 3000 r/m. It is utilized for ignition setting with the aid of a stroboscope. Note that the engine r/m must be within the limits shown after the first step on the timing curve. See "Ignition timing". If the engine is equipped with a vacuum distributor, always remove the hose to the vacuum chamber before ignition timing.

The table below is a translation fromd gress on the crankshaft to in. (mm) on the pulley outer diameter.

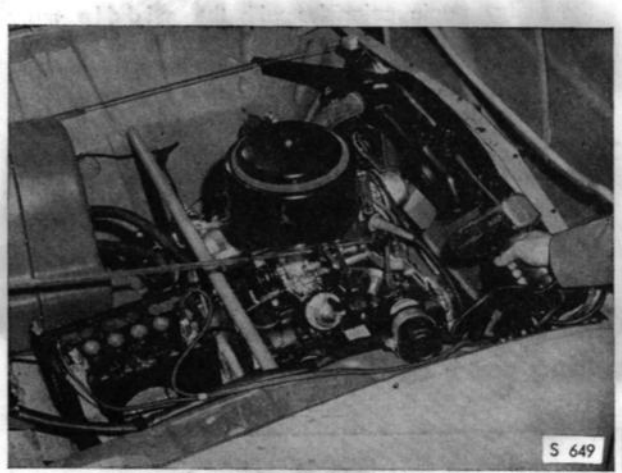
Degrees on the crankshaft	Distance on pulley from upper setting mark, i.e. U.D.C. for 2nd piston. Pulley diameter 4.961 in (126 mm)
1°	0.04 in. (1.1 mm)
7°	0.32 in. (8 mm)
10°	0.43 in. (11 mm)
17°	0.75 in. (19 mm)
20°	0.86 in. (22 mm)

Ignition setting with a stroboscope

1. Check the breaker points and arm and adjust to the correct gap. When fitting the rotor, always use a new spring washer to ensure effective locking of the screw. Inspect and clean the distributor cover, ignition coil, ignition cables, spark plugs and cable shoes at the plugs and at the distributor cover.
2. Turn the crankshaft until the mark on the pulley coincides with the m i d d l e mark on the engine block.
3. Mount the distributor so that the mark on the rotor comes opposite the mark on the edge of the distributor housing and the vacuum chamber points rearwards on the Saab 95 and 96, and that the distributor housing lubricator points forward and a little to the right on the Saab Sport.
4. Connect the stroboscope to the ignition cable of the 2nd cylinder and start the engine. Gradually increase the engine speed. A noticeable change in the ignition position will be observed somewhere between 1000 and 2000 r/m, while a further increase in engine speed causes no more change — the ignition position remains constant. Adjust the ignition within this r/m range by slackening the locking screw and turning the distributor housing. When the mark on the pulley coincides with the l o w e r mark on the engine block, secure the distributor by tightening the locking screw.

NOTE

The vacuum hose should be disconnected while adjusting the ignition in the case of JFU3 (R) (VJU3 BR2T).



CONNECTION OF STROBOSCOPE FOR CHECKING THE SETTING

Ignition setting with a test lamp

If a stroboscope is not available, the ignition setting can be adjusted with the aid of a test lamp connected between the chassis and the terminal for the low-tension cable on the distributor.

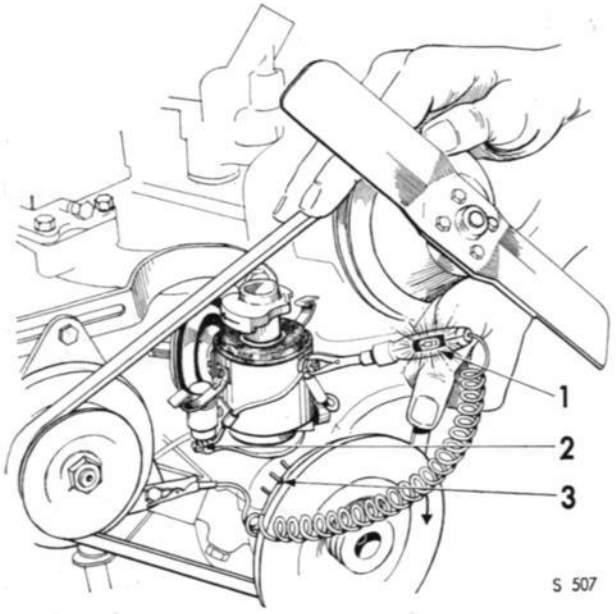
1. Remove the distributor cover, rotor and condensation trap, examine the points and adjust the gap.
2. Refit the condensation trap and the rotor. Use a new spring washer to ensure effective locking of the screw.
3. Turn the crankshaft until the mark on the pulley coincides with the middle mark on the engine block.
4. Mount the distributor so that the mark on the rotor comes opposite the mark on the edge of the distributor housing and the vacuum chamber points rearwards on the Saab 95 and 96, and that the distributor housing lubricator points forward and a little to the right on the Saab Sport.
5. Connect a test lamp between the chassis and the terminal for the low-tension cable on the distributor and switch on the ignition.
6. Turn the distributor housing a little to find the position in which the test lamp lights up. Check that the weights of the centrifugal governor are in the inner position by turning the rotor anticlockwise. Now secure the distributor with the locking screw.
7. Check that the ignition setting is correct by turning the crankshaft one turn clockwise. When the mark on the pulley again coincides with the middle mark on the engine block the test lamp should light up. At this position, check that the marks on the rotor and distributor housing coincide and that the weights of the centrifugal governor are in the inner position.
8. Switch off the ignition and remove the test lamp. Clean and inspect the distributor cover, ignition cables, spark plugs and cable shoes at the spark plugs and distributor cover.

Checking and marking the ignition setting mark on the pulley

> IMPORTANT
>
> The ignition setting mark on the pulley will not tally if a new crankshaft or pulley has been fitted.

Checking or marking of the pulley is done as follows:

1. Screw a dial indicator (tools 784040, 784060, and 784062) into the spark plug hole for the 2nd cylinder.



BASIC IGNITION SETTING

1. Test lamp
2. Locking screw
3. Timing marks

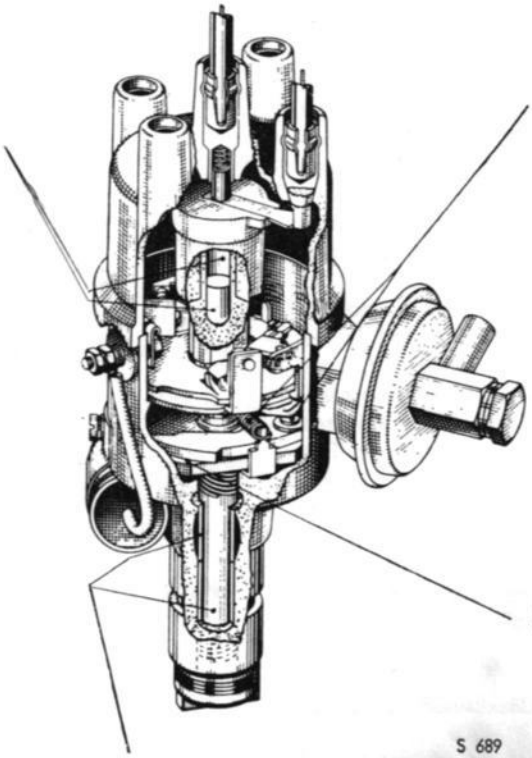
2. Turn the crankshaft until the piston is at U.D.C., determining this by means of the dial indicator.
3. The mark on the pulley will now coincide with the upper mark on the engine block — see table. If it does not, file the old mark off and make a new mark in the proper position with a file.

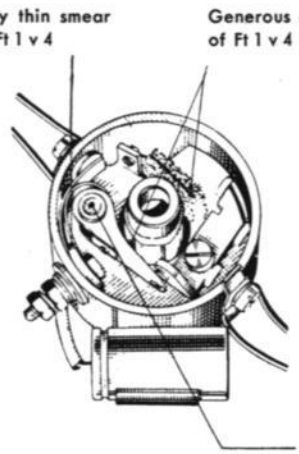
Distributor cover

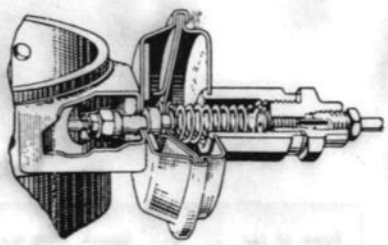
The distributor cover has a top outlet, which is connected by means of a hose to the fresh-air tank. A condensation trap is located under the rotor. This is squeezed in between the distributor cover and the housing, thus ensuring effective sealing.

> IMPORTANT
>
> Wipe the distributor cover clean at intervals of about 6,000 miles (10 000 km).

Lubrication of distributor







On distributors with vacuum advance, wipe contact surfaces with oil, O1 1 v 2, and apply grease, Ft 1 v 22, generously to friction surfaces of the breaker plate, bearer balls and carrier screws.

IMPORTANT!

Keep breaker contacts free from oil and grease. Clean contacts with trichloroœthylene after reassembly. Smear a film of oil, O1 41 v 2, on all bright parts.

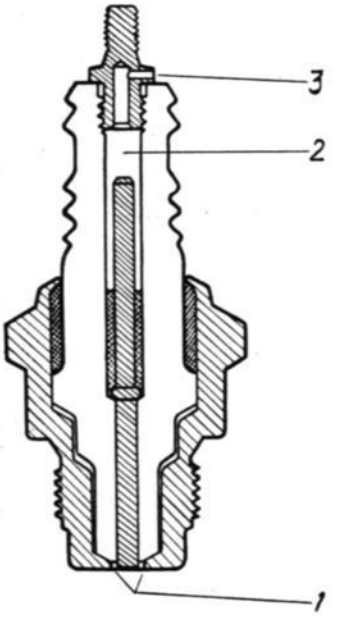
SPARK PLUGS

General

The choice of spark plugs depends on under what conditions the car is driven. Too cold spark plugs can cause oil on the spark plugs and too hot plugs can cause ignition by incandescense and pinging with engine damage as the result. It is therefore very important to choose the right spark plugs, and especially that too hot plugs are not used. The higher the engine load is the more important are these recommendations. For this reason other spark plugs than those having sufficient resistance to ignition by incandesence may not be used. For recommended spark plugs, see table below. In the Saab 95 and 96, spark plugs of conventional type are used, in the Saab Sport (for hard driving), Champion UK-16V, type Surface gap is used, see fig. The latter has no side electrode, and the spark gap consists of the space between the center electrode and the lower part of the plug. This plug remains relatively cold and is therefore suitable for hard driving. UK-16V and UK-7 have a big pre-sparking gap inside the insulator in order to give the spark higher effect. This reduces the risk for failing sparks and oiled plugs. The pre-sparking gap requires a special ignition system with high ignition voltage i.e. a special ignition coil with series resistance.

IMPORTANT

Champion UK-16V plugs must not be blasted but should be cleaned with a wire brush. As the spark gap is not adjustable, the plug must be removed when the gap is 0.05 in. (1.2 mm). The torque is 14 ft-lb (2 kgm).



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SPARK PLUG CHAMPION UK-16V, SURFACE-GAP TYPE

1. Spark gap
2. Pre spark gap
3. Ventilation hole

MAINTENANCE 3000 MILES (5000 KM)

The spark gap should be checked and adjusted at regular intervals, about every 3000 miles (5000 km). The spark gap should be 0.03 in. (0,8 mm).

Plugs with large gaps require an abnormally high ignition voltage, which involves a risk of flashover in the distributor cover, ignition coil and ignition cables. When fitted in two-stroke engines, spark plugs normally last for about 6000 miles (10000 km).

It is imperative that spark plugs with the correct heat range are used — see table below.

Table of approved spark plugs

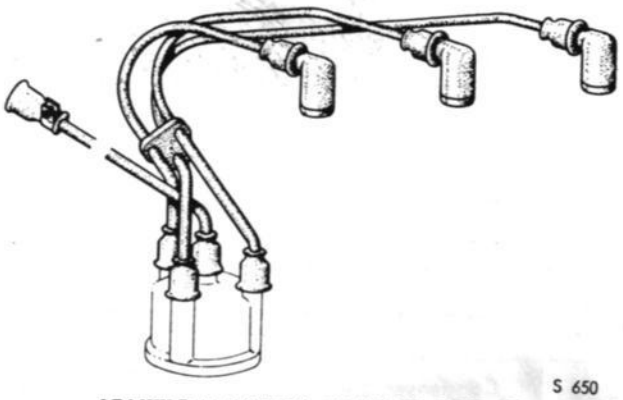
Type of car	Spark plug make and type	Use	Remarks
Saab 95 and Saab 96	AC M83	Easy driving	Note! Spark plugs recommended for easy driving must not be used for hard driving as this may damage the engine
	AC M82	Hard driving	
	AC 82-S-COM	Normal driving	
	Beru 175/18	Easy driving	
	Beru 225/18	Hard driving	
	Bosch M 175 T1	Easy driving	
	Bosch M 225 T1	Normal driving	
	Bosch M 240 T1	Hard driving	
	Champion UK-10	Easy driving	
	Champion K-9	Normal driving	
	NGK A7	Easy driving and Normal driving	
Saab Sport	Champion UK-16V	Hard driving	
	Champion UK-7 (UK-162)	Normal driving	

IGNITION CABLES

General

The ignition cables are fitted with resistors to suppress the interference produced by the electrical discharge at the spark plugs which could otherwise be picked up on radio and television receivers. They consist of a core of graphite-impregnated plastic wire covered with an insulating sheath.

Because of the high ignition voltage, the cables in the Saab Sport may not be placed closer than 0.4 in. (10 mm) to earthing parts. It is extremely important for the cables to be properly connected to the plugs, distributor cover and ignition coil, thus avoiding bad contact, and that the seals are correctly fitted. Check the resistance in cables and connections in the event of trouble in the form of oil-clogged spark plugs. When carrying out this check, bend the cable, as this makes it easier to discover possible breaks. The total resistance between the ignition coil and the distributor and spark plugs shall be within the following limits: max 35000—40000 ohms, min. 8000 ohms.



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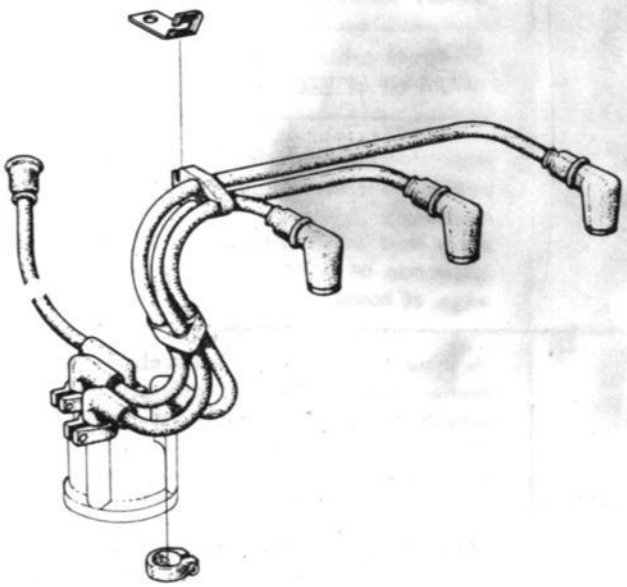
IGNITION CABLES, SAAB 95 AND 96



IGNITION CABLES, SAAB SPORT

SUPPRESSION DEVICES

General

Saab 95, 96 and Sport are fitted with suppressed ignition cables (resistor cables) to prevent interference from being picked up by radio and television receivers. If a radio receiver or transmitter is installed in the car, no separate resistors may be fitted to the distributor and spark plugs other than recommended by the manufacturer. Nor may suppressed spark plugs be used if suppressed ignition cables are fitted. This would lead to the permissible resistance value being exceeded and would result in too great a reduction of the spark effect, which has a detrimental influence on the running of the engine.

With regard to other suppression measures which may prove necessary, reference should be made to the table, 2nd and 3rd degrees of necessity. Also make sure that the engine compartment is effectively screened, implying that the radiator grill and front panel must be earthed with a multi-braided lead. Provision is made at the rear of the hood for fitting an earth lead.

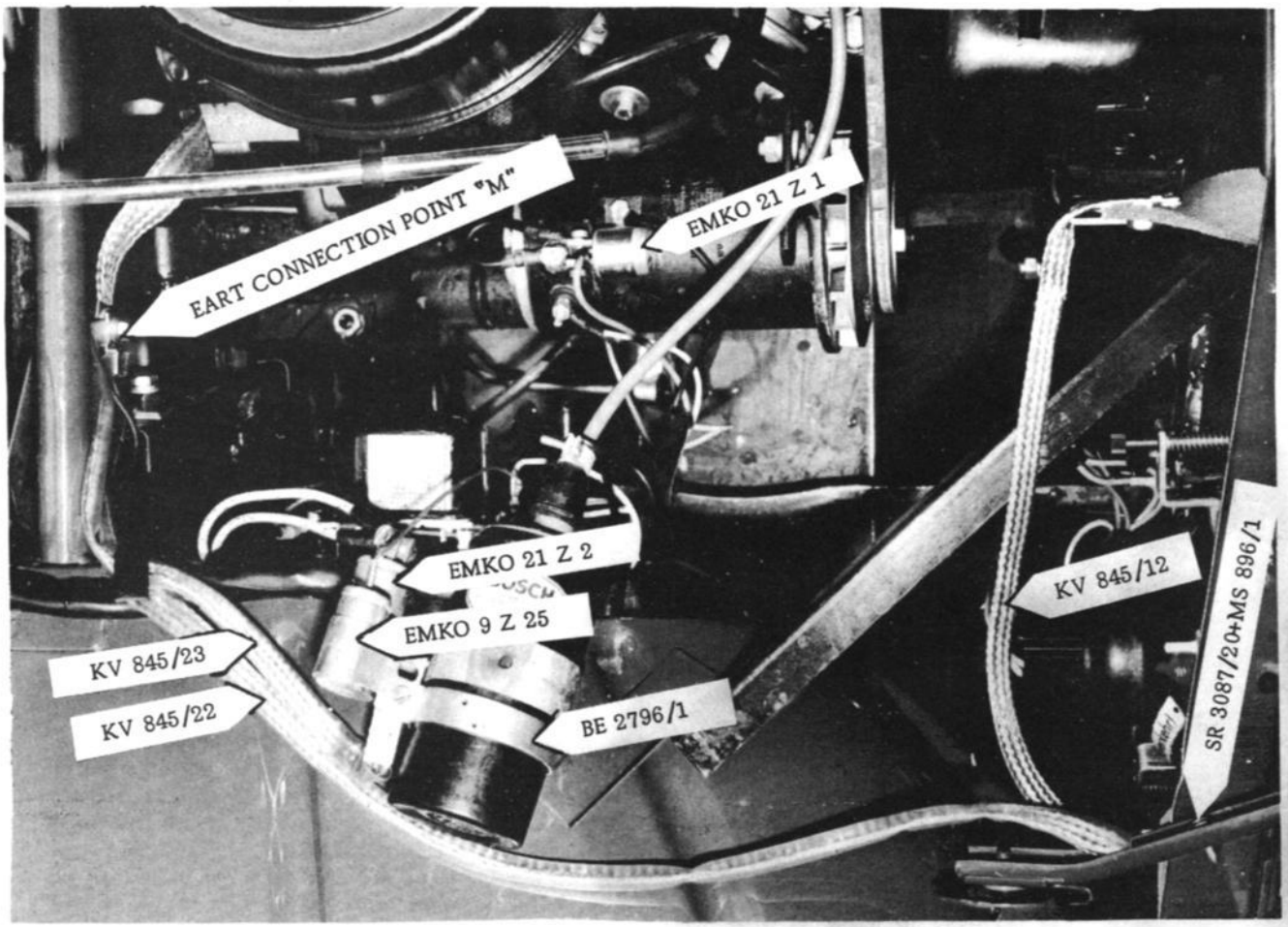
If a transmitter is to be used in the car, it may be necessary in some cases to screen the ignition system, including coil, distributor and spark plugs, instead of utilizing the standard resistor cables. For the rest, the manufacturer's instructions should be followed.

SUPPRESSION MEASURES

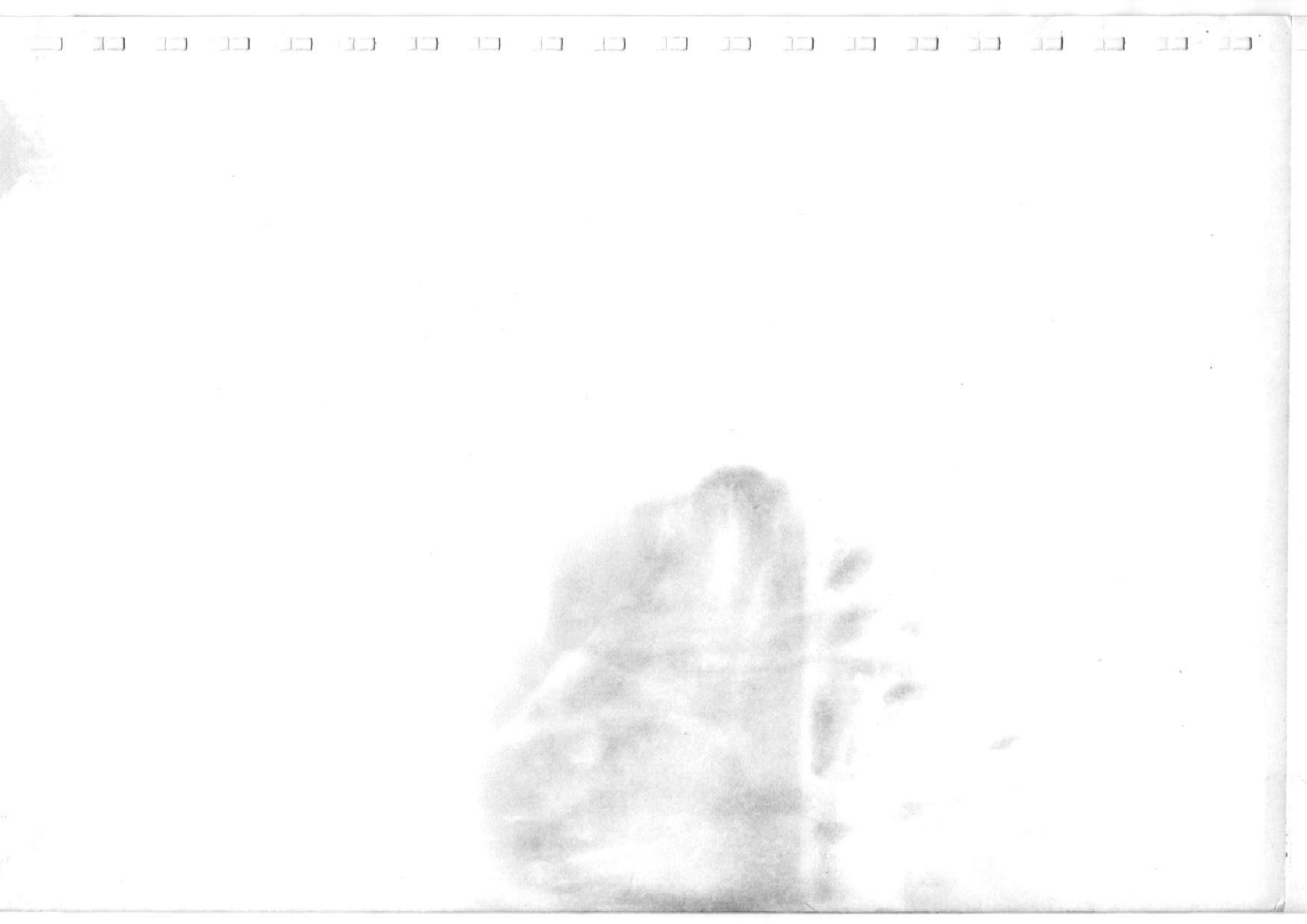
Degree of necessity	Location	Description	Bosch designation
2	Generator	Condenser, 0.5 mfd., between D+ and earth (D—)	EMKO 21Z1Z Connection cable WEA 439Z2Z
2	Voltage regulator	Condenser, 2.5 mfd., between B+ and earth	EMKO 21Z2Z Connection cable WEA 439Z2Z
2	Ignition coil	Condenser, 3 mfd., between connection 15 or (+) and earth. Earthing of ignition coil hood through a multibraided earth harness connected to the battery earthing.	EMKO 9Z25 Clip BE 2796/1 Earth connection KV 845/23
3	Spark plugs	Screened cable shoe with built- in, wire wound resistance of 1000 ohms.	EM/WFR 1/2
3	Engine compartment	Multi-braided earth lead fitted between hood and battery earthing point via the stay for the hinge. Earth lead between radiator and stay for hood. Inspection or fitting of earth connection in rear edge of hood.	KV 845/22 KV 854/12. Shortened to 380 mm.
3	Wheels	In some cases it may be necessary to provide further suppression by connecting the rear wheels in particular with metal parts. This is done by fitting a suitable coil spring between the grease fitting and the stub axle.	RK 10
1	Ignition cables	Resistor ignition cables between ignition coil — distributor — spark plugs are provided as standard. Total resistance: Max. 35000—40000 ohms. Min. 8000 ohms.	

Degrees of necessity:

1 = Basic suppression (fitted as standard at the factory)
2 = If interference occurs, suppress according to 2
3 = If interference still persists, proceed according to 3.



SUPPRESSION DEVICES, BOSCH DESIGNATION

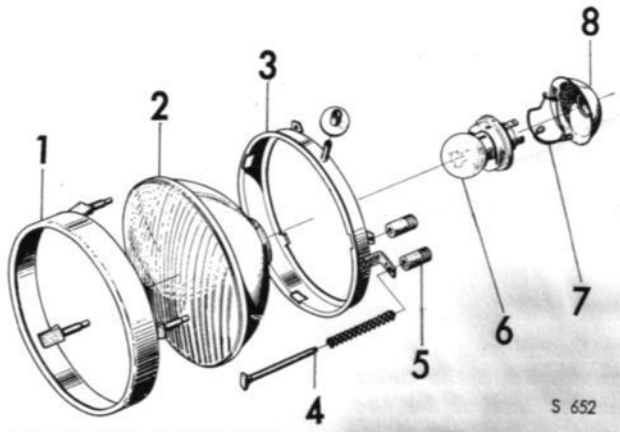


LIGHTING

Headlamps

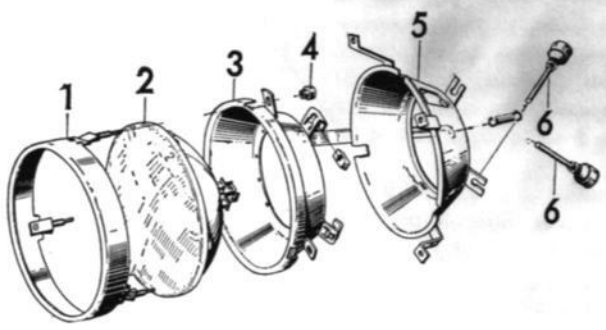
The headlamps are recessed in the front panel. The left and right headlamp inserts are identical and can be fitted on either side without alteration. The headlamp bulbs have two filaments, one for high beam and one for dipped beam. In the Saab 95 and 96, a foot dipper switch is used to regulate the beam, while in the Saab Sport, Saab 95 and 96 R.H.D. the flasher-switch lever is used for this purpose. A warning lamp in the speedometer glows with red or blue light when the headlamps are on high beam. The dipper switch is located on the foot plate to the left of the pedals. Cars for the Swedish market are fitted with left-dipping asymmetric lamps, while cars intended for export to countries with right-hand traffic have right-dipping asymmetric lamps or Sealed Beam units.

To modify the asymmetric lamps so that they produce ordinary symmetric light, for instance when travelling by car abroad, the asymmetric section can be masked with translucent tape or in some other suitable way.
Saab Sport has a special headlamp insert, adjustable for left-hand and right-hand traffic by means of a turnable bulb.



HEADLAMP, ASYMETRIC, LEFTHAND AND RIGHTHAND TRAFFIC

1. Ring
2. Insert with glass
3. Adjusting ring
4. Adjusting screw
5. Adjusting nut
6. Bulb
7. Fastening spring
8. Rubber seal



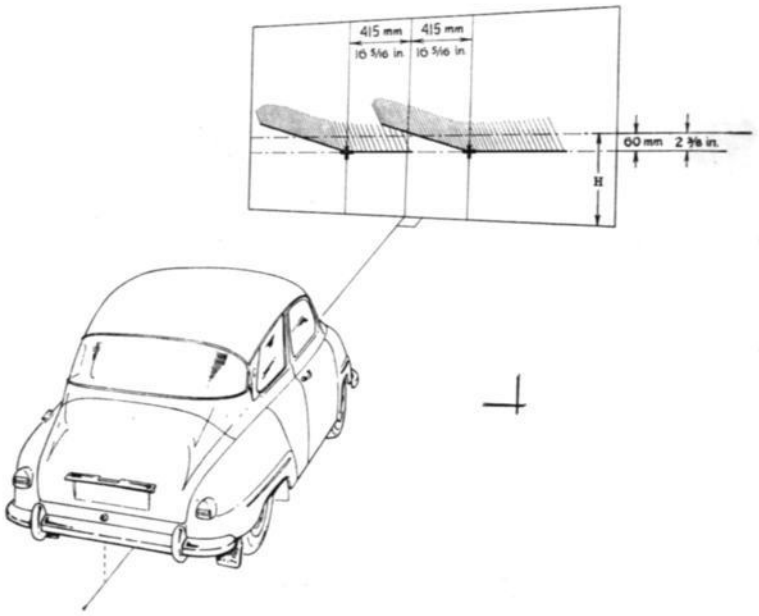
HEADLAMP, SEALED BEAM, USA

1. Ring
2. Sealed beam insert
3. Adjusting ring
4. Nut
5. Shell
6. Adjusting screw

Alignment of left-dipping and right-dipping asymmetric lamps

Alignment towards a screen, see illustrations.

1. Check the tire pressures and place the unladen car on a flat surface about 16 1/2 feet (5 metres) from the screen.
2. Switch on to dipped beam and mask one of the headlamps.
3. Check and adjust the beam so that the horizontal part of the light-dark border is exactly 2.4 in. (6 cm) lower than and to the right (to the left for right-dipping asymmetric lamps) of the measured headlamp center point — see illustration. The sloping part of the light-dark border must be entirely to the left (to the right for right-dipping asymmetric lamps) of the mark and thus meet the horizontal part exactly under the headlamp center.
4. Check the other headlamp in the same way.
5. Check that the full beam is evenly distributed. If the beam is unevenly distributed, or if it proves difficult to get correct dipped-beam settings, make sure that the bulb is correctly fitted or, if necessary, fit a new bulb.



ALIGNMENT OF RIGHT-DIPPING ASYMMETRIC HEADLAMPS

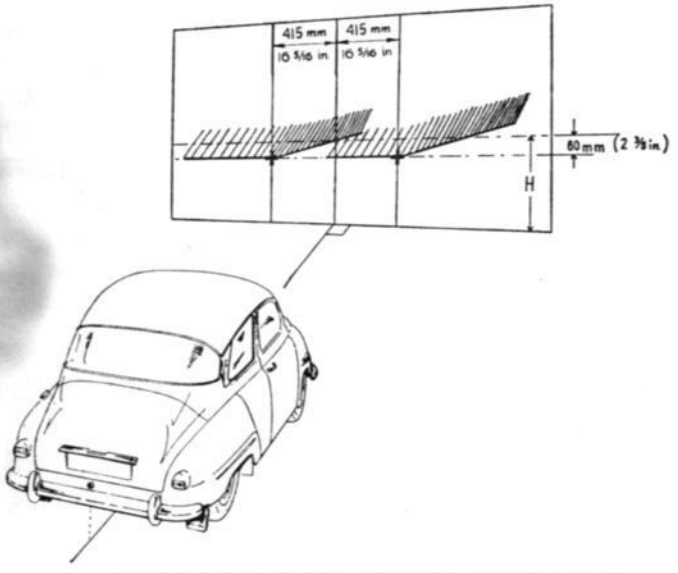
H = Height of headlamp center above ground

Alignment of sealed beam units

Alignment towards a screen, see illustration.

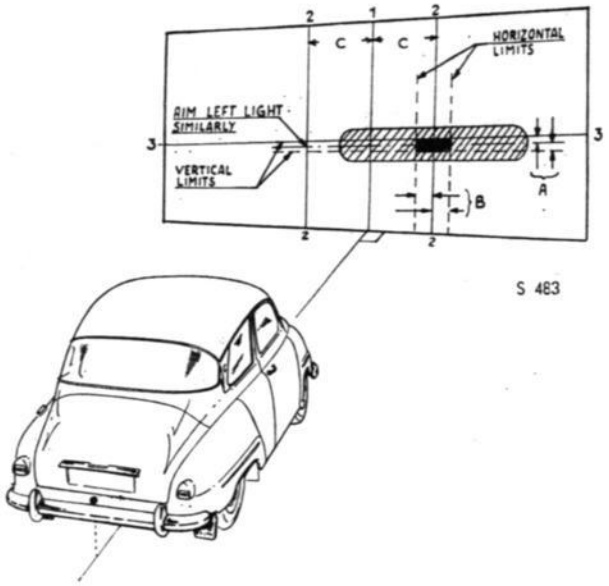
The various lines on the screen correspond to: the center line of the car 1, the vertical center lines of the two headlamps 2—2, and the horizontal center lines of the headlamps 3—3.

1. Check the tire pressures and place the unladen car about 24 1/2 feet (7.5 meters) from the screen.
2. Adjust line 3—3 so that it is horizontal and coincides with the center lines of the headlamps.
3. Switch on the high beam and mask one headlamp at a time.
4. Check and adjust the headlamps so that the beams come 2 in. (50 mm) under the intersections of lines 2—2 and 3—3. The tolerance limits which may not be exceeded by the center of the beam under any circumstances are marked by the black area on the screen. The transversal limits are 6 in. (150 mm) to the right or left of line 2—2, and vertically the center of the beam may not be above line 3—3 or more than 4 in. (100 mm) below line 3—3.
5. Check both headlamps and make sure that the beam is symmetric. If not, or if it proves difficult to get a correct setting, fit a new Sealed Beam unit.
6. If the high beams are correctly aligned it will not be necessary to adjust the dipped beams separately.



ALIGNMENT OF LEFT-DIPPING ASYMMETRIC HEADLAMPS

H = Height of headlamp center above ground



ALIGNMENT OF SEALED BEAM UNITS

1. Center line of car
2—2. Vertical center line of headlamp
3—3. Horizontal center line of headlamp

A = 2 in. (50 mm)
B = 6 in. (150 mm)
C = 5/16 in. (415 mm)

Changing headlamp bulbs

A headlamp bulb normally has full power for the first 100 hours of the burning time. Even if the lamps work longer, the light power decreases considerably after this time. In order to have as much light as possible, it is therefore advisable to change the headlamp bulbs about once a year, with normal driving.

Another factor of importance to effective lighting is that the reflector is undamaged and that the cable terminals have good contact.

1. Lift the hood and push the rubber grommet behind the headlamp out of the way.
2. Press and release the retainer spring, whereupon the bulb socket can be withdrawn.
3. Change the bulb. Use a clean cloth or the cardboard box when fitting the new bulb. Do not touch the bulb by hand.
4. Refit the lamp socket, making sure that the locating lug is correctly positioned. Make sure that the retainer spring holds the socket properly, keeping it in the proper position.
5. Refit the rubber grommet, making sure that it seals properly round the socket. Check that the cable terminals have good contact.

IMPORTANT

If the bulb is incorrectly located in the reflector, a faulty light pattern will result, and it will therefore be impossible to get a correct setting.

Changing the Sealed Beam unit

1. Disconnect the cables from the unit.
2. Remove the three nuts holding the chromed ring, and remove the ring.
3. Renew the Sealed Beam unit.
4. Make sure that the guide shoulders fit into the shell's recesses.

Parking and stop lights

The front parking lights are mounted in the front panel and are combined with the direction-indicating flashers. The rear parking lights are integral with the stop lights and flashers in the tail lights.

The stop-light switch is located in the engine compartment on the master brake cylinder.

Changing bulbs

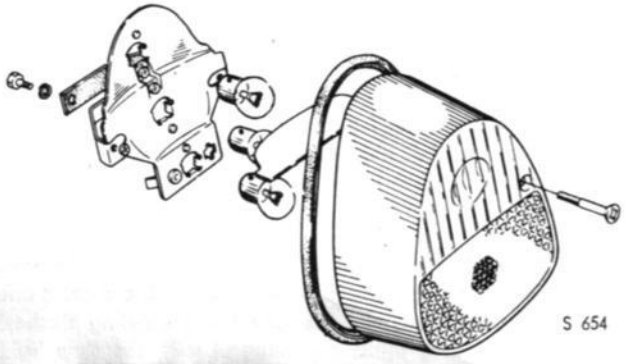
1. Back off and remove the two retaining screws and remove the lens together with frame and screws.
2. Take the bulb out of its bayonet socket.
3. Clean the bulb socket and the lens.
4. Fit a new bulb. Make sure that good contact is obtained, particularly at the earth connection.
5. Refit the lens.

Number-plate light
Changing bulbs

1. Back off and remove the retaining screws and take off the lamp housing, enabling the bulb to be removed.
2. Clean the socket and the lamp housing.
3. When fitting the new bulb, make sure that it is firmly seated and that good contact is obtained.
4. Refit the housing and tighten the retaining screws. Check that sealing is effective between the rubber gasket and the housing.

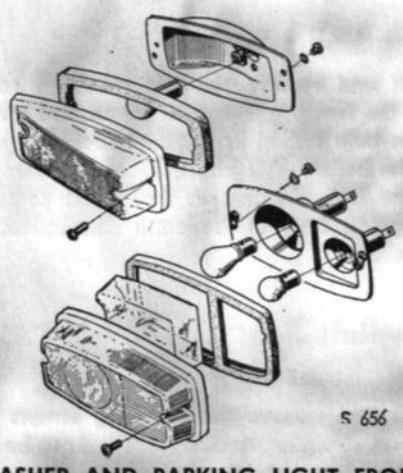
Interior lighting

The ceiling lamp and switch are fitted on the ceiling rail. In the Saab 95 there are two interior lamps, one at the front and one at the rear of the passenger compartment. These lamps can be switched on either with the door switch or with the switch on the lamp housing.



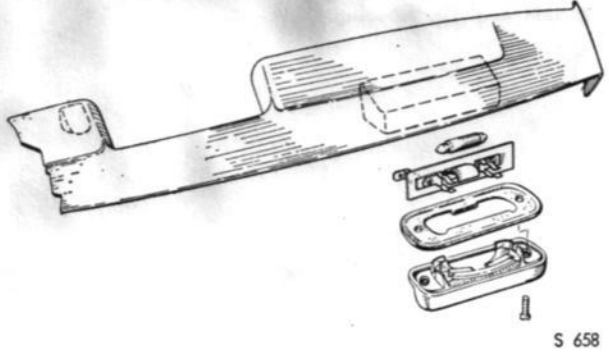
S 654

FLASHER, PARKING AND STOP LIGHT, SAAB 96 AND SPORT



S 656

FLASHER AND PARKING LIGHT FRONT, STANDARD AND EXPORT VERSION

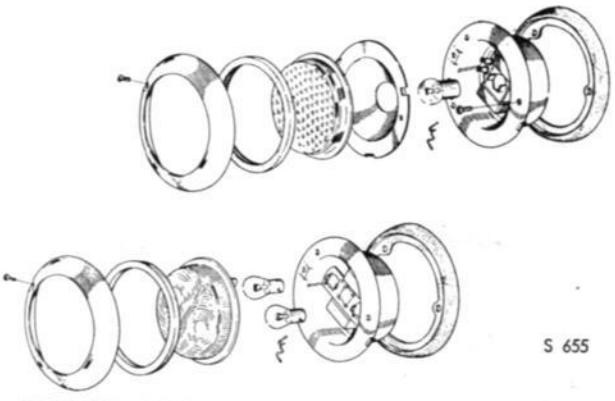


S 658

NUMBER-PLATE LIGHT, SAAB 96 AND SPORT

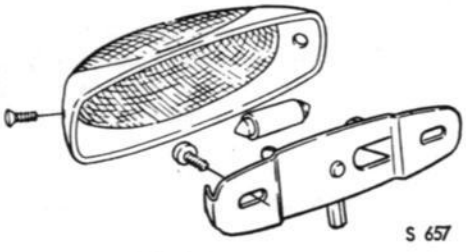
Changing bulbs

1. Back off and remove the two retaining screws on the glass shade. Remove the screws and shade, and change the bulb.
2. Make sure that both bulb retainers have good contact so that the bulb is firmly seated.
3. Refit the shade and tighten the screws. If contact is poor, take off the glass shade as described above and remove the base plate for repair or renewal.



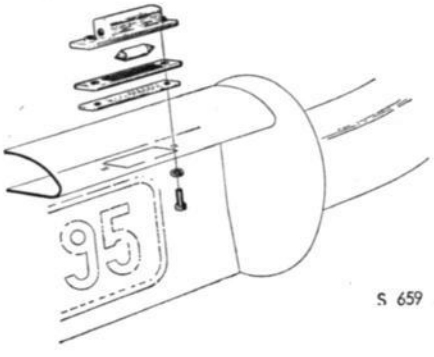
S 655

FLASHER, PARKING AND STOP LIGHT, SAAB 95



S 657

INTERIOR LIGHTING



S 659

NUMBER-PLATE LIGHT, SAAB 95

DIRECTION INDICATORS

General

The direction indicators consist of flashing lights at front and rear. At the front, the flashers are combined with the stop lights and flash with white light. At the rear, separate lamps are provided for the flashers. These are mounted in the same housings as the stop lights and tail lights and flash with red light.

The flasher unit, which is installed under the instrument panel, is combined with a control relay which indicates, by means of green warning lamps on the instrument panel, that the direction indicator is on and that both lamps are working.

If one of the flashers fails to operate, the warning lamp will not glow and the remaining light will flash more rapidly. If the flasher unit is in good condition and correct bulbs are fitted, the direction indicator will flash at the rate of 60—120 flashes per minute.

The flasher unit is not adjustable. If the other parts of the direction-indicating system (switch, wires and lamps) are in good order, erratic flashing must be due to a faulty flasher unit. In these circumstances, a new flasher unit must be fitted.

Instructions for attachment of the direction-indicator switch and return mechanism are given in Chapter 6.

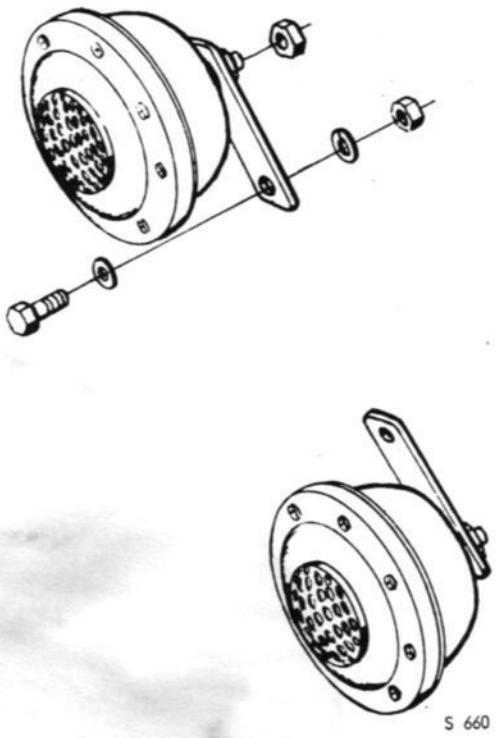
> NOTE
>
> The fitting of bulbs with incorrect ratings will result in abnormal flashing frequency.

HORNS

General

The horns are mounted inside the tront panel. One high-pitched and one low-pitched horn are harmonized to give a high-penetration signal.

If the horns produce a discordant tone, first localize the defective horn and adjust by turning the contact screw, marked with red paint, on the rear of the horn until a pure note is obtained.



S 660

HORNS

WINDSHIELD WIPERS AND WASHER

Windshield wipers

General

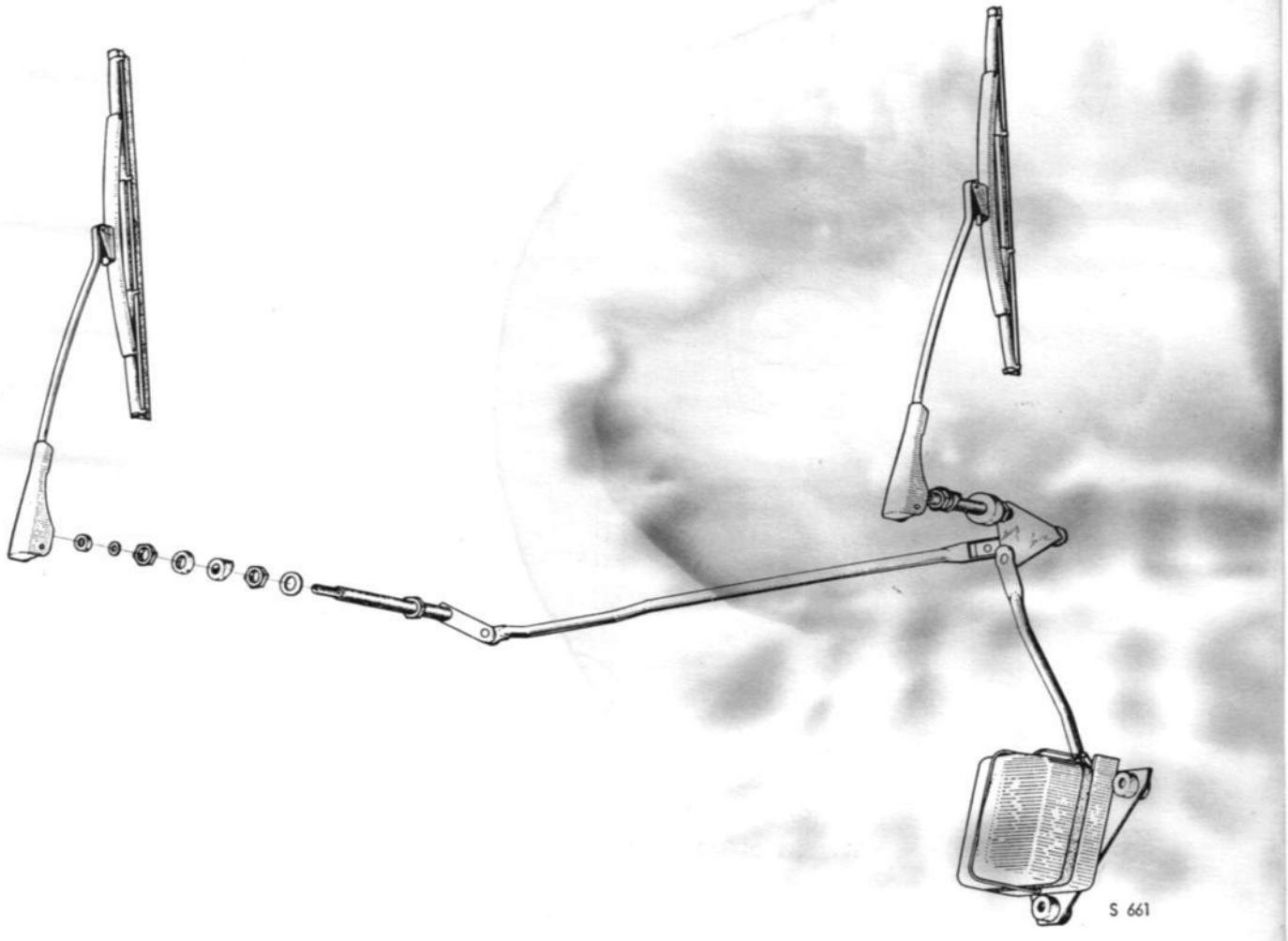
The windshield wipers are driven by a motor located on the dash panel in the engine compartment, the movement being transmitted to the wiper blades through the intermediary of two arms. These arms are adjustable lengthwise to facilitate setting of the correct blade sweep angle.

The motor is fitted with a device to ensure that it always stops at the same position when the switch is turned off. This "parking device" is located on the motor by the connection terminals. In the event of a break in or poor contact of either of the two wires connected to the "parking device", the wipers will either not stop at all or stop in the wrong position. This may also occur if dirt penetrates between the breaker contacts of the "parking device".

Function

Current for the wiper motor is supplied by the battery through the ignition contact via a fuse and switch, and direct from the fuse holder via a breaker unit located in the motor. The latter is part of a device which makes it possible to park the wiper blades in a predetermined position.

When the ignition and switch are on, the motor starts, whereupon the armature (1) rotates and drives the gearwheel (2) through a gear. The wiper arms are driven from one of the stubs on the gearwheel (2). As the gearwheel (2) continues to rotate, the cam (3) will lift the pin (4), so that the contact spring (5) is lifted from the contact (6). The contact (6) is directly connected to the battery via (53a), wire (14), via a fuse and ignition contact. The contact spring is then pressed against the contact (7), which is connected to (31b). (31b) is earthed via the conductor (16), switch and conductor (19) when the switch is off.



WINDSHIELD WIPER ASSEMBLY
(Car with lefthand drive, viewed from the front)

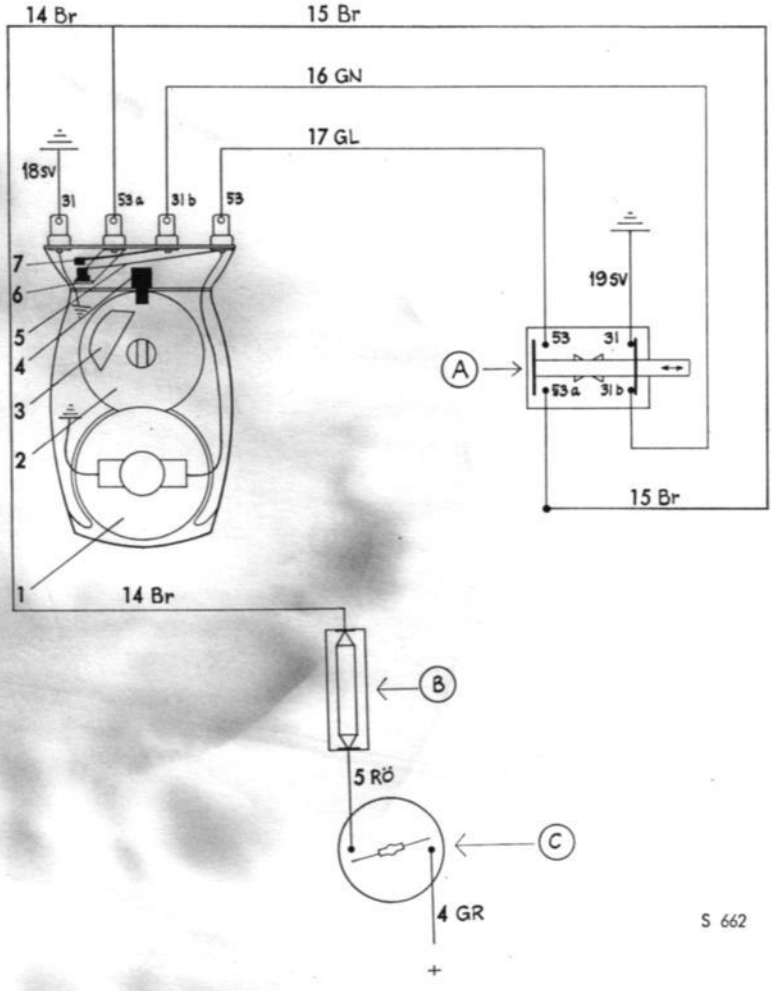
When the switch is on, nothing happens as the contact spring (5) switches from contact (6) to contact (7), when the motor is fed through (53) and the earth connection (31b) is broken at the switch.

The motor will stop immediately when the switch is turned off, provided that the contact spring (5) is in contact with (7), i.e. when the cam (3) is in a position where the contact spring (5) can be actuated. This occurs once for a brief period for each complete revolution of the gearwheel (2).

If the cam (3), and with it the wipers, is in any other position, rotation will continue until the contact spring (5) moves from (6) to (7) after the switch has been turned off. This is because the motor also receives current from (53a), which is not excited through the switch. When the contacts (5) and (6) break, the current to the motor is interrupted. At the same time, the armature leads are shorted over contacts (5) and (7) via the switch, whereupon the rotation speed of the armature is rapidly decreased. This is necessary in order for the motor to have time to stop during the period in which the cam (3) is actuating the contact spring (5). The motor would otherwise continue to rotate despite the switch being off, especially when the wipers run easily and when the tension over the motor is high (during charging and with low power consumption).

The gap between the contacts (5) and (7) should be about 0.02 in. (0.5 mm) when the cam (3) is not actuating the contact spring (5).

When the cam (3) is in its upper limit position, the gap between the contacts (5) and (6) should be about 0.04 in. (1 mm).



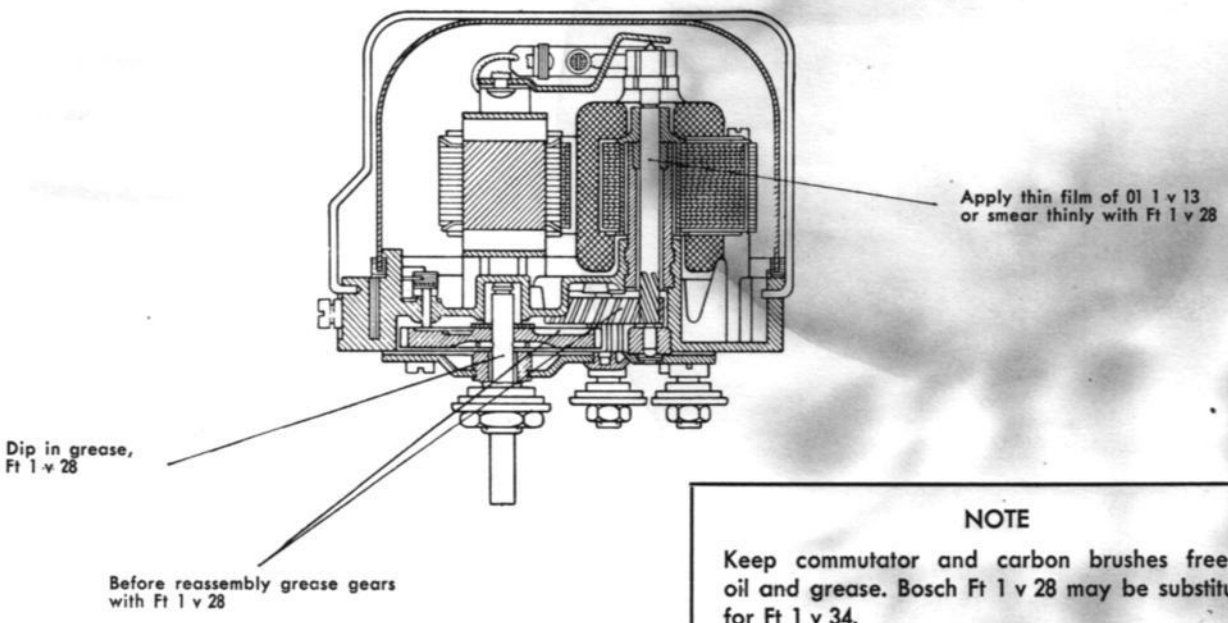
WIRING DIAGRAM, WINDSHIELD WIPER, MAKE SWF

TROUBLE SHOOTING

SOURCE OF TROUBLE	REMEDY
Wipers fail to start	Check the fuse and electrical connections at the switch and motor and the earth connection (18) at the motor.
Wipers stop in intermediate positions when the switch is turned off	Check the connections for lead (14) at the fuse and (53a). Clean the contacts (5) and (6) and check that they make and break regularly when the motor is running.
Wipers fail to stop	Make sure that the contact spring (5) breaks at (6) and makes at (7) and that there is good closing contact between (5) and (7). Check the connections (31b) on the motor and switch, as well as the earth cable (19) and its connection (31), and to the instrument panel.

Important: Check also earth connections of the instrument panel at its retention points.

Lubrication of windshield wiper motor



NOTE

Keep commutator and carbon brushes free of oil and grease. Bosch Ft 1 v 28 may be substituted for Ft 1 v 34.

Windshield washer

The Saab 95 and 96 are fitted with a mechanical windshield washer, the pump being combined with the switch for the windshield wipers.
The Saab Sport has an electric pump which is started with the same switch as the windshield wipers.

ELECTRICAL CONTROLS AND SWITCHES

General

The ignition lock is located on the steering column stand and is combined with the starter switch. A catch mechanism in the lock cylinder makes it necessary to return to position "G" on the ignition lock after every unsuccessful attempt to start, thus preventing unintentional connection of the starter motor while the engine is running. Apart from for ignition, current is provided through the ignition lock for the following items of equipment and lamps:

Air conditioner, windshield wipers, flashers, fuel gage, horns and warning lamp for charging (generator). For the Saab Sport, current is provided in the same way for the back-up lights, cigaret lighter, oil-warning, relay, temperature gage and wind shield washer.

The headlamps are operated by means of a pull switch combined with a rheostat. The intensity of the instrument lighting is regulated by turning the knob when pulled out.

In the Saab 95 and 96, the headlamps are dipped with a foot dipper switch, while in the Saab Sport, Saab 95 and 96 RHD, switching over between high beam and dipped beam is done by lifting the lever for the direction-indicator switch, whereupon a dimmer relay is actuated and dips the beam.

The automatically returning flasher switch can also be used if a special headlight signal device is fitted, in which case an operating relay must be installed in the Saab 95 and 96 (already provided in the Saab Sport but not in the Monte Carlo 850), while in the Saab Sport a connection lead must be arranged between the operating relay and the dipper relay.

The switch for the air-conditioner fan has two positions, full speed and half speed.

In the Saab 95 and 96, the windshield-wiper switch is combined with the mechanical windshield washer and is switched on by turning the knob.

In the Saab Sport, the windshield wipers are switched on and off by means of a pull switch with two positions. In the first position, only the wiper motor starts, while in the second position the electric windshield washer also works. The stop-light switch is actuated by the pressure of the brake fluid and completes the circuit to the stop-lights when a certain brake pressure is reached.

For the interior lighting, there is a switch on the lamp itself as well as door switches, which automatically turn on the light when the doors are opened.

The door switches can be disengaged by means of the switch on the lamp.

Special switches in the Saab Sport

The switch for the back-up light is located by the gearbox and is actuated by the gear-shift mechanism. The light is switched on and off when the reverse gear is engaged and disengaged.

Foglight switch

Switch for long-range light. Lights only when the headlamps are on high beam.

WIRING AND FUSES

Wiring

The cables and wires lead the current from the battery or generator to the various items of consumer equipment. In order to protect the wiring and to reduce the risk of shorting, the wires are gathered into harnesses wherever possible, i.e. a number of individually insulated wires are carried in an enclosing plastic sheath.

The harnesses are divided into three groups, one under the hood, one at the dash panel and in the engine compartment, and one running to the rear part of the car. Provided that the wiring is fitted in strict accordance with the different wiring diagrams reproduced further on, removal and installation of wires and cables should not present any difficulties. The individual wires and cables in each harness are color-marked for ready identification in accordance with the numbers given in the diagrams and accompanying tables.

The cable connections are made with AMP connectors and thus require no soldering.

Make sure that all cables and wires are properly connected, thus avoiding unnecessary voltage drops and flashovers.

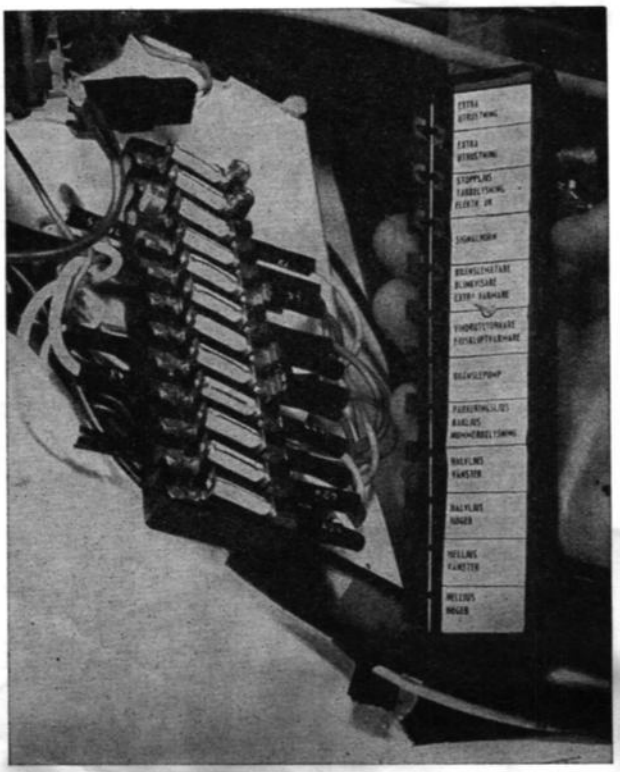
Make sure that the wire from the horn button is routed so that it will not get torn off when the steering wheel is turned.

If frequent fuse burn-out occurs, and if damaged insulation is suspected, check the insulation of the harnesses by testing. Bear in mind, however, that fuses will not burn out if a short occurs before the fuse.

When installing new wiring, always check positively that the rating of the selected wires and cables is adequate to cope with the load involved, and make sure that the cables are properly protected where they pass through panels and at clamps.

Fuses

To protect wiring, ammeter, etc., from abnormal current intensities, for instance in the event of a short circuit, and to reduce the fire hazard involved by such occurrences, the electrical system is provided with twelve 8-amp. fuses, grouped in a block attached to the dash panel on the righthand side of the engine compartment.



FUSE BLOCK

Two of the fuses are intended for the protection of extra equipment or as reserves.

All the components included in the electrical system except the instrument lighting and ignition system are fused. On the inside of the fuse-block cover is an identification text, showing which items are protected by the individual fuses.

IMPORTANT

When fitting a new fuse, take pains to secure good contact.

If wire fracture is suspected, check that the fuse concerned makes good contact before taking any further steps. Use a voltmeter for this check: the maximum permissible voltage drop is 0.1 V.

Wiring diagram, Saab 95

The electrical system consists of a number of adjoining connections. To simplify the identification of them the wires have been covered with insulation of different shades, as follows:

Black: 1, 7, 18, 19, 45, 46, 47, 49, 71, 105, 109, 135, 136, 138, 139 140.

Red: 5 8, 9, 10, 11, 21, 28, 28e, 28f, 28g, 32, 39, 61, 63, 65, 67, 68, 72, 92, 126, 129.

Green: 16, 22, 50, 51, 53, 54, 55, 57, 58, 60, 86, 87, 88, 101, 104, 110.

Gray: 4, 25b, 29, 35, 44a, 62a, 62b, 64, 69, 70, 74, 75, 85, 93.

White: 20, 23b, 24b, 40, 42b, 66, 82, 83, 118, 128a.

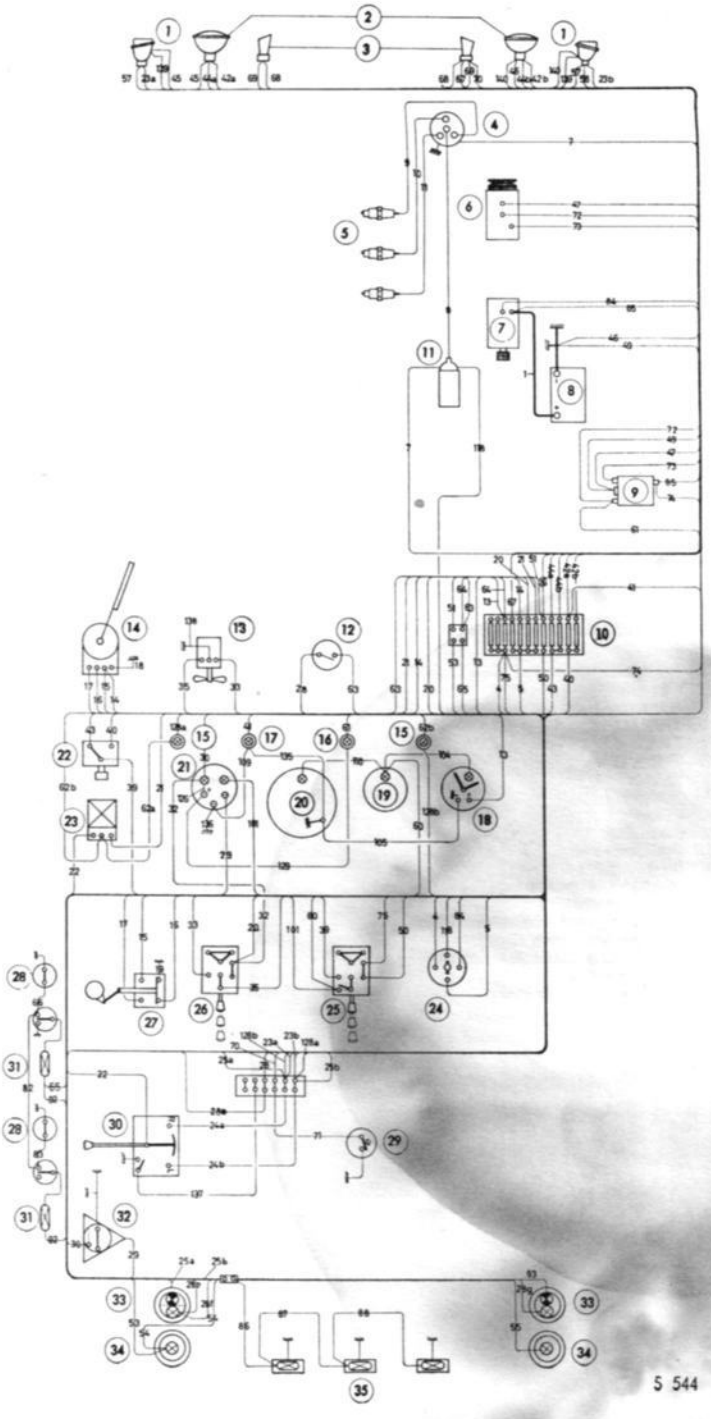
Yellow: 17, 23a, 24a, 33, 43, 44b, 73, 84, 128b.

Brown: 14, 15, 30, 137.

Blue: 13, 25a, 41, 42a.

KEY TO NUMBERS ENCIRCLED IN THE FIGURE

1. Turn indicators and side lights
2. Headlights
3. Horn
4. Distributor
5. Spark plugs
6. Generator
7. Starter
8. Battery
9. Relay
10. Fuse box
11. Ignition coil
12. Stop light switch
13. Heater fan motor
14. Wiper motor
15. Turn indicator repeater light
16. Charge indicator light
17. High beam indicator lamp
18. Electric clock
19. Coolant thermometer
20. Speedometer and milage recorder
21. Fuel gage
22. Dip switch
23. Flasher
24. Ignition and starter switch
25. Headlight switch and Instrument illumination rheostat
26. Heater fan switch
27. Windshield wiper switch
28. Courtesy light switch
29. Horn button
30. Turn indicator switch
31. Courtesy light with switch
32. Fuel tank gage
33. Stop lights and turn indicators
34. Tail lights
35. Number plate light



WIRING DIAGRAM, SAAB 95

Cable numbers refer to table on opposite page

Wiring diagram, Saab 96

The electrical system consist of a number of adjoining connections. To simplify the identification of them the wires have been covered with insulation of different shades, as follows:

Black: 1, 7, 18, 19, 45, 46, 47, 49, 71, 105, 109, 135, 136, 138, 139, 140.

Red: 5, 8, 9, 10, 11, 21, 28, 28e, 28f, 32, 39, 61, 63, 65, 67, 68, 72, 126, 129.

Green: 16, 22, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 69, 70, 85, 101, 104, 110, 121, 133.

Gray: 4, 25b, 29, 35, 44a, 62a, 62b, 64, 74, 75.

White: 20, 23b, 24b, 40, 42b, 66, 118, 128a.

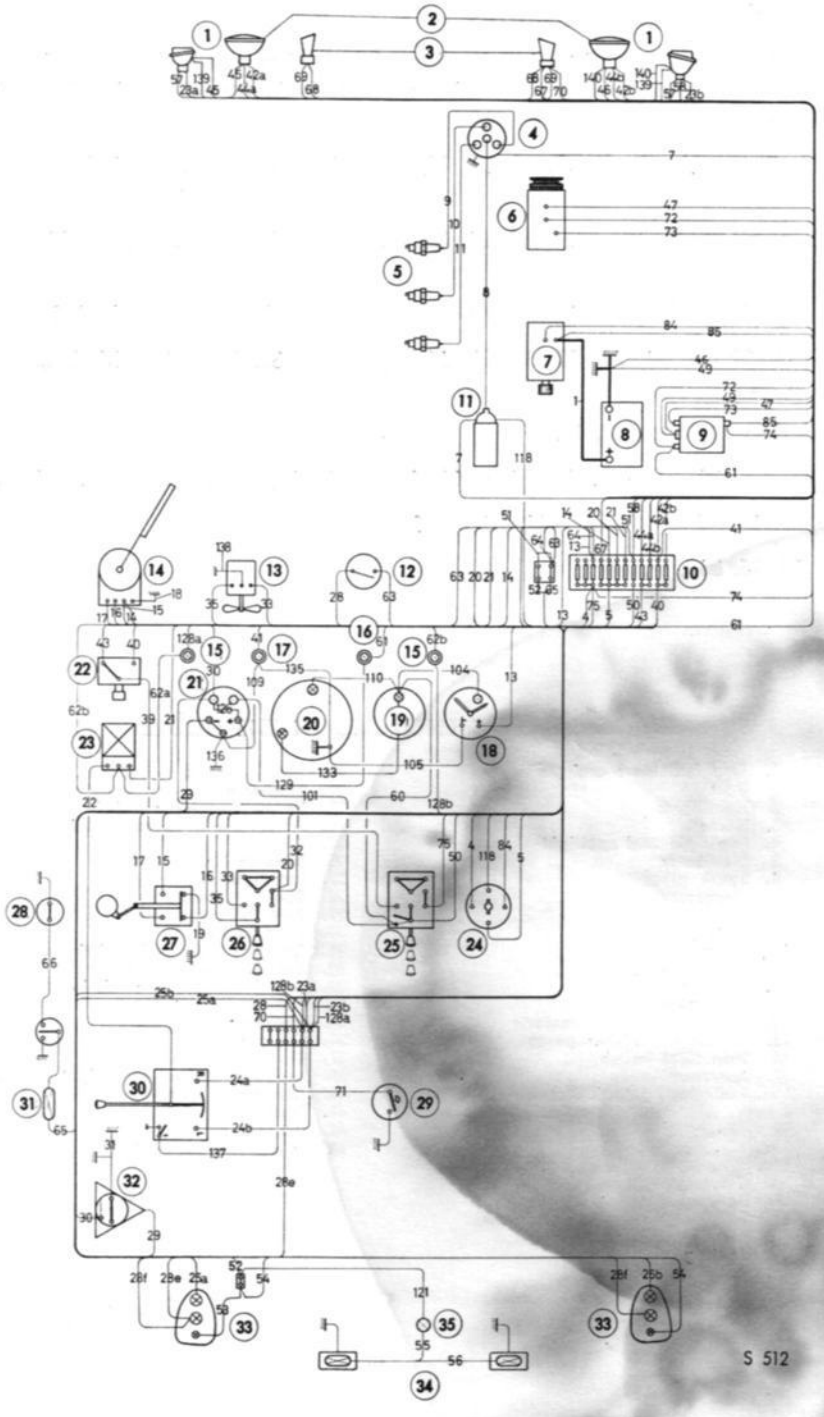
Yellow: 17, 23a, 24a, 33, 43, 44b, 73, 84, 128b.

Brown: 14, 15, 30, 137.

Blue: 13, 25a, 41, 42a.

KEY TO NUMBERS ENCIRCLED IN THE FIGURE

1. Turn indicators and side lights
2. Headlights
3. Horn
4. Distributor
5. Spark plugs
6. Generator
7. Starter
8. Battery
9. Relay
10. Fuse box
11. Ignition coil
12. Stop light switch
13. Heater fan motor
14. Wiper motor
15. Turn indicator repeater light
16. Charge indicator light
17. High beam indicator lamp
18. Electric clock
19. Coolant thermometer
20. Speedometer and milage recorder
21. Fuel gage
22. Dip switch
23. Flasher
24. Ignition and starter switch
25. Headlight switch and Instrument illumination rheostat
26. Heater fan switch
27. Windshield wiper switch
28. Courtesy light switch
29. Horn button
30. Turn indicator switch
31. Courtesy light with switch
32. Fuel tank gage
33. Stop lights, turn indicators and tail lights
34. Number plate light
35. Trunk light



WIRING DIAGRAM, SAAB 96

Cable numbers refer to table on opposite page

Wiring diagram, Saab Sport

The electrical system consist of a number of adjoining connections. To simplify the identification of them the wires have been covered with insulation of different shades, as follows:

Black: 1, 7, 7b, 18, 45, 46, 47, 49, 71, 80, 88, 106, 107, 108, 109, 123, 123e, 124, 125, 135, 138, 139, 140

Red: 5, 8, 9, 10, 11, 21, 28, 28e, 28f, 32, 39, 61, 63, 65, 67, 68, 72, 83, 86, 86e, 111, 126, 129

Yellow: 17, 23a, 24a, 33, 43, 44b, 73, 81, 84, 99, 100, 112, 112e, 128b, 130

Green: 16, 22, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 82, 101, 102, 104, 110, 119, 121, 133, 143

Blue: 13, 25a, 41, 42a, 103, 145

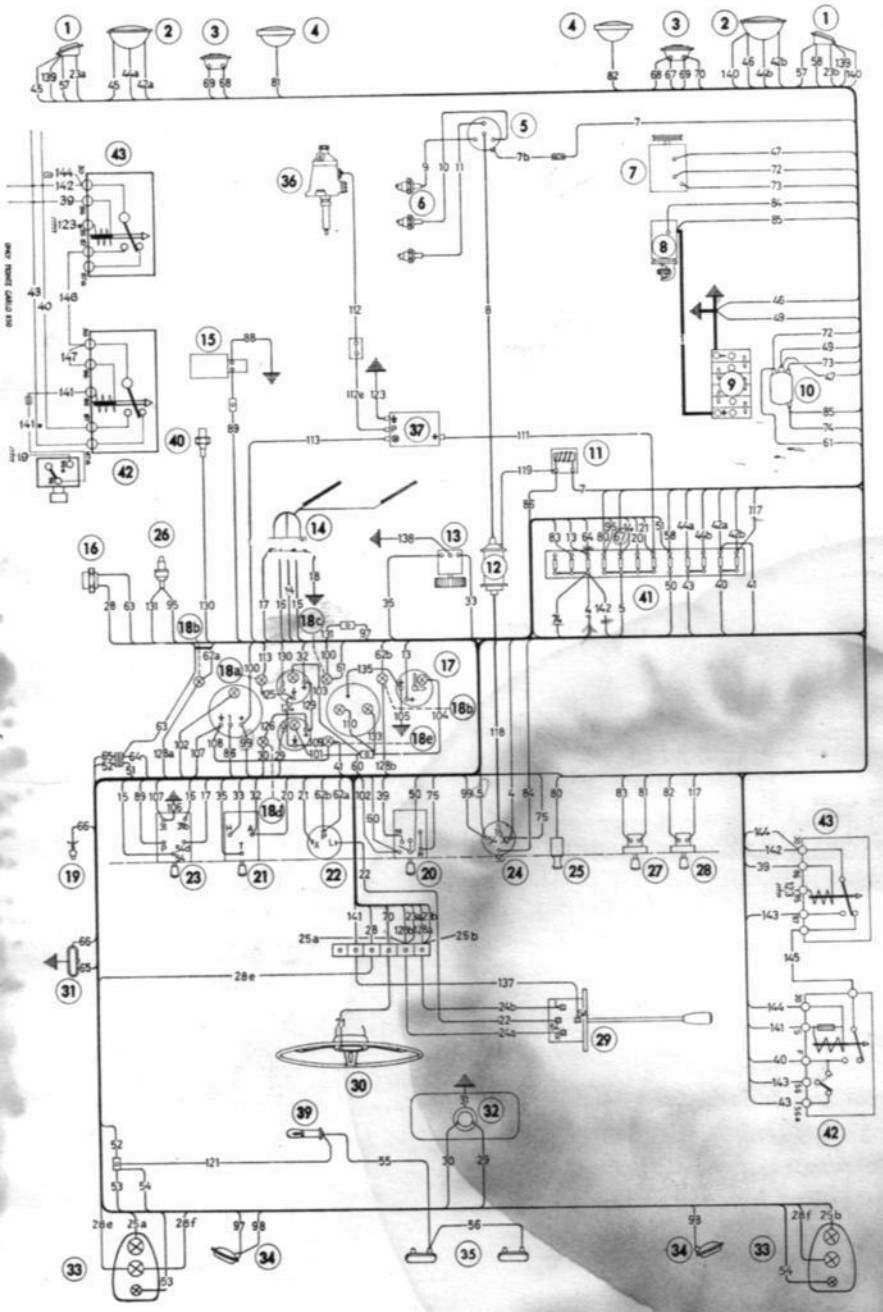
Gray: 4, 25b, 29, 35, 44a, 62a, 62b, 64, 69, 70, 74, 75, 85, 89, 113, 117, 142, 144

White: 20, 23b, 24b, 40, 42b, 66, 95, 97, 98, 118, 128a, 131

Brown: 14, 15, 30, 137, 141

KEY TO NUMBERS ENCIRCLED IN THE FIGURE

1. Turn indicators and parking light
2. Headlights
3. Horns
4. Fog light and spotlight
5. Distributor
6. Spark plugs
7. Generator
8. Starter
9. Battery
10. Relay
11. Resistance
12. Ignition coil
13. Fan motor
14. Windshield-washer motor
15. Windshield-washer pump
16. Stop light switch
17. Instrument unit
18a. Indicator light, oil pressure
18b. „ „ turn indicators
18c. „ „ charge
18d. „ „ fuel
18e. „ „ high beam
19. Courtesy light switch
20. Headlight and parking light switch and rheostat for intensity of instrument panel lighting
21. Ventilator fan switch
22. Flasher unit
23. Windshield-wiper switch
24. Ignition and starter switch
25. Cigarett lighter
26. Back-up light switch
27. Fog light switch
28. Spotlight switch
29. Turn indicator switch
30. Horn button
31. Courtesy light with switch
32. Tank unit fuel gage
33. Turn indicators and tail lamps
34. Back-up light
35. Number plate light
36. Oil gage
37. Oil gage relay
39. Luggage compartment light
40. Temperature meter
41. Fuse box
42. Dipping relay
43. Manoeuver relay, light



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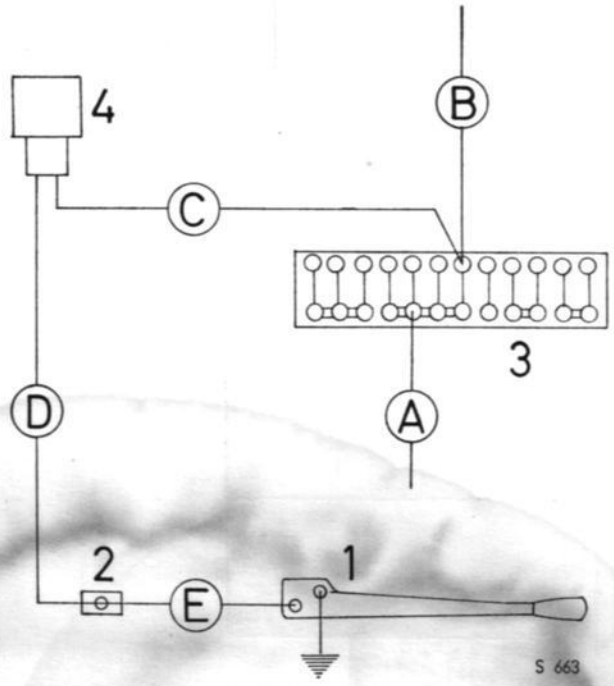
WIRING DIAGRAM, SAAB SPORT

Cable numbers refer to table on opposite page

Saxomat cars

Cars fitted with the Saxomat automatic clutch are provided with extra wiring, connected as shown below.



WIRING DIAGRAM, SAXOMAT CLUTCH

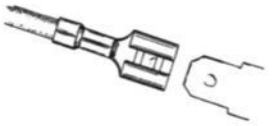
1. Gear-shift lever
2. Connection
3. Fuse block
4. Manueuver valve

A. Feeder cable from ignition lock (red)
B. Cable to flashing relay (red)
C. Positive cable to manueuver valve (green)
D and E. Earth connections from manueuver valve via the contact gap of the gear-shift lever (black).

Repair, connection of accessories

General

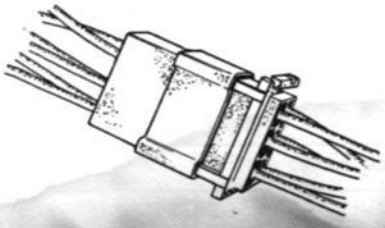
The use of solder for producing electrical connections has been superseded by AMP-terminals crimped on the wires. Apart from ordinary ring tongue terminals, certain automotive types are also used to provide simplified electrical assembly.



FASTON CONNECTION

Saab 95, 96 and Sport

The wires are to a large extent connected to the components by Faston receptacles. To provide separable connections, Fastin-Faston harness connectors are used. A larger type of them is fitted to headlights and flasher unit. For permanent connection, pre-insulated splice connectors are used.



FASTIN-FASTON HARNESS CONNECTOR

Description

Faston connections are of the "push on" type. Two rolled springs provide high and constant electrical contact over the tab. Detent action is provided by an independently sprung ramp-shaped dimple.

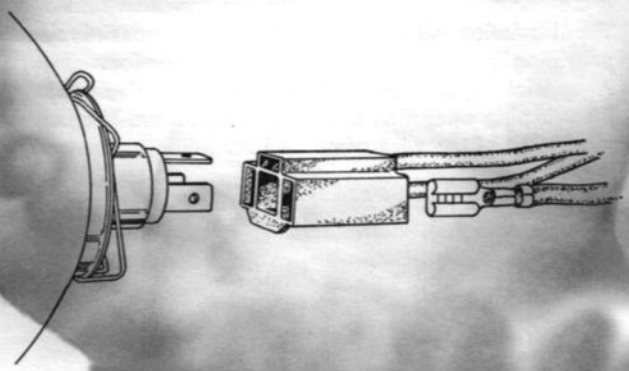
When repairing, these should be replaced by corresponding pre-insulated parts. For connecting accessories, the new wires should be terminated with Piggy-Back receptacles, which provide male tabs for the primary receptacles. The Piggy-Back receptacles are then fitted to the primary tabs.

Fastin-Faston harness connectors consist of receptacles and tabs featuring small locking lances to prevent inadvertent retraction from the housings. Both units provide positive insulation for the completed assembly.

If, exceptionally, a receptacle has to be retracted from the housing, a 1/16" (2 mm) drill or steel rod should be inserted into the track on the front side of the housing to disengage the locking lance. When inserting again, check correct angle of lance.

When repair of harness connector or part thereof is required, replace by pre-insulated Faston receptacles and connectors.

A larger type of the receptacles and a corresponding housing is fitted to headlights and flashing relay. When repairing, replace by corresponding pre-insulated receptacles.



FASTIN-FASTON HEADLIGHT CONNECTOR

Service assembly

The primary production types are not advisable for repair use and accessory connection. Instead, pre-insulated terminals, splices, Faston receptacles and connectors should be used.

Pre-insulated terminals, type Plasti-Grip, are made from high-conductivity copper, electro-tinned for corrosion resistance. Barrel of terminal is serrated so that under crimping pressure the strands of wire "flow" into these serrations making a connection of great tensile strength. Bell mouth opening assures easy wire insertion.

They have a vinyl insulation sleeve withstanding ordinary oils, gasoline and corrosive agents. This extends from the back of the barrel to provide a support for the wire.

The insulation sleeve is color-coded by wire size, in accordance with the table shown below, to facilitate selection and eliminate errors during installation.

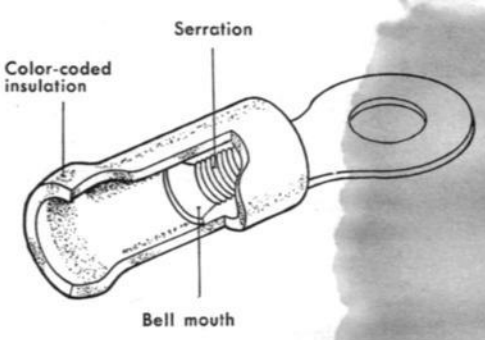
Wire Size Range mm²	Color-Coding
0.5—1.5	Red
1.5—2.5	Blue
3—6	Yellow

Pre-insulated splices, type Plasti-Grip, incorporate the same design features as terminals. A wire stop in the center of the splice facilitates the proper placement of wires.

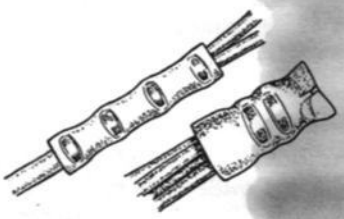
Pre-insulated Faston receptacles, type PDG, are made of brass, electro-tinned for corrosion resistance. The insulation sleeve is bonded to a special sleeve providing a firm support to the wire insulation.

A special repair tool, Super Champ, is designed for the crimping operation and wire preparation. The correct placement of the wire crimp and insulation support crimp is shown below.

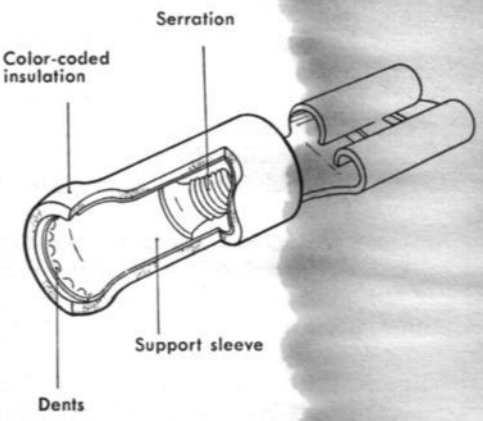
Terminals and tool or complete service kits are available through local AMP-distributors.



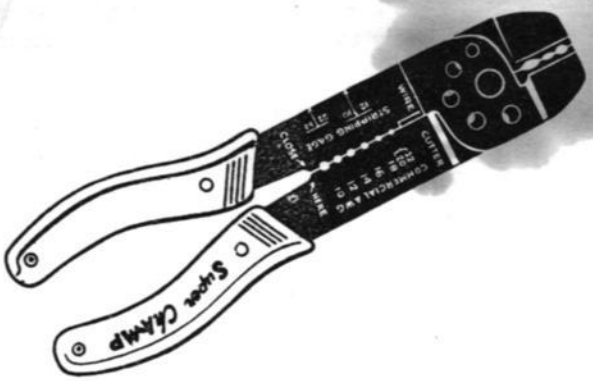
PRE-INSULATED TERMINAL



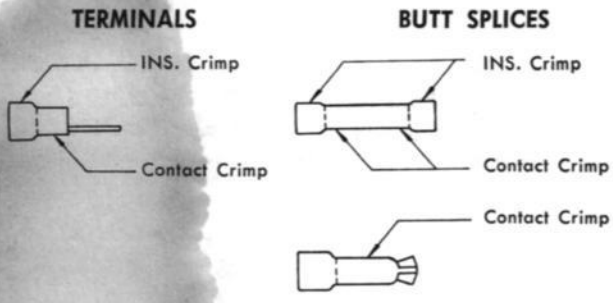
PRE-INSULATED SPLICES



PRE-INSULATED FASTON RECEPTACLE



REPAIR TOOL



Wire cutting

1. Place wire in "Wire Cutter" section of handles.
2. Close handles all the way.

Wire stripping

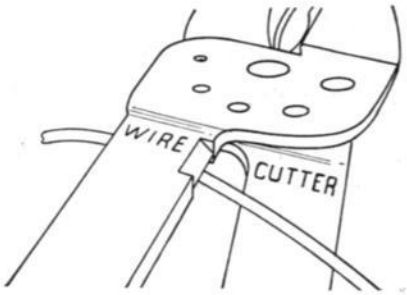
1. Place wire in proper section of tool.
2. Close handles and rotate tool back and forth.
3. Open tool slightly and pull forward.
4. Check that the strands are undamaged.

Crimping procedure

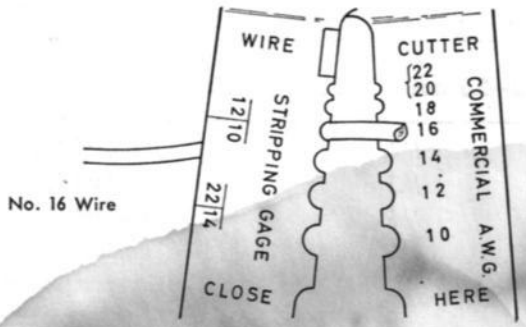
1. Choose terminal to match the wire area.
2. Place terminal in jaws with matching color.
3. Insert stripped wire into terminal barrel.
4. Close handles all the way.
5. Make insulation support crimp in same way.

Inspection

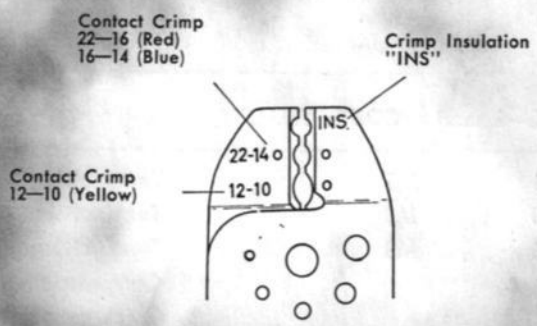
1. Check appearance of crimps.
2. Pull the wire.



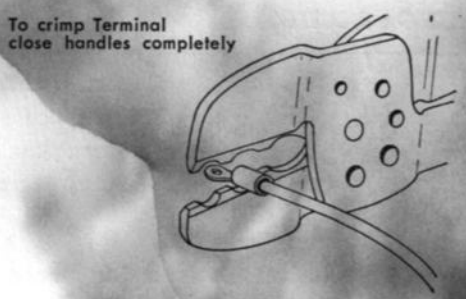
WIRE CUTTING



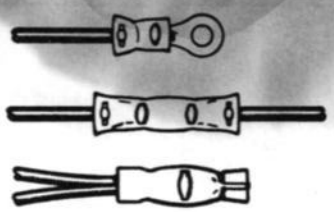
WIRE STRIPPING



CRIMPING JAWS



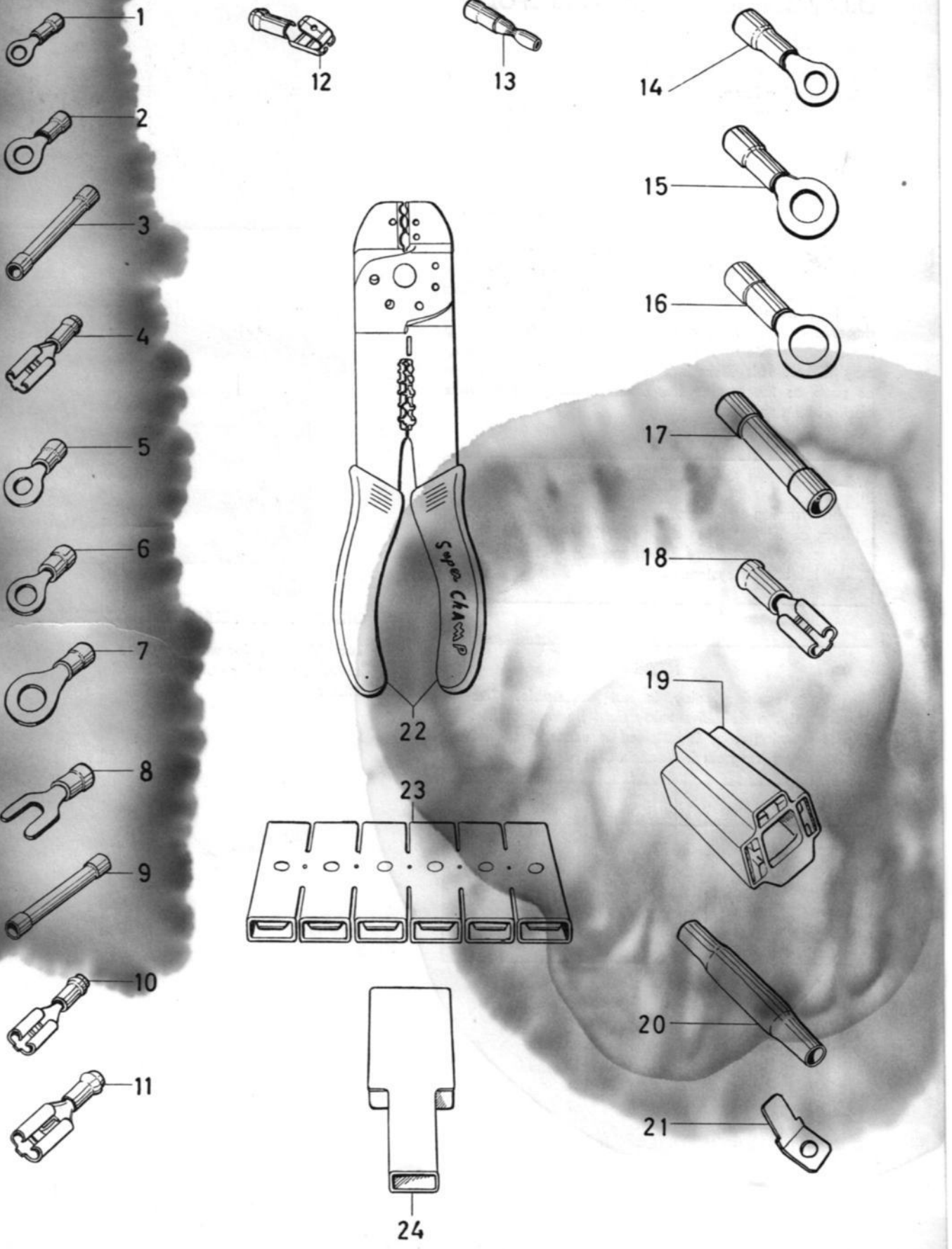
CRIMPING PROCEDURE



APPEARANCE OF CORRECTLY CRIMPED TERMINAL AND SPLICES

Connector parts

Item No.	Screw size	Description	Part. No. (Saab)	AMP Cat. No.	AMP U.S. Cat. No.
AREA: 0.5—1.5 mm² CODE: RED					
1	M4	Terminal lug	715521	34148	34148
2	M5	Terminal lug	712122	130014	34149
3		Compression splice	715520	34070	34070
4		Quick connector	782960	42599	42599
AREA: 1.5—2.5 mm² CODE: BLUE					
5	M4	Terminal lug	715523	34160	34160
6	M5	Terminal lug	711788	130102	34161
7	M6	Terminal lug	782961	34162	34162
8	M5	Terminal fork	715562	160171	34167
9		Compression splice	715514	34071	34071
10		Quick connector	782962	42332	42332
11		Quick connector, lights	782963	160326	160326
12		Quick branch connector	782964	160353	160353
13		Douglas plug	782965	160214	324225
AREA: 3—6 mm² CODE: YELLOW					
14	M5	Terminal lug	715565	160292	34854
15	M6	Terminal lug	782966	165035	34855
16	M8	Terminal lug	782967	160296	34856
17		Compression splice	715563	34072	34072
18		Quick connector	782968	160314	42844
OTHER CONNECTOR ACCESSORIES					
19		Connector socket, lights	715502	480100	480100
20		Socket splice	782969	36840	36840
21		Flat prong for quick connector	782970	140598	140598
22		Crimping pliers	784093	47100	47100
				Franz Kirsten cat. No.	
23		Socket strip for quick connectors, 6-pole, divisible	782971	226620	
24		Socket for quick connectors, 1×2 pole	782972	223120	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Super CHAMP

OIL-WARNING SYSTEM, SAAB SPORT

General

The oil warning system comprises an oil monitor, a relay and a warning lamp.
The oil-warning relay lights the warning lamp on the instrument panel upon receipt of an impulse from the oil monitor on the lub. oil pump, indicating that something is wrong with the engine lubrication system.
The warning relay consists of a box containing two bi-metallic relays, one for voltage control and one for signalling — see illustration.
The relay has a certain preset delay, and has to receive a certain number of impulses from the pump before the warning light goes out after starting the engine. This can take from 15 seconds up to a minute and a half, depending on how the car is being driven. When running for a long while at low idling speed the warning lamp may flicker. This flickering, however, should disappear as soon as the engine has been running for a while above idling speed.

NOTE

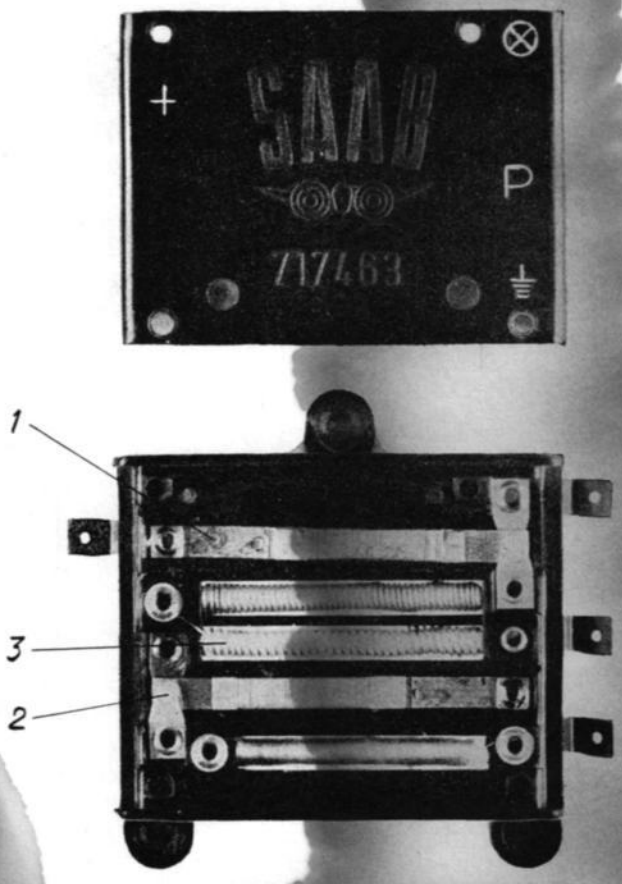
The warning lamp may continue to glow for as long as 1 1/2 minutes after start in certain circumstances without there being anything wrong with the lubrication system.

NOTE

The oil-warning relay is not adjustable. Conseqvently, a defective relay must be replaced.
The warning relay is installed in accordance with the wiring diagrem in Section 371.

CAUTION

If the wire from the pump oil monitor is incorrectly fitted to the warning relay, both the oil monitor and the relay will be ruined. Connect the wire to "P".



OIL-WARNING RELAY WITH COVER REMOVED

1. Bimetallic relay for warning lamp
2. Bimetallic relay for voltage control
3. Resistor

Checking the oil warning system

The function of the oil warning system should be checked at regular intervals. This can be done with aid of a watch or clock with a second hand as described in the following:

1. Switch on the ignition and check that all consumer equipment is switched off. The oil-warning lamp should light immediately, and should go out again after 15—30 seconds.
2. The warning lamp should light up again about 1—1 1/2 min. after the ignition key was turned.

NOTE

The above applies only if the voltage between the relay connections for + and earth is at least 12.5 volts, i.e. the battery must be fully charged, no consumer equipment may be switched on, and there must be no transitional resistances in wires and connections.

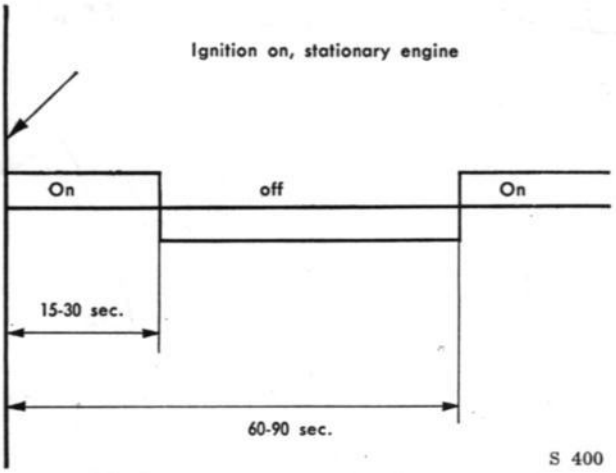


DIAGRAM FOR TESTING THE OIL-WARNING SYSTEM

Trouble-shooting – oil-warning system

If the warning lamp does not function in the manner described above, carry out the following checks:

1. Disconnect the wire at the pump oil monitor and connect it direct to earth. Wait for a minute or so in order for the relay to have time to cool, and recheck as described in the foregoing. If the warning lamp now works, the fault is probably to be found in the oil monitor, which should be checked as prescribed in Chapter 2, section 221.
2. Make sure that the fuse is intact and that oxide has not been formed on the fuse holder.
3. Check the warning lamp.
4. Check that wires and connections are flawless and that good contact is obtained.
5. If the oil-warning system still fails to work properly after rechecking in this manner, a new relay must be fitted.

CONTENTS

DESCRIPTION

Standard clutch

The clutch is a single dry-plate type, comprising clutch disc, pressure-plate assembly and release bearing. Two different makes of clutch may be fitted in the car, viz. Fichtel & Sachs or Borg & Beck.

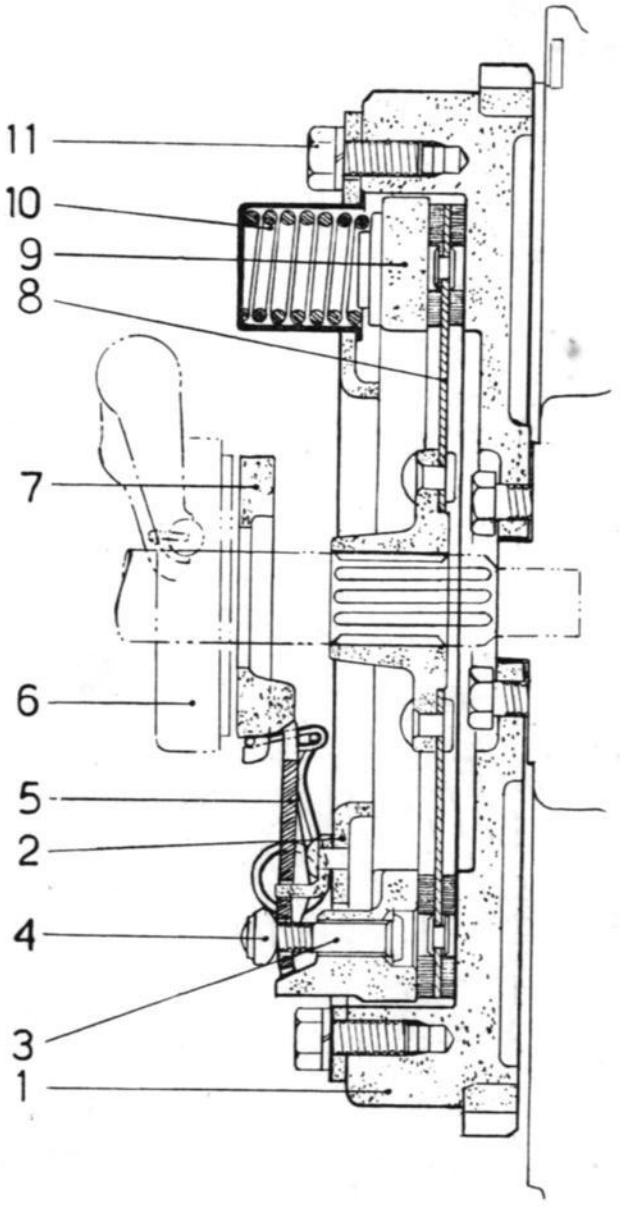
The clutch plate consists of a resilient steel disc attached to a splined hub sliding on the clutch shaft. The clutch facings are riveted to both faces of the disc.

The pressure-plate assembly, which consists of a steel disc and a cast pressure plate under pressure from spiral springs, is attached to the flywheel by means of six bolts. The coil springs are located in cups fitted in holes in the steel disc.

Three clutch levers are carried on struts, riveted to the steel disc. The pressure-plate assembly is held together by three adjusting screws with nuts, which rest against the clutch levers. A spring-loaded steel disc, against which the release bearing is pressed when declutching, rests on the inner ends of the clutch levers.

The release bearing comprises a ball bearing held in a bearing housing, which is retained in the clutch fork by springs. A graphite ring on the ball bearing presses against the release plate when declutching. The power is transmitted from the flywheel through the steel disc and pressure plate to the clutch disc, and from there to the clutch shaft. One end of the clutch shaft is carried in a self-lubricating bearing in the crankshaft, and the other in a needle bearing in the transmission primary shaft. In the middle of the clutch shaft is a ball bearing with radial clearance in the clutch housing but locked axially by means of retaining rings. Axial guiding of the clutch shaft is provided for by this bearing. The pressure plate is pressed against the clutch disc by the coil springs, and when declutching is moved away from the flywheel by the three clutch levers. The release bearing is supported by the clutch fork which is attached to the vertical release shaft carried in the gearbox cover.

The clutch operation is hydraulic. It comprises a master cylinder that is actuated by the clutch pedal. A hose connects the master cylinder to a slave cylinder which influences the clutch lever and release bearing.



SECTIONED CLUTCH ASSY

1. Flywheel
2. Clutch cover
3. Stud
4. Adjusting nut
5. Clutch lever
6. Release bearing
7. Release plate
8. Clutch disc
9. Pressure plate
10. Spring
11. Screw

SAXOMAT CLUTCH

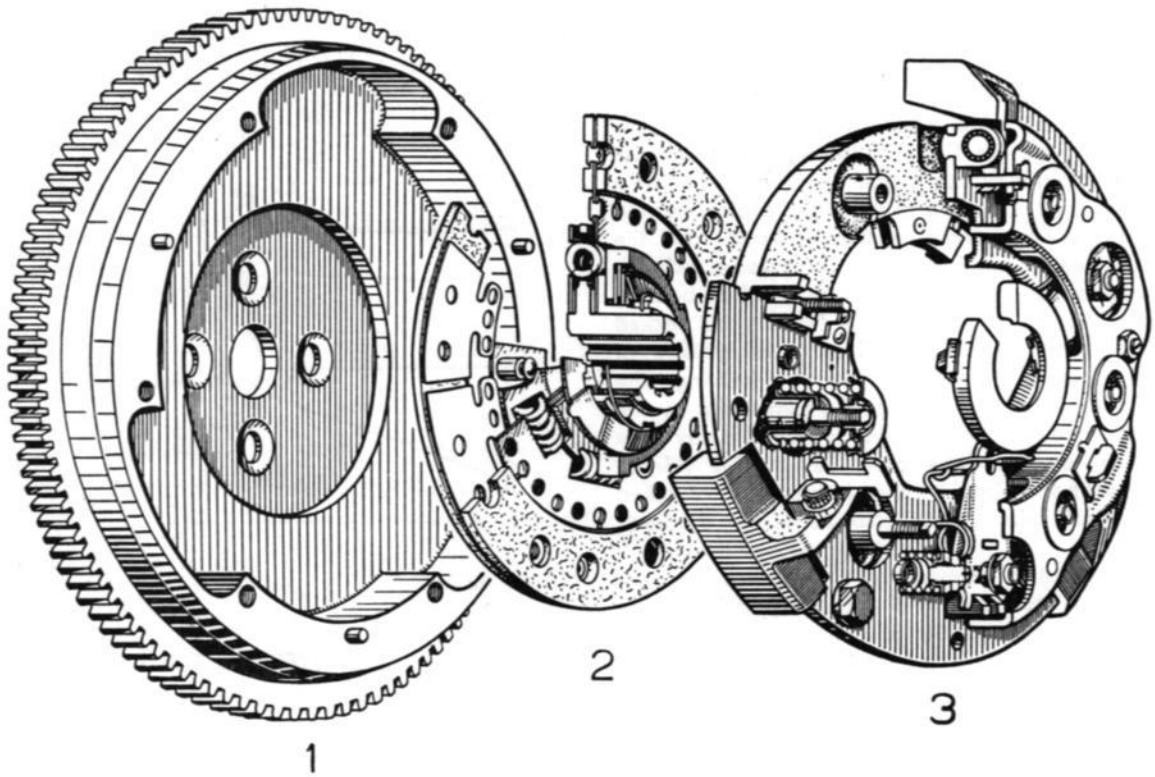
The SAXOMAT FL automatic clutch, manufactured by Fichtel & Sachs and supplied as an optional extra in certain cars, comprises two independent assemblies: the centrifugal clutch and the servo clutch. In these cars, the clutch pedal has been dispensed with, as the clutch is automatically engaged or disengaged when starting, changing gear and stopping. By applying very light pressure on the accelerator pedal, it is also possible to slip the clutch.

Centrifugal clutch

The centrifugal clutch, which is fitted in the specially modified flywheel, is shown in fig. 1 below. Its functioning is entirely dependent on the engine speed. Below 1000 r/m, the clutch is disengaged, but as the engine speed increases the centrifugal weights fly out and the clutch begins to slip. Further increase in engine speed causes harder engagement, full clutch engagement being obtained above about 1800 r/m. The various stages of clutch function are illustrated in the figures.

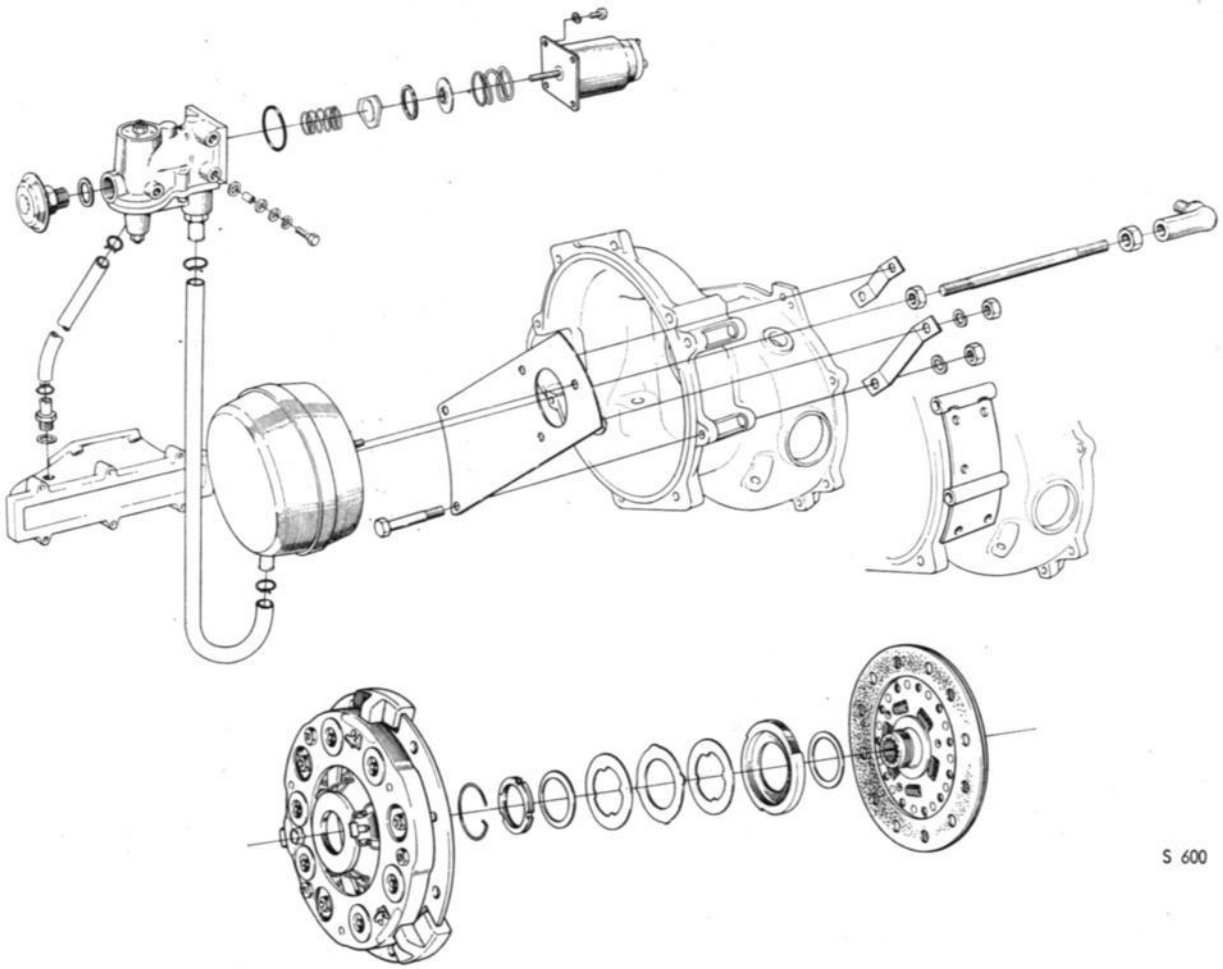
The centrifugal clutch is fitted with a ratchet and pawl arrangement which makes it possible to start the engine by towing the car and to use the engine as a parking brake. The ratchet and pawl arrangement acts only in the normal direction of engine rotation and at engine speeds below 300 r/m. Note that the freewheel must be locked when the ratchet and pawl arrangement is to be used.

A characteristic noise due to this arrangement will be heard if the engine stops while the car is still moving (freewheeling).



SECTIONED VIEW OF CENTRIFUGAL CLUTCH

1. Flywheel
2. Clutch disc
3. Pressure plate assembly



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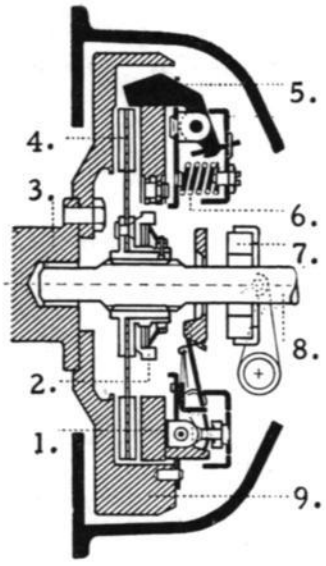
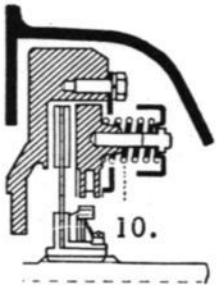
SAXOMAT DETAILS

Top: Pilot valve

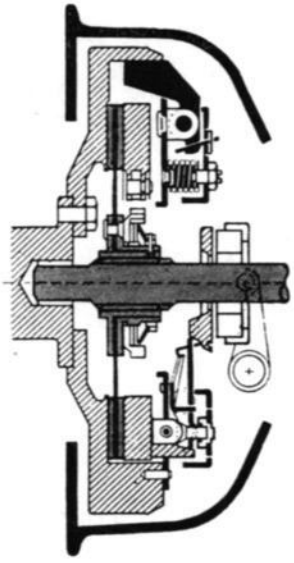
Center: Vacuum power chamber and details for fitting the chamber to the gear box clutch housing

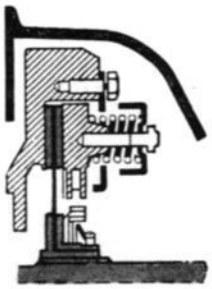
Bottom: Pressure plate assembly



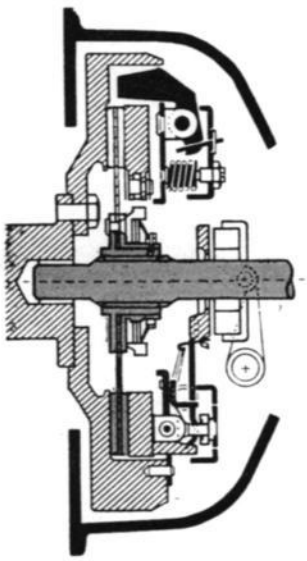


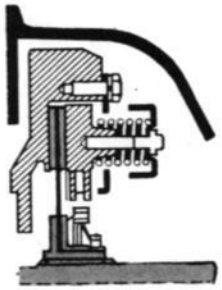
A. When engine is idling or stationary, weights are at inner position and clutch is released.





C. At about 1.800 r.p.m. weights are fully extended and clutch is completely engaged.

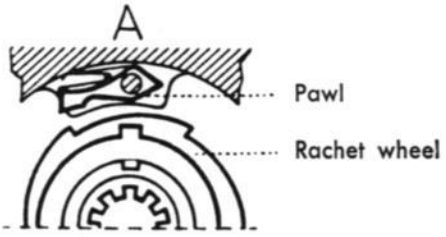




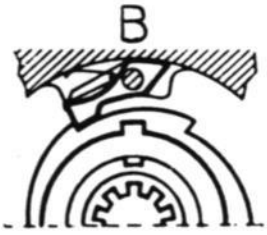
B. At engine speed of about 1.000 r.p.m. clutch begins to engage.

FUNCTIONING OF CENTRIFUGAL CLUTCH

1. Clutch
2. Ratchet wheel
3. Crankshaft
4. Clutch disc
5. Centrifugal weight
6. Spring for centrifugal weight
7. Release bearing
8. Transmission shaft
9. Flywheel
10. Main spring



A. At idling or higher speeds pawls are disengaged.



B. When engine is stopped or turning only very slowly (below 300 r.p.m.) pawls are engaged.

RATCHET AND PAWL ARRANGEMENT

Servo clutch

The servo clutch takes care of engagement and disengagement when changing gear while driving. It comprises a vacuum power chamber with a diaphragm (f) — see fig. — which is vacuum-operated by a valve in the hose fitted to the induction manifold (d). The construction of the servo clutch is illustrated by the figure, and it functions during gear-changing in the manner described in the following.

As soon as the gear-shift lever (a) is moved, the electric circuit to the solenoid of the pilot valve is closed, causing the valve (c) to open the communication between the vacuum power chamber and the induction manifold (d). As the accelerator pedal is released at the same time, a powerful vacuum is formed in the induction manifold and is passed to the vacuum power chamber. Atmospheric pressure pushes in the diaphragm, and this movement is transmitted via the pull-rod (g) and clutch lever (h) to the release bearing. The clutch is disengaged in this way at the beginning of each gear change, and the servo clutch reacts so rapidly that gear change may be made instantaneously.

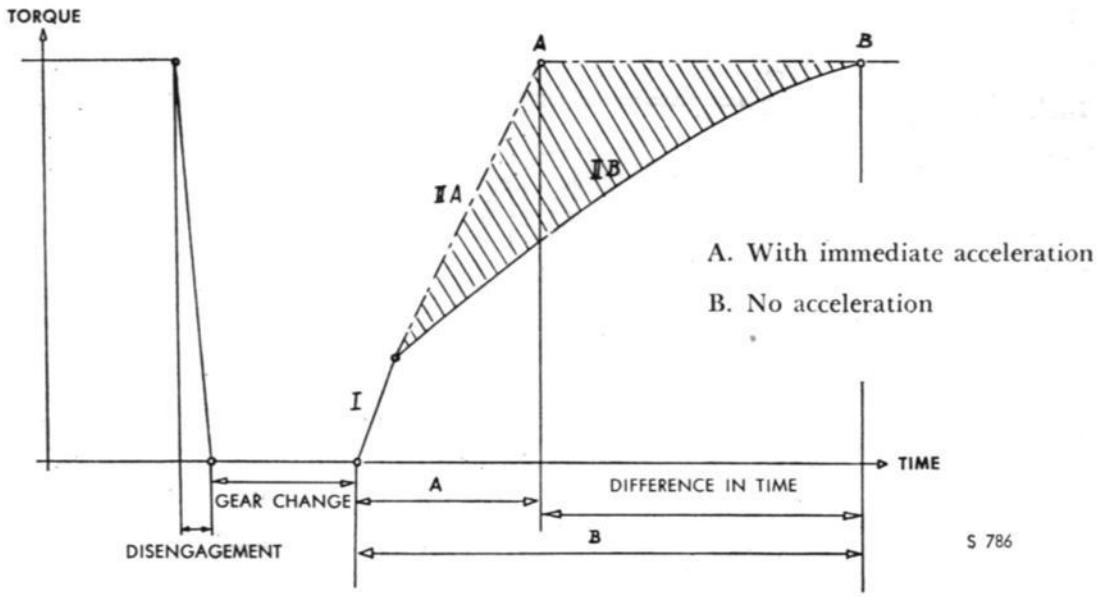
Upon completion of gear changing, the clutch immediately commences to re-engage, since the circuit through the solenoid is opened when the gear-shift lever is released. The vacuum in the vacuum power chamber is then reduced in two stages, the hardness of the clutch engagement increasing accordingly.

I. In the first stage, rapid reduction of the vacuum in the chamber follows on the closing of the valve (c). The clutch begins to slip.

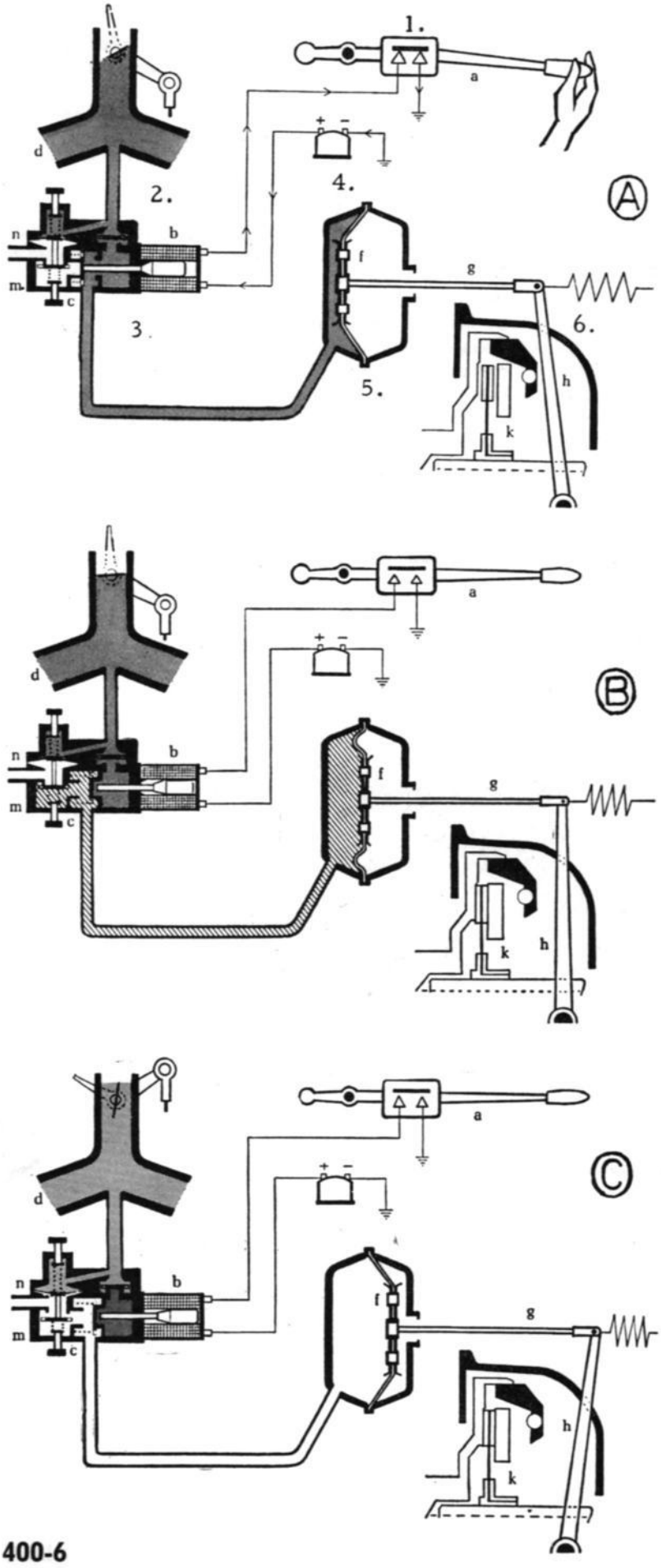
II. In the second stage, the remaining vacuum is equalized through a small nozzle and — if the accelerator pedal is not depressed — clutch engagement will be complete after approx. 3 seconds.

By accelerating at the same time as the gear-shift lever is released, the clutch engagement can be speeded up, as the diaphragm (n), which is in direct communication with the induction manifold, actuates the reduction valve. As the accelerator pedal is depressed, the diaphragm opens the reduction valve, causing very rapid equalization of pressure in the vacuum power chamber, and the clutch will engage virtually instantaneously.

The graph below illustrates the difference in time between complete clutch engagements, with and without acceleration immediately after the gear change.



GRAPH ILLUSTRATING DIFFERENCE IN TIME ELAPSED BETWEEN CLUTCH ENGAGEMENT WITH AND WITHOUT ACCELERATION



ARRANGEMENT OF SERVO SYSTEM AND FUNCTIONING WHEN GEAR SHIFTING WHILE DRIVING

A. Circuit closed, no accelerator pressure. Clutch released.
B. Circuit open, no accelerator pressure. Clutch engagement commences.
C. Accelerator pedal depressed, full clutch engagement.

1. Gear lever and switch
2. Engine inlet manifold
3. Pilot valve
4. Relay
5. Vacuum power chamber
6. Clutch linkage lever

= Atmospheric pressure

= Vacuum

= Intermediate pressure

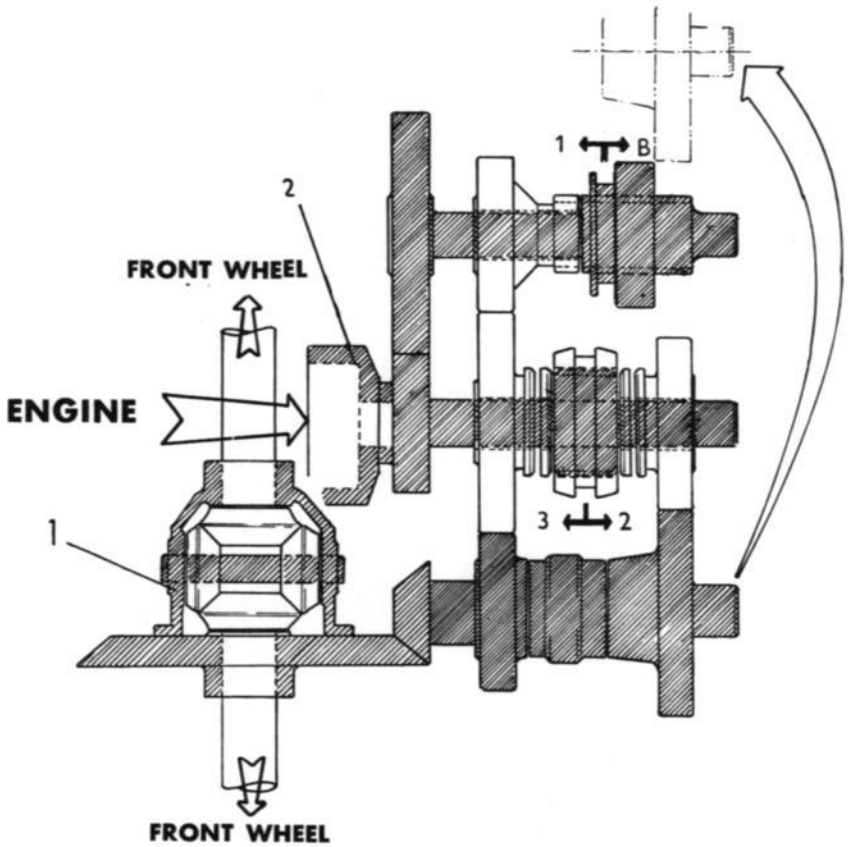
TRANSMISSION

Transmissions for the Saab 95, 96 and Saab Sport are designed for front-wheel drive and arranged so that all shafts with their gears, freewheel, differential and inner universal joints form a complete unit.

The Saab 96 is equipped with either a 3-speed or a 4-speed transmission, whereas the Saab 95 and Saab Sport have 4-speed transmissions, differing from each other only in respect of the pinion:ring- gear ratios. The 4-speed transmissions have synchromesh for all forward gears, whereas the reverse gear comprises a sliding gearwheel.

The 3-speed transmission has syncromesh on 2nd and 3rd gears. The 1st gear has a dog clutch and the reverse gear is sliding. There is very little difference in the outward appearance of the 3-speed and 4-speed transmissions and the trains are arranged in a similar manner, with an input clutch shaft, freewheel, primary shaft, countershaft, pinion shaft, differential and inner universal joints. Certain parts, such as the freewheel and differential case, are identical for both transmissions. The shafts are carried in ball bearings in the gearbox cover.

The unit is connected to the engine by means of a clutch housing of light alloy, which also encloses the differential. All gears are helical cut and — except for the reverse gear — in constant mesh with one another. Shaft-borne gears are carried on needle bearings. The synchronizer unit for the 3-speed transmission is located on the primary shaft, while the 4-speed transmission has synchronizers on both the primary shaft and the countershaft.



DIAGRAMMATIC ARRANGEMENT OF 3-SPEED TRANSMISSION

1. Differential case
2. Freewheel sleeve
B. Reverse gear

Gear-changing movements are transmitted from the steering column gear-shift lever to 2 shift forks in the 3-speed transmission and to 3 shift forks in the 4-speed transmission. These shift forks are able to slide on their shafts and are locked in their respective gear positions by spring-loaded poppet balls, which fit into recesses on the shafts. In addition, an arrangement is provided which makes it impossible to engage two gears simultaneously.

3-speed transmission

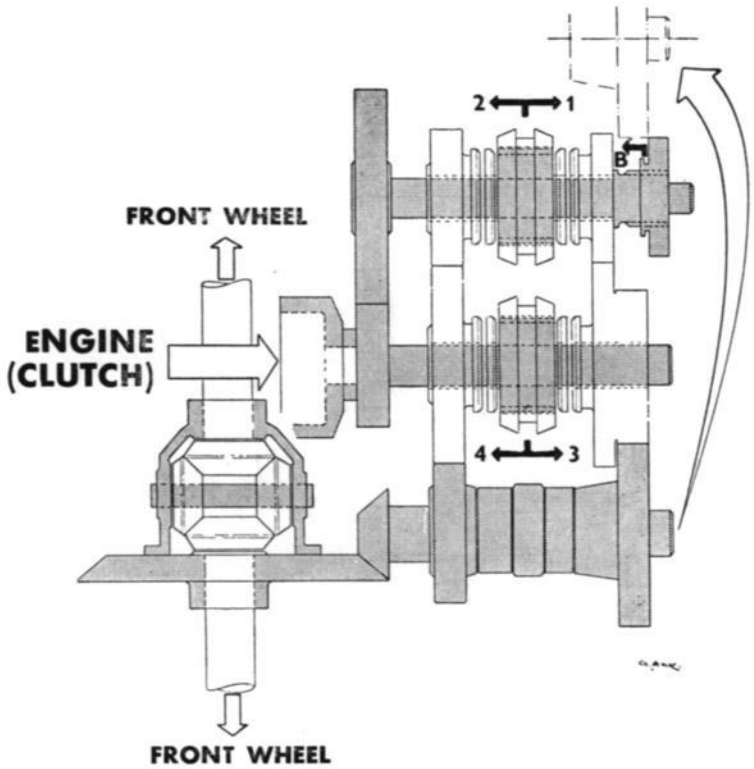
The function of the 3-speed transmission is illustrated by the explanatory sketch on the previous page.

When driving in 1st gear, power is transmitted by the intermediate gear located behind the freewheel from the primary shaft to the countershaft.

The 1st speed gear on the countershaft is in constant mesh with the 3rd speed gear on the primary shaft, the 3rd speed gear acting as an intermediate idler. Thus when the 1st gear is locked to the countershaft by its dog clutch, power is transmitted to the pinion shaft by way of the two gearwheels of the 3rd speed gear.

In 2nd gear, power is transmitted from the primary shaft to the pinion shaft by locking the 2nd speed gear to the primary shaft with a sliding engagement sleeve.

In 3rd gear, power is transmitted to the pinion shaft in the same way as when driving in 2nd gear, except that the engagement sleeve now locks the 3rd speed gear, instead of the 2nd, to the primary shaft. In reverse, power is transmitted from the primary shaft to the countershaft by way of the previously mentioned intermediate gear behind the freewheel. The reverse gear is splined to and slides on the countershaft. When the reverse gear meshes with the 2nd gear pinion shaft, power is transmitted to this shaft. Both pinion shaft and gears thus now rotate in the reverse direction. The reverse gear also acts as an engagement sleeve for the 1st speed gear.



DIAGRAMMATIC ARRANGEMENT OF 4-SPEED TRANSMISSION

4-speed transmission

The working of the 4-speed transmission is shown by the explanatory sketch.

In 1st gear, power is transmitted from the primary shaft to the counter shaft via an intermediate gear behind the freewheel. The 1st speed gear, which otherwise is carried on the countershaft, is locked to the shaft by a sliding sleeve. The power is then transmitted to the 3rd speed gear, which is borne on the primary shaft, and thence to the 3rd gear on the pinion shaft.

In 2nd gear, power is transmitted to the pinion shaft in the same way as when driving in 1st gear, except that the engagement sleeve now locks the 2nd speed gear, instead of the 1st, to the countershaft.

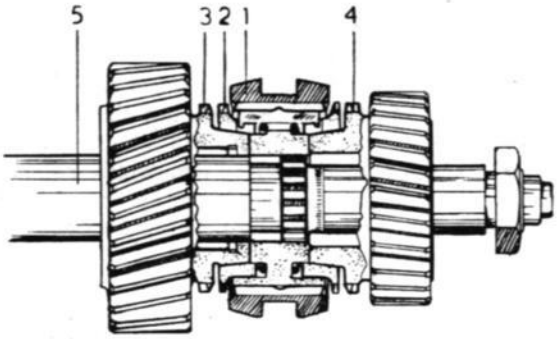
The power is then transmitted to the 4th speed gear on the clutch shaft and thence to the 4th gear on the pinion shaft.

In 3rd and 4th gears, power is transmitted from the primary shaft to the 3rd or 4th speed gear, as applicable, which is then locked to the primary shaft by means of a sliding sleeve. In reverse, power is transmitted from the primary shaft to the countershaft by way of the previously mentioned intermediate gear behind the freewheel. The reverse gear, splined to and sliding on the countershaft, meshes directly with the 3rd gear on the pinion shaft, thus turning the latter, together with the gears, in the reverse direction.

Synchromesh

The synchronizer units for 3-speed and 4-speed transmission are similar in principle. The synchronizer unit, which is illustrated in the adjacent fig., functions as described in the following:

When the synchronizer sleeve is made to mesh with, for instance, the dog ring on the 3rd speed gear, it pushes in front of it an internally tapered bronze ring. This ring has external teeth corresponding to those of the gear dog ring. The bronze ring is able to change its position in relation to the sleeve by half a tooth space, and it also rotates at the same speed as the primary shaft. If the speed of the 3rd speed gear differs from that of the primary shaft at the moment when engagement should commence, the teeth on the bronze ring will move inte the way of the internal teeth on the sleeve, thus preventing the sleeve from moving in the direction of the 3rd speed gear. The internal taper of the bronze ring is then forced over the external 3rd gear taper and the friction will cause the gear and sleeve to rotate at the same speed. The path is thus opened for the sleeve, enabling the synchronizer sleeve teeth to engage the teeth of the dog ring on the 3rd speed gear.



SYNCHRONIZER UNIT

1. Synchronizer sleeve
2. Bronze blocking ring
3. Dog ring, 3rd speed gear
4. Dog ring, 2nd speed gear
5. Primary shaft

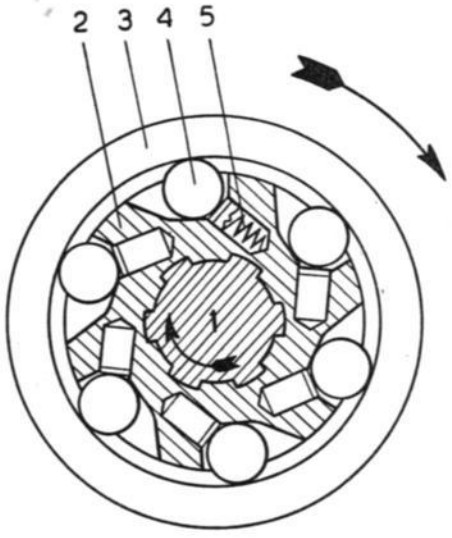
Freewheel

The freewheel transmits the power from the clutch shaft to the transmission primary shaft. The freewheel hub, which is splined to the clutch shaft, has six roller seats each containing a roller. Each of these rollers is individually spring-loaded by a coil spring, which constantly endeavours to press the roller into the curve-shaped roller seat. The freewheel hub is surrounded by a cylindrical sleeve, which is an integral part of the primary shaft — see fig.

The clutch shaft is connected to the engine crankshaft, and when the engine is driving the car the freewheel engages, being caused to do so because the freewheel hub tends to rotate faster than the primary shaft. The rollers are then forced up onto the curve-shaped roller seats in the freewheel hub.

When the rollers are thus held between the freewheel hub and the sleeve, the primary shaft is forced to rotate at the same speed as the clutch shaft, with which it is thus virtually united. If, on the other hand, the primary shaft tends to rotate faster than the clutch shaft, as may occur when running downhill with the engine idling, for example, the rollers are released, i.e. they are carried back to their curve-shaped seats by the freewheel sleeve. Consequently, the sleeve — the primary shaft — is able to rotate faster than the clutch shaft.

The freewheel is equipped with a blocking device by means of which it can be completely locked.



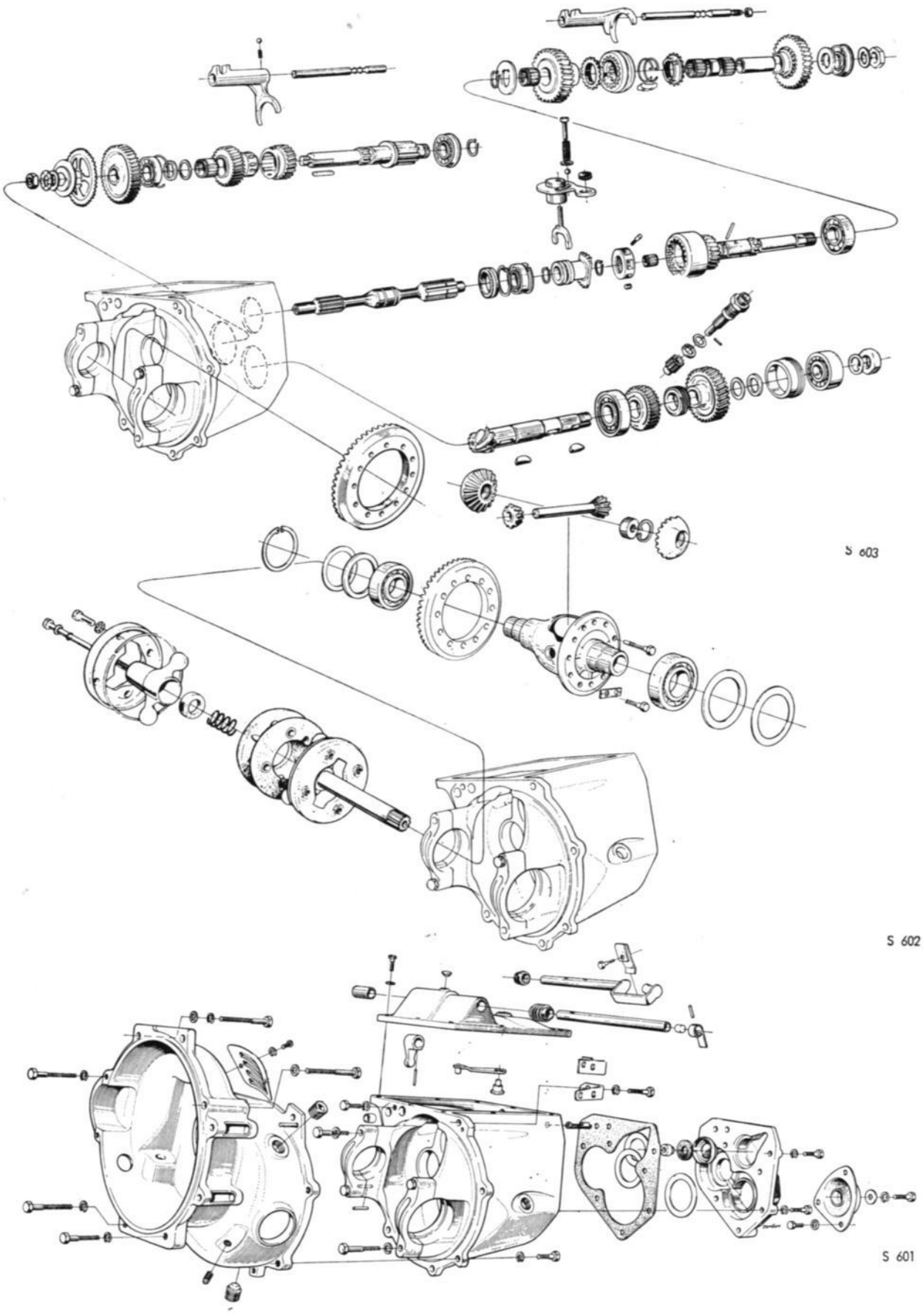
DIAGRAMMATIC ARRANGEMENT OF FREEWHEEL

1. Clutch shaft
2. Freewheel hub
3. Freewheel sleeve
4. Roller
5. Coil spring

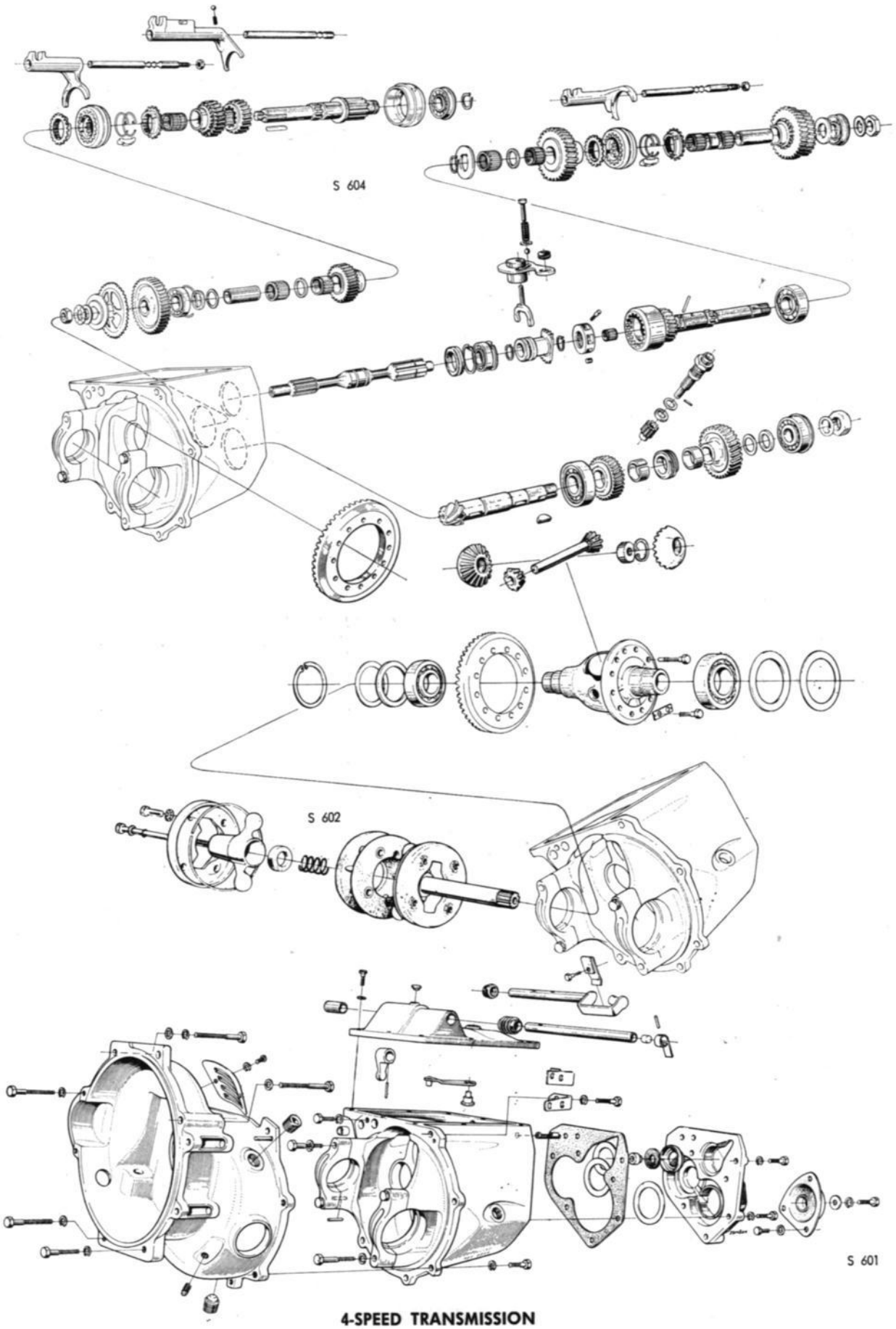
Differential and speedometer drive

The speedometer drive is taken from the transmission pinion shaft, being transmitted by way of a worm gear to the connection for the speedometer cable.

The differential comprises two differential gears and two front drive shaft gears, one for each front drive shaft. The differential and front drive shaft gears have plain bevel teeth. The shaft gears are splined on stubs, through which they are connected with inner universal joints and inner drive shafts. The ring gear, to which the pinion shaft transmits the transmission torque, is bolted to the differential case.



3-SPEED TRANSMISSION

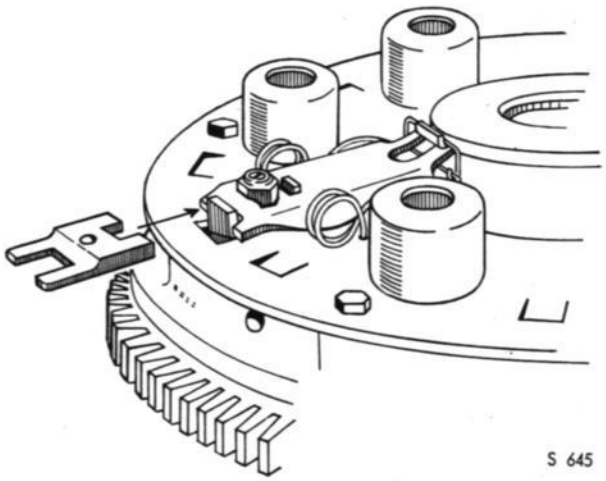


4-SPEED TRANSMISSION

STANDARD CLUTCH

Removal of clutch

1. Remove the engine from the car — see Section 201.
2. Back off the six bolts holding the pressure-plate assembly to the flywheel. Slacken the bolts gradually, placing spacers under the clutch levers as shown in the figure. Use tool No. 784209 for Fichtel & Sachs and for Borg & Beck as well.
3. Remove the pressure-plate assembly and clutch disc.



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FITTING OF SPACERS WHEN REMOVING OR INSTALLING THE CLUTCH PRESSURE-PLATE ASSEMBLY

Installation of clutch

1. Insert the clutch disc and refit the pressure-plate assembly in the flywheel, fitting spacers as illustrated to ensure that the locating tongues afford correct support for the pressure-plate assembly in the flywheel.

NOTE

Balanced clutch and flywheel combinations are color-marked. Upon reassembly, possible unbalance should be corrected by locating the color-marks as close to 180° apart as the hole spacing permits. Unmarked parts can be fitted in any position, or in the same position as prior to removal.

2. Center the clutch disc with the arbor, tool No. 784064, which fits into the clutch-shaft bearing at the crankshaft end.
3. Tighten the six pressure-plate bolts gradually and remove the three spacers.

NOTE

Before reinstalling the engine, check the clutch shaft seal, and then apply a sparse coat of graphite grease to the shaft splines.

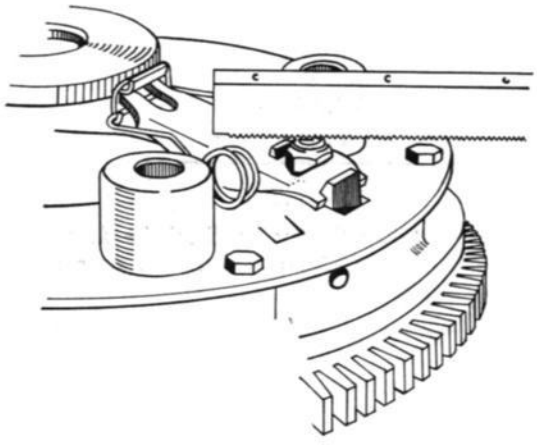
4. Install the engine as described in Section 201.

Disassembly

Before disassembling the pressure-plate assembly, mark all the parts to ensure reassembly in the same relative positions. This is important in view of clutch balance.

1. On Fichtel and Sachs clutches, saw off the nut locks on the clutch lever adjusting screws. On the Borg and Beck clutch, bend the adjusting nut locking plates aside.
2. Remove the release plate by lifting the lever springs.
3. Mount the clutch together with a new disc on a flywheel. Use the three spacers.
   a) If a press is available, apply an evenly distributed pressure to the clutch disc in order to compress the coil springs.
   b) If a press is not available, mount the clutch on the flywheel using six 50-mm bolts together with nuts and washers.

4. Remove the clutch levers by backing off and removing the adjusting bolts or adjusting nuts.
5. a) If the clutch is fitted in a press, reduce the pressure in order to relieve the springs.
   b) If the clutch is mounted on a flywheel, slacken the nuts successively while holding the bolts in place. By this means the coil springs can be relieved.
6. When the pressure on the springs has been relieved, remove the clutch from the press or the flywheel. The pressure plate with springs and spring holders can now be removed.



UNDOING THE LOCKING OF ADJUSTMENT SCREWS

Fichtel and Sachs clutch

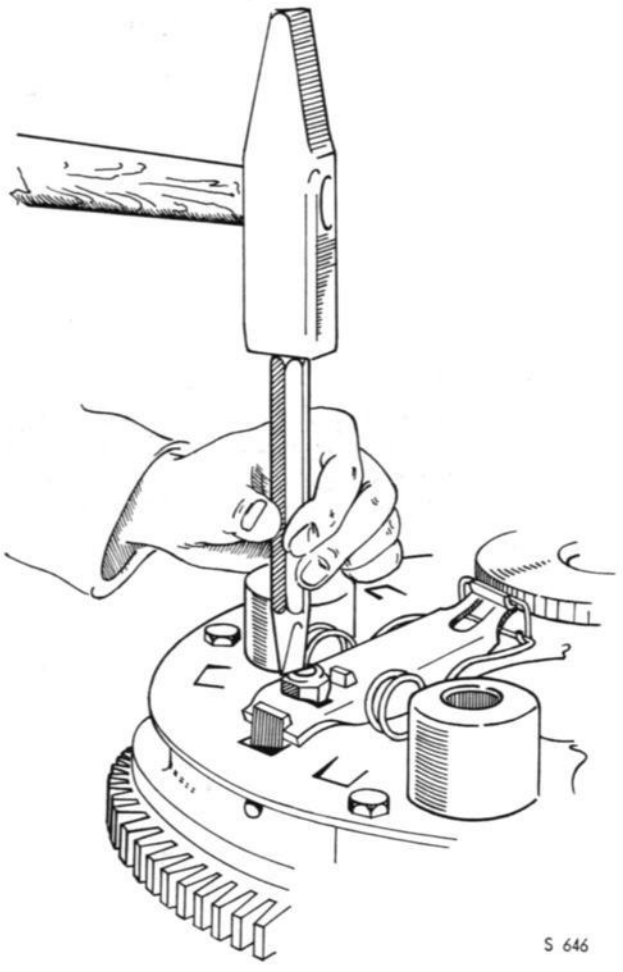
Reassembly

Before reassembling the pressure-plate assembly, check that the spring pressures lie within normal values. See the specifications in section 020—7. Inspect all parts for damage or wear. Lubricate the friction surfaces sparsely with graphite grease or SAAB Special Chassis Grease.

1. Fit a new clutch disc of the correct thickness in a flywheel and put on the pressure plate fitted with lever screws. These are loose on the Fichtel and Sachs clutch and fixed on the Borg and Beck clutch.
2. Place the coil springs on their holders and put on the clutch housing with the spring cups.
3. Press the clutch together, either in a press or with the aid of six 50-mm bolts together with nuts and washers. Make sure that the pressure-plate locating tongues enter the recesses in the clutch housing and that the clutch housing is properly supported in the flywheel.
4. Screw the clutch levers on the lever screws. Use new locking screws and retaining plates. New screws should also be fitted if the old ones have been damaged in course of removal.
5. Refit the release plate together with the fork springs.
6. Adjust the release plate to the correct height.

Adjusting the release plate

When the clutch has been disassembled or the release plate found to be incorrectly positioned, the latter can be adjusted as follows:



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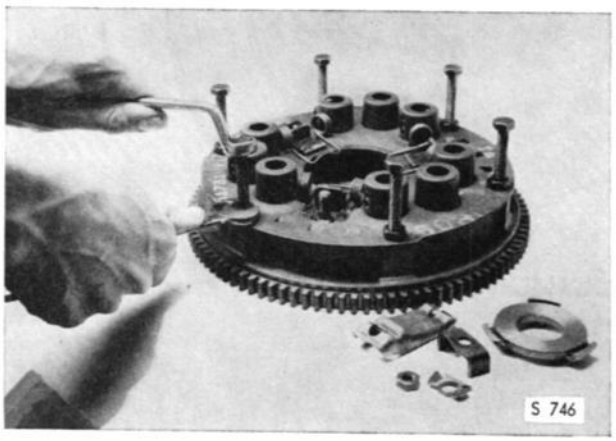
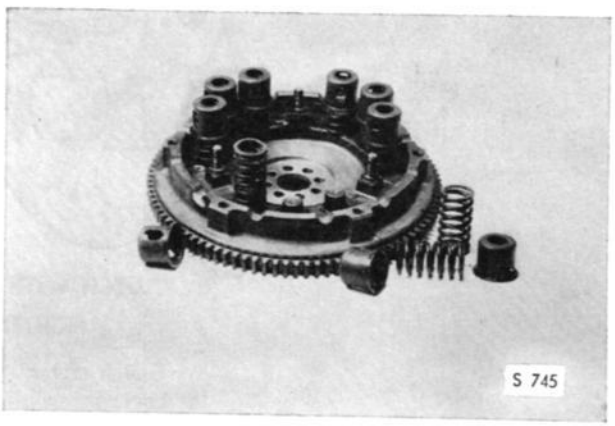
LOCKING THE ADJUSTMENT SCREWS

Fichtel and Sachs clutch

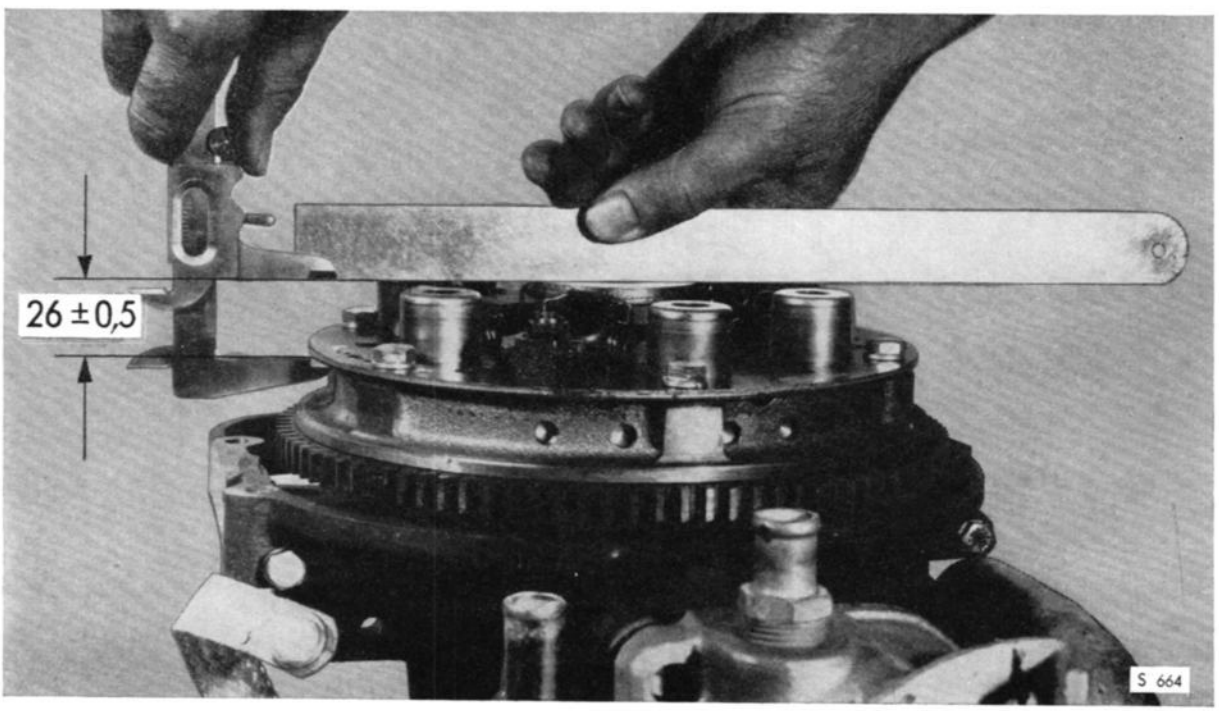
1. Insert the reassembled pressure-plate assembly in the flywheel on a flawless clutch disc. Tighten the six retaining bolts successively and remove the spacers. Center the clutch disc with tool No. 784064.
2. Depress and release the release plate a few times, and then measure.
3. Place a steel rule over the release plate. The distance, see fig. should be 1.0 in. (26 mm) Note. On the Borg and Beck clutch the measure must be taken on the part of the clutch which is against the flywheel. It is important that the measurement 1 in. (26 mm) distance is the same all round, as otherwise the release plats will become skewy. Adjust the aligment of the release plate with the adjusting screws.
4. Depress and release the release plate a few times and check the measurement.
5. Lock the adjusting screws by knocking in the nut locking flanges (Fichtel and Sachs) see fig., or bend up the locking plate (Borg & Beck clutch).



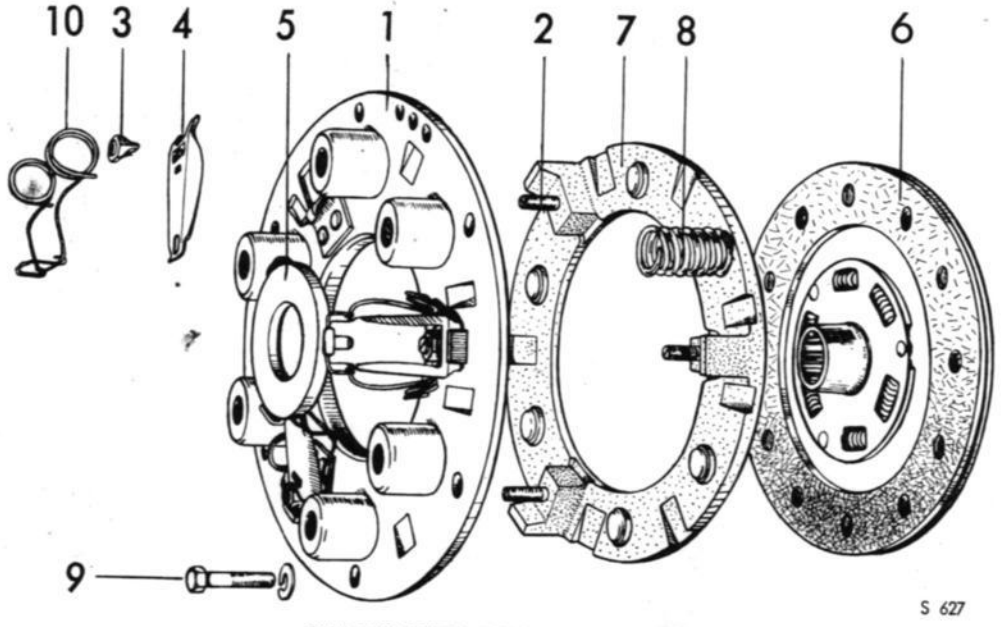
DISASSEMBLING A CLUTCH USING LONG BOLTS (BORG AND BECK)



A PARTLY DISASSEMBLED CLUTCH (BORG AND BECK)



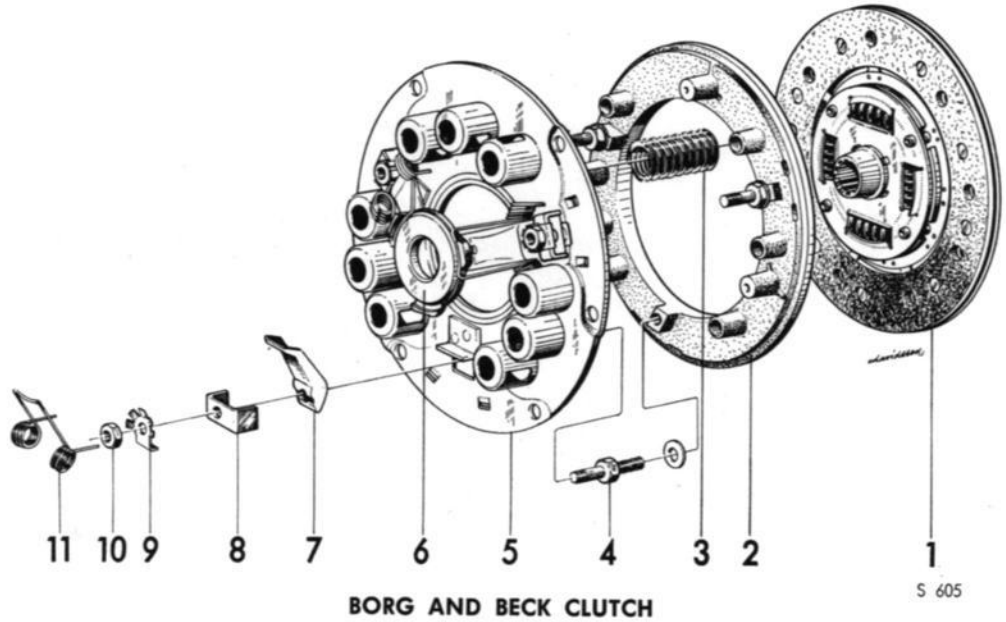
CHECKING ADJUSTMENT OF PRESSURE PLATE- ASSY, AFTER REASSEMBLY



CLUTCH WITH DISC, DISASSEMBLED

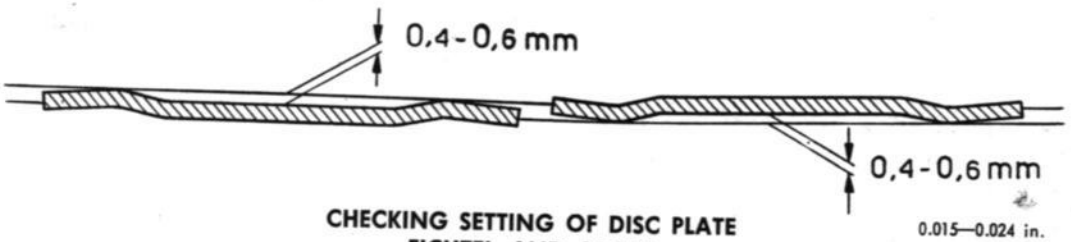
FICHTEL AND SACHS

1. Clutch cover
2. Lever screw
3. Lock nut
4. Clutch lever
5. Release plate
6. Disc
7. Release plate
8. Spring
9. Screw
10. Retaining spring



BORG AND BECK CLUTCH

1. Disc
2. Release plate
3. Spring
4. Lever screw
5. Clutch cover
6. Release plate
7. Clutch lever
8. Bracket
9. Flap washer
10. Nut
11. Spring



CHECKING SETTING OF DISC PLATE
FICHTEL AND SACHS

CLUTCH DISC

Checking the clutch and changing disc facings

1. Examine the clutch face in the flywheel. Burns or small scratches on the face are of minor importance. If deep scores are present, on the other hand, the flywheel should be machined or a new one fitted. See description in Chapter 2.
2. Check the pressure plate for scores or skewness. If the surface is uneven, fit a new pressure plate or machine the worn face.
3. Check the three clutch levers for wear. These are worn by pressure against the release plate, which must therefore be removed before the levers can be checked.
4. Make sure that the release plate is undamaged. Damage can occur if the graphite ring on the release bearing is severely worn or damaged.
5. Examine the release bearing, paying particular attention to the graphite ring, which must not be worn down to the level of its retainer.
6. Check the clutch disc for wear and reface if necessary.
7. Before riveting on the new facings, check the setting of the clutch plate and adjust if necessary. All the segments must have the same setting, which should be between 0.015 and 0.024 in. (0.4—0.6 mm) for Fichtel and Sachs and 0.015—0.030 in. (0.4—0.8 mm) for Borg and Beck — see fig. Rivet locations are illustrated in the figure.
8. After having fitted new facings, the clutch disc should be checked for skewness. Lateral throw may not exeed 0.024 in. (0.6 mm).
   Check with the aid of a dial indicator and an arbor. See fig.

> NOTE
>
> A special clutch facing is supplied for the Saab Sport. See Spare Parts List.

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CHECKING SETTING OF DISC PLATE
BORG AND BECK

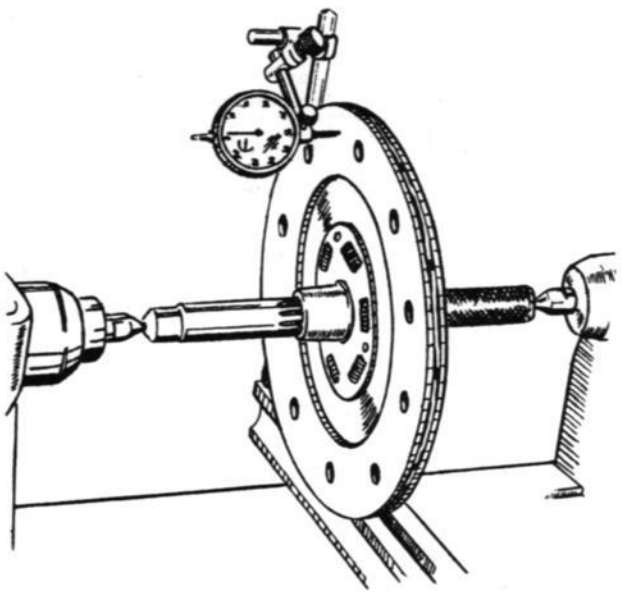
S 606

LOCATION OF FACING RIVETS, FICHTEL AND SACHS CLUTCH

Thickness of new unloaded disc, 0.36—0.37 in. (9.1—9.4 mm)

LOCATION OF FACING RIVETS (BORG AND BECK)

Thickness of a new, unloaded disc: 0.36—0.37 in. (9.1—9.4 mm)



CHECKING THROW OF CLUTCH DISC

Max. lateral throw: 0.024 in. (0.6 mm)

SAXOMAT CLUTCH

Work on the power unit

Saab cars equipped with the SAXOMAT clutch have a modified power unit, which differs from the standard unit in the following respects:

1. Completely new type of disc and clutch.
2. The flywheel has recesses for the centrifugal weights.
3. The engine induction manifold is fitted with a connection for the suction hose.
4. The clutch housing is adapted to take the SAXOMAT clutch mechanism. When changing any of these parts, make sure that the correct replacement part is fitted. Use only genuine SAXOMAT spare parts.

Removal of centrifugal clutch

1. Lift the engine out of the car — see chapter 2.
2. Back off successively the six bolts holding the pressure-plate assembly to the flywheel.
3. Remove the pressure-plate assembly and the disc.

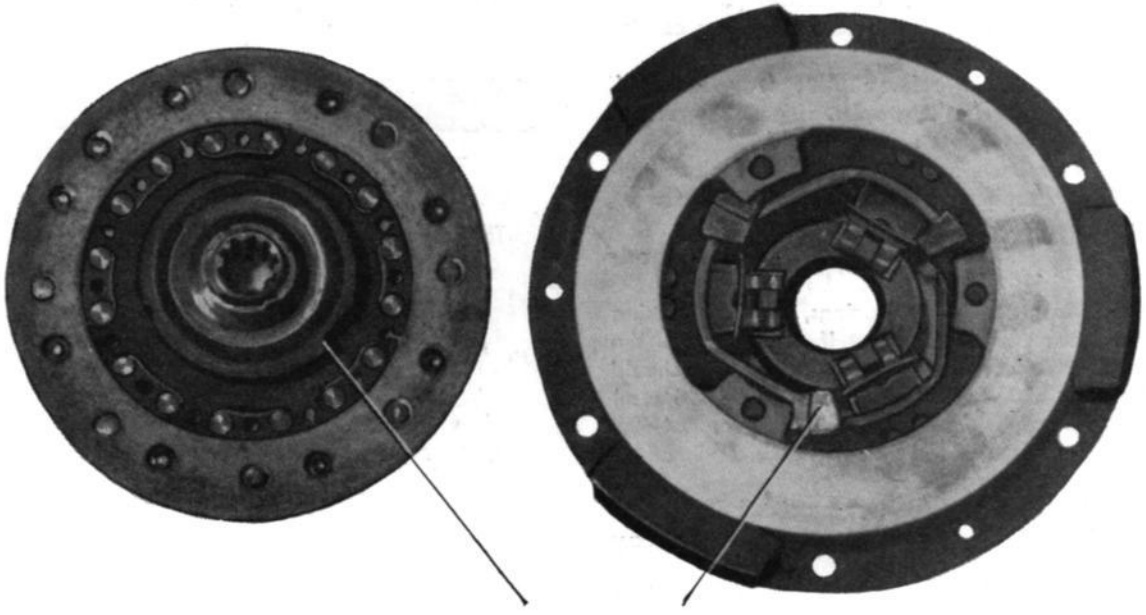
Installation of centrifugal clutch

Before installing the clutch assembly, make sure that the disc slides easily on the clutch shaft splines without excessive clearance. Smear the shaft sparsely with a mixture of oil and graphite. Excessive lubrication may result in splashing on the clutch facings, which should be avoided.

Check also the shaft seal in the transmission case.

1. Place the clutch disc against the pressure plate in the centrifugal clutch, making sure that the clutch pawls engage with the disc ratchet wheel — see fig.

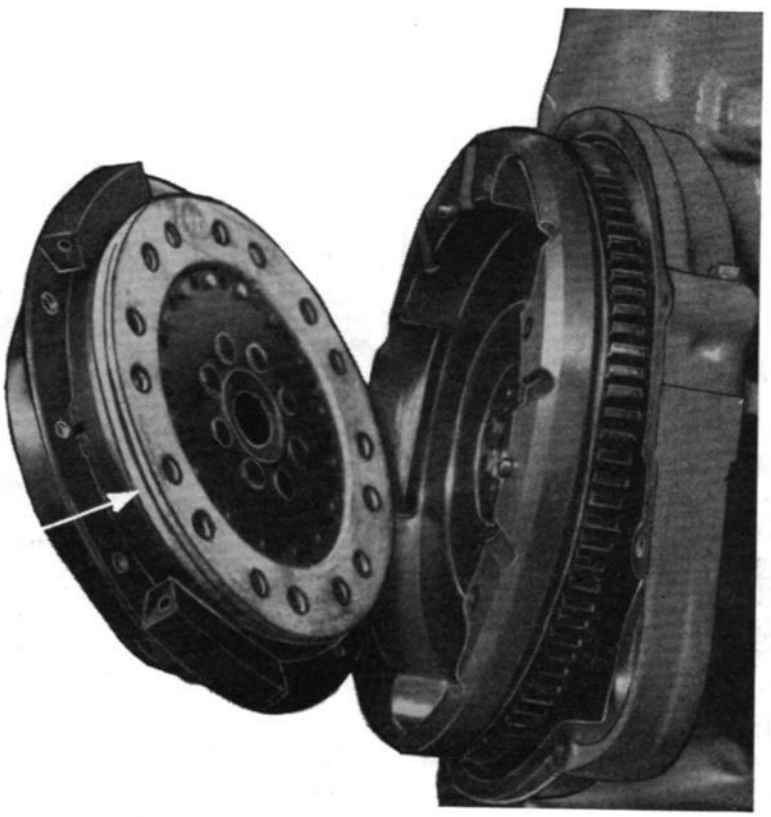
> WARNING
>
> If the disc is fitted in the flywheel in the ordinary manner, the pawls may get damaged during installation of the clutch.



CLUTCH DISC AND PRESSURE-PLATE ASSY

1. Ratchet wheel
2. Pawls

2. Refit the centrifugal clutch complete with disc to the flywheel, locating the disc with the aid of the arbor No. 784064. Take care not to damage the pawls.
3. The centrifugal clutch should be located on the flywheel locating pins. Tighten the 6 clutch retaining bolts successively.
   As the centrifugal clutch is installed in the disengaged position, i.e. with the centrifugal weights in their inner positions, there will be no need to overcome any spring pressure during installation. Consequently, the clutch can be screwed on without using any spacers for the clutch levers. Remember to center the clutch disc.
   When the clutch assembly has been fitted, it should be easy to turn the clutch disc against the normal direction of engine rotation. If, on the other hand, the clutch disc is turned in the same direction as that in which the engine rotates, the ratchet and pawl arrangement should engage, causing the flywheel to rotate.
4. Refit the engine in the car.
5. Adjust the release bearing clearance — see Section 412.
6. Road-test the car, adjusting the pilot valve and the gear-shift lever contact gap as necessary — see Section 412.



FITTING THE CLUTCH ASSEMBLY IN THE FLYWEEL

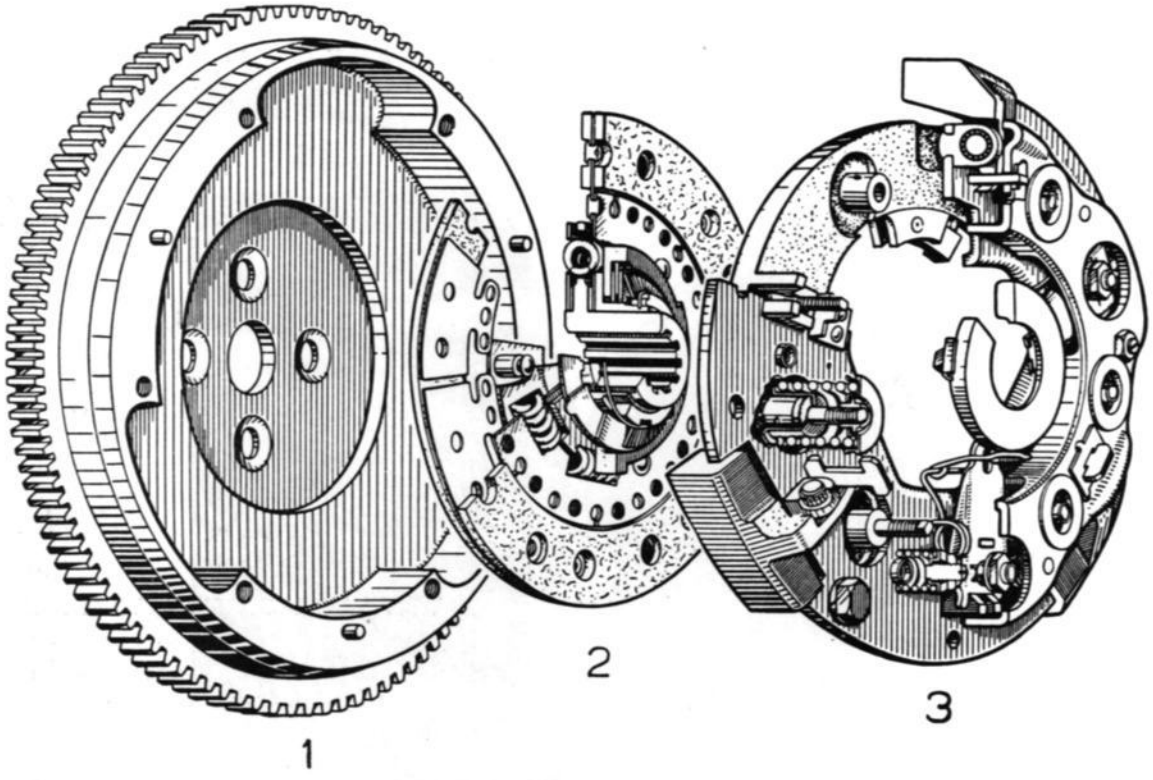
Check that the pawls engage in the ratchet wheel, see fig., and that the clutch disc lies flat against the pressure-plate assembly until the clutch is in place. Otherwise, the pawls may get broken off

Pressure-plate assembly

Special equipment is needed for correct assembly and adjustment of the pressure-plate assembly in the centrifugal clutch, and therefore the assembly should never be dismantled for replacement of parts or adjustment of spring tension, if necessary. In case of damage, the entire assembly should be renewed or returned for reconditioning to the representative of the makers, Fichtel & Sachs.

Clutch disc

The clutch disc or facings may be renewed after the engine has been lifted out of the car and the clutch assembly removed. A special type of clutch facing is provided for the SAXOMAT clutch.



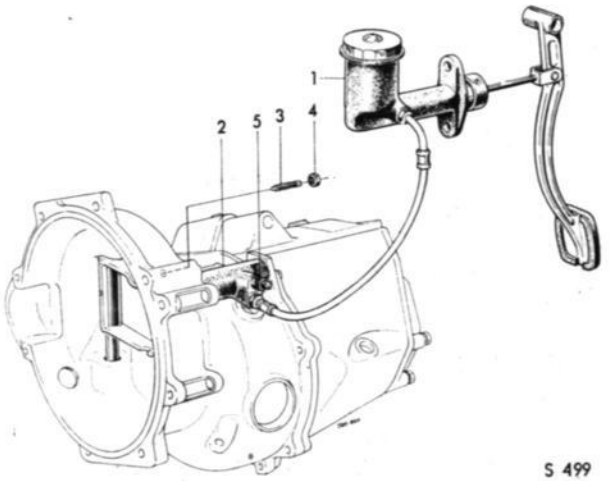
CENTRIFUGAL CLUTCH, SECTIONED

1. Flywheel
2. Clutch disc
3. Pressure-plate assembly

CLUTCH OPERATION
STANDARD CLUTCH

Removal and installation of clutch pedal

1. Remove the cotter and washer, and pull out the pin retaining the master-cylinder push-rod.
2. Remove the cotter and washer from the pedal shaft.
3. Lift the pedal clear of the spring and pull it off the shaft.
4. Remove the spring.
5. Before reinstalling, grease the pedal bearings with chassis grease.
   Reassembly takes place in the reverse sequence.

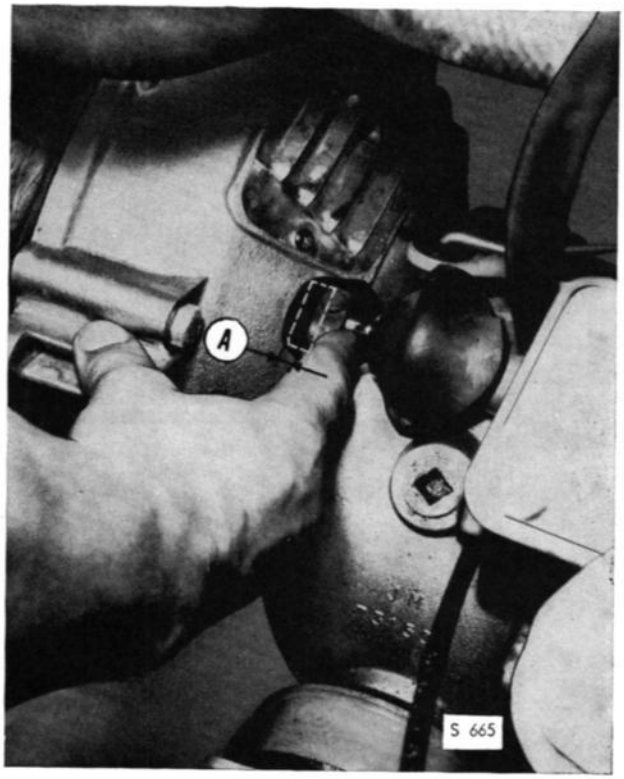


CLUTCH PEDAL WITH ADJUSTMENT DEVICE

1. Master cylinder
2. Slave cylinder
3. Adjustment screw
4. Stop nut
5. Bleeder nipple

Adjustment of clutch-pedal free movement

The clearance between release bearing and release plate is gradually decreased by wear on the clutch facings. Adjust the clutchpedal free movement with the screw on the clutch housing, located in the opposite side in relation to the slave-cylinder. The free movement is increased by slackening the screw (turning to the left). The clearance shall be 0.2 in. (5 mm) and is checked by pressing the slave cylinders connection to the clutch arm. See fig.



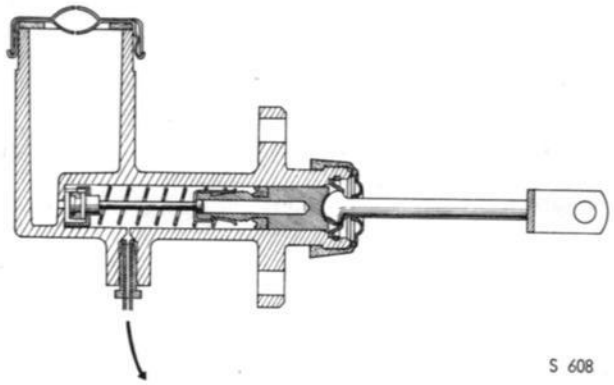
ADJUSTING THE CLUTCH CLEARANCE

A = 0.2 in. (5 mm)

MASTER CYLINDER

General

The master cylinder comprises a cast unit enclosing the cylinder and fluid reservoir.
The cylinder consists of an alloyed body with a surface-polished bore and an inner assembly, made up of the push-rod, cupped washer, lock ring, piston, end seal, piston seal, spring retainer, piston-return spring, valve spacer, elastic washer, valve spindle and valve seal. The open end of the cylinder is protected by a rubber dust cap.
When the piston returns to the position of rest, the valve which affords a seal in the bottom of the cylinder during disengagement opens. When the valve is open the fluid is able to pass freely from the slave cylinder to the reservoir.



MASTER CYLINDER, CUT-AWAY VIEW

Removal

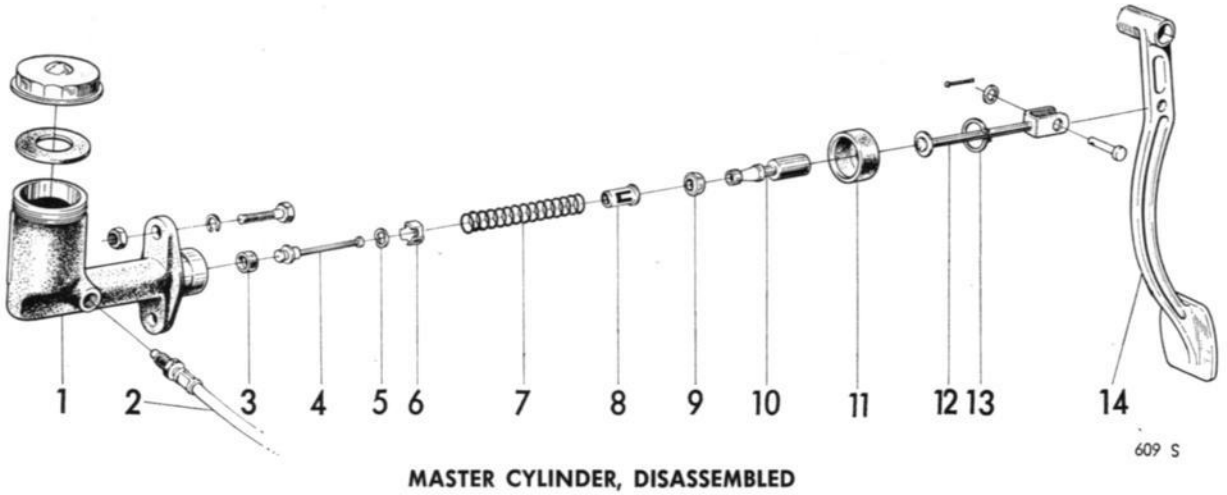
1. Detach the hose from the slave cylinder and pump the oil into a clean container.
2. Separate the push-rod from the clutch pedal by removing the cotter, the plain washer and the pin.
3. Back off and remove the retaining bolts and remove the master cylinder from the dash panel.

Installation

1. Install the master cylinder in position on the dash panel.
2. Attach the push-rod to the clutch pedal by inserting the pin through the holes in the push-rod fork and the hole in the clutch pedal. Refit the plain washer and secure with the cotter.
3. Reconnect the hose.
4. Bleed the system.

Disassembly

Ease the rubber dust cap back and remove the lock-ring, using long-nosed pliers. It is now possible to remove the push-rod and the cupped washer. Removal of the push-rod reveals the piston and its seal. Remove the complete piston assembly. The assembly can be disassembled by lifting the retainer spring leaf over the tongued end of the piston. Carefully take the piston seal off the piston and remove the end seal.
Push down the piston-return spring, thus enabling the valve spindle to slide through the key-shaped hole in the retainer so that the spring lets go. Remove the valve spacer, taking care not to damage the elastic washer located under the valve head. Remove the seal from the valve head.



MASTER CYLINDER, DISASSEMBLED

1. Cylinder housing
2. Hose
3. Seal
4. Rod
5. Elastic washer
6. Valve spacer
7. Spring
8. Spring retainer
9. Seal
10. Piston
11. Rubber dust cap
12. Push-rod with cupped washer
13. Lock ring
14. Clutch pedal

Examine the cylinder bore and if it not scored or distorted, and feels smooth to the touch, new seals may safely be fitted. If, on the other hand, the slightest doubt is entertained about the condition of the bore, a new cylinder should be fitted.
If the old seals are loose on the piston and too big, contamination by mineral oil may be suspected. This is the commonest cause of cylinder trouble, and often sufficient pains are not taken to prevent it. Seals of natural rubber are highly susceptible, and even minute quantities of oil can gradually cause considerable swelling. If the slightest trouble in this respect is suspected, fit new seals throughout the system and flush the system clean with pure brake fluid.

Reassembly

Fit the valve seal with its flat side properly located on the valve head. Then put on the elastic washer with the dished side facing the lower side of the valve head, retaining it in position by means of the valve-spacer, the legs of which are turned towards the valve seal. Refit the piston-return spring, centering it on the washer, insert the spring retainer in the spring and press down until the valve spindle bottoms through the key-shaped hole, checking at the same time that the spindle is correctly located in the middle of the retainer. Check that the spring is still centered on the spacer. Fit a new piston seal on the piston, with the flat side turned towards the front of the piston, and a new end seal with its lip facing the piston seal. Insert the small end of the piston in the retainer until the retainer spring leaf engages the piston tongue. Press the retainer leaf fully home.
Lubricate the piston thoroughly with Girling Red Rubber Grease and refit the assembly in the cylinder bore, valve end first, easing the piston seal lips slowly into the bore. Remount the push-rod in the cylinder with the dished side of the washer under the spherical head, followed by the lock-ring, placing the latter in the milled groove in the cylinder body. Replace the rubber dust cap or, if it is damaged, fit a new one.

SLAVE CYLINDER

General

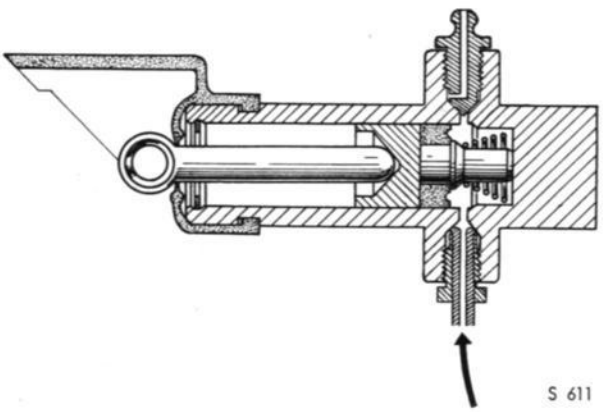
In the 3-speed transmission, the slave cylinder is secured to the clutch housing by means of two retaining bolts, whereas only one bolt is used for the same purpose in the case of the 4-speed transmission. In all other respects, the cylinders are identical.
The inner assembly comprises the push-rod, lock-ring, piston and piston spring. The open end of the cylinder is protected by a rubber dust cap. A bleed nipple is located in the bleeder opening.

Removal

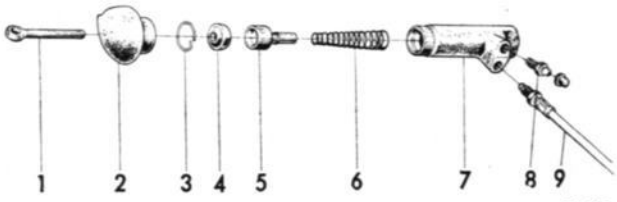
1. Disconnect the hose and pump the oil into a clean container.
2. Back off the retaining screw(s) for the cylinder.
3. Separate the cylinder from the push-rod and clutch housing.

Installation

1. Locate the slave cylinder on the clutch housing and pass the push-rod through the hole in the rubber dust cap.
2. Refit and tighten the retaining screw(s).
3. Reconnect the hose.
4. Bleed the system.



SLAVE CYLINDER, CUT-AWAY VIEW



SLAVE CYLINDER, DISASSEMBLED

1. Push-rod
2. Rubber dust cap
3. Lock ring
4. Seal
5. Piston
6. Spring
7. Cylinder body
8. Bleeder screw
9. Hose

Disassembly

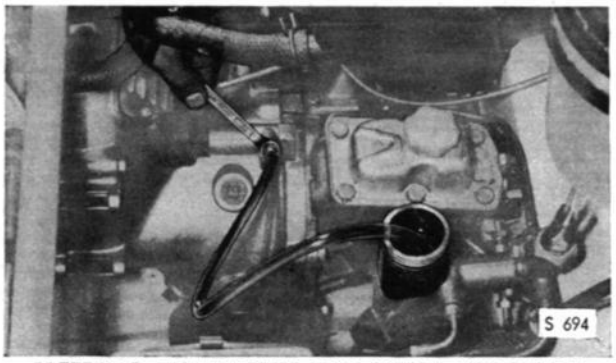
Ease the dust cap back and remove the lock-ring, using long-nosed pliers. The piston with seal attached can now be removed, followed by the spring. Examine the cylinder bore and if it is not scored or distorted, and feels smooth to the touch, a new seal can be fitted. If, on the other hand, the slightest doubt is entertained about the condition of the bore, a new cylinder should be fitted.

Reassembly

Reassemble by following in reverse sequense the instructions given for "Disassembly", taking pains to lubricate the seal and to pack the rubber boot with Wakefield/ Girling Rubber Grease No. 3. Always lubricate the cylinder bore with brake fluid when reassembling this unit.

Bleeding the master and slave cylinders

Remove the protective cap from the bleed nipple on the slave cylinder and connect a hose (inside diameter approx. 0.25 in. (6 mm). Dip the free end of the hose into the container of the master cylinder.
Fill the master cylinder reservoir with brake fluid.
Open the bleed nipple half a turn and depress the clutch pedal. Close the bleed nipple just before the bottom position and release the pedal.
Repeat this procedure until all air has been cleared out of the system, i.e. until air bubbles no longer flow out from the hose.
Check the oil level in the reservoir during the course of this work.
Refit the protective cap on the bleed nipple.



BLEEDING THE MASTER AND SLAVE CYLINDERS

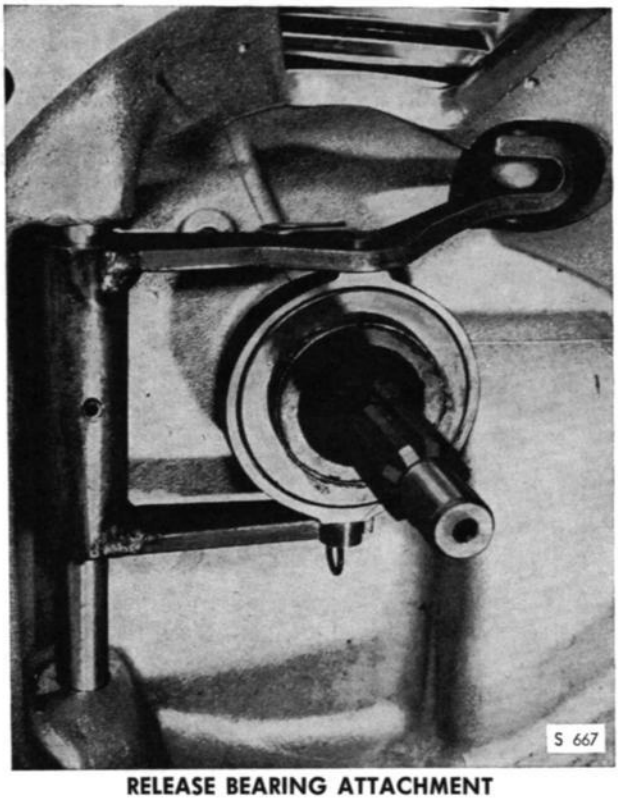
RELEASE BEARING

Removal and installation of release bearing

1. Lift the engine out of the car as described in Section 201.
2. Turn the clutch lever forward and remove the two spring clips retaining the release bearing in the fork. See fig.
3. Remove the release bearing.
   After changing the bearing, reinstall in the reverse sequence. The graphite ring on the release bearing must not be worn level with its retainer: if it is, fit a new ring.

IMPORTANT

Always make sure that the spring clips are correctly located.



RELEASE BEARING ATTACHMENT

CLUTCH OPERATION
SAXOMAT CLUTCH

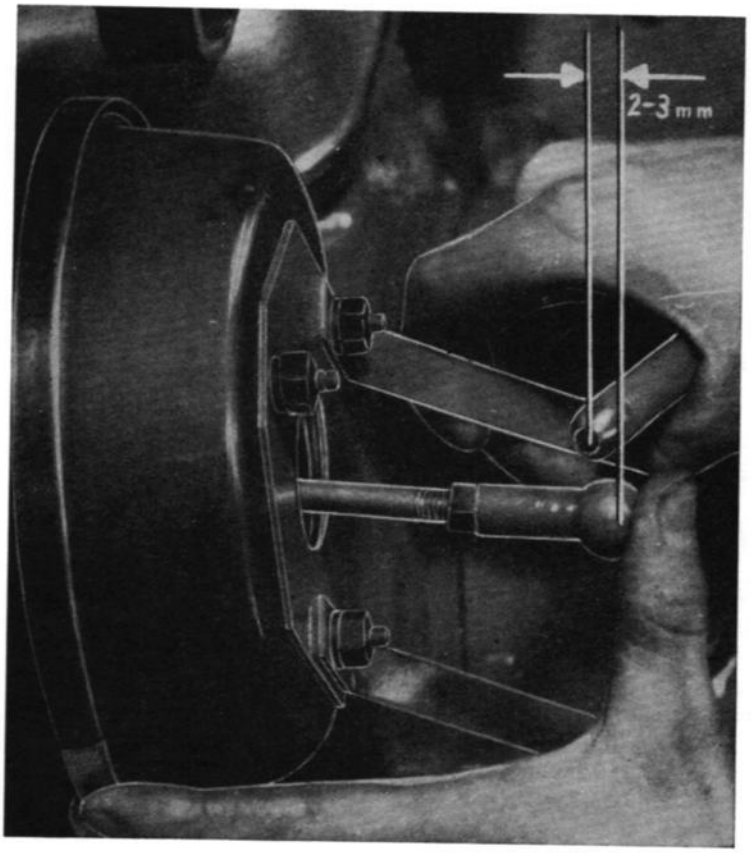
Vacuum power chamber

In the event of leakage from the power chamber diaphragm or suction lines, damaged parts must be renewed. Check the free movement of the pull-rod as described in the following when a new vacuum power chamber is installed.

Basic setting of release bearing clearence

The following basic adjustment of the release bearing clearance must be made when a new centrifugal clutch or vacuum chamber has been fitted.

As the clutch is disengaged when the engine is idling or still, the release lever must be mounted on the clutch shaft splines so that its free movement is not impeded by the transmission case. Check this by moving the lever forward as far as it will go, at which point there should still be clearance between the lever and the case. At the same time, press the pull-rod right into the vacuum power chamber and check that the lever ball center lies 0.08—0.12 in. (2—3 mm) in front of the ball seat in the end of the pull-rod, as indicated in the figure. The correct clearance is obtained by adjusting the length of the rod. Don't forget to lock the rod end with the locknut after adjusting.



ADJUSTING LINKAGE ROD

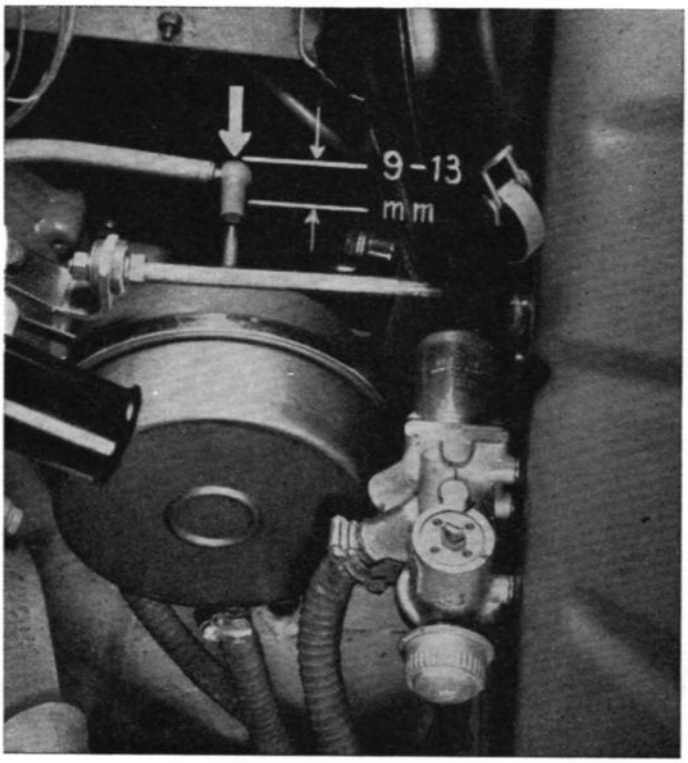
Adjusting linkage rod adjustment of length is necessary before connecting to clutch servo release lever after fitting of new clutch unit.

Checking and adjusting release-bearing clearance

The clearance between the release bearing and the pressure plate should be checked and adjusted regularly. In the case of the conventional clutch, this is done at the clutch pedal, but as there is no pedal in cars equipped with the SAXOMAT clutch the clearance in these cars must be checked at the outer end of the lever or at the pull-rod. It is also possible to open the inspection plate over the release bearing and to estimate the clearance between the bearing and the plate, which should be 0.08—0.12 in. (2—3 mm) at engine speeds above 2000 r/m, i.e. when the centrifugal weights are fully extended. This corresponds to a free movement of 0.35—0.51 in. (9—13 mm) at the outer end of the clutch lever — see fig. To adjust the release-bearing clearance, detach the pull-rod from the lever and screw lever end in or out until the correct clearance is obtained. Remember to lock the lever end with the stopnut after adjusting.

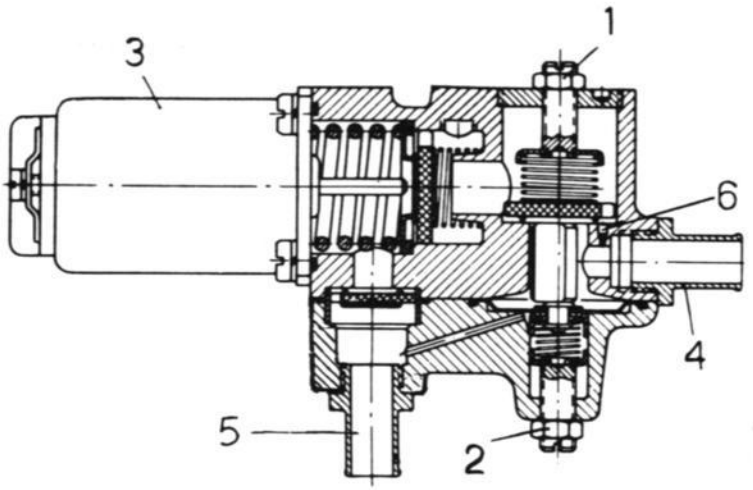
NOTE

The centrifugal weights must be fully extended when checking the clearance, wich means that the engine speed must be run up to about 2000 r/m.



RELEASE-BEARING CLEARANCE MEASURED AT THE PULL-ROD.

Pilot valve



PILOT VALVE, CUT-AWAY VIEW

1. Adjusting screw for reduction valve
2. Adjusting screw for bleeder diaphragm
3. Solenoid
4. Air inlet (with filter)
5. Connection for hose to engine induction manifold
6. Pressure-equalizing nozzle

The pilot valve assembly comprises a solenoid and a valve body with valves and connections for the vacuum lines. The pilot valve assembly may be regarded as the brain of the servo system and should be adjusted with great care.

The pilot valve assembly is held to the inside of the left front wheel house by means of three bolts. These must not be tightened excessively, causing the rubber bushings to lose their resilience. Make sure that the vacuum lines are correctly connected and that there is no leakage. The electric wiring for the pilot valve can be connected arbitrarily, as the functioning of the solenoid and valve is not dependent on the direction of the current.

As a rule it is not necessary to disassemble the pilot valve, but if this does have to be done no great difficulty is involved. The positions of the adjusting screws should be left unchanged to facilitate adjustment after reassembly. The design of the pilot valve is illustrated by the figure above. There are two possibilities of adjustment: of the reduction valve and of the clutch-engagement delay.

Reduction valve

The reduction valve is adjusted by means of the screw 1 on the upper side of the valve body, see fig. The reduction valve determines the fierceness of clutch engagement if the accelerator pedal is not used immediately after a gear change while the car is moving. Tightening the screw gives a softer engagement and vice versa.

After driving for 600—1200 miles (1000—2000 km), a fine adjustment may be necessary, to compensate for clutch wear during running-in. The simplest way of checking clutch fierceness is to take the car out for a test run, making quick changes from 1st to 2nd gear without depressing the accelerator pedal afterwards. Adjust the reduction valve until the clutch engages softly and pleasantly, so that the engine gives full traction after about 3 sec., causing a momentary increase in speed. See also under "Adjustment of pilot valve".

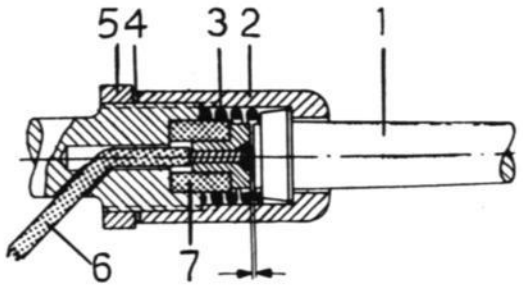
Delay of clutch engagement

The screw 2 on the bottom of the valve body — see fig. — is used to adjust the load on the spring which retains the pressure-equalizing diaphragm. The spring tension governs the speed of clutch engagement if the accelerator pedal is depressed immediately after changing gear while the car is moving. Adjustment of this screw, however, is very seldom necessary. Tightening of the screw gives quicker engagement and vice versa. The clutch should engage virtually immediately if the accelerator pedal is depressed after changing from, for example, 2nd to 3rd gear at moderate speed. If the reduction valve is properly adjusted and no other part of the system is damaged, the screw (2) can be adjusted to counteract engine racing prior to clutch engagement. See also under "adjustment of pilot valve".

GEAR-SHIFT LEVER

Adjusting switch contacts

The gap between the contacts of the switch built into the gear-shift lever should be 0.006—0.008 in. (0.15—0.20 mm) — see fig. To adjust, bend up the lock washer and back off the lock nut. The correct gap is obtained by tightening the sleeve nut fully and then backing if off 1/4 turn. In conjunction with this adjustment, check also that the contact faces are smooth and free of deposits. After adjusting the gap, lock the sleeve with the nut and bend down the lock washer. Take care not to damage the lock washer when tightening the locknut.



0.006—0.008 in. (0.15—0.20 mm)

CONTACTS IN GEAR-LEVER SWITCH

1. Gear-shift lever
2. Sleeve nut
3. Spring
4. Lock washer
5. Locknut
6. Cable
7. Insulation

Adjustment of pilot valve

After installing a new pilot valve, which is correctly adjusted ex-works, the car should be given a test run and the valve fine-adjusted if necessary, see below. If, on the other hand, a pilot valve assembly has been stripped down, the basic setting can first be adjusted as follows.

Do not adjust the screws more than one turn at a time without taking the car for a test run to check the results.

Basic setting

1. Back off the lower adjusting screw and tighten the upper one until both reach their respective stop positions.
2. Advance the lower screw until the clutch functions if the accelerator pedal is depressed immediately after gear change during the test run.
3. Back off the upper screw (about 5 turns) until the clutch engages gently and pleasantly after about 3 seconds when changing gear without depressing the accelerator pedal during the test run.

Continue adjusting as described in the following.

Fine adjustment

If it is found that the pilot valve is incorrectly adjusted, give the car a test run as follows:

A. Accelerate to about 20 m.p.h. (30 km/h) in 1st gear and change smartly to 2nd gear. Release the gear-shift lever without depressing the accelerator pedal afterwards. When the clutch engages — after about 3 seconds — the engine should take the load gently and pleasantly, causing a brief increase in road speed.

If the test run does not give the results indicated above, adjust screw 1 for the reduction valve as follows:

RESULT OF TEST RUN	CAUSE AND REMEDY
I. Speed increase not noticeable or delayed.	Power chamber vacuum reduced too slowly: **BACK OFF SCREW 1 TURN**
II. Fierce clutch engagement causes car to jump.	Power chamber vacuum reduced too quickly: **ADVANCE SCREW 1 TURN**

For fine adjustment, the screw may be moved only half a turn, but never more than 1 turn without another test run.

B. Drive the car in 2nd gear at about 25 m.p.h. (40 km/h). Change to 3rd gear and accelerate hard. The clutch should then engage virtually immediately, the engine r/m increasing slowly as the car gains speed.

If the test run does not give the results indicated above, adjust the bleeder diaphragm screw 2 as follows.

Adjustment of this screw is called for only in exceptional cases and should be undertaken only when the reduction valve is correctly set as above and there is no other apparent cause of clutch slipping.

RESULT OF TEST RUN	CAUSE AND REMEDY
Engine speed increases abnormally, adjusting to road speed after a short interval.	Vacuum in power chamber reduced too slowly when accelerator is depressed after change: **ADVANCE SCREW HALF A TURN**

If the measures indicated above do not give completely satisfactory results, and the other component parts of the system are in perfect condition, a new pilot valve should be installed.

NOTE

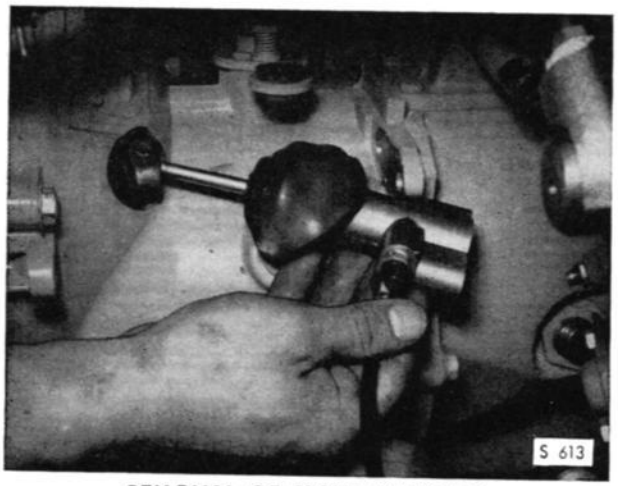
Always set the upper adjusting screw first.
Don't forget to lock the screws after adjusting.

REMOVAL AND INSTALLATION OF TRANSMISSION UNIT

Removal

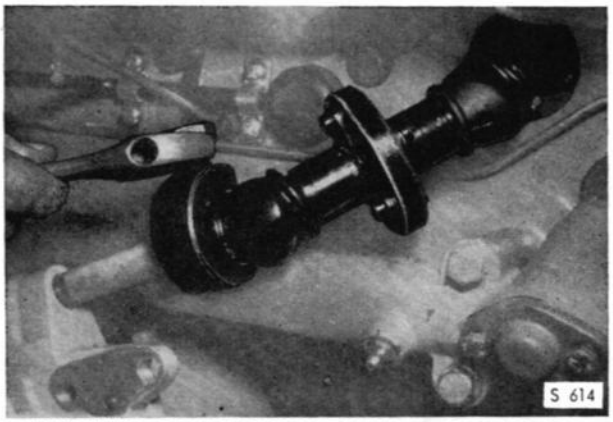
If the transmission unit is to be removed from the car the entire power unit must be lifted out.

1. Disconnect the battery earth cable at the engine and battery.
2. Remove the hood. To do this, open the hood wide and then grip the hinge stay, bending it slightly inwards to release the pin on one side. The assistant holding the hood on the other side helps to lift it off.
3. Drain the cooling system.
4. Disconnect the headlamp and direction-indicating flasher cables.
5. Disconnect the radiator blind cord and the hood lock mechanism.
6. Back off the four bolts retaining the front panel and detach the two radiator supports from the body plate. Remove the upper clamping straps from the radiator.
7. Lift off the front panel, taking great care to avoid damaging the paintwork by knocking against the overriders.
8. Disconnect the upper and lower coolant hoses from the engine.
9. Back off and remove the two radiator retaining bolts and remove the radiator.
10. Disconnect the distributor primary cable, the ignition coil cable and the ventilation hose from the distributor cover.
11. Disconnect the generator and starter cables and the battery cable clamp at the transmission unit.
12. Remove the air cleaner and preheater pipe.
13. Disconnect the fuel hose from the pump.
14. Disconnect the cold start control and the throttle linkage rubber bellows from the carburetor. Pull the control shaft out of its bearing and attach it to the stay pipe.
15. Disconnect the two heat-exchanger hoses and the temperature gage sender unit from the engine block.
16. Detach the engine side stay.
17. On Saab Sport cars: disconnect the oil pressure monitor line and the hose from the oil pump. Bend the hose upwards and tie in this position to prevent escape of oil. Cover the connections to prevent foreign matter from entering the oil pump or hose.
18. Back off and remove the two muffler flange bolts on the exhaust manifold and remove the exhaust pipe clamp.
19. Back off the muffler retaining nut and tie the muffler in order to avoid distortion of the exhaust pipe.
20. Disconnect the front engine supports from the body. The six bolts are accessible from under the engine compartment floor.
21. Disconnect the freewheel control from the transmission unit.
22. Remove the two rear clutch cylinder retaining bolts and locate the cylinder over the engine compartment stay pipe.



REMOVAL OF SLAVE CYLINDER

23. Detach the gear-shift shaft joint from the transmission unit, using tool No. 784083.



REMOVAL OF GEAR-SHIFT SHAFT, TOOL 784083

24. Disconnect the speedometer cable from the transmission unit.
25. Turn back the front part of the rubber floor mat and remove the rubber plugs, thus providing access to the rear engine bracket center screw. Back off and remove this screw, using a 9/16 in. socket wrench and extension.

26. If the engine bracket is jammed, tap it off with an arbor inserted through the upper hole. See fig.
27. Remove the steering arm from the upper ball joint on the right steering knuckle housing and pull the middle drive shaft from the inner joint.
    On Saab Sport cars: the upper ball joints must be removed on both sides and the inner joints split by taking off the large clips for the rubber boots and then fitting protective covers 731762 and 783846 on the joints.
28. Attach the lifting hook (tool No. 784058) and move the power unit slightly to the right, so that the left drive shaft comes out of the joint (not applicable to the Saab Sport), and lift the power unit out of the car.
29. Clean the power unit and separate the transmission unit from the engine.

REMOVAL OR INSTALLATION OF POWER UNIT

REMOVAL OF THE REAR ENGINE BRACKET CENTER SCREW

Installation of transmission unit

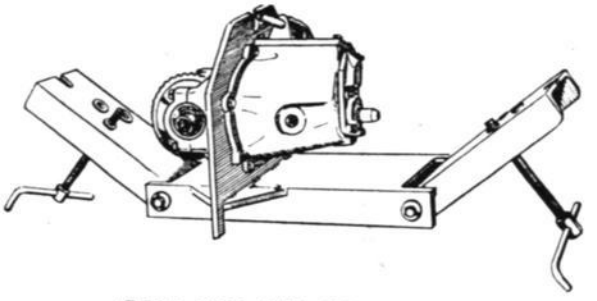
1. After reassembling the engine, transmission and starter, lift the entire power unit into the car, using lifting hook No. 784058..
2. While lifting in the power unit, guide the left drive shaft into its joint. Then reassemble the right joint, at the same time securing the steering arm and upper ball joint to the steering knuckle housing.
   On Saab Sport cars: lift the power unit into the car. Then refit the inner universal joints in the transmission unit and put back the upper ball joints on the steering knuckle housing. Prevent dirt from entering the joint and fit a new clamp on the rubber bellow.
3. Tighten the retaining screws for the rear engine bracket, fit the rubber plugs in the toe-board and replace the rubber floor mat.
4. Tighten the bolts for the front engine brackets.
5. Refit the muffler, connecting it to the exhaust manifold before permanently tightening the suspension bolt. Tighten the exhaust-pipe clamp.
6. Refit the wheels and lower the car to the floor.
7. Reconnect the earth cable to the engine.
8. Reconnect the speedometer cable and the freewheel control to the transmission unit.
9. Reconnect the throttle control and the cold-start control.
10. Refit the gear-shift shaft joint. On the 3-speed transmission unit, remember to attach the spring to the shaft between the joint and the dash panel.
11. Refit the clutch cylinder and adjust the clutch.
12. Refit the engine side stay.
13. Reconnect the temperature gage sender unit and the coolant hoses to the heat-exhanger.
14. Reconnect the starter and generator cables, as well as the cables and hose for ventilation, to the distributor. Refit the battery cable clamp to the transmission unit.
15. Reconnect the fuel hose to the pump.
16. Refit the air cleaner and preheater pipe.
17. On Saab Sport cars. Reconnect the oil monitor cable and the hose from the oil tank. Then remove the plug located in the middle of the upper part of the pump and crank the pump shaft round about 100 times by hand with the aid of a screwdriver or with tool No. 784128. See chapter 2.
18. Refit the radiator and tighten the two lower retaining bolts.
19. Reconnect the upper and lower coolant hoses.
20. Refit the grille and the radiator clamping straps.
21. Refit the radiator blind cord and the hood lock mechanism.
22. Reconnect the headlamp and direction-indicating flasher cables.
23. Refill the cooling system and check the transmission oil.
24. Reconnect the battery earth cable and refit the hood.
25. Test the engine.

3-SPEED TRANSMISSION

Disassembly

Proceed step by step as described in the following until the part concerned has been removed.

1. Clean the outside of the transmission unit and drain off the oil.
2. Remove the inner universal joints with shafts. On the Saab 96, they are connected to the side gears inside the differential by means of bolts which pass through the centers of the shafts, whereas in the case of the Saab Sport they are retained by a locking ring. See Section 473.
3. Separate the transmission unit at the joint between the clutch housing and the transmission case. After removing all the bolts, the clutch shaft will have to be turned to a specific position to allow separation of the casings. Turn the clutch shaft and find this position while removing the differential case.
4. Fit the transmission case in the fixture, tool No. 784100, as illustrated.



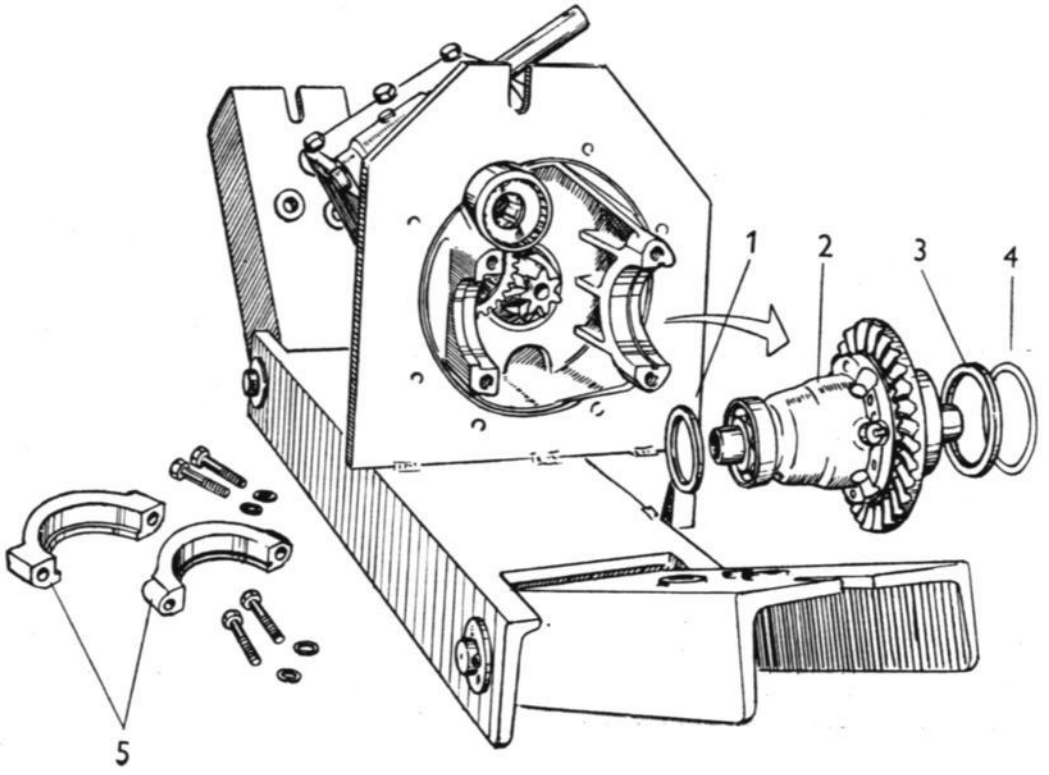
GEAR BOX HELD IN FIXTURE

NOTE

Before continuing to dismantle the transmission unit, always check the location of the pinion and measure the ring-gear backlash to ascertain if the setting has been incorrect. See Section 473.

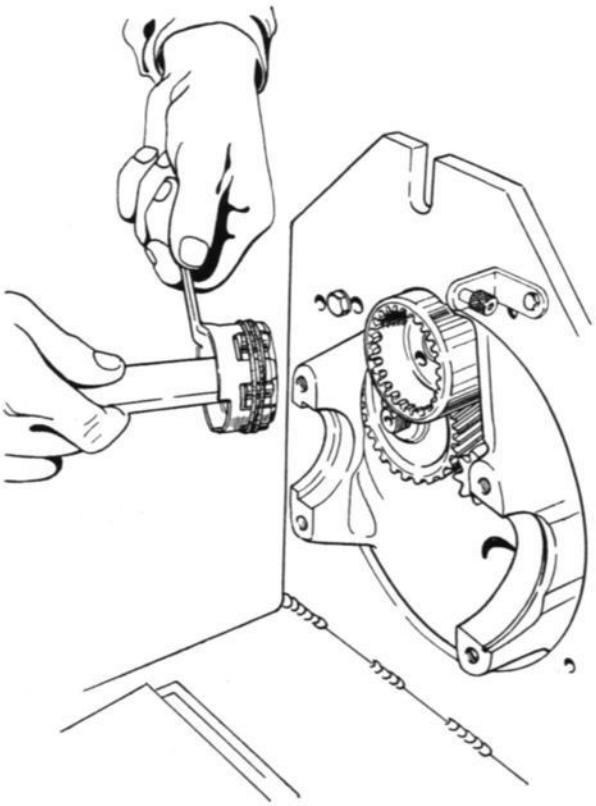
Differential, freewheel, etc.

5. Release the two differential bearing caps and lift the differential out. — NOTE: Collect the spacers and shims outside the two bearings and note their positions — see fig. Disassembly of the differential is described in Section 473.

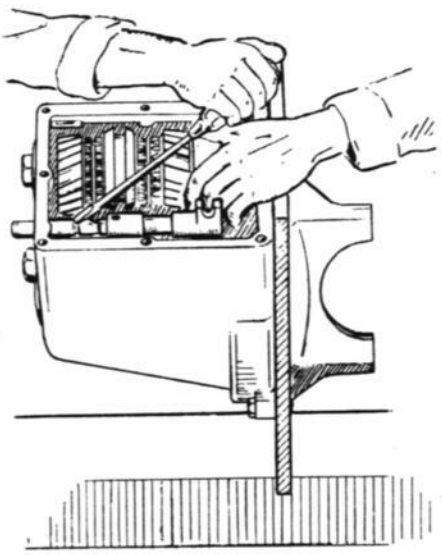


DISASSEMBLY OF DIFFERENTIAL

1, 3 and 4. Spacers and shims
2. Differential case
5. Caps



DISASSEMBLY OR REASSEMBLY OF FREEWHEEL HUB WITH TOOL 784068



DISASSEMBLY OF 1ST AND REVERSE SHIFT FORK

6. Remove the freewheel hub together with the six rollers from the freewheel sleeve, using tool No. 784068 and a strong rubber band to prevent the spring-loaded rollers from being thrown out. See fig. Next, remove the needle bearing. Check that none of the rollers is missing.
7. If the pinion shaft or bearings are to be disassembled, measure the location of the pinion shaft before removing the end cover. See Section 473.

Gear-shift forks

8. Remove the transmission case cover.
9. Remove the end cover together with the attached shift fork rail for the 2nd and 3rd gears. Take care to prevent ejection of the poppet ball. Collect the shims and gasket.

> NOTE
>
> If only the rear pinion shaft bearing is to be removed, this can be done now. Back off the nut and extract the bearing with tool No. 784101.

10. Using a screwdriver, push the 1st and reverse gear-shift fork rail through the end of the transmission case. Take care to prevent ejection of the poppet ball when the shaft is removed. See fig.

Countershaft with bearings and gears

11. Shift the synchronizer sleeves to engage two gears simultaneously.
12. Back off the nut at the front end of the countershaft. Remove the friction wheel and washer. Also back off the end nuts of the primary and pinion shafts if these are to be removed.

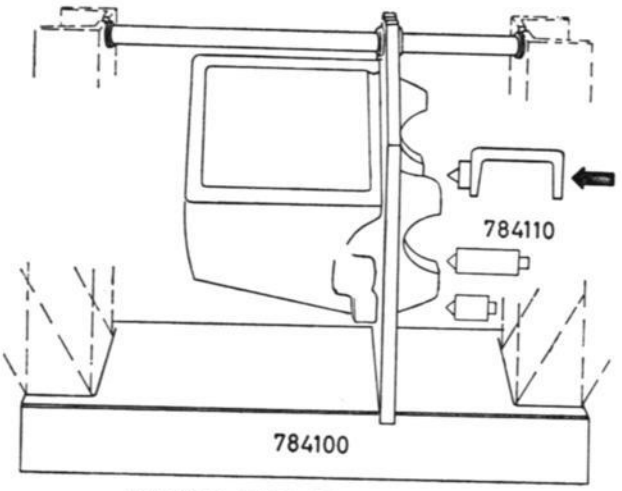
> NOTE
>
> The nut on the pinion shaft is left-hand threaded.

13. Return the synchronizer sleeves to the neutral position.
14. Lift the front end plate of the fixture and make it fast.

15. Locate the arbor, tool No. 784110, fitted with the shortest point, between the front press screw and the countershaft. See fig. Press in the shaft until the arbor rests hard against the gearwheel. Change the arbor point to the next longest one and press again. Repeat the procedure once more with the longest point until the bearing and countershaft gear are released. Collect the gear key. Remove the tool and drop the fixture end plate down.
16. Lift the front end of the countershaft, grip the gears with one hand and draw the shaft through the rear bearing opening. Remove the gear wheels. Note the washer between the 1st speed gear and the ball bearing, and collect the two needle bearings inside the 1st gear.

If necessary:

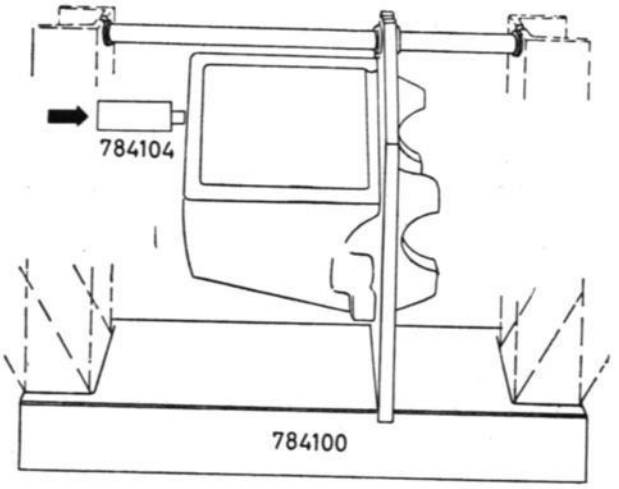
17. Remove the retaining ring and drive the ball bearing off the shaft.
18. Using an arbor, carefully drive or tap the remaining bearing towards the differential side. Note the retaining ring located behind the bearing.



DRIVING OUT COUNTERSHAFT

Primary shaft with bearings and gears

19. Fit the rear press screw of the transmission fixture against the primary shaft and locate the arbor, tool No. 784104, between the screw and the shaft.
20. Press the shaft out forwards, as illustrated, until it is released from the bearings.
21. Back off the press screw and remove the arbor.
22. Extract the shaft in the forward direction.
23. Hold the synchronizer unit and gears, and allow the washer to drop from between the 2nd speed gear and the ball bearing into the transmission case. Lift out the speed gear and synchronizer as a single assembly.
24. If the twin needle bearing in the 3rd speed gear hub did not accompany the shaft, remove it.
25. Remove the needle bearings from the 2nd speed gear hub.
26. Strip down the synchronizer unit.
27. Drive the rear primary shaft bearing out of the case with the press screw in the front end of the fixture, using tool No. 784109 and sleeve No. 784106.
28. Remove the thrust washer and locking pin from the shaft.
29. Remove the retaining ring and press the ball bearing off the shaft.



DRIVING OUT PRIMARY SHAFT

Pinion shaft with bearings and gears

NOTE

The rear pinion shaft bearing can be removed separately for bearing renewal or pinion adjustment as soon as the end cover has been removed, i.e. without removing the countershaft or primary shaft.

30. Apply the puller, tool No. 784101, to the pinion shaft rear bearing sleeve and pull the sleeve out together with the bearing. See fig. Use the front press screw of the transmission fixture for support against the drive pinion. Collect the spacer and shims from inside the bearing.

NOTE

On transmissions with an aluminium casing, use puller No. 784115 instead, as the construction is the same as in the 4-speed unit.

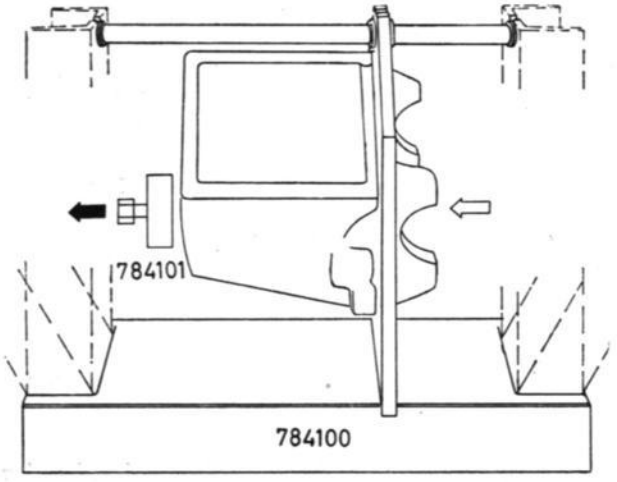
31. Remove the speedometer drive gear.
32. Place the rear fixture press screw against the pinion shaft and press the shaft out forwards. As soon as the press unit gives, remove the shaft and lift the gears out of the transmission case.
33. If necessary, drive the roller bearings off the pinion shaft.

Reassembly

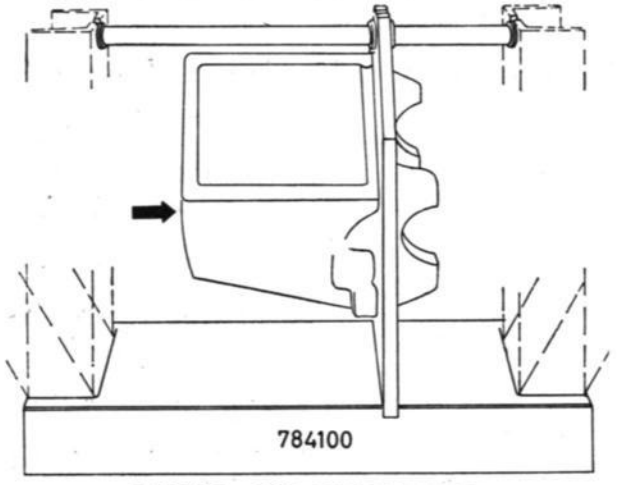
When the part concerned has been removed, clean the cover dividing plane and remove any gasket fragments and residual sealing compound. Inspect and clean all disassembled parts, as well as the transmission case, in kerosene, etc. Make sure that such items as poppet balls, needles from broken bearings, etc., are not left in the case. Then commence reassembly at the appropriate point in the following description.

NOTE

When fitting new gears, note that the following are supplied in matched sets:
3rd speed gear — pinion shaft 3rd gear
2nd speed gear — pinion shaft 2nd gear
Pinion shaft — ring gear
Quiet operation is ensured only if gears are renewed in complete sets and fitted with MATCHING NUMBERS FACING THE SAME SIDE.



PULLING OFF PINION SHAFT BEARING



DRIVING OUT PINION SHAFT

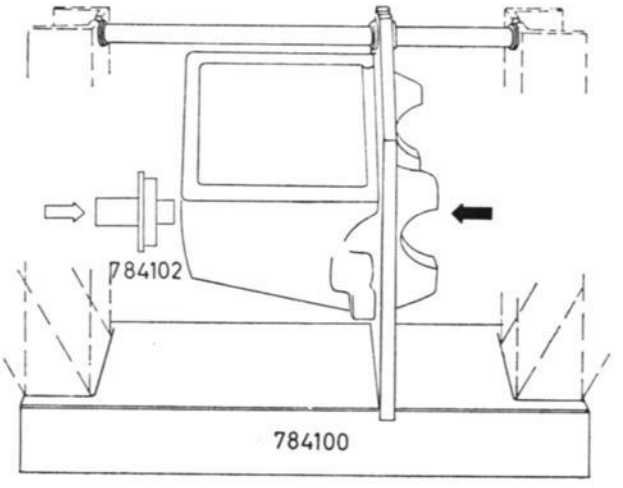
Pinion shaft with bearings and gears

1. After renewing worn or damaged parts, press the roller bearing onto the pinion shaft with the sleeve, tool No. 784106, and locate the two Woodruff keys in their grooves. Note that the keys are of different size and that the thinner one is intended for the 2nd gear.
2. Fit the 2nd and 3rd gears in the transmission case together with the speedometer drive gear.

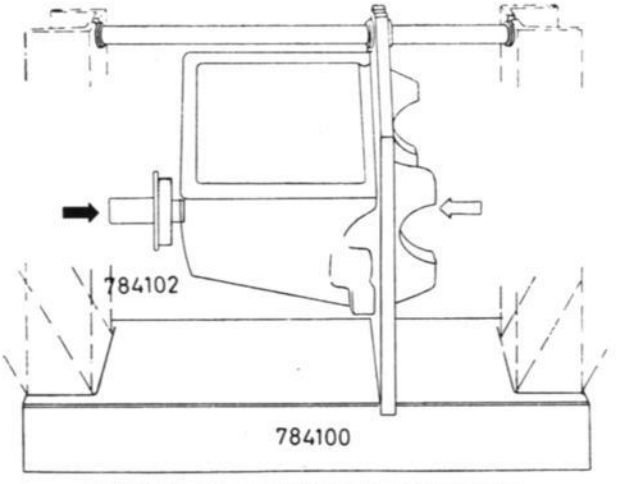
NOTE

Locate the speedometer drive gear with the bevelled side facing the differential. The matching number on the pinion shaft 3rd gear should face the same direction as the number on the 3rd speed gear.

3. Insert the pinion shaft from the front.
4. Locate the 3rd gear in relation to the key groove. Ensure that the speedometer drive gear is properly engaged and finally locate the 2nd gear in relation to the key groove. The best way of doing this is to align the groove in the gear after the retainer groove which is in line with the shaft key groove.
5. Locate the front press screw of the fixture against the pinion shaft and press carefully a mere fraction of an inch so that the drive pinion rides on the shaft. The pinion shaft 2nd gear will now rest against the rear end of the transmission case. Check that it is at right angles to the pinion shaft.
6. Back off the press screw a few turns, supporting the gearwheels meanwhile, and then locate the aligning arbor, tool No. 784102, in the rear bearing seat. Make sure that the shaft end passes into the arbor.
7. Drive the arbor in with the press screw until its flange is flush against the end of the transmission case. Allow the press screw to remain in this position.
8. Using the opposite press screw, drive the pinion shaft in from the front until the roller bearing is hard against the 3rd gear. See fig.
9. Back off the press screws and remove the arbor from the rear bearing seat.
10. Place a spacer, 0.14 in. (3.6 mm) thick, on the end of the shaft. Provided that the pinion shaft or any part thereof has not been renewed, use the previously fitted spacer and shims.
11. Refit the twin bearing in its sleeve if these items have been separated. The bearing marking should face inwards — see Section 473.
12. Drive the bearing and sleeve assembly in with the press screw and the arbor, tool No. 784102, using the press screw at the other end of the fixture as a support for the pinion shaft. See fig.
13. Fit a new tabbed retaining washer on the pinion shaft and screw on the left-hand threaded nut. Turn the tab on the washer outwards. Do not tighten the nut with a torque wrench until the primary shaft and countershaft have been refitted.
14. Refit the speedometer drive.



DRIVING IN PINION SHAFT



DRIVING IN PINION SHAFT BEARING

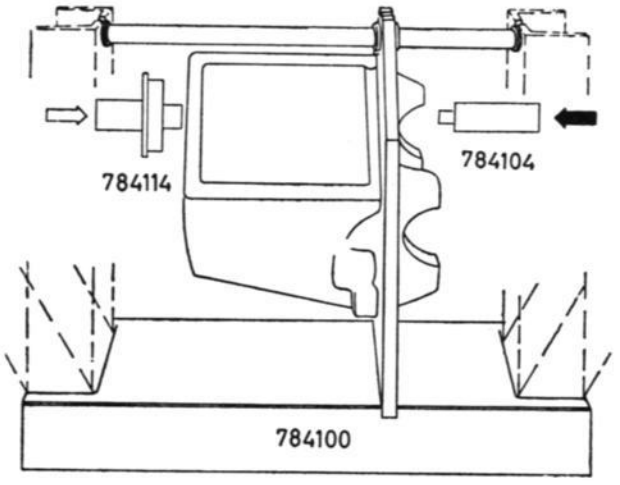
Primary shaft with bearings and gears

15. Drive the ball bearing onto the primary shaft and lock with the retaining ring. Use tool No. 784107.
16. Insert the locking pin in the shaft and fit the thrust washer behind the ball bearing retainer so that the locking pin drops into the groove in the washer, preventing it from rotating.
17. Reassemble the 3rd speed gear complete with twin needle bearing, synchronizer unit with rings, and the 2nd speed gear WITHOUT ITS BEARINGS. Pass this assembly into the transmission case and fit the aligning arbor, tool No. 7841114, in the end of the transmission case so that it enters the 2nd speed gear hub.
18. Pass the primary shaft in from the front, turning it gently back and forth meanwhile so that its lands enter the synchronizer hub.
19. Fit the arbor, tool No. 784104, in the freewheel sleeve.

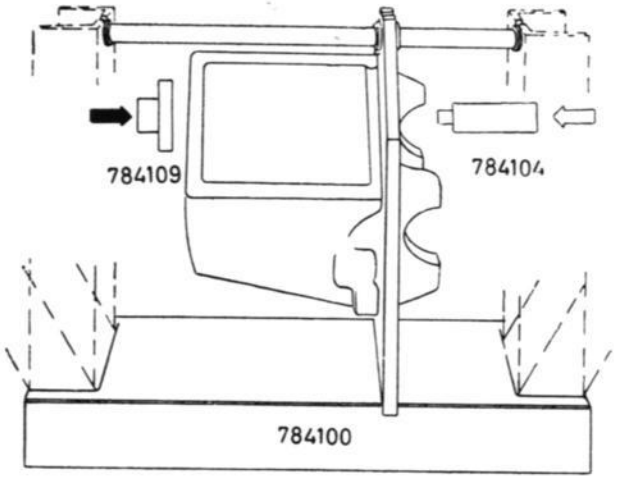
NOTE

The needle bearing must be removed from the freewheel sleeve to protect it from being damaged.

20. Lift and lock both ends of the fixture and support the arbor in the 2nd speed gear hub with the rear press screw.
21. Drive the primary shaft carefully in from the front towards the arbor in the freewheel sleeve (see fig.), using the press screw. Make sure that the synchronizer hub slides easily on the shaft.
22. Back off the rear press screw and remove the arbor from the 2nd speed gear hub.
23. Place the needle bearings and the steel bushing in the 2nd speed gear and fit the washer on the shaft. Note that the bevelled side of the washer hole should face outwards.
24. Drive in the primary shaft rear bearing with the aid of the press screw and tool No. 784109. Note that the press screw and tool No. 784104 at the freewheel sleeve serve to support the shaft.
25. Back off the two press screws and remove the arbors.
26. Place a new tabbed washer, with the tab facing outwards, and an end nut on the shaft.
    Do not tighten the nut with a torque wrench until the countershaft has been refitted.



DRIVING IN THE PRIMARY SHAFT



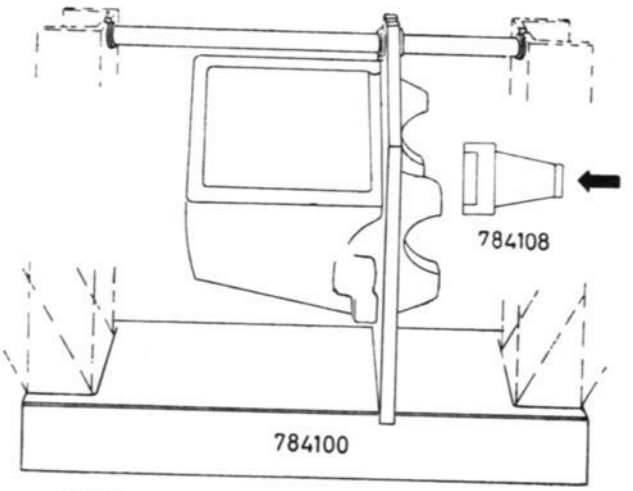
DRIVING IN THE PRIMARY SHAFT BEARING

Countershaft with bearings and gears

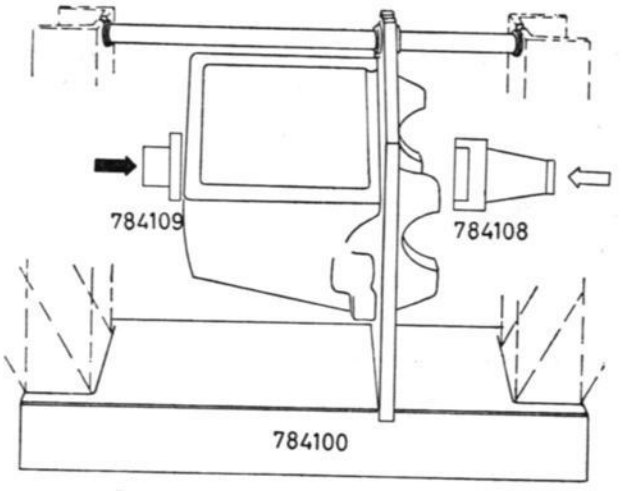
27. If the countershaft front ball bearing has been removed, drive it into the transmission case from the differential side until it lies hard against the retaining ring. To do this, lift and lock the rear end plate of the fixture and drive the bearing in with the press screw and arbor, tool No. 784108. See fig.
28. Place the countershaft gear on the outside of the bearing, holding it with tool No. 784108. Tighten the front press screw as much as necessary to hold the gear in position against the bearing. See fig. Note that the turned part of the hub is to face the clutch housing.
29. Reassemble the reverse gear and the 1st speed gear with its two needle bearings and washer. Mount these parts as an integral unit, inserting the countershaft through the rear bearing seat at the same time. If the ball bearing has not been removed from the shaft, it can remain in position during reassembly, provided that the retaining ring is taken off.
30. Drive the shaft in, using the rear press screw and the arbor, tool No. 784104. Make sure that the shaft passes into the countershaft gear.
    If the shaft is driven in complete with bearing, tool No. 784109 (see fig.) should be used instead. This tool is also used for fitting the ball bearing after insertion of the shaft. Don't forget to fit the ball bearing retaining ring.
31. Shift the synchronizer units to engage two gears simultaneously, and turn the 3rd speed gear to align the key grooves in the countershaft and countershaft gear. Using an arbor, drive the key in as far as it goes.
32. Fit a new retaining ring with the tab facing inwards, or mount the friction wheel with a new friction washer and star washer. Tighten the countershaft end nut with a torque of 60 ft-lb (8 kgm), and the primary shaft nut with 35 ft-lb (5 kgm). Tighten the pinion shaft nut initially with a torque of 90 ft-lb (12 kgm), back off, and retighten with 45 ft-lb (6 kgm).

NOTE

Check that the friction wheel is not located outside the opposing gear and that there is sufficient clearance between the primary shaft ball bearing and the countershaft gear. See "Countershaft" in this section.



REFITTING THE COUNTERSHAFT BEARING



DRIVING IN THE COUNTERSHAFT

33. Return the synchronizer sleeves to the neutral position.
34. Lock the countershaft and primary-shaft nuts. The pinion-shaft nut can also be locked, provided that you are confident that the shaft is properly adjusted. If not, leave the nut unlocked until the adjustment has been carried out.
35. Check the end-cover shims and adjust if necessary. See "Transmission unit with end cover" in this section.

Gear-shift forks

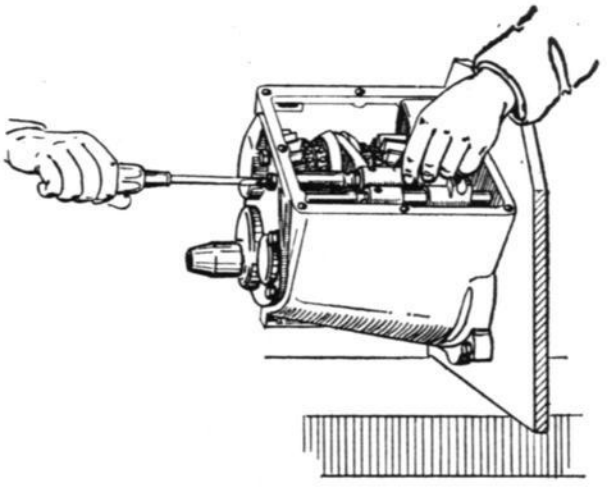
36. Insert the spring and poppet ball in the 1st-and-reverse gear-shift fork. Put the fork in position and push the shaft in. To simplify this task, use tool No. 784069 to hold the poppet ball in place.
37. Put the 2nd-and-3rd gear-shift fork in place, after having fitted the poppet ball and spring with the aid of tool No. 784069.
38. Check that the rubber washer and plastic plug have been mounted in the end cover and the oil collector in the transmission case end.
39. Fit the 2nd-and-3rd gear-shift fork to the end cover and push the shaft in. Be sure to fit the previously used or newly selected shims after coating them with a little grease so that they adhere to the end cover. If adjustment of the pinion drive is not called for, coat both sides of the gasket with sealing compound, for instance Permatex No. 3. Tighten the end-cover bolts with a torque of 18 ft-lb (2.5 kgm).
40. If necessary, back off the locking nut and adjust the 2nd-and-3rd gear-shift fork (see fig.), so that it is not subjected to axial pressure when 2nd or 3rd gear is engaged. There must be a definite clearance between the synchronizer sleeve and the respective gear.

Differential, freewheel, etc.

41. Check the drive pinion setting and adjust if necessary. See section 473.

> NOTE
>
> Before measuring the drive pinion setting, always tighten the pinion shaft end nut and all end-cover bolts with the correct torque.

42. After having adjusted the drive pinion, remember to check that the shaft nut is locked before finally tightening the end cover.
43. Insert the differential and ring gear in the bearing seats and adjust the backlash between the drive pinion and the ring gear. See Section 473.
44. Fit the freewheel hub complete with rollers in the freewheel sleeve, using tool No. 784068. See fig.



ADJUSTING THE 2ND-AND-3RD GEAR-SHIFT FORK SHAFT

> NOTE
>
> The hub should engage firmly when twisted to the right. It is marked on the front face.

45. Check that all the gears are at neutral and fit the transmission case cover after having coated the sealing surface with sealing compound such as Permatex No. 3.
46. Remove the transmission case from the fixture.
47. Clean the clutch housing sealing surface and coat with sealing compound.
48. Insert the needle bearing in the freewheel sleeve.

> NOTE
>
> Check the clutch-shaft seal and drive-shaft seals and renew as necessary. Fit the seals so that the dust-guard lips face outwards. Fill the space between the lips with chassis grease.

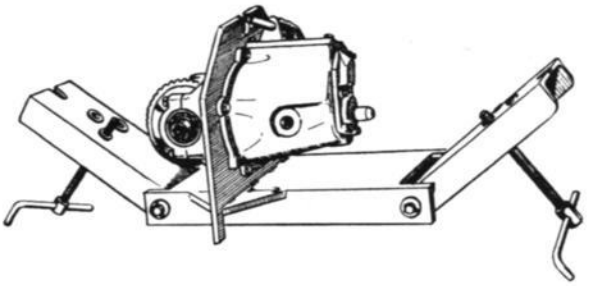
49. Refit the clutch housing to the transmission case. Turn the clutch shaft so that it clears the differential. Drive the locating pin in.
50. Refit the inner universal joints and shafts. Pass the shafts in carefully, to avoid damaging the sealing rings or dislocating their retaining springs.
51. Smear the clutch shaft splines with graphite grease and fill the transmission unit with transmission oil.

4-SPEED TRANSMISSION

Disassembly

Proceed step by step as described in the following until the part concerned has been removed.

1. Clean the outside of the transmission unit and drain off the oil.
2. Remove inner universal joints with shafts. On Saab 95 and 96 these are bolted to the differential side gears through the center of the shafts. On Saab Sport they are fitted with a snap ring. See section 473.
3. Separate the transmission unit at the joint between the clutch housing and the transmission case. After removing all the bolts, the clutch shaft must be turned to a specific position to allow separation of the casings. Turn the clutch shaft and find this position while removing the clutch housing.
4. Remove the transmission case cover together with the gear-shift fork shaft.
5. Fit the transmission case in the fixture, tool No. 784100, as illustrated.

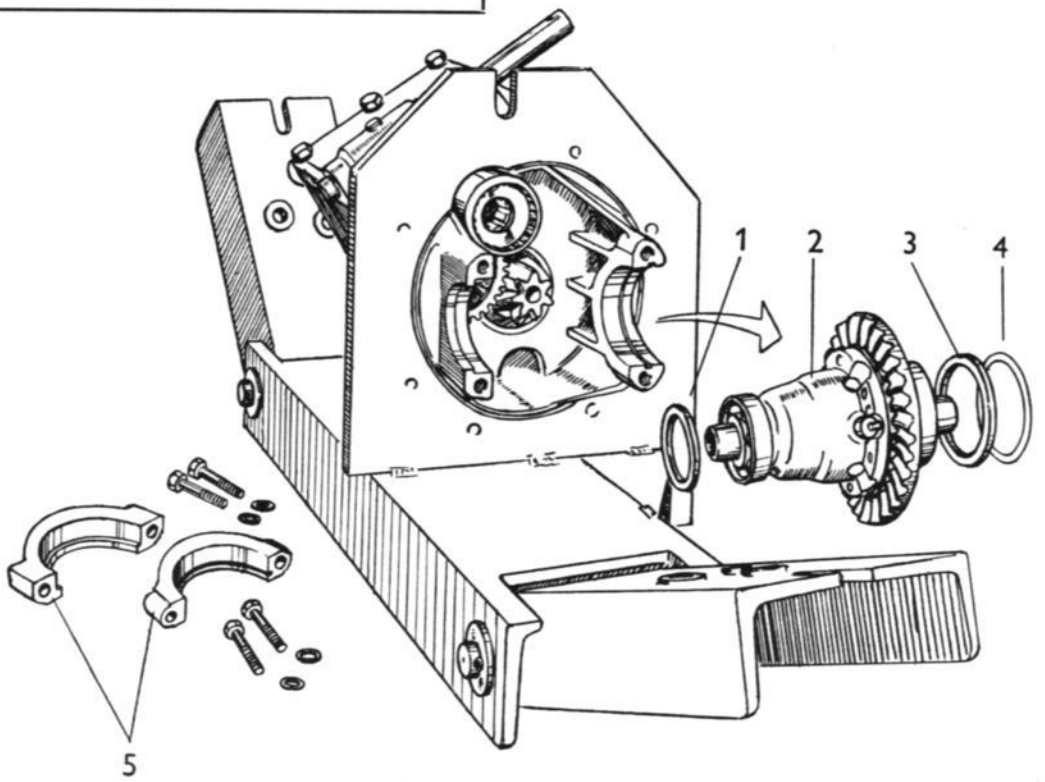


TRANSMISSION CASE HELD IN FIXTURE

5. Release the two bearing caps and lift out the differential assembly. Collect the spacers and shims outside the bearings for subsequent refitting, provided that differential backlash has not been altered by the fitting of a new part. Disassembly of the differential is described in Section 473.

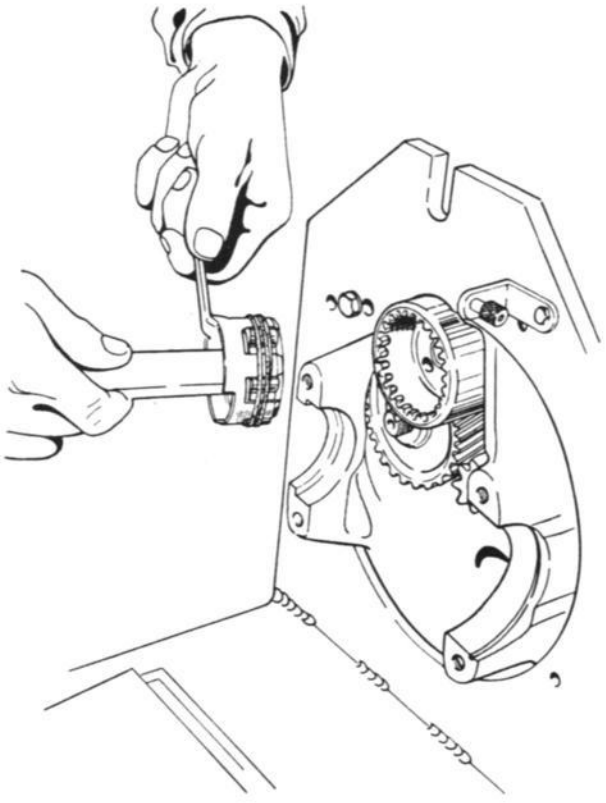
Differential and freewheel

> NOTE
>
> Before continuing to dismantle the transmission unit, always check the location of the pinion and measure the ring-gear clearance to ascertain if the setting has been incorrect.



DISASSEMBLY OF DIFFERENTIAL

1, 3 and 4. Spacer rings and shims
5. Bearing caps

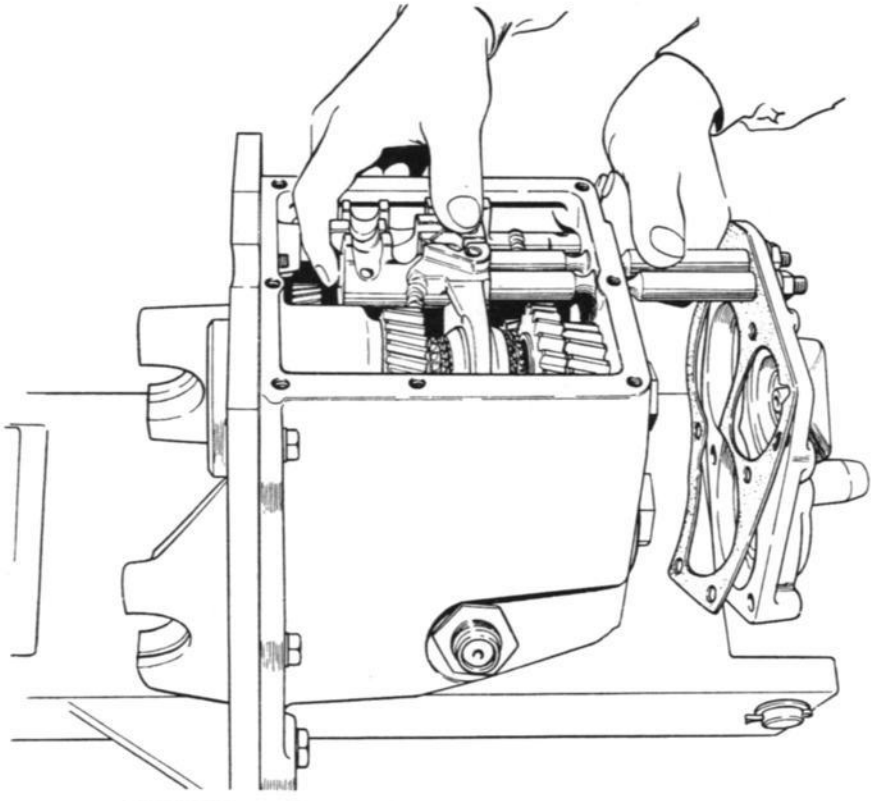


DISASSEMBLY OR REASSEMBLY OF FREEWHEEL HUB WITH TOOL 784068

6. Remove the freewheel hub from the freewheel sleeve, using tool No. 784068 and a rubber band. See fig.
7. Take the needle bearing out of the freewheel sleeve. Check that none of the rollers is missing. If the pinion shaft or bearings are to be dismantled, measure the location of the shaft before removing the end cover. See Section 473.

Gear-shift forks

8. Back off the end-cover bolts and drive out the 1st-2nd and 3rd-4th gear-shift fork shaft from the front, using an arbor or similar tool.
9. When the cover is free, take it off rearwards, keeping the gear-shift forks in position and preventing them from tipping on the shafts, see fig.
   Note the location of shims in the cover and collect the shims.
   Take care to prevent ejection of the poppet balls in the gear-shift forks. See fig.
10. If only the rear pinion shaft bearing is to be removed, this can be done now as follows: Engage two gears (reverse and 3rd), release the retaining washer and back off the left-hand threaded end nut on the shaft, whereupon the bearing can be removed with the aid of puller 784115. See fig. A new bearing can now be fitted and the pinion shaft shimmed.



DISASSEMBLY OF END COVER AND SHIFT FORK RAILS

11. Using a screwdriver or similar implement, release the reverse gear-shift fork shaft and withdraw it rearwards. See fig.Take care to prevent ejection of the poppet ball.
12. Lift out the three gear-shift forks.

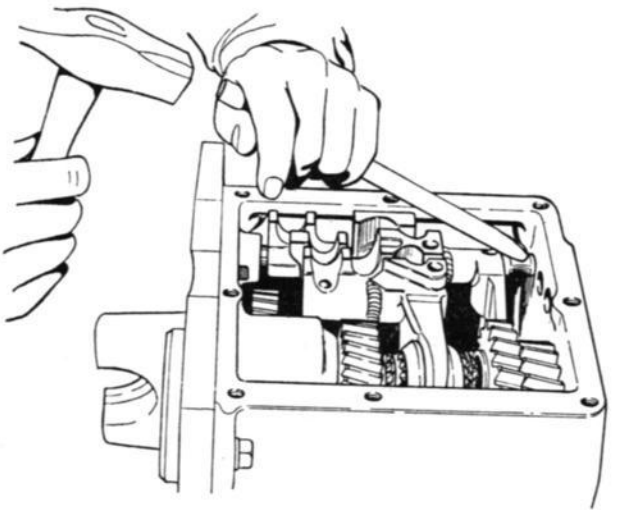
Countershaft with bearings and gears

13. Engage two gears simultaneously, e.g. reverse and 3rd.
14. Back off the nut at the front end of the countershaft. Remove the friction wheel and washer. Also back off the end nuts of the primary and pinion shafts if these are to be removed.

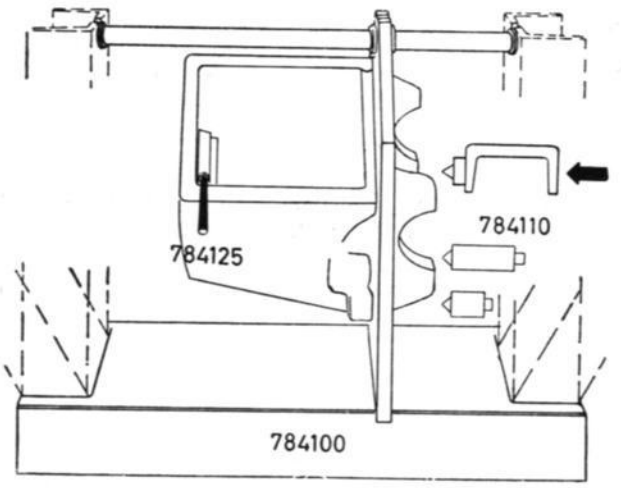
> NOTE
> The pinion shaft nut is left-hand threaded.

15. Return the synchronizer sleeve to the neutral position. Lift up and secure the front end plate of the fixture.
16. Locate the arbor, tool No. 784110, fitted with the shortest point, between the front press screw and the countershaft — see fig. — and press in the shaft until the arbor rests hard against the gearwheel. Meanwhile, the supporting tool, No. 784125, should be located between the 1st speed gear and the rear end of the transmission case, as illustrated. Change the arbor point to the next longer one and press the shaft in again. Repeat the procedure with the longest point until the bearing and countershaft gear are released. Remove the tools and drop the fixture end plate down.
17. Grip the rear end of the shaft and pull it out rearwards, whereupon the countershaft gear is released. Allow the spacer at the front bearing to drop down into the case while lifting the entire assembly, comprising the two gears and interlying synchronizer unit, out of the case. Collect the washer and key for the countershaft gear.
    If necessary:

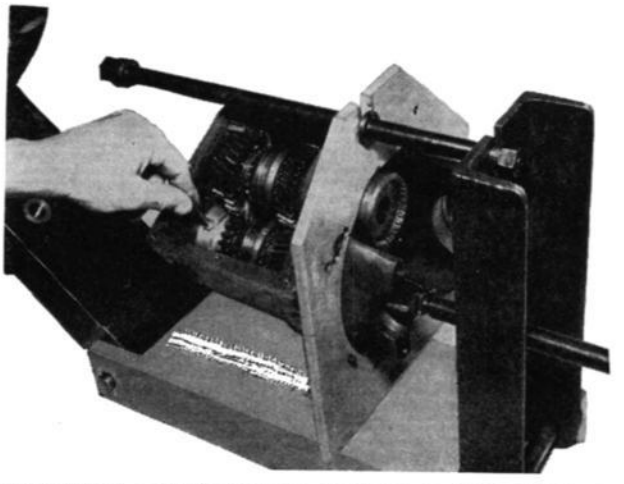
a. Remove the retaining ring from the shaft and drive off the rear ball bearing and the bearing seat, enabling the reverse gear to be removed.
b. The front countershaft bearing cannot be changed without removing the primary shaft.



DRIVING OUT REVERSE SHIFT FORK RAIL



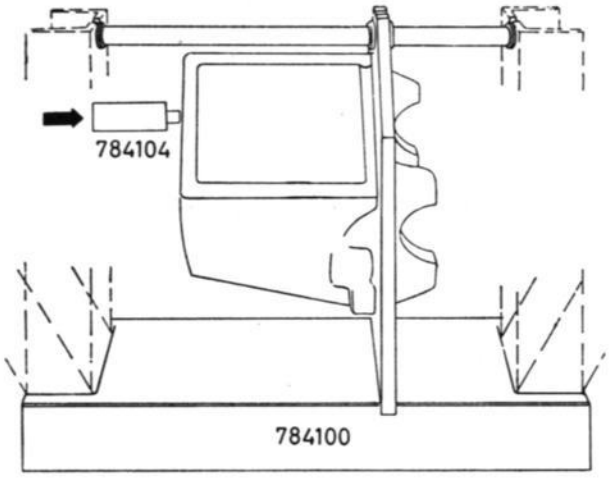
DRIVING OUT COUNTERSHAFT



LOCATING OF HOLDING-UP TOOL 784125 DURING DRIVING-OUT OF COUNTERSHAFT

Primary shaft with bearings and gears

18. Back off the primary shaft end nut and remove the retaining washer. Lift up and secure the rear end plate of the fixture.
19. Place the arbor, tool No. 784104, between the rear press screw and the shaft, as illustrated, and press the shaft in until it is released from the bearings.
20. Remove the shaft in the forward direction, allowing the spacer at the rear bearing to drop down into the transmission case while lifting out the gears and synchronizer as a single unit.
21. When the primary shaft has been withdrawn, the front bearing of the countershaft can be removed by gently tapping it with a fiber mallet towards the differential side.
22. Drive out the rear primary shaft bearing, using the front press screw, tool No. 784109 and the extension sleeve No. 784106. If necessary:
    a. Remove the thrust washer and locking pin from the shaft.
    b. Remove the retaining ring from the shaft and drive off the front bearing.

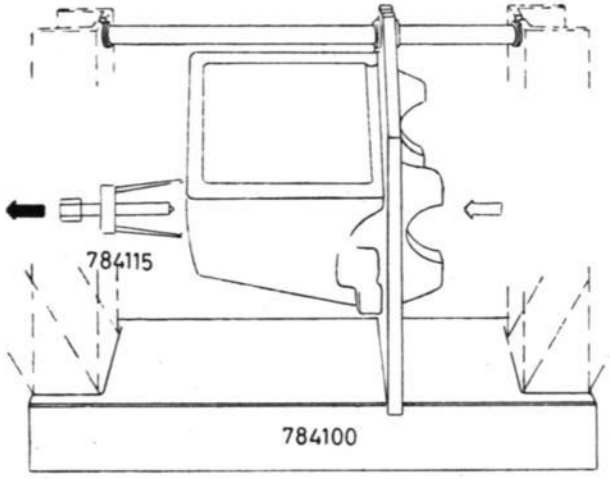


DRIVING OUT PRIMARY SHAFT

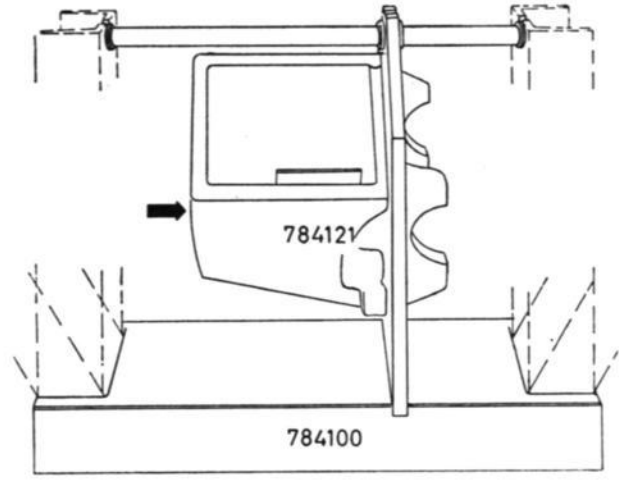
Pinion shaft with bearings and gears

> NOTE
>
> The rear pinion shaft bearing can be removed separately for bearing renewal or pinion adjustment as soon as the end cover has been removed, i.e. without removing the primary shaft and countershaft.

23. Remove the speedometer drive gear.
24. Remove the left-hand threaded end nut from the shaft and pull out the rear pinion shaft bearing with the puller, tool No. 784115, using the front press screw to support the shaft. Collect the spacer and shims from inside the bearing. See fig.



DRIVING OUT PINION SHAFT BEARING



DRIVING OUT PINION SHAFT

25. Locate the supporting tool, No. 784121, on the lower side of the shaft between the rear gearwheel and the front end of the case — see fig. Make sure that the tool is centered on the gearwheel so that the gear does not tip on the shaft.
26. Lift and secure the rear end plate of the fixture and drive the pinion shaft out in the forward direction with the press screw until the roller bearing clears the front end of the case. Remove the tool and drop the fixture end plate. Lift the 3rd gear out of the case, withdrawing the shaft at the same time. Collect the Woodruff key, if loose.

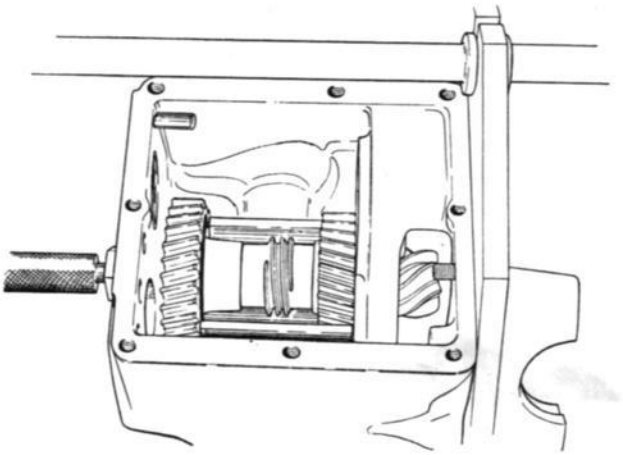
If necessary:

a. Press the front roller bearing and pinion shaft 4th gear from the shaft, proceeding as follows:
b. Remove the retaining ring from the roller bearing, if the latter is to be saved for subsequent reassembly. If the bearing is to be rejected there will be no need to remove the ring.
c. Place the pinion shaft and the supporting tool, No. 784123, in an arbor press, as illustrated, and drive out the shaft. Make sure that the outer bearing race is flush against the gearwheel.

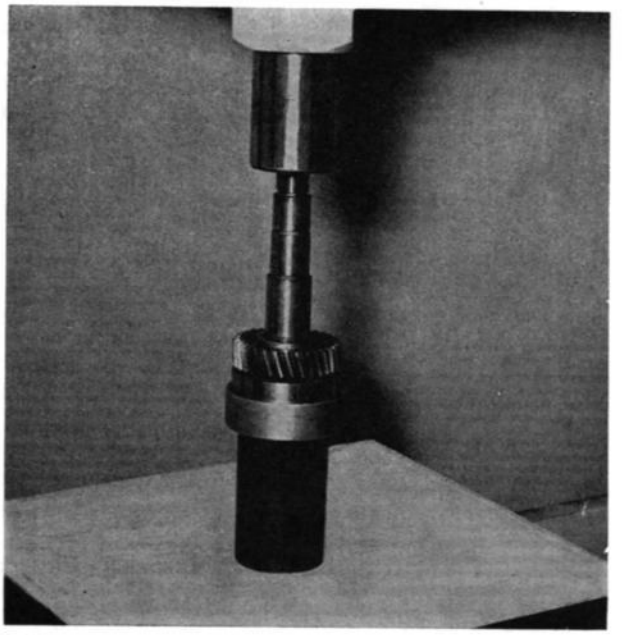
   On no account should the bearing be taken apart if it to be reassembled later. Take care to prevent the rollers from falling out and refit the retaining ring immediately, expanding it first so that it springs properly in the groove.
d. Remove the oil collector from the transmission case by gently pressing it out.

NOTE

When installing new gears in the transmission unit, remember that the 3rd speed gear and pinion shaft 3rd gear are supplied in matched sets, as are the 4th speed gear and the pinion shaft 4th gear. Quiet operation is ensured only if both the gears in the set are renewed at the same time. The pinion shaft and ring gear are also matched and must be changed in pairs. Fit the gears so that the matching numbers face the same way in the case of wheels for which alternative positioning is possible.



DRIVING OUT THE PINION SHAFT



PRESSING OFF THE FRONT PINION SHAFT BEARING AND 4TH GEAR IN AN ARBOR PRESS WITH THE AID OF THE SUPPORTING TOOL, No. 784123

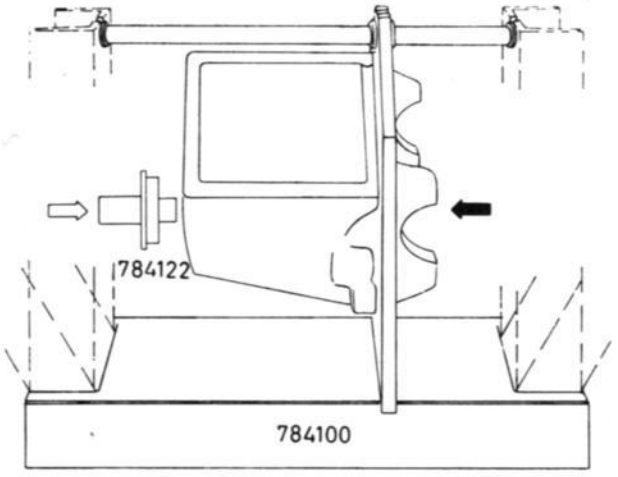
Reassembly of transmission unit

When the part concerned has been removed, clean the cover dividing plane and remove any gasket fragments and residual sealing compound. Inspect and clean all disassembled parts, as well as the transmission case, in kerosene or the like. Make sure that such items as poppet balls, needles from broken bearing, etc., are not left in the case. Then commence reassembly at the appropriate point in the following description.

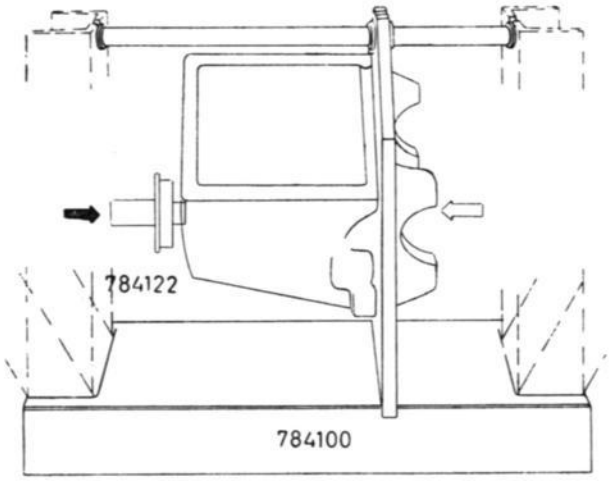
Pinion shaft with bearings and gears

1. Locate the front roller bearing, pinion shaft 4th gear, spacers and speedometer drive gear on the pinion shaft. Using an arbor press and tool No. 784106, drive the roller bearing and pinion shaft 4th gear in until the inner bearing race is flush with the drive pinion. Check that the matching number faces the same way as on the 4th speed gear.
2. Next, pass the pinion shaft through the end of and into the transmission case from the differential side, and then locate the pinion shaft 3rd gear on the shaft inside the case. Make sure that the Woodruff key for the 3rd gear has been fitted to the pinion shaft. In some older units, the pinion shaft 4th gear is also held by a Woodruff key instead of being press-fitted.
3. Turn the shaft to align the Woodruff key in relation to the groove in the 3rd gear.
4. Insert the guiding arbor, tool No. 784122, in the rear bearing seat so that the pinion shaft passes into it.
5. Secure the arbor with the rear press screw so that its flange is flush against the transmission case end. See fig.
6. Drive the pinion shaft finally home with the front press screw, checking that the key engages in the pinion shaft 3rd gear.
7. Back off the rear press screws and remove the arbor from the bearing seat.
8. Place an 0.14 in. (3.6 mm) spacer on the shaft end.

> NOTE
>
> If no part of the pinion shaft assembly has been renewed, the previously used spacer and shims may be refitted.



DRIVING IN PINION SHAFT



DRIVING IN PINION SHAFT BEARING

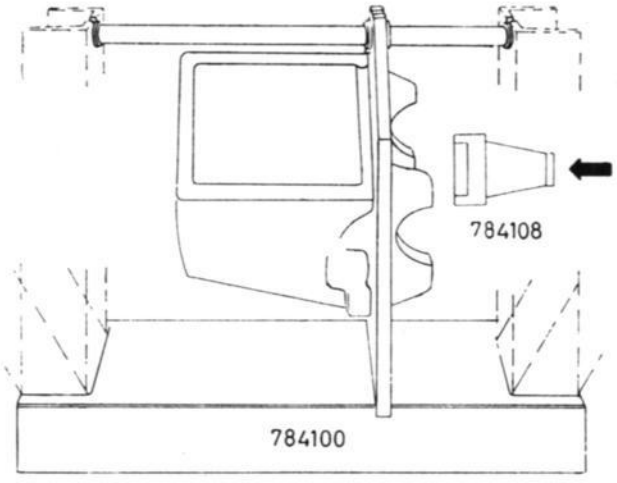
9. Using the press screw and arbor No. 784122, press the rear ball bearing, complete with retaining ring, into the transmission case end. Use the press screw at the front end of the pinion shaft as a support during this operation.
10. Back off the rear press screw, remove the tool and drop both fixture end plates down.
11. Fit a new tabbed washer onto the pinion shaft, with the tab facing outwards. Put on the left-hand threaded nut, but do not tighten it with a torque wrench until the primary shaft and countershaft have been reassembled. See point 28.

Primary shaft with bearings and gears

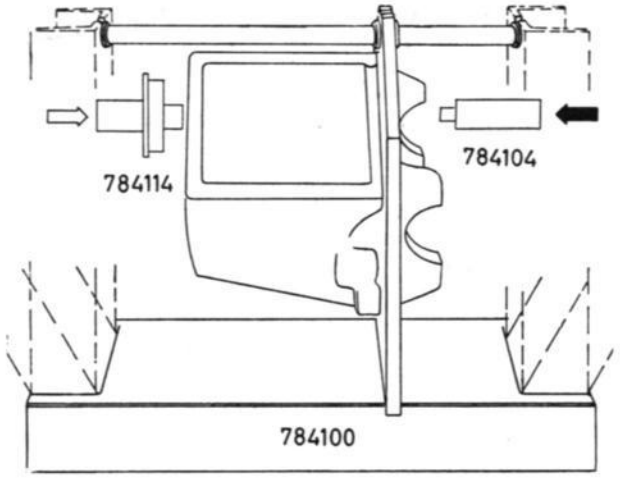
12. Refit the front bearing (using tool No. 784107) and place the retaining ring, locking pin, thrust washer and 4th speed gear needle bearing on the primary shaft. Check that the locking pin prevents the thrust washer from rotating.
13. Before pressing in the primary shaft, the countershaft front bearing must be placed in position. Press the bearing in from the front with the aid of the arbor, tool No. 784108, until it rests hard against the retaining ring in the bearing seat.
14. Assemble the primary shaft components, the 3rd and 4th speed gears together with the synchronizer sleeve and rings, and lift the entire assembly into the transmission case while passing the aligning arbor 784114 into the 3rd speed gear through the rear bearing seat.
15. Pass the shaft in carefully from the front until its splines enter the synchronizer hub.
16. Fit the arbor, tool No. 784104, into the freewheel sleeve.

> NOTE
>
> The needle bearing must be removed from the freewheel sleeve while this is being done.

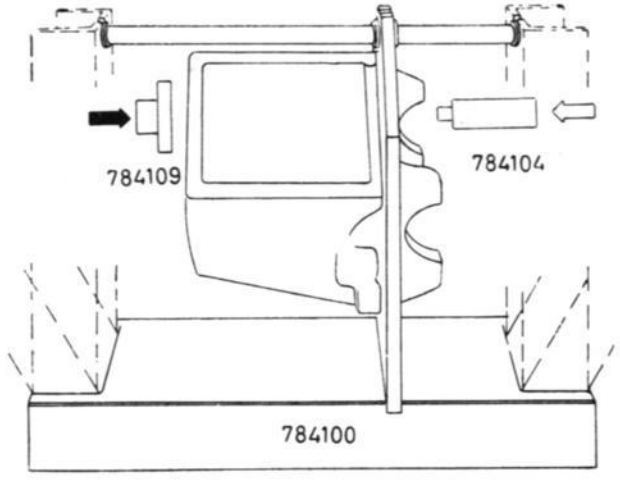
17. Lift and secure the front end plate of the fixture and drive the primary shaft carefully in against the arbor in the freewheel sleeve with the press screw (see fig.) until the 3rd speed gear lies hard against the rear case end. Check that the synchronizer hub does not tip.
18. Remove the aligning arbor from the 3rd speed gear and locate the needle bearing, spacer sleeve and bushing for this gear on the shaft inside the gear hub.
19. Place the spacer — with the bevelled side facing outwards — and the rear bearing on the primary shaft, and then drive the bearing in with tool No. 784109. Note that the front press screw and the arbor in the freewheel sleeve serve to hold up the shaft.
20. Back off the two press screws and drop down the rear fixture end.
21. Place a new tabbed washer, with the tab facing outwards, and a nut on the shaft. Do not tighten the nut with a torque wrench until the countershaft has been refitted. See point 28.



DRIVING IN COUNTERSHAFT BEARING



DRIVING IN PRIMARY SHAFT



DRIVING IN PRIMARY SHAFT BEARING

Countershaft with bearings and gears

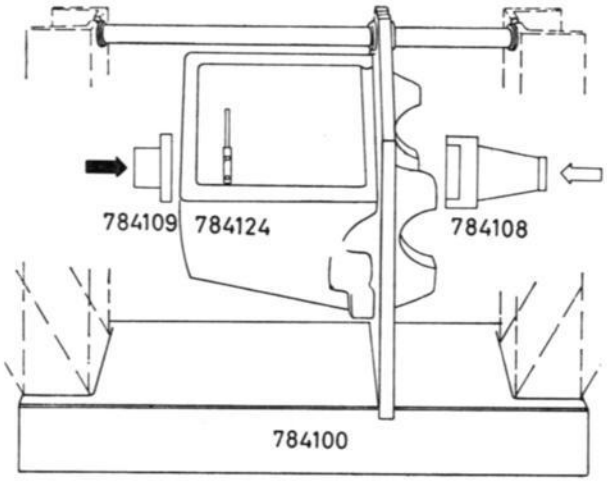
22. Reassemble the 1st and 2nd speed gears, the latter complete with needle bearing, spacer and bushing, and the synchronizer unit with its rings.
23. Lift this assembly into the transmission case, passing the countershaft, complete with the 1st speed gear needle bearing, through the rear end of the transmission case at the same time.

> NOTE
>
> If the rear bearing, bearing seat and reverse gear have not been removed, they may remain on the shaft during reassembly. In this case, however, the bearing must first be pressed into the seat and the rear retaining ring removed from the shaft.

24. Place the spacer on the shaft between the 2nd speed gear and the front ball bearing. Then pass the shaft through the front bearing and into the countershaft gearwheel, holding the latter in position with the front press screw and tool No. 784108. See fig.
25. Raise and secure the end plates of the fixture and place the countershaft gearwheel in its correct position with the machined part facing the clutch bearing. Use the front press screw and tool No. 784108 to hold the countershaft gearwheel and bearing in position. See figs.
26. Drive the countershaft in with the press screw and tool No. 784109. See fig. In so doing, make sure that the shaft splines engage with the synchronizer hub and that the shaft passes into the countershaft gear. Use the peg wrench, tool No. 784124, to turn the shaft. See fig.
    Drop both fixture end plates and secure the rear bearing with the retaining ring after pressing home.

> NOTE
>
> If the countershaft is refitted complete with reverse gear and bearing, use tool No. 784109. This tool is also to be used if the reverse gear and the seat with the bearing are mounted separately.

27. Engage two gears simultaneously, e.g. 2nd and 4th, and turn the 3rd speed gear in order to align the key grooves in the countershaft and the countershaft wheel. Drive the key in with an arbor.



DRIVING IN COUNTERSHAFT

28. Refit the friction wheel together with a new friction washer and star washer. Tighten the countershaft end nut with a torque of 60 ft-lb (8 kgm). The primary shaft and pinion shaft nuts, the latter left-hand threaded, should also be tightened with a torque wrench at this stage, if they have been backed off.
    Tighten the pinion shaft nut initially with a torque of 90 ft-lb (12 kgm), back off, and retighten with a torque of 45 ft-lb (6 kgm). The primary shaft nut is to be tightened with a torque of 35 ft-lb (5 kgm).

> NOTE
>
> Check that the friction wheel is not located outside the opposing gear and that there is sufficient clearance between the primary shaft ball bearing and the countershaft gear. See "Countershaft" in this section.

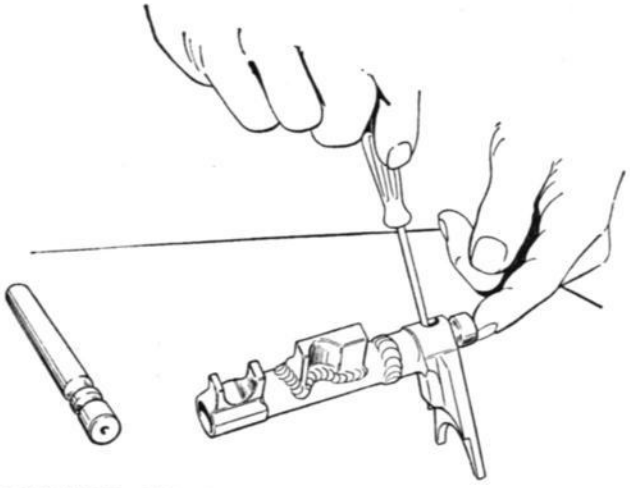
29. Secure all nuts by bending down the tabs on the washers. If you are uncertain whether the pinion shaft is properly adjusted, leave the pinion shaft nut unlocked until this adjustment has been carried out.

Gear-shift forks

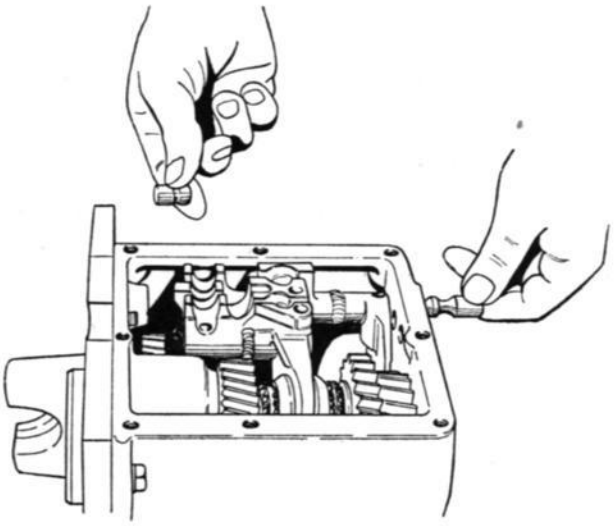
30. Return the synchronizer sleeve and reverse gear to the neutral position and insert the gear-shift forks. Note that springs and poppet balls, especially in the reverse gear-shift fork, must be fitted and secured with tool No. 784069 before the forks are inserted in the transmission case. See fig.
31. Pass the reverse gear-shift fork through the rear end and collect the tool used to hold the poppet ball in position as it is displaced at the front end of the fork. See fig.
32. Check that the rubber washer and plastic plug have been mounted in the end cover and the oil collector in the transmission case end.
33. Check the shims in the end cover, or select new ones. See "Transmission case and end cover" in this section.
    When the end cover is to be finally replaced, affix a new gasket by coating it on both sides with sealing compound such as Permatex 3.
34. Pass the 1st-and-2nd and 3rd-and-4th gear-shift fork shafts through the rear end, positioning them so that the forks engage with their respective shafts.
35. Fit the poppet balls in the forks. This is simplified if the balls are held with two tools No. 784069 while the cover is being pressed in.
    Do not forget to fit the previously used or newly selected shims in the end cover after coating them with a little grease so that they adhere to the end cover during assembly.
36. Collect the two fixing tools as they are pressed out at the front ends of the forks, and tighten the end cover bolts with a torque of 18 ft-lb (2.5 kgm).

> WARNING
>
> Check that the bolt opposite the reverse gear-shift fork is not too long, which would impede fork movement.

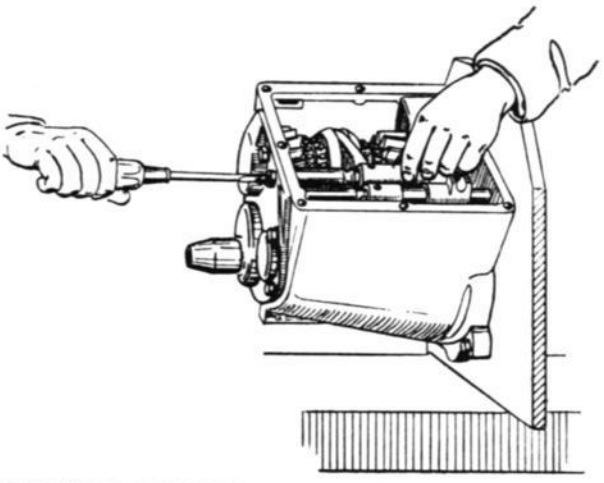
37. If necessary, adjust the gear-shift fork shafts (see fig.), so that the forks are not subjected to axial pressure when a gear is engaged. Roughly the same amount of clearance should exist between the synchronizer sleeve and the gear concerned in all gear positions.
38. NOTE: The pinion shaft should be measured and adjusted as necessary at this point. See section 473.



LOCATING POPPET BALL IN REVERSE SHIFT FORK WITH TOOL 784069



COLLECTING TOOL 784069 WHEN SHIFT FORK RAIL HAS BEEN DRIVEN IN



ADJUSTING THE 1ST-2ND AND 3RD-4TH GEAR SHIFT SHAFTS

Differential

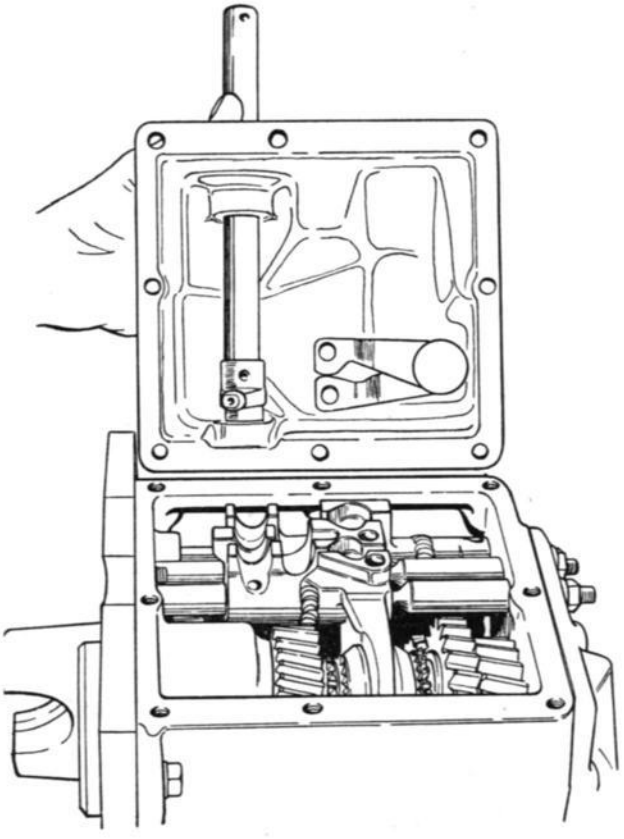
39. Refit the differential assembly and spacers, and tighten the bearing cap bolts with a torque of 28 ft-lb (4 kgm).

> NOTE
>
> If the pinion shaft setting has been altered or parts of the differential assembly renewed, always check the side clearance of the bevel gear and adjust if necessary. See Section 473.

40. Refit the speedometer drive gear.
41. Coat the top cover with sealing compound such as Permatex No. 3, and check that the three gear-shift forks in the transmission case and the dogs and catch in the cover are at neutral. Now fit the cover on the case. See fig.
42. Check the function of the gear-shift mechanism.
43. Check that the freewheel hub and an undamaged needle bearing are inserted in the primary shaft/freewheel sleeve. The hub should engage firmly when twisted to the right. Use tool No. 784068 for assembling.

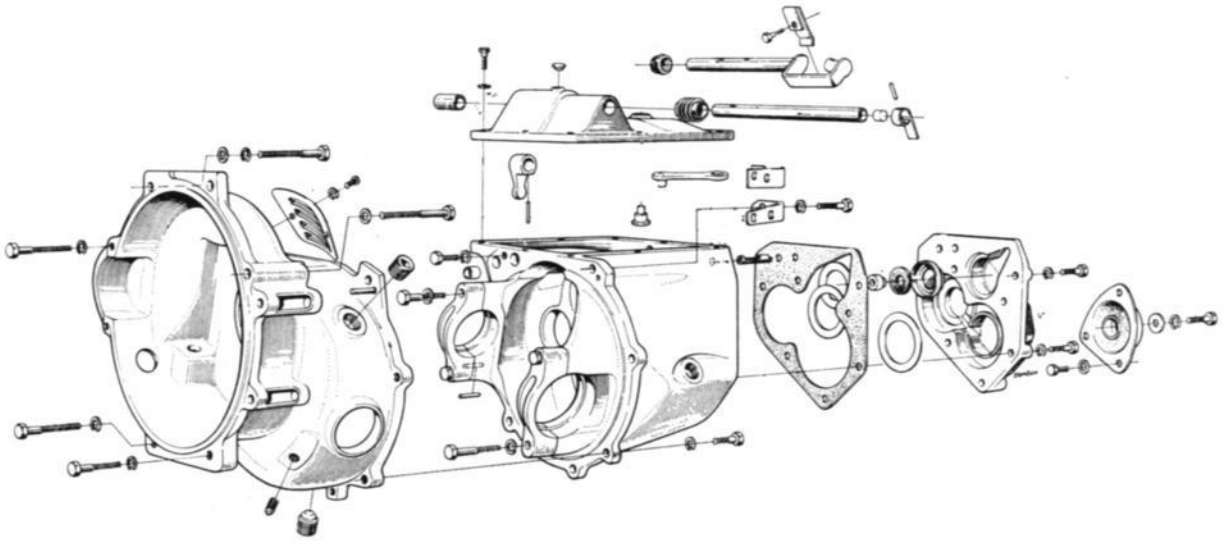
> NOTE
>
> Check the clutch-shaft seal and drive-shaft seals and renew as necessary. Fit the seals so that the dust-guard lips face outwards. Fill the space between the lips with chassis grease.

44. Coat the sealing surface of the clutch housing with sealing compound such as Permatex No. 3, and attach the clutch housing to the transmission case. Turn the clutch shaft so that it clears the differential. Make sure that the clutch shaft is not subjected to lateral stress and that the freewheel hub engages with the clutch-shaft splines.
45. Check the sealing rings in the clutch housing and mount the two output shafts, taking care to avoid damaging the sealing rings or dislocating the retaining springs.
46. Smear the clutch-shaft splines with graphite grease and fill the unit with transmission oil.



GEAR SHIFT MECHANISM AND CATCH IN TRANSMISSION CASE COVER

TRANSMISSION CASE AND END COVER



TRANSMISSION CASE, CLUTCH HOUSING AND END COVER

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Transmission case, clutch housing

The transmission unit comprises two principal parts, viz. the transmission case proper and the clutch housing, these being correctly positioned in relation to each other by means of a locating pin. The sealing surface between the parts has no gasket, but should be coated with a suitable sealing compound, e.g. Permatex No. 3.

End cover

The end cover of the transmission unit is bolted to the transmission case and sealed with a gasket, both sides of which should be coated with sealing compound.
An oil collector inside the transmission case collects the oil, which is passed through a passage, by a rubber washer and a plastic plug, to the primary shaft. Always make sure that the rubber washer presses the plastic plug against the end of the shaft and that the oil passage is not clogged.
Shims inside the end cover are provided to retain the three rear bearing outer races. The shims for the 3-speed transmission unit differ slightly from those for the 4-speed unit. See table.

A new combination of shims will have to be selected if the end cover or any of the three bearings in the rear end of the transmission case are renewed, as otherwise the bearings will not be properly secured, or leakage may occur at the gasket when the end cover bolts have been tightened. Shims for the three shafts are available in three different thicknesses, viz. 0.004, 0.006 and 0.012 in. (0.1, 0.15 and 0.30 mm). The spare-part numbers etc. are listed in the table overleaf.

Shimming

1. Remove the gear-shift fork shafts from the end cover.
2. Remove the end cover gasket and clean the sealing surfaces of the cover and the transmission case.
3. Make sure that all the bearings are properly fitted.
4. Insert a suitable combination of shims for one of the shafts in the end cover.
5. Press the end cover in by hand and measure the space between the cover and the end of the transmission case with a feeler gage.
6. Adjust the combination of shims until the space measures 0.01±0.002 in. (0.25±0.05 mm). Measure at several points around the cover to eliminate the risk of incorrect results on account of possible misalignment.
7. Remove the shims for this shaft and proceed in the same manner with the other two shafts, one at a time.
8. Refit the gear-shift fork shafts.
9. Fit a new gasket of the thin type. If the pinion does not require adjustment, coat both sides of the gasket with sealing compound. Fit the selected shims, applying a little grease to hold them in place. Refit the end cover.
10. Tighten the bolts with a torque of 18 ft-lb (2.5 kgm).

Location of shim or part	4-speed transmission			3-speed transmission		
	Spare-part No.	Thickness (in.)	Thickness (mm)	Spare-part No.	Thickness (in.)	Thickness (mm)
On primary shaft	708093	0.004	0.10	708093	0.004	0.10
	708101	0.006	0.15	708101	0.006	0.15
	708102	0.012	0.30	708102	0.012	0.30
On counter-shaft	708094	0.004	0.10	708093	0.004	0.10
	708103	0.006	0.15	708101	0.006	0.15
	708104	0.012	0.30	708102	0.012	0.30
On pinion shaft	708095	0.004	0.10	708095	0.004	0.10
	708105	0.006	0.15	708105	0.006	0.15
	708106	0.012	0.30	708106	0.012	0.30
End cover	708058			710432		
Gasket	708059		(thin)	708058		(thin)

CLUTCH SHAFT

The clutch shaft is borne up in the clutch housing in the axial direction only. A sealing ring is fitted outside the bearing.

Changing the sealing ring

1. Lift the engine out of the car.
2. Remove the release bearing,
3. Pry the sealing ring out of the clutch housing, using 'tool 784220. See fig.
4. Obtain a new sealing ring and fill the space between the sealing lips with chassis grease. Then fit the ring with tool 784220, taking care to turn it in the correct direction. See fig.
5. Refit the release bearing and remount the engine in the car.

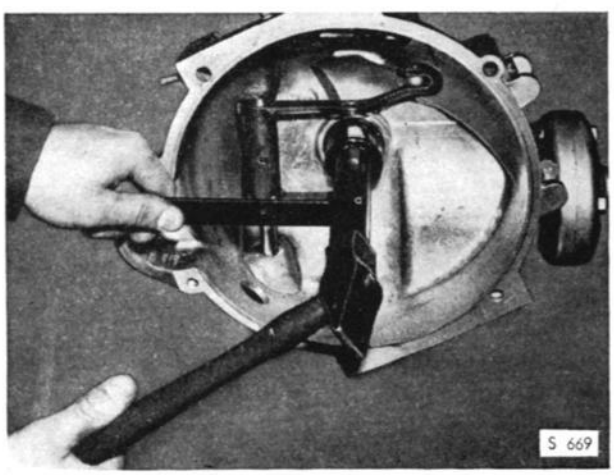
Changing the clutch shaft or bearing

Disassembly

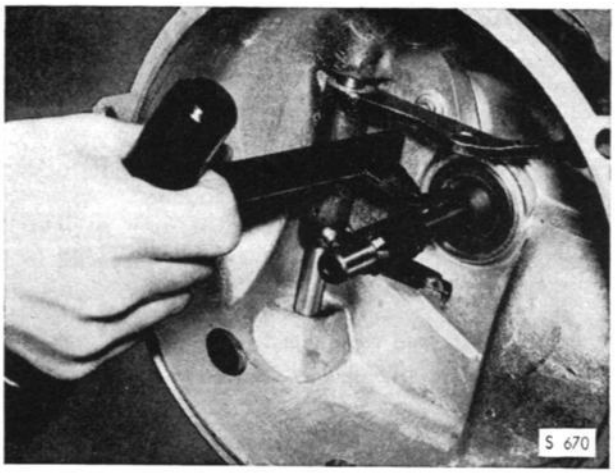
1. Lift out the transmission case, remove the inner universal joints, separate the clutch housing from the transmission case, remove the release bearing and the clutch shaft sealing ring.
2. Remove the retaining ring from the bearing seat inside the sealing ring, as well as the retaining ring which forms the rear stop for the locking sleeve on the shaft.

> NOTE
>
> This bearing, which is primarily intended to locate the shaft in the axial direction, has a large radial clearance in the bearing seat.

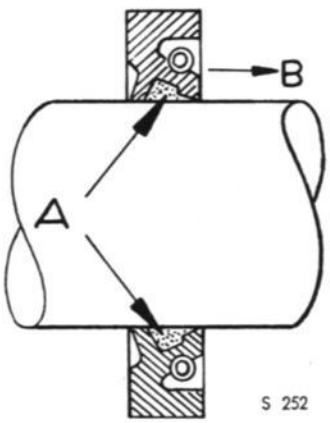
3. Pull the clutch shaft forwards, and collect the locking sleeve and freewheel operating fork which are now released.
4. Remove the retaining rings from the shaft and drive the bearing off.



FITTING THE CLUTCH SHAFT SEAL



REMOVAL OF THE SEALING RING FROM THE CLUTCH SHAFT



CLUTCH-SHAFT SEAL

A. The space between the sealing lips is to be filled with chassis grease.
B. Turn this side to face transmission case

Reassembly, clutch shaft

1. Place the rear retaining ring in the clutch housing bearing seat.
2. Press the bearing onto the shaft and refit the two retaining rings. See fig.
3. Place the freewheel operating fork and the locking sleeve in position in the clutch housing.
4. Pass the clutch shaft in from the front so that it engages with the locking sleeve. Then fit the rear retaining ring on the shaft, behind the sleeve.
5. Refit the front retaining ring in the clutch housing bearing seat and check the function of the freewheel operating mechanism.
6. Fit a new sealing ring and replace the release bearing, filling the space between the sealing lips with chassis grease first. Attach the clutch housing to the transmission case and refit the universal joints.

Freewheel

Disassembly and reassembly

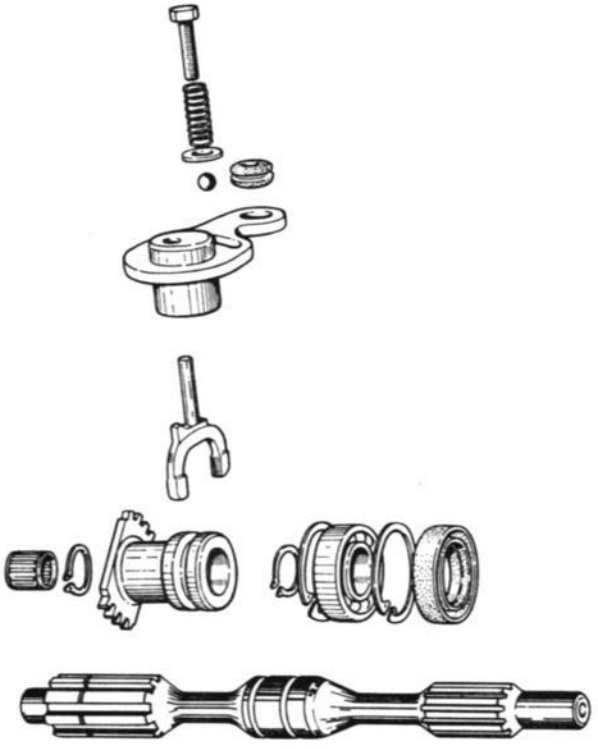
1. Lift out the transmission unit, remove the inner universal joints and separate the clutch housing from the transmission case.
2. Remove the clutch shaft so as to allow removal of the locking sleeve and operating fork.
3. Back off the operating lever locking screw, thus providing access to the spring, operating lever and poppet ball. See fig. Reassemble in the reverse order after renewing worn or damaged parts.

Freewheel hub

When the freewheel is disassembled for repairs it is generally sufficient to fit a new hub complete with its six rollers. If, however, the freewheel sleeve is also defective, a new primary shaft must be fitted.

Disassembly and reassembly

1. Lift out the transmission unit, remove the inner universal joints and separate the clutch housing from the transmission case.
2. Remove the needle bearing from inside the freewheel sleeve.
3. Insert the prongs of tool No. 784068 between the freewheel hub and the sleeve, and then insert the other part of the tool in the hub splines. Twist the freewheel hub so that the rollers are firmly tensioned against the tool prongs and pull out the hub until the rollers are halfway outside the freewheel sleeve.



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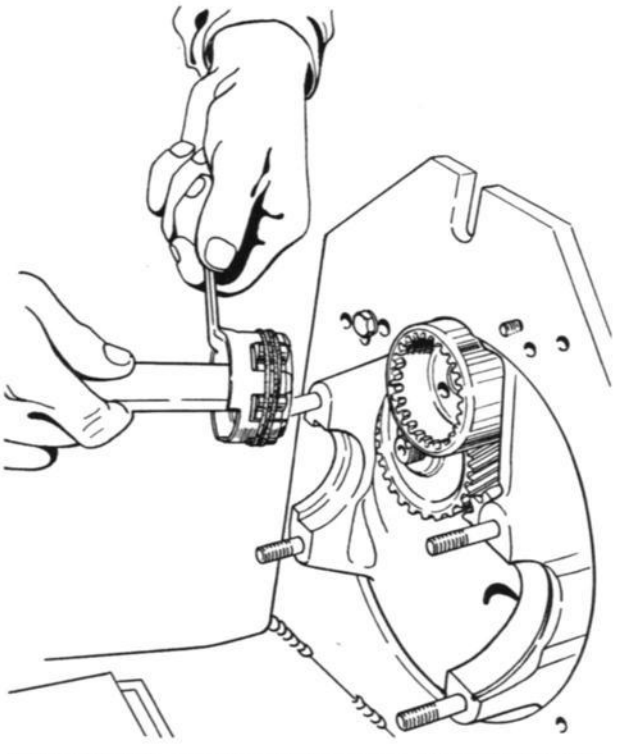
CLUTCH SHAFT WITH BEARING AND FREEWHEEL OPERATING MECHANISM



DISASSEMBLY OR REASSEMBLY OF THE FREEWHEEL HUB, USING TOOL NO. 784068

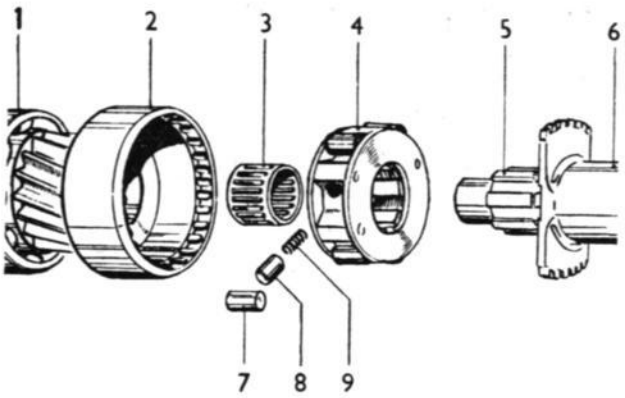
Apply a strong rubber band around the rollers and the hub can now be taken out completely. See fig. If this special tool is not available, any implement able to grip the internal splines of the freewheel hub may be used, the hub being turned anticlockwise while being drawn out far enough to allow a rubber band to be fixed round the rollers.

A spring-loaded plunger is fitted under each roller. Always check the plunger for wear, and make sure that it can move freely in its hole. Also check the spring tension.

Reassemble the freewheel hub and needle bearing in the reverse order and then refit the transmission unit.

NOTE

Never re-use the old rollers after fitting a new freewheel hub.



FREEWHEEL ASSEMBLY

1. Ball bearing
2. Freewheel sleeve (primary shaft)
3. Needle bearing
4. Freewheel hub
5. Clutch shaft
6. Locking device
7. Roller
8. Plunger
9. Spring

IMPORTANT

Fit the hub so that the freewheel engages firmly when the hub is turned clockwise.

COUNTERSHAFT

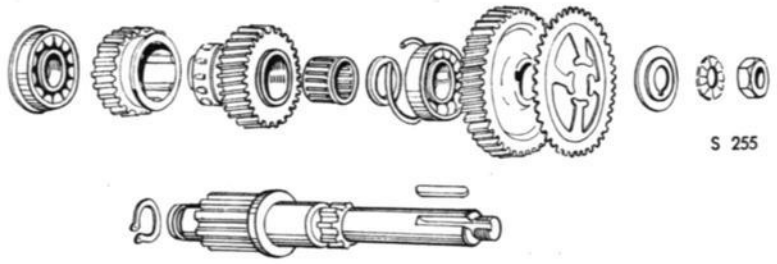
General

3-speed transmission

The countershaft should be disassembled and reassembled in accordance with the instructions at the beginning of this section.

The countershaft is borne up in the transmission case by means of two ball bearings, the front bearing being held in the case by means of a retaining ring. On the countershaft, the 1st speed gear is carried on needle bearings, whereas the reverse gear slides on splines. See fig.

The countershaft gear located behind the freewheel sleeve is provided with a friction brake which serves to take up the gearing backlash.



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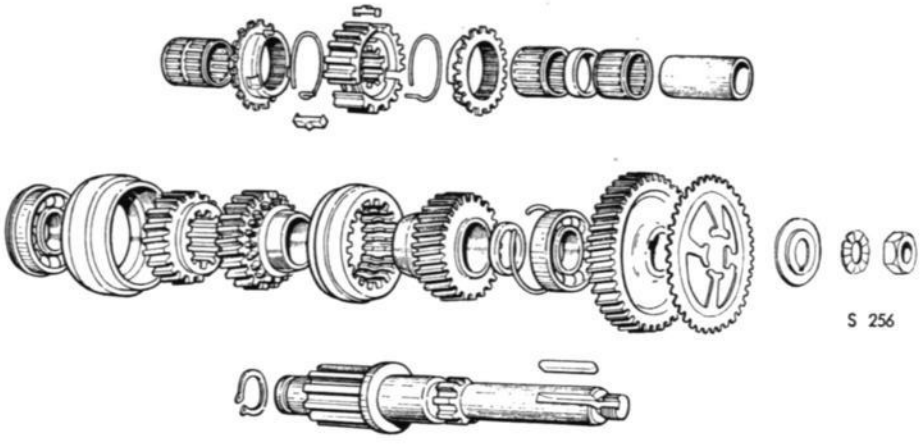
COUNTERSHAFT WITH GEARS AND BEARINGS, 3-SPEED GEAR BOX

4-speed transmission

The countershaft should be disassembled and reassembled in accordance with the instructions at the beginning of this section.

The 1st and 2nd speed gears on the countershaft are carried on needle bearings, whereas the reverse gear slides on splines. See fig. Between the 1st and 2nd speed gears is a synchronizer unit for these gears. The synchronizer units on the countershaft and primary shaft are identical. The synchronizer unit is obtainable only as a complete unit, excluding synchronizer rings.

The countershaft gear is provided with a friction brake which serves to take up the gearing backlash.



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COUNTERSHAFT WITH GEARS, BEARINGS AND SYNCHRONIZER UNIT, 4-SPEED GEAR BOX

FRICTION BRAKE

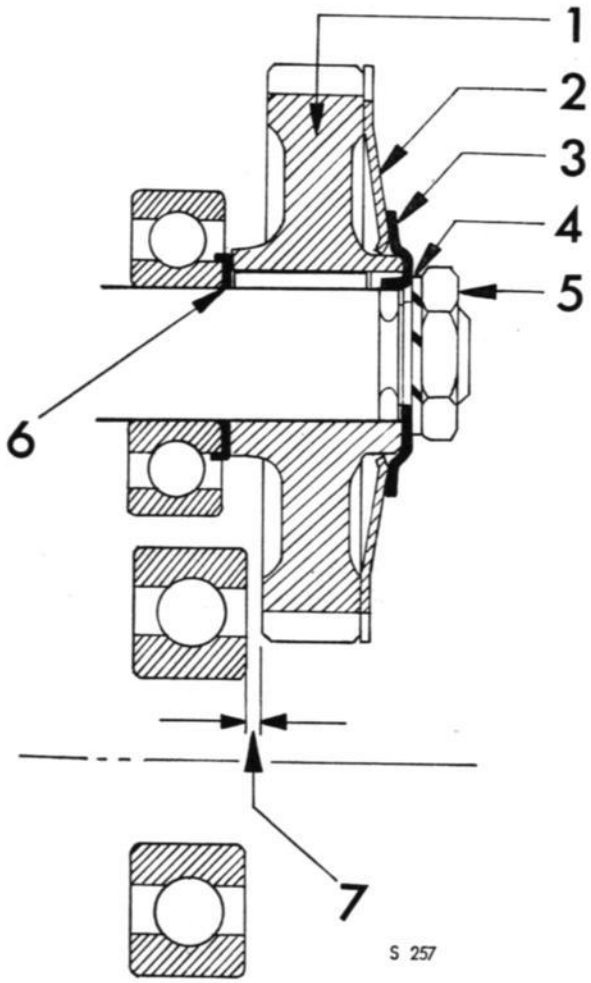
General

The countershaft gear in 3-speed and 4-speed transmissions is fitted with a friction brake, which serves to eliminate gearing backlash and thus reduces noise.
The device comprises a friction wheel which has one tooth less than the countershaft gear, implying that the friction wheel will turn slowly in relation to the gear during the rotation. Spring-loading of the friction wheel provides the brake power required to counteract the gearing backlash against the primary shaft.

Installation instructions

When installing the friction brake, note the following points.

1. Check that the friction wheel has a smooth contact surface at the teeth, and that the spring tongues are located within the prescribed distance from the contact surface. See fig.
2. When installing the friction brake, make sure that the countershaft gear is turned so that the machined part of the hub comes out towards the friction wheel.
3. Check that the clearance on the back of the countershaft gear at the primary shaft bearing is at least 0.02 in. (0.5 mm), and if not, fit a special shim between the front countershaft bearing and the countershaft gear. See fig.
4. After fitting the friction wheel, and when the friction washer with its retaining tab has been put on, check that there is some springiness in the spring tongues.
5. Take care not to squeeze the spring tongues when tightening the countershaft gear nut. Tighten with a torque of 60 ft-lb (8.5 kgm).



FRICTION BRAKE

1. Countershaft gear
2. Friction wheel
3. Friction washer
4. Retaining washer
5. Nut
6. Shim. To be used only if the clearance at 7 is less than 0.02 in. (0.5 mm).

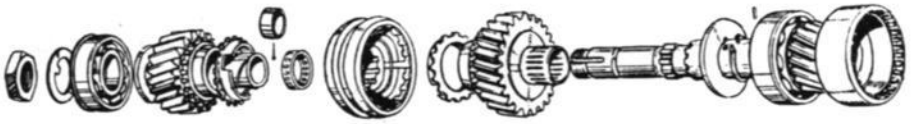
FRICTION WHEEL

Dim. A = 0.205—0.216 in. (5.2—5.5 mm) in 3-speed transmission
0.146—0.157 in. (3.7—4.0 mm) in 4-speed transmission

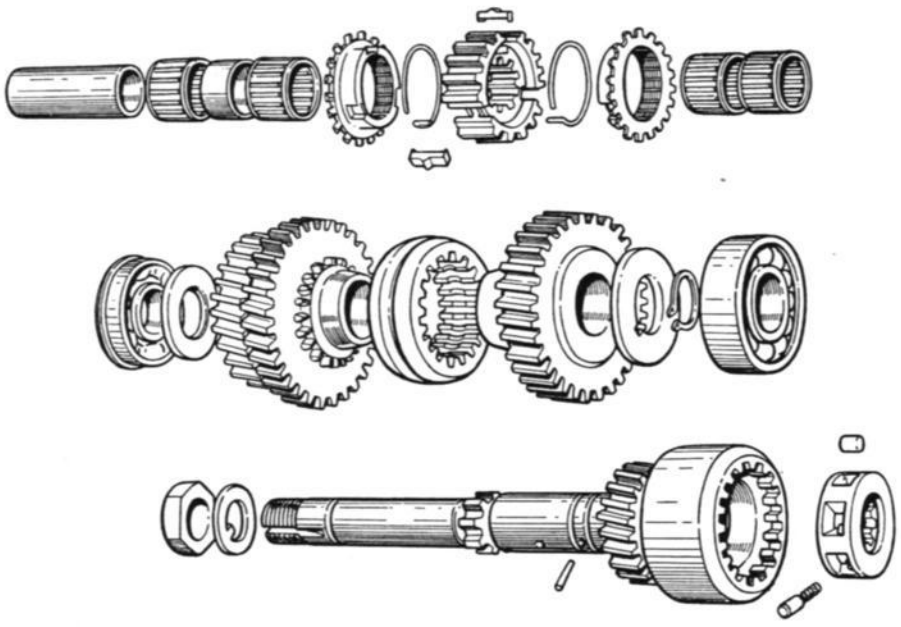
PRIMARY SHAFT

General

The primary shaft should be disassembled and reassem-in the manner described at the beginning of this section, where it is stated that the countershaft must be removed before the primary shaft can be disassembled.
The primary shaft, which is carried in two ball bearings in the transmission case, is machined in one piece with the freewheel sleeve and the pinion for the countershaft. See figs. Carried in needle bearings on the primary shaft are the 2nd and 3rd speed gears in the 3-speed unit, and the 3rd and 4th speed gears in the 4-speed unit. These speed gears are matched with their mating gears on the pinion shaft. The synchronizer unit is splined between the speed gears it serves. There are some differences between the synchronizer units for 3-speed and 4-speed transmissions, and they are supplied only as complete assemblies, excluding rings.
The primary shaft has a drilled passage which serves as an oilway for lubrication of the 3rd and 4th speed needle bearings and of the freewheel. Always make sure that this passage is not clogged. A thrust washer is fitted against the front bearing of the primary shaft and is prevented from rotating by means of a locking pin in the shaft.



3-SPEED TRANSMISSION. PRIMARY SHAFT WITH GEARS, BEARINGS AND SYNCHRONIZER



4-SPEED TRANSMISSION. PRIMARY SHAFT WITH GEARS, BEARINGS AND SYNCHRONIZER

SYNCHROMESH, 3-SPEED AND 4-SPEED TRANSMISSION UNITS

Synchronizer rings

For satisfactory synchromesh function, it is essential that the synchronizer rings rest correctly against the tapers. If the ring tilts when pressed against the taper, lapping is called for.

The ring is lapped by applying fine-grain carborundum to the gear taper and then twisting the ring against this in both directions.

When the ring fits properly, clean the parts thoroughly to remove all traces of grinding dust.

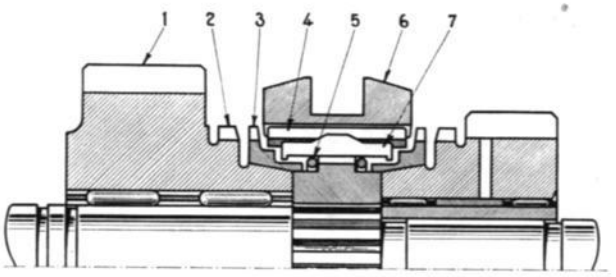
When the synchronizer ring is installed, the clearance between it and the dog ring must be at least 0.04 in. (1 mm), which leaves an allowance for wear. The clearance, however, must always amount to at least 0.012 in. (0.3 mm).

Synchronizing force

During a gear change, the synchronizer ring is pressed against the gear taper with a certain force, the magnitude of which depends on the tension of the synchronizer springs located inside the hub. If it is suspected that this force is incorrect, measure it as described in the following, using a spring balance or weights.

Place the gear on a flat surface with the taper facing upwards. Place the synchronizer rings and the complete synchronizer unit over it.

Lightly oil all the parts. Next, press the synchronizer sleeve down a few times, causing the ring to take up its correct location. Now put a ring or similar object on the synchronizer sleeve and place a 9-lb (4 kg) weight on top of it. The sleeve must not now move downwards. If, on the other hand, the load is increased by a further 4½ lb (2 kg), the sleeve should slide downwards. The force required to move the synchronizer sleeve over the dog rings on the speed gear should thus amount to 30—45 ft-lb (4—6 kgm). It can be adjusted by stretching the circular synchronizer springs.



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SYNCHRONIZER UNIT

1. Gearwheel
2. Dog ring
3. Synchronizer ring
4. Synchronizer hub
5. Spring-loaded ring
6. Synchronizer sleeve
7. Dog

GEAR-SHIFT MECHANISM
3-SPEED TRANSMISSION

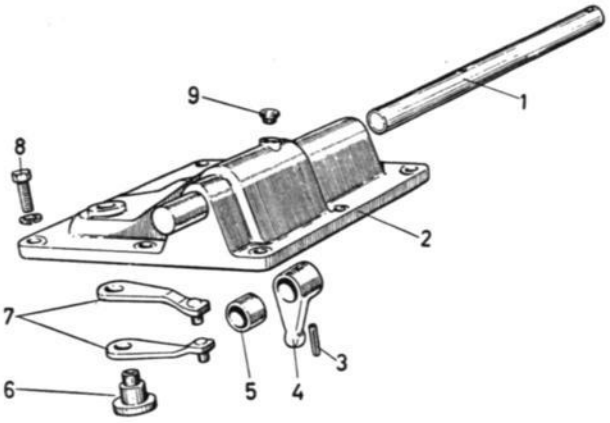
The gear-shift mechanism comprises the gear-shift forks, shafts, poppet balls and springs in the transmission case, and the catch and operating shaft with its shifter in the transmission case cover. See fig.

Disassembly

If the task in hand concerns the gear-shift mechanism only, it will suffice to lift the power unit out of the car and remove the transmission case top cover and perhaps the end cover as well.

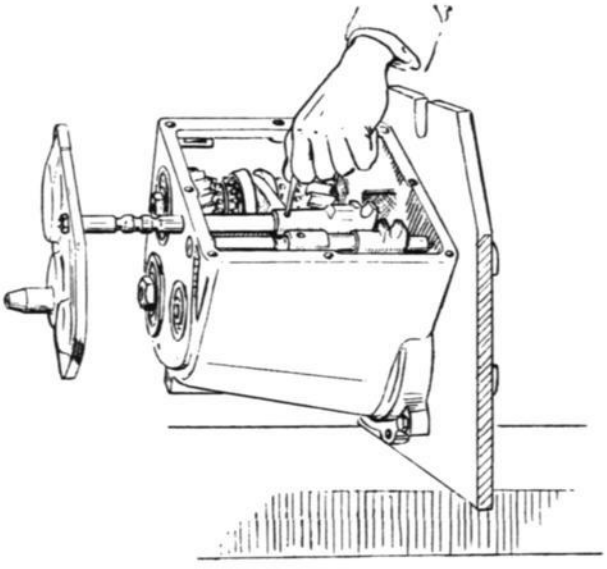
1. Remove the transmission case cover.
2. Back off the end-cover bolts and pull the end cover off, together with the 2nd-and-3rd shift-fork shaft. See fig. Collect the poppet ball and spring of the gear-shift fork.

> NOTE
>
> Proceed with great care, collecting the shims from inside the cover and noting their locations at the respective bearings.

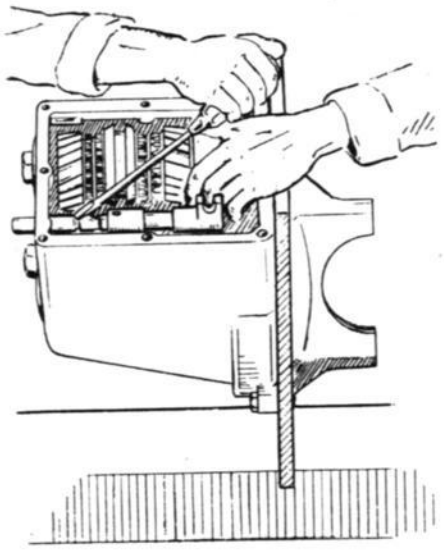


TRANSMISSION CASE COVER WITH SHIFTER MECHANISM AND CATCH ASSEMBLY, 3-SPEED TRANSMISSION

1. Operating shaft
2. Cover
3. Tension pin
4. Shifter yoke
5. Spacer
6. Catch shaft
7. Catches
8. Screw
9. Plug



2nd-and-3rd gear-shift fork



1st-and-reverse gear-shift fork

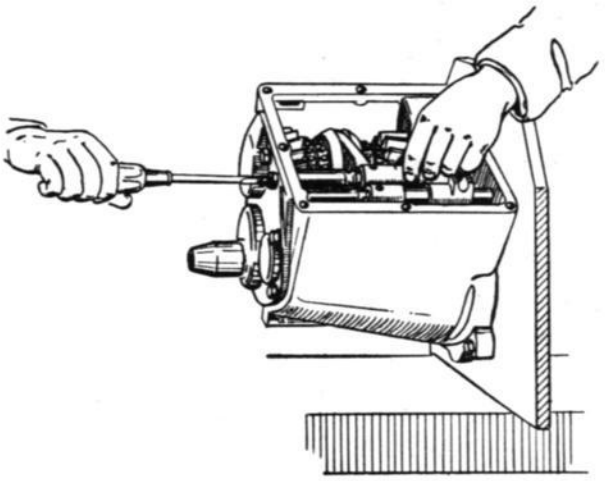
REMOVING SHIFT FORKS

3. Remove the 1st-and-reverse gear-shift fork by driving it out through the transmission case end with a screwdriver. Collect the poppet ball and spring. See fig.
4. Lift out the gear-shift forks.
5. If any of the parts fitted in the top cover — shifter yoke, shaft or catch — are to be renewed, the countersunk head or rivet in the top cover must be drilled out. After reassembly, fit a rubber plug or a self-tapping screw in the hole in the cover, this hole being provided to permit the tension pin to be driven out of the shifter shaft.

Reassembly

Before commencing reassembly, remove all gasket fragments and all traces of old sealing compound from the two covers and their sealing surface on the transmission case.

1. After changing worn parts, fit the gear-shift forks in the transmission case.
2. Pass the 1st-and-reverse shift-fork shaft into the fork. Hold the poppet ball and spring in place with tool No. 784069. Don't forget to collect the tool so that it does not drop down into the transmission case.
3. Refit the end cover together with the 2nd-and-3rd shift-fork shaft, holding the poppet ball and spring in place with tool No. 784069. Make sure that the shims for the bearing are correctly located in the end cover, or select a new combination of shims. See "Transmission case and end cover". Coat the cover gasket with a suitable sealing compound, e.g. Permatex No. 3.
4. Screw in and tighten the end-cover bolts with a torque of 18 ft-lb (2.5 kgm).
5. Check the 2nd-and-3rd shift-fork shaft and adjust as necessary (see fig.), so that the synchronizer sleeve has a noticeable clearance, of roughly the same magnitude, in relation to the 2nd and 3rd speed gears when the gear concerned is engaged.



ADJUSTING THE 2ND-AND-3RD SHIFT-FORK SHAFT

6. Place the gear-shift forks at neutral and refit the cover so that the catch and shifter dog take up their correct positions. Coat the surface of the cover with sealing compound.
7. Check the function of the gear-shift mechanism.

NOTE

The transmission case is ventilated through the operating shaft and the hole in the lower side, under the universal joint for the gear-shift rod. Check that this hole is not clogged, and that the cork affording the seal against the joint has not been displaced down over the hole, since this could lead to oil leakage at the seals.

GEAR-SHIFT MECHANISM

4-speed transmission

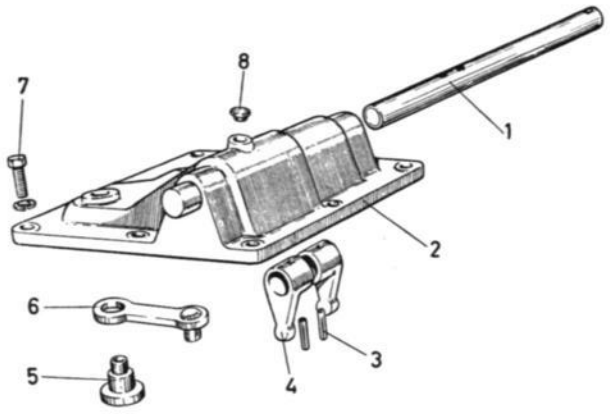
If the task in hand concerns the gear-shift mechanism only, it will suffice to lift the power unit out of the car and remove the transmission case top cover and the end cover.

Disassembly

1. Back off the screws holding the transmission case cover and lift off the cover.
2. Back off and remove the end-cover bolts and loosen the cover by inserting a slender screwdriver between the cover and the transmission case at both sides and carefully prying it loose.

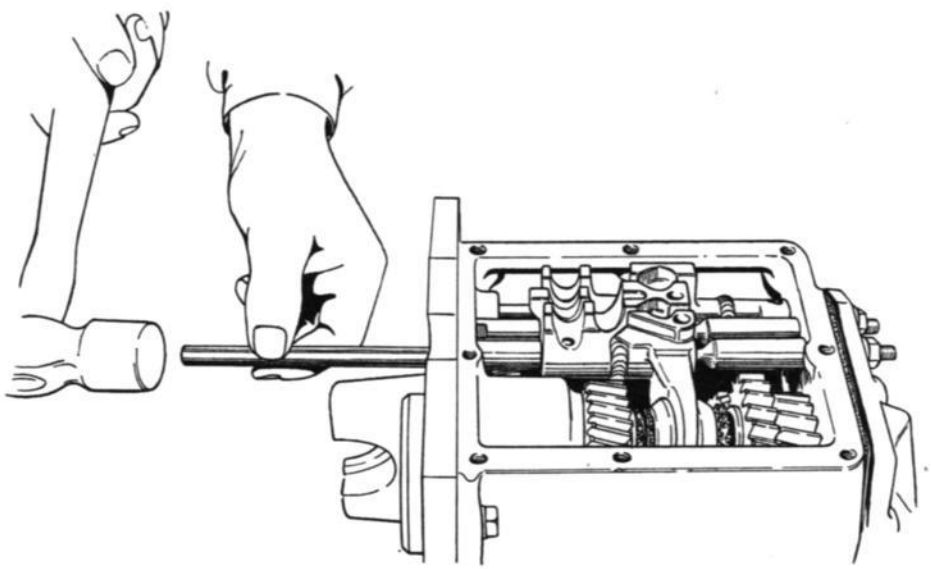
> NOTE
>
> Proceed with great care, collecting the shims from inside the cover and noting their locations at the respective bearings.

3. Remove the end cover, which will be accompanied by two of the gear-shift fork shafts. See fig. Collect the gear-shift fork poppet balls, which are ejected when the shafts are removed.



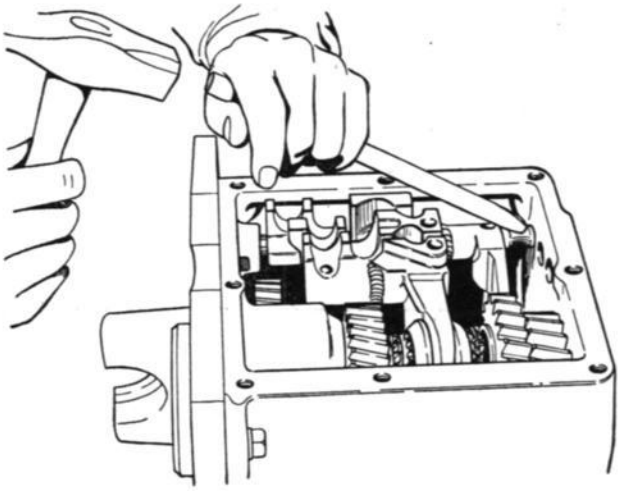
TRANSMISSION CASE COVER WITH SHIFTER MECHANISM AND CATCH ASSEMBLY. 4-SPEED TRANSMISSION

1. Shifter shaft
2. Cover
3. Pin
4. Shifter
5. Catch pivot
6. Catch
7. Screw
8. Plug



REMOVAL OF END COVER

4. Release the reverse gear-shift fork shaft with the aid of an arbor, screwdriver, or other suitable implement. See fig. The shaft can now be driven out with a screwdriver or pulled out with pliers. Collect the poppet ball from the fork, so that it does not drop down into the transmission case.
5. Lift out the three gear-shift forks.
6. If any of the parts fitted in the top cover — shifter yoke, shaft or catch — are to be renewed, the rivet or countersunk head in the cover must be drilled out. After reassembly, fit a rubber plug or a self-tapping screw in the hole in the cover, this hole being provided to permit the pin to be driven out of the shifter shaft.



REMOVAL OF REVERSE GEAR-SHIFT FORK SHAFT

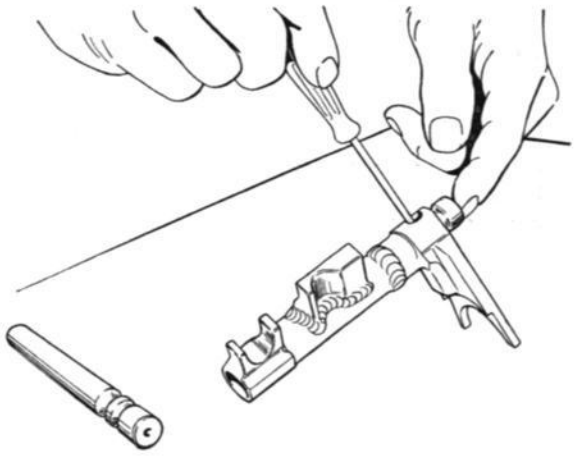
Reassembly

Before commencing reassembly, remove all gasket fragments and all traces of old sealing compound from the two covers and their sealing surface on the transmission case.

1. Check positively, for instance with the aid of a magnet, that none of the poppet balls has dropped down into the transmission case.
2. Place the synchronizer sleeves and reverse gear at neutral and put in the three gear-shift forks.

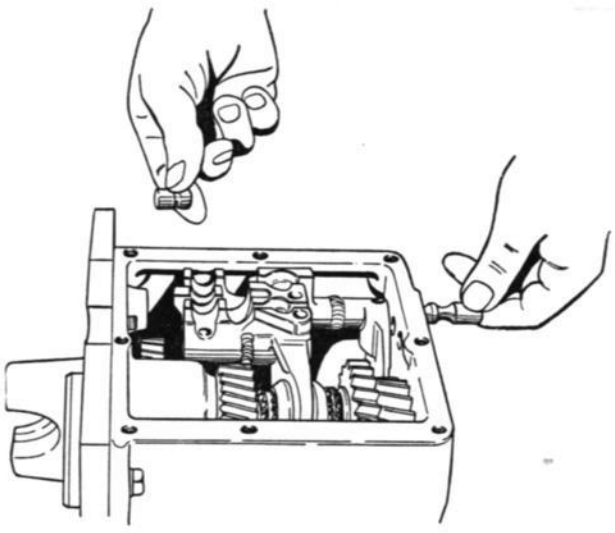
NOTE

The reverse gear-shift fork must be fitted with its spring and poppet ball before being placed in the transmission case. Hold the ball in place with tool No. 784069. See fig.



HOLDING THE POPPET BALL IN THE REVERSE GEAR-SHIFT FORK WITH TOOL No. 784069

3. Drive in the reverse gear-shift fork shaft and collect the tool as it is ejected at the front end of the fork. See fig.
4. Pass the two gear-shift fork shafts through the end wall on the end cover and into their respective forks. Use tool No. 784069 to hold the poppet balls in place, in the same way as the ball in the reverse gear-shift fork. Don't forget to coat the end-cover gasket with a suitable sealing compound, e.g. Permatex No. 3. Check also that the rubber washer and plastic plug have been fitted in the cover.
5. Place the shims inside the end cover in the same position as prior to removal of the cover, or select a new combination of shims. See "Transmission case and end cover" in this section. Smear a little grease onto the shims to hold them in the cover, thus facilitating reassembly.



TOOL No. 784069 IS COLLECTED AS THE GEAR-SHIFT FORK SHAFT IS DRIVEN IN

6. Refit the poppet balls and springs in the gear-shift forks, and then drive the end cover in, holding the poppet balls in position with two tools No. 784069 or by pressing them down with a slender arbor or similar tool. If these tools are not available, the task is simplified by sliding one of the forks in onto its shaft (engaging one gear), thus assembling it slightly before or after the other one.
7. Screw in the end-cover bolts and tighten with a torque of 15—18 ft-lb (2—2.5 kgm).

> CAUTION
>
> Make sure that the bolt opposite the reverse gear-shift fork is not too long, thereby impeding the movement of the fork.

8. Check the gear-shift fork shafts and adjust as necessary (see fig.), so that the forks are not subjected to axial pressure when a gear is engaged. In all gear positions, there must be a noticeable clearance, of roughly the same magnitude, between the synchronizer sleeve and the respective gear.
9. Place the three gear-shift forks at neutral, as well as the shifter yoke and catch in the top cover. See fig.
10. Coat the surface of the transmission case with sealing compound, e.g. Permatex No. 3. Then refit the cover and tighten the bolts.
11. Check the function of the gear-shift mechanism.

> NOTE
>
> The transmission case is ventilated through the operating shaft and the hole in the lower side, under the universal joint for the gear-shift rod. Check that this hole is not clogged, and that the cork affording the seal against the joint has not been displaced down over the hole, since this could lead to oil leakage at the seals.

SPEEDOMETER DRIVE GEAR

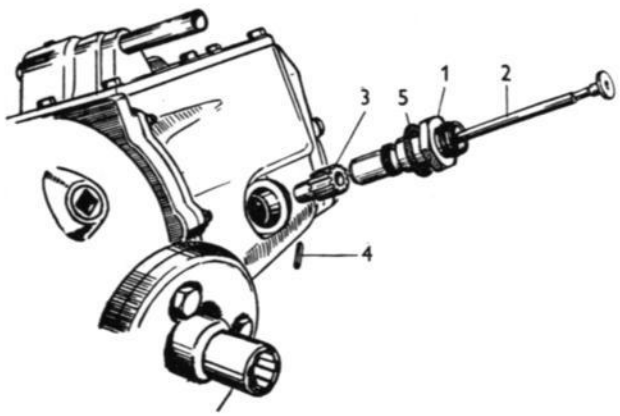
Disassembly and reassembly

1. Disconnect the speedometer drive cable from the transmission case.
2. Back off and remove the bearing sleeve 1 (see fig.), together with the spindle 2 and the speed gear 3. Collect the gasket 5.
3. Drive out the tension pin 4, which holds the speed gear to the spindle. The speed gear, spindle and bearing sleeve can now be separated.

Change all worn or defective parts and reassemble in the reverse order.

Shimming

To prevent oil leakage, the axial spindle clearance should be between 0.002 and 0.008 in. (0.05—0.2 mm). This clearance can be adjusted by inserting shims, 0.008 and 0.02 in. (0.2 and 0.5 mm) thick, between the speed gear and the bearing sleeve.



SPEEDOMETER DRIVE GEAR

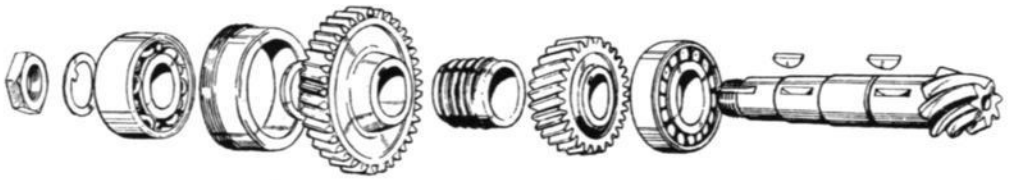
1. Bearing sleeve
2. Spindle
3. Speed gear
4. Tension pin
5. Gasket

DIFFERENTIAL AND PINION-RING GEAR
Pinion shaft and ring gear, general

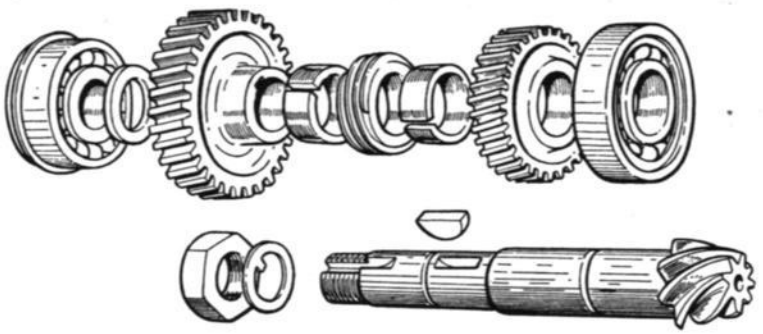
For the 4-speed transmission there are two different ratios pinion — ring gear, a higher for Saab Sport and a lower for Saab 95.

To remove the pinion shaft and the differential ring gear, follow the instructions given in Section 471 for the 3-speed or 4-speed transmission, as applicable. These instructions make it clear that the countershaft, and then the primary shaft, must be removed first. The pinion shaft is carried in a roller bearing and a double-row ball bearing which constitutes the axial bearing. The shaft for the 3-speed transmission carries the keyed 2nd and 3rd gear wheels, while in the case of the 4-speed transmission it carries the keyed 3rd gear wheel and the press-fitted 4th gear wheel. The speedometer drive is located between the gearwheels. See figs. The pinion shaft gears are matched with their counterparts on the primary shaft and care must be taken when installing to ensure that the matching numbers will face the same way on both pinion shaft and primary shaft.

The ring gear and pinion shaft also form a matched set, implying that these two components can only be changed as a pair. These parts have been tested together for

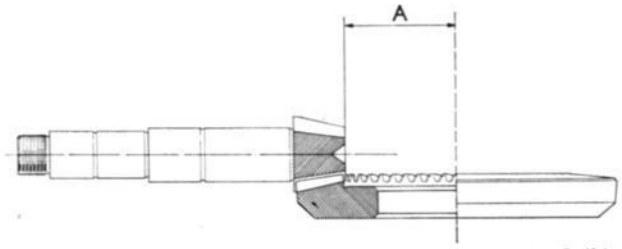


PINION SHAFT WITH BEARING AND GEARS
(3-SPEED TRANSMISSION)



PINION SHAFT WITH BEARING AND GEARS
(4-SPEED TRANSMISSION)

noise and the most favourable setting for quiet running has been measured. Measurements of particular importance for the pinion and ring gear are the distance between the end face of the pinion and the center of the ring gear, and the gearing backlash. See fig. These measurements, as well as the matching numbers, are stamped into the parts concerned in conjunction with the noise test. When assembling the pinion and ring gear, these measurements must be adjusted very accurately with shims and a special measuring tool. The pinion shims are located by the rear pinion shaft bearing, and the shims for the differential ring gear by both bearings.



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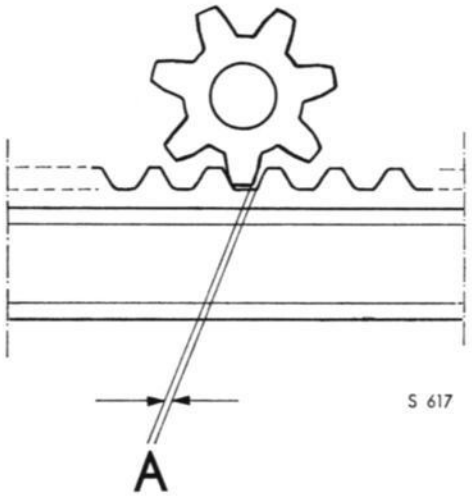
ADJUSTMENT OF DISTANCE BETWEEN PINION END FACE AND CENTER OF RING GEAR BY SHIMMING THE PINION SHAFT

The measurement A to be adjusted by shimming the pinion shaft



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GEARING BACKLASH IS ADJUSTED BY SHIMMING THE DIFFERENTIAL

The backlash A to be adjusted by shimming the differential bearings

ADJUSTMENT OF PINION

General

To facilitate adjustment of the distance between the pinion and the center of the ring gear, certain data are stamped into the end face of the pinion. As different makes of final gear are used, the markings vary as follows:

IMPORTANT

Before disassembling the transmission unit, always measure the relative positions of the pinion and ring gear, in order to determine whether the adjustment has possibly been incorrect. If the pinion and ring gear have been used only for a short mileage (less than 6000 miles or 10000 km), the unit can be readjusted. However, after longer mileages, when the gears will have become worn in at a certain position, adjustment should be made to agree with the readings obtained prior to disassembly.

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THE PINION END FACE, MAKE DANA

+3 = Measurement for pinion adjustment.
R913 = Matching number, also to be found on ring gear.
0 = Pinion is not displaced, but the pinion shaft is directed towards the center of the ring gear. All pinions are marked with an "0", and this information has no influence on the adjustment.

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THE PINION END FACE, MAKE ENV AND ZF

60.97 = Measurement for pinion adjustment. = Distance between pinion and center of ring gear.
678 = Matching number, also to be found on ring gear
X = Tooth for measuring backlash when adjusting the ring gear

Remedys before measuring

During all measurements of the pinion setting, the following points must be observed.

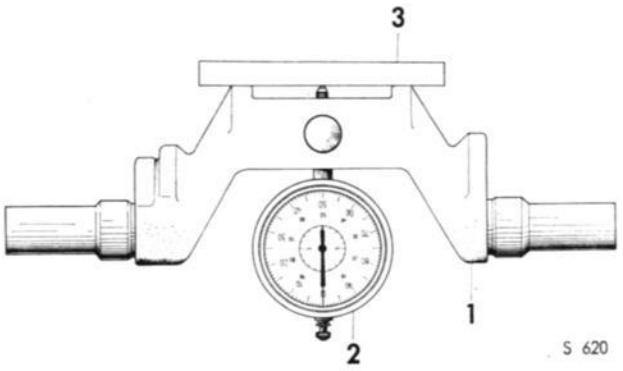
1. The pinion shaft end nut must be correctly tightened, first with a torque of 85 ft-lb (12 kgm), then with a torque of 45 ft-lb (6 kgm).
2. The transmission case end cover must be shimmed, fitted with its gasket, and its bolts tightened with a torque of 18 ft-lb (2.5 kgm). For shimming of end cover, see Section 471.
3. The differential must be removed to allow application of the measuring tool, which comprises a jig carrying a dial indicator. A ground gage block is provided for adjustment of the dial indicator. The gage block is placed against the setting lugs of the tool, and the distance between these and the center of the ring gear is always 60.94 mm. This figure is also marked on the measuring jig. The jig is suitable for use in all types of transmission cases, and therefore has different stops to suit the various diameters of bearing seats. To measure the pinion setting, proceed as follows:

Measuring

First find by trial the hole in the measuring jig in which the dial indicator must be located in order for the measuring point to be in contact with the end face of the pinion at the same time as the correct stops rest in the bearing seats.

The dial indicator has two scales, one black and one red. The red scale is graduated counterclockwise and gives a lower reading when the measuring point is pressed in. Always use the red scale.

Place the ground gage block against the two setting lugs and against the measuring point. Now zero the dial indicator and carry out the measuring as follows:



ZEROING THE DIAL INDICATOR

1. Measuring jig
2. Dial indicator
3. Gage block

PLACING OF MEASURING JIG WHEN MEASURING

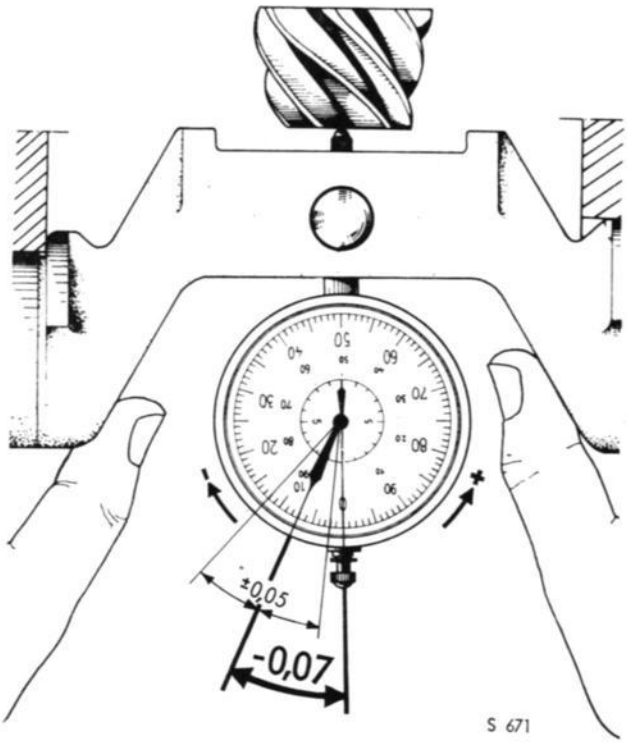
For the DANA make

1. Adjust the dial indicator so that the hands point at 0.00 when the measuring point rests against the gage block. See fig.
2. Locate the measuring jig in the differential bearing seats with the measuring point in contact with the ground face of the pinion and take a reading. See fig.
3. When the pinion is correctly adjusted, the dial indicator should show the same figure, in hundredths of a millimeter, as that marked on the pinion, with a permissible deviation of ±0.05 mm.
   Note that the red scale on the dial indicator must be used, i.e. + is counted counterclockwise and — clockwise.

For the ENV and ZF makes

1. Adjust the dial indicator so that the hands point at 0.00 when the measuring point rests against the gage block. See fig.
2. Locate the measuring jig in the differential bearing seats with the measuring point against the end face of the pinion and take a reading. See fig.
3. First check whether the figure stamped into the pinion is larger or smaller than the basic measurement, 60.94 mm, and note the amount of deviation.
   Example: PINION MARKED 60.97.
   The measurement is thus 0.03 mm bigger, i.e. + 0.03.
   PINION MARKED 60.87.
   The measurement is thus 0.07 mm smaller, i.e. — 0.07.
   When the pinion is correctly adjusted, the dial indicator should show the same figure as that calculated above, with a permissible deviation of ±0.05 mm. Note that the red scale on the dial indicator must be used, i.e. + is counted counterclockwise and — clockwise.

Example of dial-indicator reading when adjustment is correct

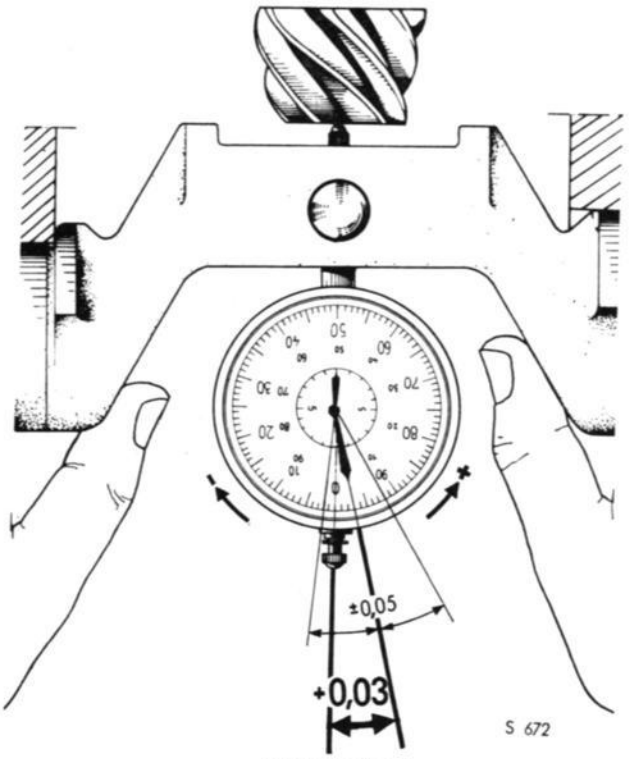


MAKE DANA

The pinion is marked —7.
The indicating hands should then point to —0.07 mm.
On this value a deviation of ±0.05 mm is permissible.

MAKE ENV AND ZF

The pinion is marked 60.87 which is 0.07 mm less than the basic measurement 60.94, i.e. the indicating hands shall point to —0.07. On this value a deviation of ±0.05 mm is permissible.



MAKE DANA

The pinion is marked +3. The indicating hands should then point to +0.03. On this value a deviation of ±0.05 mm is permissible.

MAKE ENV AND ZF

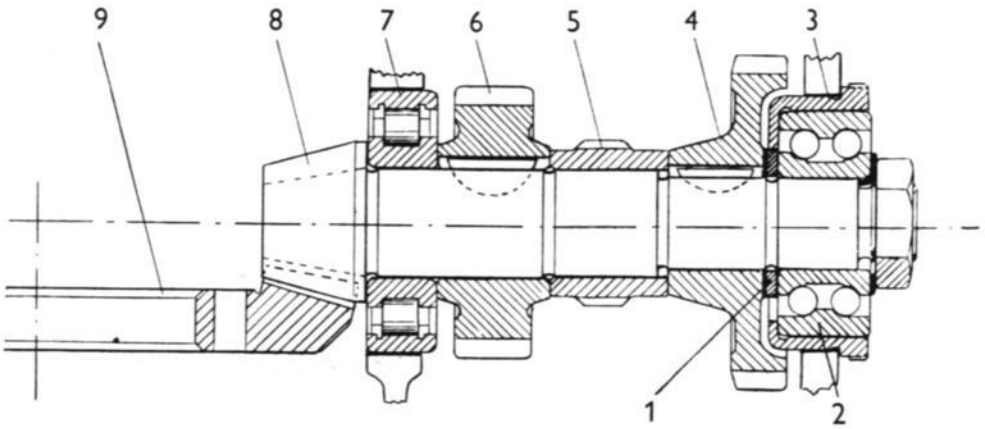
The pinion is marked 60.97 which is 0.03 mm more than the basic measurement 60.94, i.e. the indicating hands should then point to +0.03. On this value a deviation of ±0.05 mm is permissible.

Shimming

If the measured value deviates from the correct one more than permitted by the tolerance, the pinion shaft must be adjusted.

The adjustment is to be made with spacer and shims, which shall be placed between the rear thrust bearing and the 2nd-and-reverse gear. See fig.

When doing this, always place the shims next to the bearing and the spacer against the gear. The spacers are available in two thicknesses and the shims can be had in three different thicknesses. See table. When adjusting, take only one of the spacers plus maximum three shims in a suitable combination. This covers the adjustment range from 3.1 mm up to 4.2 mm with intervals of 0.05 mm.



ADJUSTMENT OF PINION SHAFT WITH SHIMS AND SPACER

1. Spacer and shims
2. Ball bearing
3. Bearing sleeve (3-speed gear box)
4. 2nd-and-reverse gear (3-speed gear box)
5. Speedo. gear
6. 3rd gear
7. Roller bearing
8. Pinion shaft
9. Ring gear

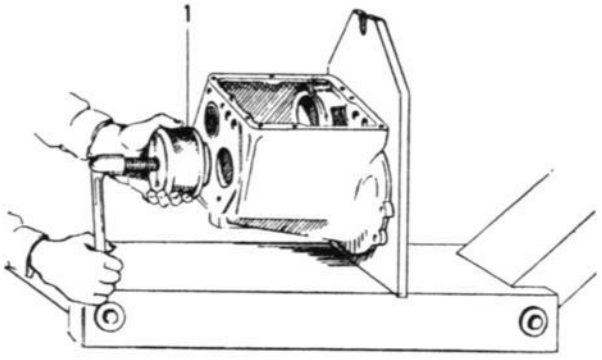
Gear box	Location	Spacers		Shims	
		Thickness mm	Spare part No.	Thickness mm	Spare part No.
3- and 4-speed	Pinion shaft between thrust bearing and gear	3.1 3.6	782207 782215	0.1 0.15 0.3	782208 782209 782210

When shimming, proceed as follows:

1. Remove the end cover, and loosen the pinion shaft end nut.
2. Pull out the pinion shaft thrust bearing with puller 784101 for the 3-speed, and with puller 784115 for the 4-speed gear box. To support the shaft, use the front press screw. See fig.
3. Remove the spacer and shims.
4. Change the shimming as per the following rules:
   If the dial indicator reading was too high, increase the thickness of the shim combination.
   If the value recorded by the indicator was too small, reduce the thickness of the shim combination. Note! Use the red scale, i.e. + is counted counterclockwise and — clockwise.
   The amount of increase or decrease in shimming thickness is the same as the difference between measured and true values.
5. Having selected the correct combination of shims, place the spacer, followed by the shims, on the pinion shaft. Drive the pinion shaft bearing in with tool No. 784102 in the case of the 3-speed transmission unit and with tool No. 784122 in the case of the 4-speed unit, using the front press screw to support the shaft.
6. Fit the retaining ring with its tab facing outwards. Then tighten the pinion shaft end nut, first with a torque of 85 ft-lb (12 kgm) and then with 45 ft-lb (6 kgm). Secure the nut.
7. Refit the end cover and appurtenant shims. Coat the gasket with sealing compound (Permatex No. 3) and tighten the bolts with a torque of 18 ft-lb (2.5 kgm).

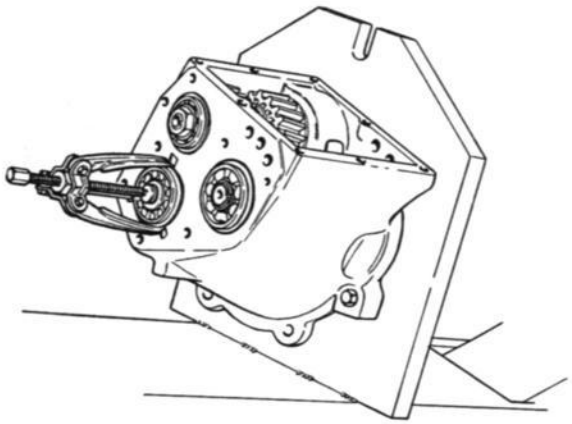
Rechecking

After shimming, refit the measuring jig in the differential bearing seat and check that the dial indicator gives the correct reading. (±0.05 mm) Readjust if necessary.

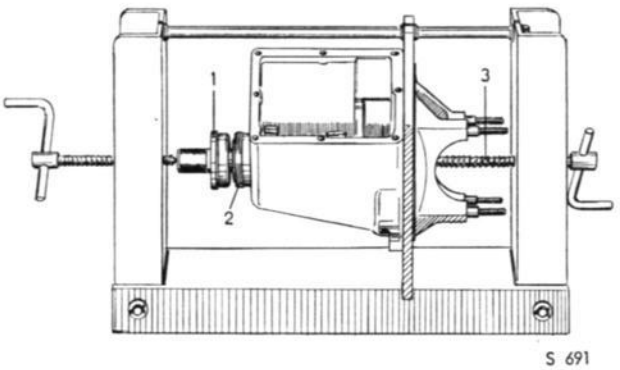


REMOVAL OF PINION SHAFT BEARING, 3-SPEED TRANSMISSION

1. Puller 784101



REMOVING PINION SHAFT BEARING WITH PULLER 784115 (4-SPEED TRANSMISSION)



S 691

DRIVING IN PINION SHAFT THRUST BEARING

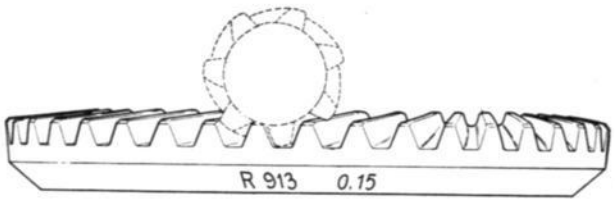
1. Tool 784102, 3-speed gear box
   Tool 784122, 4-speed gear box
2. Bearing sleeve
3. Press screw for holding-up

ADJUSTMENT OF RING GEAR BACKLASH

General

During adjustment and measurement of ring gear backlash, the pinion shaft end nut must always be tightened to the correct torque and the end cover must be properly shimmed and tightened to the correct torque.
To facilitate adjustment of ring gear backlash, certain data are stamped into the ring gear as per the following:

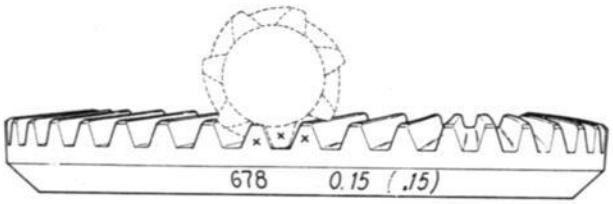
Check the backlash at 4 points round the circumference of the ring gear. The deviation from the indicated value must not exceed ±0.05 mm. The gear ring backlash can be adjusted to the correct value with spacers and shims. There are two different thicknesses of spacers and three of shims for each bearing — see table below. For shimming, use one of the spacers together with up to three shims in different combinations.



S 623

DANA MAKE

R913 = Matching number
0.15 = Ring gear backlash.
Note! If this figure is not given, 0.15 mm applies.
The backlash may be measured at any point.



S 624

ENV AND ZF MAKES

678 = matching number
0.15 or
.15 = Ring gear backlash.
X = These teeth must mesh when the backlash is being measured.

Type of transmission unit	Location by differential bearings	Spacers			Shims		
		Thickness in.	(mm)	Spare part No.	Thickness in.	(mm)	Spare part No.
3-speed	Right	0.16	(4.2)	781393	0.004	(0.1)	781394
		0.19	(4.9)	782213	0.006	(0.15)	781400
					0.012	(0.3)	782200
4-speed	Right	0.13	(3.4)	782489	0.004	(0.1)	782491
		0.15	(3.9)	782490	0.006	(0.15)	782492
					0.012	(0.3)	782493
3-speed	Left	0.13	(3.4)	781391	0.004	(0.1)	781392
4-speed	Left	0.15	(3.9)	782212	0.006	(0.15)	781398
					0.012	(0.3)	781399

Measuring and shimming

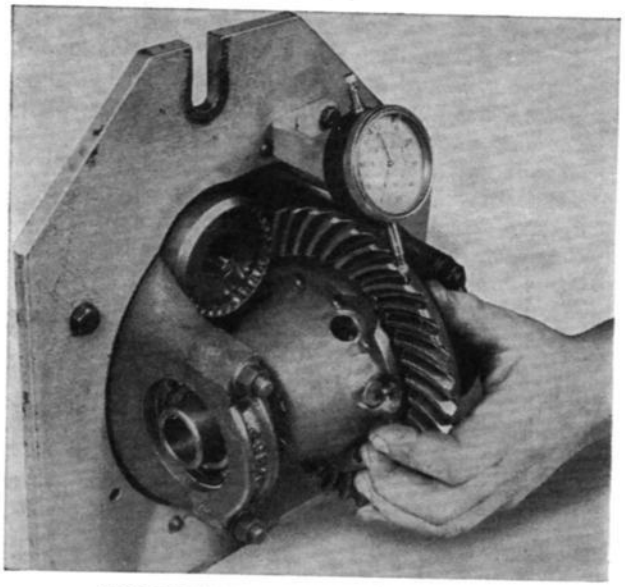
1. Locate the differential and ring gear assembly in the bearing seats and make sure that the marked teeth are meshed as indicated in the figure.

> NOTE
>
> Before measuring the backlash of the ring gear, rotate the ring gear until the marked teeth mesh with each other.

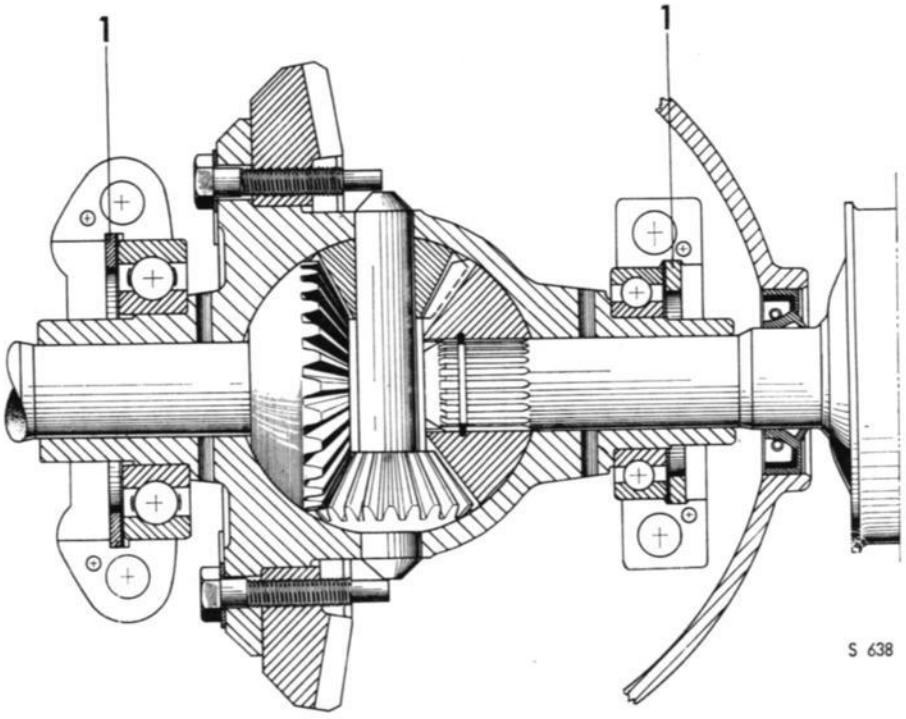
2. Insert a suitable spacer at the smaller bearing seat and then fit a suitable combination of shims between the spacer and the bearing so that roughly the correct amount of backlash is obtained.
3. Insert the spacer and shims for the other bearing seat, again with the shims nearest the bearing. See fig. Select a suitable total thickness which ensures that there will be no axial play on the differential side, but which does not give rise to tension between the bearings. It should be possible to drive the spacer into its position with thumb pressure.
4. Fit the bearing caps and tighten the bolts with a torque of 29 ft-lb (4 kgm).

> NOTE
>
> In the 4-speed transmission unit, the screws are of different lengths for the left and right sides.

5. Measure the backlash with the dial indicator screwed into the holder belonging to the transmission case fixture. See fig. Fit the indicator with a short measuring point and align it at right angles to the tooth flank at the ring gear periphery.
6. Lock the pinion shaft by passing a screwdriver or other suitable implement into the aperture for the speedometer drive gear. Turn the ring gear gently back and forth while checking the backlash reading. While this is being done, the gears must be dry and the marked teeth must be in mesh (ENV and ZF makes). The backlash must not deviate from the etched value by more than ±0.05 mm. Check the backlash at four more points on the ring gear.
7. If the backlash does not agree with the figure etched on the ring gear, remove the bearing caps and select new combinations of spacer and shims. Note that if shims are removed from one side, the same thickness must be added on the other side.



MEASURING RING GEAR BACKLASH



LOCATION OF SPACER AND SHIMS
1) AT DIFFERENTIAL BEARINGS

A change of 0.004 in. (0.1 mm) in shimming results in a change of 0.002 in. (0.05 mm) in backlash.

8. Recheck the adjustment after any change of shimming.

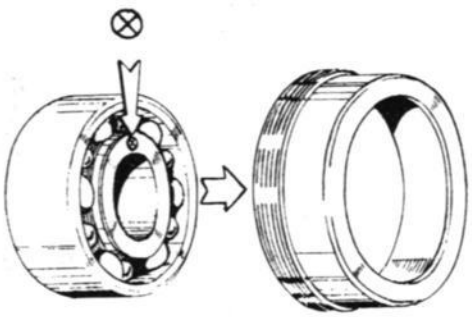
> IMPORTANT
>
> Before disassembling the transmission unit, always measure the relative positions of the pinion and ring gear, in order to determine whether the adjustment has possibly been incorrect. If the pinion and ring gear have been used only for a short mileage (less than 6000 miles or 10000 km), the unit can be readjusted. However, after longer mileages, when the gears will have become worn in at a certain position, adjustment should be made to agree with the readings obtained prior to disassembly.

Replacement of axial bearing

To change the rear axial bearing on the pinion shaft, separate the clutch housing from the transmission case and mount the latter in the transmission case fixture.

Removal

1. Remove the differential and record the position of the pinion.
2. Remove the transmission case cover and end cover.
3. Engage two gears simultaneously and back off the lefthand-threaded, pinion shaft end nut.



FITTING PINION BEARING IN SLEEVE
(3-SPEED TRANSMISSION)

4. Extract the pinion shaft axial bearing with puller No. 784101 for the 3-speed transmission and with puller No. 784115 for 4-speed gear box.
   Use the front press screw to support the shaft.
5. Drive the bearing out of the sleeve (3-speed transmissions only).

Installation

1. Drive the bearing into its sleeve. Note that the text and marking on the bearing must face inwards (in 3-speed transmission unit only). See fig.
2. Check that the shims and spacer have been fitted and drive the bearing into the transmission case, using tool No. 784102 for the 3-speed unit and No. 784122 for the 4-speed unit. Use the front press screw to support the shaft.

3. Tighten the pinion shaft end nut initially with a torque of 85 ft-lb (12 kgm), and then again with a torque of 45 ft-lb (6 kgm).
4. As the new axial bearing will have changed the adjustment of the pinion as well as the pinion shaft shimming in the end cover, the end cover shimming must be readjusted first. See Section 471.
5. Refit the end cover and tighten the bolts with a torque of 18 ft-lb (2.5 kgm).
6. Measure and adjust the position of the pinion as described in this section.
7. After final adjustment, secure the pinion shaft end nut. Then refit the cover and tighten the bolts finally with a torque wrench.
8. Refit the differential and transmission case cover with the appurtenant shims. Remove the transmission case from the fixture and refit the clutch housing to it.

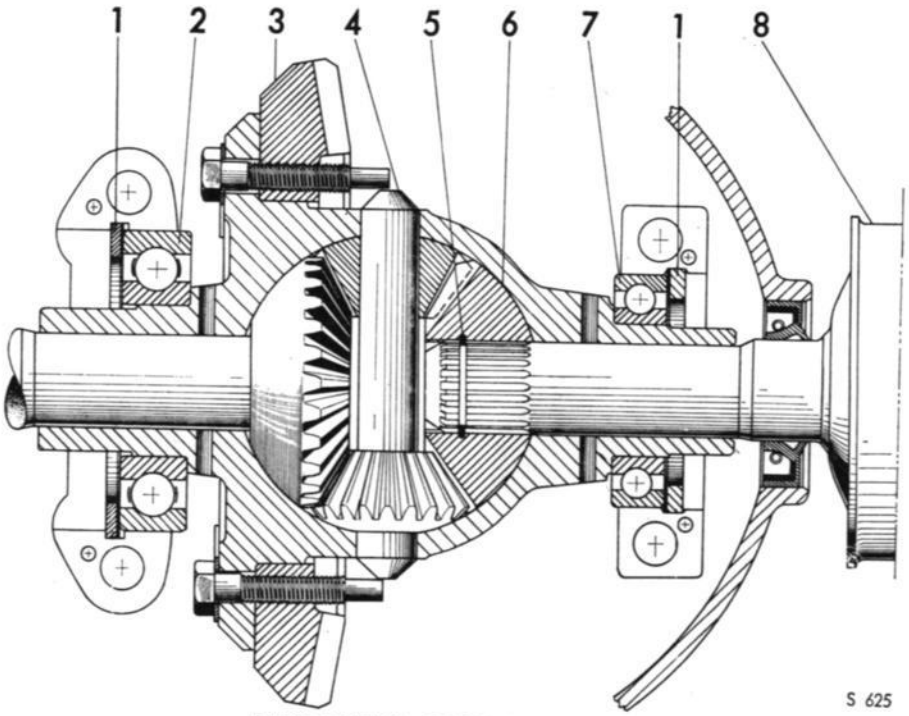
DIFFERENTIAL

Disassembly

It is not necessary to fix the transmission case in the fixture in order to disassemble the differential, although doing so would facilitate checking and adjustment of ring gear backlash.

NOTE

To renew parts inside the differential assembly, only the two long ring-gear bolts which lock the differential pinion shaft need be removed. The shaft and the pinions can then be removed without disassembling the differential.



DIFFERENTIAL, CROSS-SECTIONED

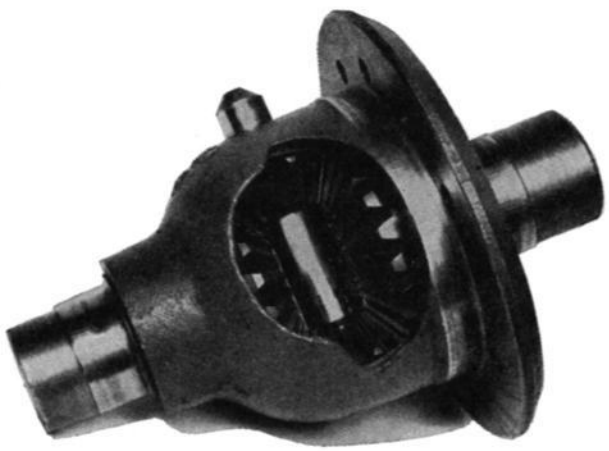
1. Spacer
2. Ball bearing
3. Ring gear
4. Differential shaft
5. Lock ring
6. Differential wheel
7. Ball bearing
8. Inner drive shaft

1. Remove the universal joints and clutch housing.
2. Remove the differential bearing caps and lift out the differential assembly. Collect the spacers from outside the bearings.
3. If necessary, drive both bearings off the differential assembly.
4. Back off and remove the ring gear bolts and remove the ring gear.
5. Drive out the differential pinion shaft.
6. Remove the pinions from the differential and collect the two splined nuts used to secure the differential output shafts axially. Remove the retainers or circlips from the pinions.

Reassembly

> IMPORTANT
>
> The ring gear must not be changed without fitting a new pinion shaft, since these two parts are supplied in matched sets.

1. Change all worn or defective parts.
2. SAAB 95 AND 96:
   Fit the retainers in the two pinions and pass the splined nuts onto the pinions.
   SAAB SPORT:
   Fit the circlips in the two pinions.



DIFFERENTIAL WITH INTEGRAL CASE

3. Locate the pinions in the differential casing and drive the differential pinion shaft in.
4. Refit the ring gear and tighten the bolts with a torque of 18 ft-lb (2.5 kgm).
   Note that the two long screws also serve to lock the differential pinion shaft axially — see fig.
5. Secure the ring gear bolts with retaining rings and then press the bearings on if they have been removed.
6. Position the differential in its bearing seats and place spacers and shims at the outside of the bearings. Check that the differential has no axial play and that the bearings are not jammed. Use thumb pressure only when fitting the spacer.
   If any part affecting the total width of the differential assembly has been renewed, for instance a bearing, the ring gear backlash must be checked. The backlash is adjusted by changing the combination of spacers and shims as described under "Pinion shaft and ring gear".
7. Refit the two bearing caps and tighten the bolts with a torque of 29 ft-lb (4 kgm). Reassemble the clutch housing and universal joints.

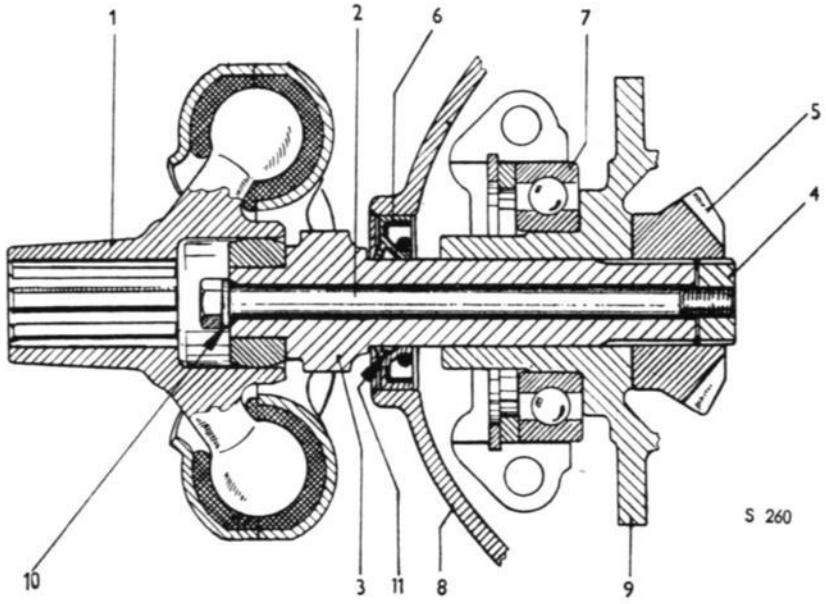
UNIVERSAL JOINTS AND SHAFTS

Inner universal joint, Saab 95 and 96

General

Inside the universal joint, power is transmitted by two rubber rings. Excessive compression of the rubber may result in transmission of engine vibrations to the body panels. To reduce this compression, a wire ring may be fitted between the two halves of the universal joint.

Three different thicknesses of wire rings are available, viz. 0.06 in. = 1.5 mm, (No. 710441), 0.08 in. = 2 mm, (No. 710437), and 0.1 in. = 2.5 mm, (No. 710442). Choice of size will depend on the adjustment required in each particular case. The 0.08 in. (2—mm) ring should be tried first. To fit the ring, merely back off the universal joint bolts slightly, insert the ring, and tighten the bolts again.

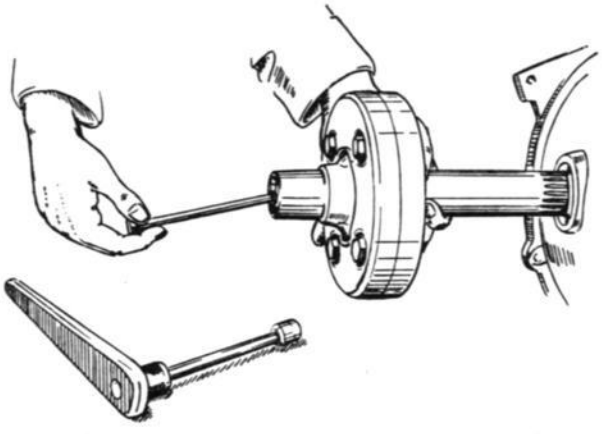


OUTPUT SHAFT, INNER UNIVERSAL JOINT

1. Yoke
2. Bolt
3. Output shaft
4. Splined nut
5. Differential side gear
6. Sealing ring
7. Ball bearing
8. Clutch housing
9. Differential case
10. Flat washer and O-ring
11. The space between the sealing lips is to be filled with chassis grease

Disassembly and reassembly

1. Jack up the car and remove the wheel.
2. Remove the upper control arm ball joint from the steering knuckle on the side from which the universal joint is to be removed. The most appropriate way of doing this is to back off the two bolts which retain the ball joint and the steering arm to the steering knuckle.
3. Pull the shaft out of the inner universal joint.
4. Back off the screw which holds the inner universal joint and shaft to the differential case inside the transmission. See fig. Collect the spring located outside the screw.
5. Pull out and remove the inner universal joint and shaft. See fig.
6. Divide the universal joint and remove the rubber rings.
7. Reject defective parts and provide new ones in their places. Then reassemble in the reverse order. The seal at the screw head is formed by a plain washer and an O-ring.
8. Before refitting the joint, fill the space between the lips of the sealing ring with chassis grease.



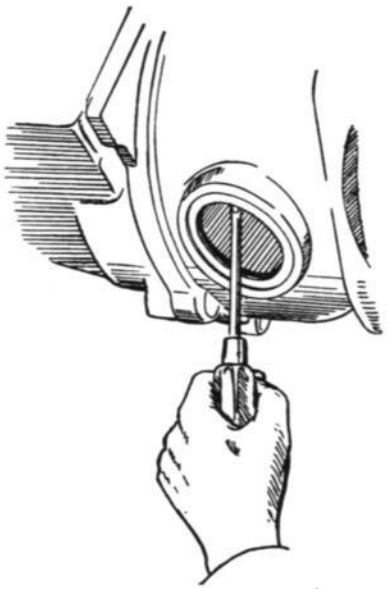
REMOVAL OF OUTPUT SHAFT AND INNER UNIVERSAL JOINT

Changing the sealing ring

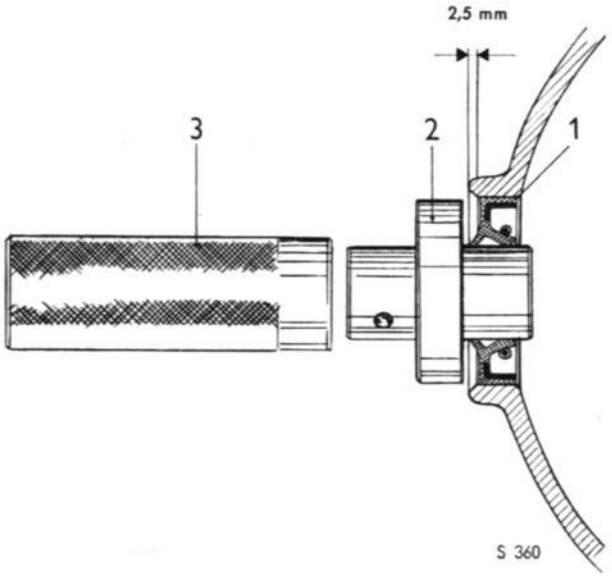
1. Remove the inner universal joint as described in the foregoing.
2. Prise the sealing ring out of the transmission case with the aid of a screwdriver or other suitable implement. See fig. Make sure that the seal is accompanied by its spring.
3. Using arbors No. 784033 and 784030, fit a new sealing ring, pressing it in 0.1 in. (2.5 mm) as shown in the fig., in order to ensure sufficient clearance.

IMPORTANT

Before refitting the universal joint, fill the space between the lips of the sealing ring with chassis grease.
Take great care when reassembling to prevent the drive-shaft splines from ruining the seal.



REMOVAL OF SEALING RING AROUND OUTPUT SHAFT



FITTING A NEW SEALING RING

1. Sealing ring
2. Arbor 784033
3. Handle 784030

INNER UNIVERSAL JOINT, SAAB SPORT

General

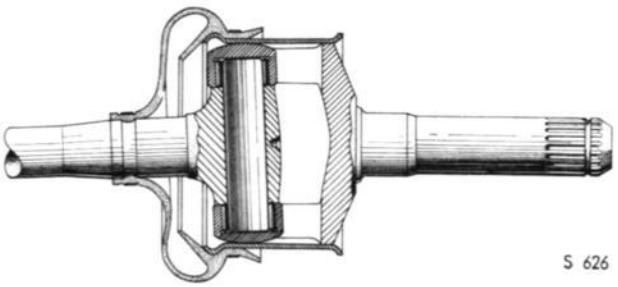
The inner universal joint in the Saab Sport comprises a driver which is borne up in the differential casing and splined to the differential gears, to which it is secured be means of an elastic retainer located in a groove in the differential gear.
When the driver is to be removed or refitted, the retainer springs out in its groove.
Externally, the driver is in the form of a fork in which a T-shaped drive shaft is carried in needle bearings. When the car is in motion, the shaft is axially slidable and also articulated. The universal joint is lubricated with SAAB Special Grease and is protected by a rubber boot. Lubrication is only necessary after reconditioning or if the universal joint has been removed for some other reason.
Always use SAAB Special Grease.

Disassembly

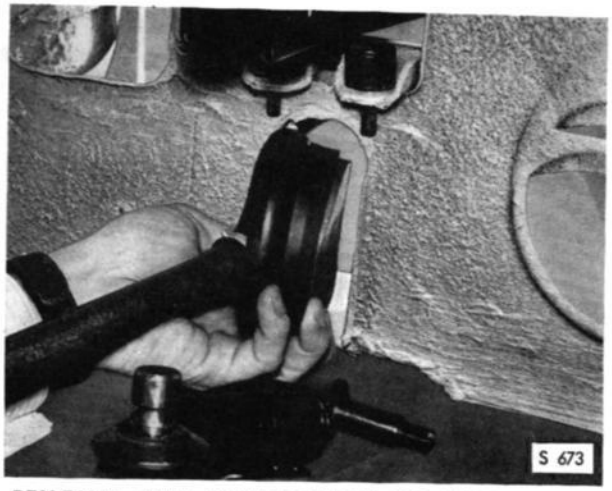
1. Jack up the front part of the car and remove the wheel.
2. Detach the brake housing, and hang it up by the wheel house so that the brake hose will not get damaged. Remove the wheel hub and brake disc.
3. Remove the large clip holding the rubber boot in position.
4. Remove the upper ball joint from the steering arm and the lower ball joint from the steering knuckle.
5. Open up the inner universal joint and fit a cover, tool 731762 in the rubber boot to keep the needle bearings in and dirt out. On the inner driver, fit protective cover 783846.
6. Withdraw the middle shaft together with the rubber boot through the wheel house. See fig.
7. Next, possibly tap the driver off the transmission case, using an arbor, and remove it. See fig.
8. If the rubber boot at the inner or outer universal joint needs to be changed, separate the shaft from the outer joint. See "Outer universal joint".
   The rubber boots can then be removed from the shaft.

Reassembly

1. Check that the inner driver is clean and then fill the needle-bearing grooves with 1.75 oz. (50 grammes) of SAAB Special Grease. The correct quantity of grease will be obtained if the grooves are filled first, and roughly as much again inserted in the bottom of the driver.
2. Refit the inner driver by sliding it into the transmission case.
   Check that the retainer in the differential gear engages correctly.
3. Pass the rubber boots onto the middle drive shaft and fit the shaft and rubber boot to the outer universal joint. See "Outer universal joint".
4. Apply SAAB Special Grease to the needle bearings and fit these to the shaft journals.



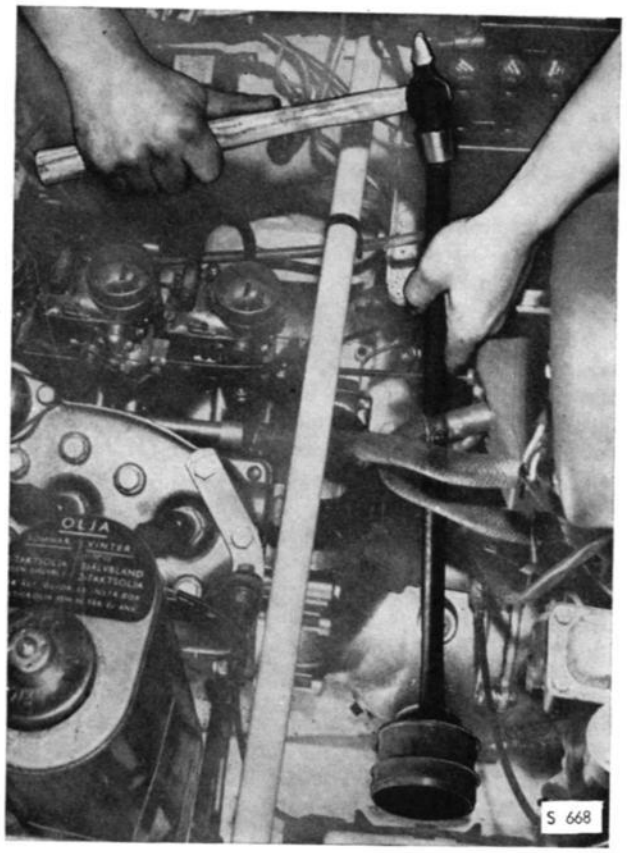
INNER UNIVERSAL JOINT, SAAB SPORT



REMOVAL AND INSTALLATION OF INNER DRIVE SHAFT

Fit the cover, No. 731762, in the rubber boot to protect the needle bearings and to prevent them from falling out. Then pass the shaft and rubber boot in through the wheel house.

5. Remove the cover from the rubber boot and pass the shaft and needle bearings into the inner driver. Then refit the rubber boot and the clips.
6. Refit the upper and lower ball joints to the steering knuckle.
7. Refit the brake disc and wheel hub, as well as the brake housing and friction pads.
8. Refit the wheel.



REMOVAL OF INNER DRIVER

Removal of inner driver
Replacement of sealing ring

1. Detach the steering knuckle from the upper and lower ball joints and hang it up to prevent damage to the brake hose.
2. Drive the inner universal joint out of the transmission case with the aid of an arbor, and pull the shaft out without disassembling the inner universal joint.
3. Prise the sealing ring off with a screwdriver, making sure that it is accompanied by its spring.
4. Fit a new sealing ring, using arbors No. 784033 and 784030. Press the ring in 0.1 in. (2.5 mm) as shown in the figure, in order to ensure sufficient clearance.
5. Refit the universal joint to the transmission case and connect the ball joints to the steering knuckle.

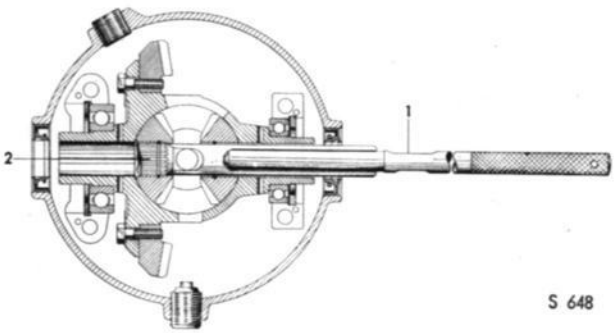
IMPORTANT

Before refitting the universal joint, fill the space between the lips of the sealing ring with chassis grease. Take great care when reassembling the universal joint, so that the splines do not damage the seal.

Replacement of broken inner driver, Saab Sport

If the pin for the inner driver has broken inside the transmission case, a special tool can be used to remove it without any necessity of disassembling the transmission unit.

1. Remove the defective inner driver. On the opposite side, remove the middle shaft and outer universal joint.
2. Using the driving arbor, No. 784142, first tap out the broken pin with the short part of the tool, inserting it from the side opposite that where the broken pin is located. Then reverse the tool and tap the pin out completely with the fork-shaped part. See fig.
3. Fit new parts.



TAPPING-OUT BROKEN INNER DRIVER

1. Driving arbor
2. Shaft pin

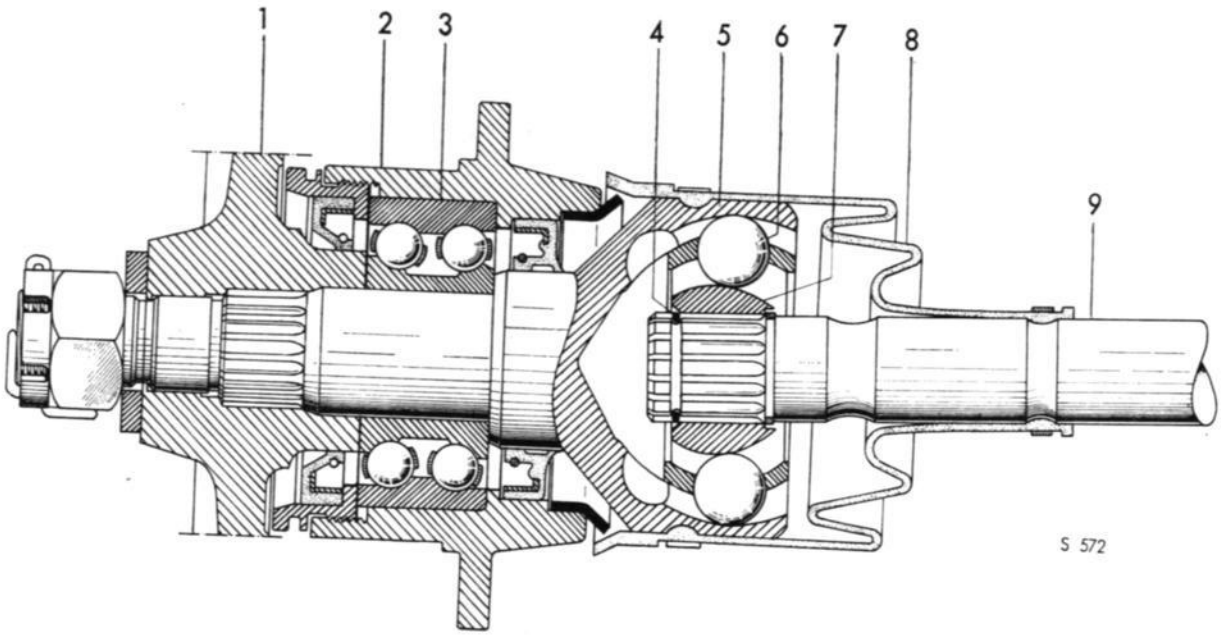
OUTER UNIVERSAL JOINT

General

On the outer universal joints, the outer drive shaft is in the form of a dome with spherical grooves, in which 6 balls transmit the power from a hub. The middle drive shaft and the hub are splined, and a retaining spring is used to hold the shaft at the hub. When installing the shaft, the retaining spring is compressed with a special tool, and the shaft is then passed into the hub. A special tool is also used to drive the shaft out ot the hub in disassembling.

The only spare parts available are the outer drive shaft, complete with hub, ball holders and balls. These parts are matched and must not be interchanged. Balls are also available as separate items.

Lubrication is necessary only after reconditioning, or if the universal joint has been removed for some other reason. Always use SAAB Special Grease.



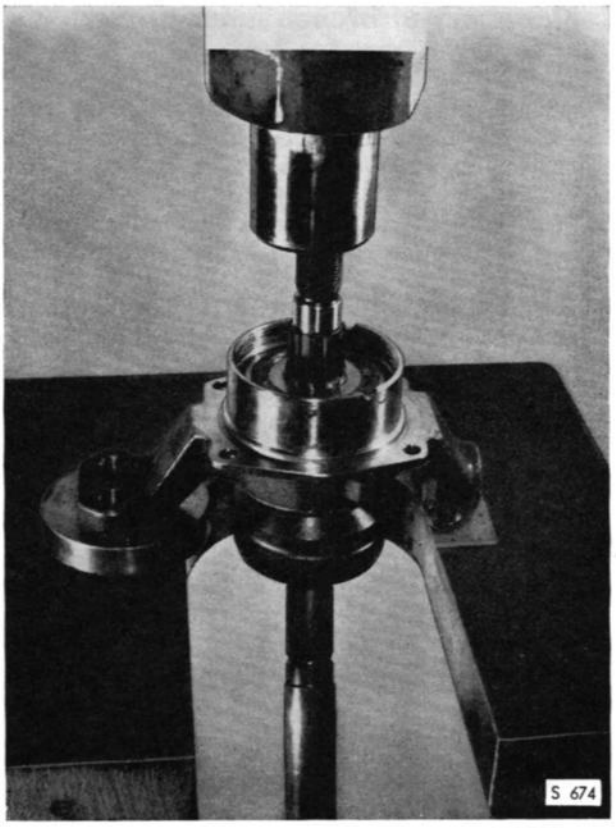
OUTER UNIVERSAL JOINT, SAAB SPORT

1. Wheel hub
2. Steering knuckle housing
3. Ball bearing
4. Lock ring
5. Outer drive shaft
6. Balls
7. Hub
8. Rubber bellow
9. Inner drive shaft

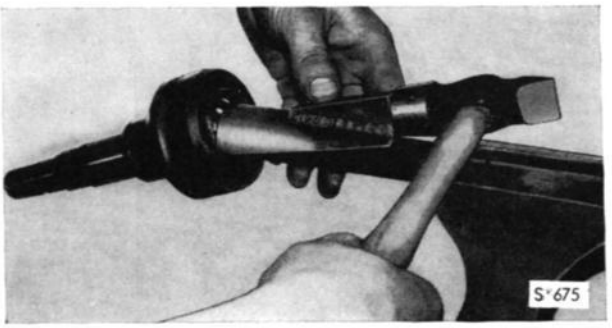
Disassembly

1. Jack up the front part of the car and remove the wheel and brake drum.
   SAAB 95 AND 96:
   Remove the backplate and hang it up by the wheel house to prevent damage to the brake hose.
   SAAB SPORT:
   Remove the brake housing and hang it up by the wheel house to prevent damage to the brake hose. Then remove the hub and the brake disc.
2. Remove the steering arm and upper ball joint from the steering knuckle.
3. Back off the clamping screw which holds the lower ball joint to the steering knuckle.
4. SAAB SPORT:
   Remove the large clamp for the rubber boot on the inner universal joint and open up the joint. Fit the cover, No. 731762 in the rubber boot to keep the needle bearings in and dirt out. See "Inner universal joint". On the inner driver, fit cover 783846.
5. Pull the drive shaft out through the wheel house and remove the front-axle assembly. Wash this assembly thoroughly.
6. Remove the nut and shaft seal from the steering knuckle. Use the pegged key, No. 784020. First prise up the nut retainer with an arbor or other suitable tool.
7. Remove the outer drive shaft by applying pressure to its outer end. The outer drive shaft will be accompanied by the universal joint, rubber boot and middle drive shaft. See fig.
8. If necessary, drive the bearing out of the steering knuckle from the inside.
9. Remove the two sealing rings from their seats in the steering knuckle nut if they require changing.
10. Secure the middle drive shaft in a vise and strike the hub off the shaft with the aid of arbor No. 784165. See fig.

> NOTE
>
> The hub, ball holder and balls can be removed from the dome if the hub is turned 90° in a certain position. Disassembly, however, should be carried out only if absolutely essential.



PRESSING OUT THE OUTER DRIVE SHAFT



REMOVAL OF INNER DRIVE SHAFT FROM OUTER UNIVERSAL JOINT WITH TOOL 784165

Reassembly

Clean all the component parts thoroughly, and replace worn or damaged parts by new ones. Pay particular attention to shaft seals and rubber boots.

1. Fit a new sealing ring into the steering knuckle if the old seal has been removed.
2. Pack the bearing with SAAB Special Grease. Always use genuine bearings.
3. Drive the ball bearing into the steering knuckle, using tool No. 784075 and 784030, with the number stamped on the outer race facing outwards. See fig.
4. Screw on the nut and the shaft seal and secure the nut.
5. Fill the space between the lips of the sealing ring with chassis grease and drive the shaft in until it butts against the bearing.
6. Lubricate the universal joint with SAAB Special Grease. The correct amount of grease (1.75 oz. = 50 grammes) will be obtained if you fill the dome, with hub and balls inserted, with grease. This operation must be carried out in conditions of scrupulous cleanliness in order to prevent dirt and foreign matter from entering the universal joints and bearings.
7. Ease the rubber boots and clamps onto the middle drive shaft.

PRESSING IN THE BALL BEARING IN THE STEERING KNUCKLE, TOOLS 784030 AND 784075. THE MARK ON THE BALL BEARING FACING OUTWARDS

8. Fit a new elastic washer on the middle drive shaft and compress it with the aid of tool No. 784161. See fig.

NOTE

Place the ends of the elastic washer under one of the plier jaws. The ends must not be free when the pliers are closed.

9. Insert the shaft in the hub and tap the end of the shaft lightly so that the elastic retainer engages. Detach the pliers and slide the shaft fully into the hub.
10. Fit the two clamps on the outer rubber boot and the clamp for the inner boot at the shaft.
11. SAAB 95 AND 96:
    Lubricate the splines of the inner drive shaft with SAAB Special Grease. Pass the shaft through the wheel house and into the inner universal joint.

    SAAB SPORT:
    If the needle bearings have been removed, lubricate them with SAAB Special Grease and mount them on their journals. Fit the cover, No. 731762, to protect the needle bearings, and pass the drive shaft in through the wheel house. Make sure that the inner driver is clean and that it has been packed with fresh SAAB Special Grease — see "Inner universal joint". Then reassemble the inner universal joint and tighten the clamp round the rubber boot.
12. Refit the steering knuckle to the steering arm and lower ball joint. Remember to provide tabbed washers at the screws, and to secure these.
13. SAAB 95 AND 96:
    Refit the backplate and brake drum.

    SAAB SPORT:
    Refit the hub and the brake disc, followed by the brake housing and friction pads. Secure the bolts with tabbed washers.
14. Refit the wheel and lower the car to the floor. Tighten the axle nut to a torque of 130 ft-lb (18 kgm), and secure.
15. Refit the hub cap.

WARNING

The friction pads in the Saab Sport must be returned to their positions near the brake disc. To ensure correct positioning, pump repeatedly with the brake pedal. Neglect in this respect will result in brake failure.

PLACING THE LOCK RING IN TOOL 784161

INSTALLATION OF INNER DRIVE SHAFT

CONTENTS

DESCRIPTION

General

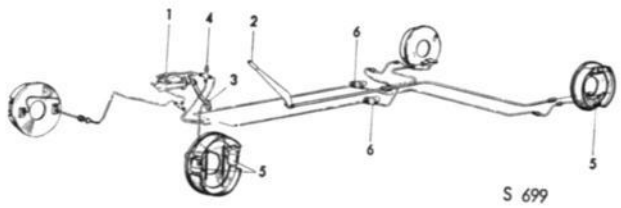
The hydraulic footbrake acts on all four wheels. The brake system is of the two-circuit type, which means that the master cylinder controls the left front and right rear wheels simultaneously with, but independently of, the right front and left rear wheels. Consequently, if leakage occurs as a result of damage to the brake system, braking effect will be lost only on one diagonal pair of wheels, while remaining for the other pair. Leakage is revealed both by excessive pedal travel and by a tendency for the car to swerve towards the side at which brake pressure remains on the front wheel when the brakes are applied. The Saab 95 and 96 have drum brakes on front and rear wheels, whereas the Saab Sport has disc brakes on the front wheels and drum brakes on the rear wheels.

The front brakes on the Saab 95 and 96 are equipped with two single-acting brake cylinders and are self-adjusting. The rear wheels have double-acting brake cylinders. Pressure-regulating valves are fitted to the brake lines for the rear brakes in order to prevent premature locking of the rear wheels. The brake-fluid reservoir is housed in the engine compartment on the master cylinder. The mechanical handbrake acts on the rear wheels. The brake lever is located between the two front seats and the braking effect is transmitted to the rear wheels by two sealed Bowden cables.

Two-circuit brake system, function

When the brake pedal is depressed, the master cylinder pistons apply a force to the brake fluid, which is displaced through brake pipes and hoses to the cylinders at the wheels, causing the brake shoes to contact the drums or, in the case of the Saab Sport, the brake pads to contact the discs. The master cylinder has two pistons which work simultaneously, but independently, so that one acts on the left front and right rear wheels while the other acts on the right front and left rear wheels. Consequently, if leakage occurs as a result of damage to the brake system, braking effect will be lost only on one diagonal pair of wheels, while remaining for the other pair. Leakage is revealed by a tendency for the car to swerve towards the side where the brake power is still effective on the front wheel upon application of the brakes, and by excessive pedal travel. The reason for this is that the master cylinder piston serving the damaged circuit moves without actuating the brake shoes. Every application of the brakes thus pumps a certain amount of brake fluid out of the system, but as the upper part of the brake cylinder forms two chambers separated by a partition, the system can only be emptied as far as the partition. The brake fluid remaining for the undamaged circuit is sufficient to allow the car to be driven safely to a garage to have the damage repaired. Since the two-circuit brakes operate on the diagonal wheels, maximum braking effect is ensured and affords greater safety when steering the car, as one front wheel and one rear wheel roll freely at the same time and are not locked.

The brake lines to the rear brakes on the Saab 96 are fitted with pressure-regulating valves to prevent premature locking of the rear wheels. This is due to the fact that when the master cylinder pressure has reached a certain figure as a result of heavy brake application, the valves prevent further fluid from passing to the rear brakes. Any additional pressure is then transmitted only to the front brakes.



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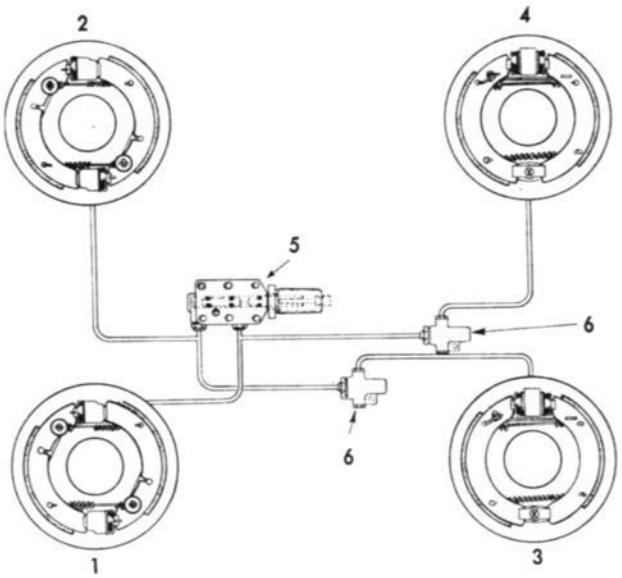
TWO-CIRCUIT BRAKE SYSTEM

1. Master cylinder incl. brake-fluid reservoir
2. Handbrake lever
3. Brake pedal
4. Stop-light contact
5. Wheel cylinders
6. Pressure-regulating valves (Saab 96 and Sport only)



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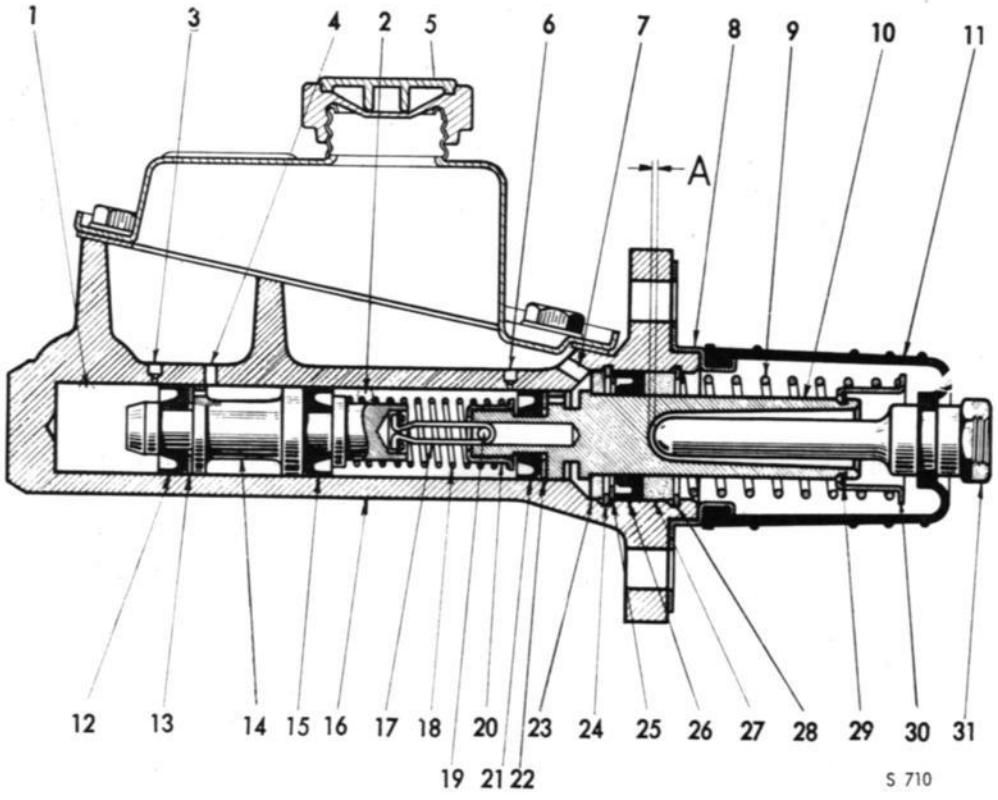
HYDRAULIC SYSTEM — PRINCIPLE

1. Left front wheel
2. Right front wheel
3. Left rear wheel
4. Right rear wheel
5. Master cylinder
6. Pressure-regulating valve



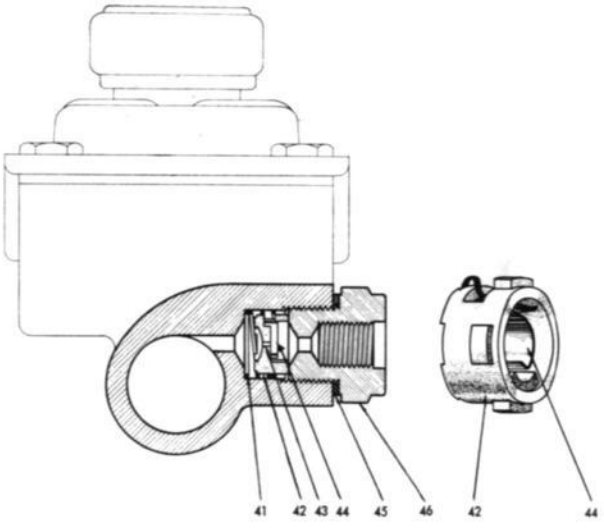
MASTER CYLINDER, SECTIONED

A = 0.024—0.047 in. (0.6—1.2 mm)

1. Outlet to one circuit
2. Outlet to other circuit
3. Bypass port
4. Feed hole
5. Brake-fluid reservoir
6. Bypass port
7. Feed hole
8. Retaining plate
9. Spring
10. Primary piston
11. Rubber boot
12. Primary cup
13. Piston washer
14. Secondary piston
15. Secondary cup
16. Body
17. Clip
18. Spring
19. Retaining pin
20. Spring holder
21. Primary cup
22. Piston washer
23. Piston stop ring
24. Circlip
25. Washer
26. Secondary cup
27. Guide bearing
28. Circlip
29. "Spirolox" circlip
30. Spring retainer
31. Push-rod

Master cylinder

The tandem master cylinder comprises a body housing a primary piston (10) and a secondary piston (14), which are actuated by the push-rod (31) from the brake pedal. The pistons are held apart by a spring (18), the distance between them being determined by the clip (17) and the retaining pin (19). The secondary piston has a primary cup (12) and a secondary cup (15). Fitted behind the primary cup is a dished piston washer (13) which prevents the cup from being extruded into the feed holes in the flange. The primary cup of the primary piston (21) also has a dished piston washer (22) and a secondary cup (26), which keys against the piston rod and prevents leakage of brake fluid. The spring (9) returns the pistons to the initial position. Non-return valves are fitted in the two outlets (1 and 2) see fig.



NON-RETURN VALVE IN MASTER CYLINDER

41. Spring
42. Valve body
43. Equalizing hole
44. Spring clip
45. Gasket
46. Adapter

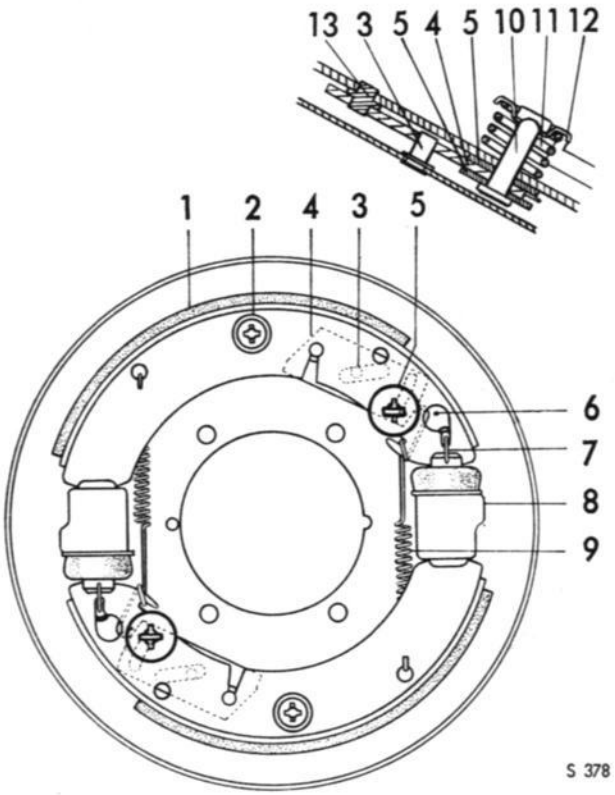
When the brake pedal is depressed, the push-rod (31) actuates the primary piston, the thrust being transmitted by the spring (18) to the secondary piston, which forces brake fluid out through the non-return valve to one brake circuit. As the secondary chamber pressure rises, the spring force between the pistons is overcome, and further effort on the brake pedal compresses the spring slightly, causing brake fluid to be forced out to the second brake circuit. The pressure in front of the primary piston also reacts on the back of the secondary piston. Consequently, the latter forms a partition and balances the pressures until they are equal in both brake circuits.

Upon removal of the load from the brake pedal, the return spring (9) returns the pistons to the initial position faster than the brake fluid is able to flow back from the wheel cylinders. The front (or primary) cups therefore move forwards a little and the dished washers uncover the feed holes behind the cups and admit brake fluid from the reservoir. Meanwhile, the brake-shoe pull-off springs pull back the brake pistons, whereupon brake fluid flows back through the open non-return valves. The brake fluid then flows back to the reservoir via the by-pass ports (3) and (6), which also compensate for contraction or expansion of the brake fluid due to temperature changes. When the brake shoes have been returned, the non-return valve closes, and any residual pressure is relieved through the hole (43) in the valve. The purpose of the non-return valve is to prevent the re-entry of brake fluid from the wheel cylinders when bleeding the brake system. This ensures that a fresh charge of brake fluid, completely free of air, will pass from the reservoir and through the system at each stroke of the brake pedal. In the event of a leak occuring in the system operated by the primary piston, the spring (18) is compressed until the primary piston strikes the secondary piston. The latter can then function normally.

If leakage occurs in the circuit operated by the secondary piston, the secondary piston will be thrust forward by the primary piston and spring until it touches the bottom of the cylinder bore, whereupon brake fluid can be forced out into the intact circuit.

Front brakes, Saab 95 and 96

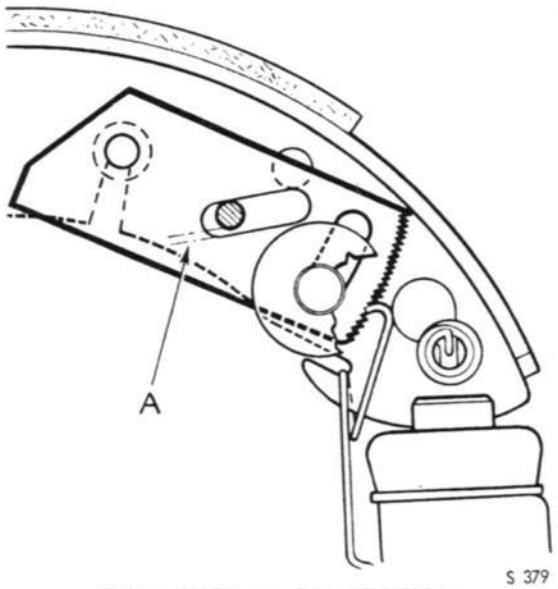
The front brake shoes are of the self-adjusting type, and each one is operated by its own single-acting brake cylinder. The shoes are engaged in slots in the wheel cylinder piston and opposing wheel cylinder, where they are free to slide and thus able to center in relation to the drum. Each shoe carries its own automatic adjustment device, comprising an adjuster lever (4), secured to the brake shoe by a peg (13) at one end and with serrations at the other end. The lever is held to the brake shoe by two retaining washers (5), a retaining pin (10), loaded by a spring (11), and a spring retainer (12). One end of the brake-shoe pull-off springs (9) is designed as a clicker catch which engages in the serrations of the adjuster lever. On the backplate, a peg (3) is provided, which slides in a groove in the center of the lever. The brake shoes are held against the backplate by a steady spring, a washer and a steady spring (2). They are also held to the wheel cylinder piston by means of a piston-locking spring (7).



FRONT BRAKE

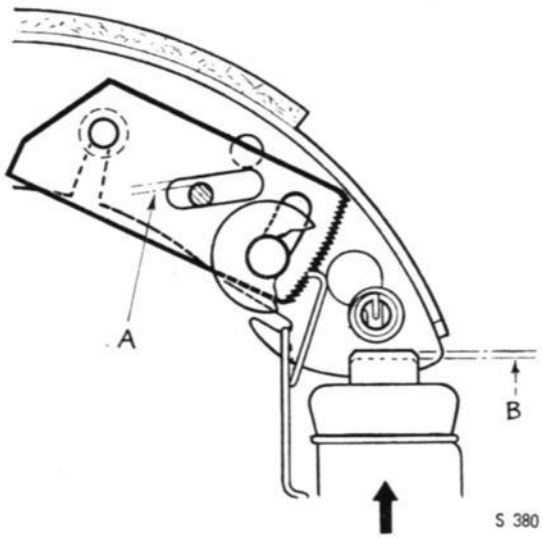
1. Brake shoe
2. Steady spring
3. Backplate peg
4. Adjuster lever
5. Retaining washers
6. Hole for locking spring
7. Piston-locking spring
8. Wheel cylinder
9. Pull-off spring
10. Retaining pin
11. Spring
12. Spring retainer
13. Peg

The backplate peg (3) always has a certain amount of clearance in the adjuster lever slot (see fig.), and this determines how much free movement there will be between brake linings and brake drums when the shoes are "off". Upon application of the brakes, the shoe is forced out against the drum by the piston and is accompanied by the adjuster lever, so that the peg takes up a new position in the slot. As the brake linings get worn, the automatic adjustment device becomes effective. Further travel of the brake shoe together with the adjuster lever will result in the detention of the lever in the middle by the peg (3). However, since the lever is carried in a bearing (2) at one end, it will turn there and will slide between the retaining washers (4) at the other end. The friction of these retaining washers will now hold the adjuster lever in this new position when the brake shoes return to the "off" position. When the adjusted lever has travelled far enough, the clicker catch of the pull-off spring will drop into the next serration and thus ensure positive retention of the adjuster lever. When the brake shoe returns to the off position, it will move only as much as is allowed by the free movement at the peg, which is just enough to ensure that the brake shoe runs clear of the drum. In order to prevent any variation in the brake-pedal stroke due to the wheel cylinder piston working back into the cylinder of its own, the piston is connected to the brake shoe by a piston-locking spring.



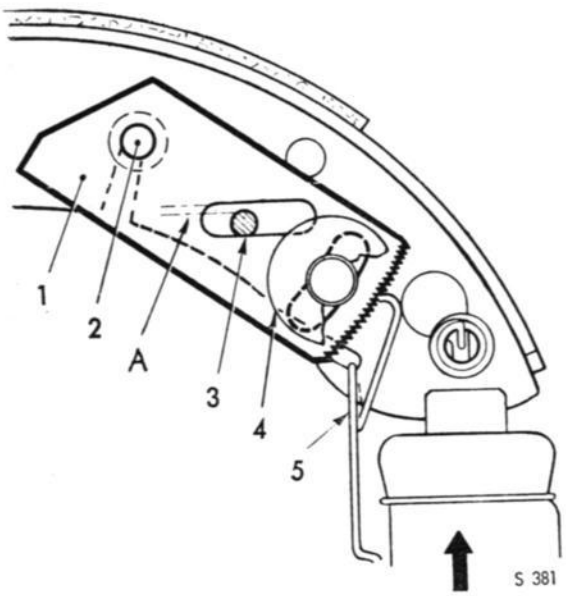
BRAKE SHOE IN OFF POSITION

A = Clearance



BRAKE SHOE WITH NEW LINING, UPON APPLICATION OF BRAKE

A = Clearance
B = Piston travel

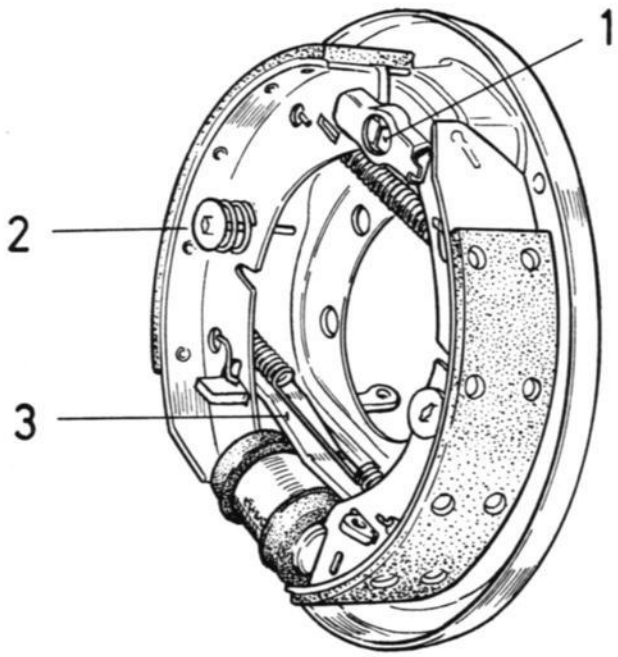


BRAKE SHOE WITH WORN LINING, UPON APPLICATION OF BRAKE

A = Clearance
1 = Adjuster lever
2 = Bearing
3 = Backplate peg
4 = Friction washers
5 = Pull-off spring with clicker catch

Rear wheel brakes and handbrake

The rear wheel brakes and the handbrake are identical for all models and have a wheel cylinder mounted in the backplate. The cylinder is fitted with two pistons, each of which acts on one brake shoe — see fig.
The brake shoes are manually adjustable.
The brake system features a pressure-regulating valve for the rear brakes, to ensure that the braking effect will be distributed in the most appropriate manner between the front and rear wheels. This valve is not provided on the Saab 95, as this model has a different weight distribution.
The handbrake lever is located between the two front seats and the braking movement is transmitted by sealed Bowden cables to levers in the rear wheel cylinders.



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REAR-WHEEL BRAKES

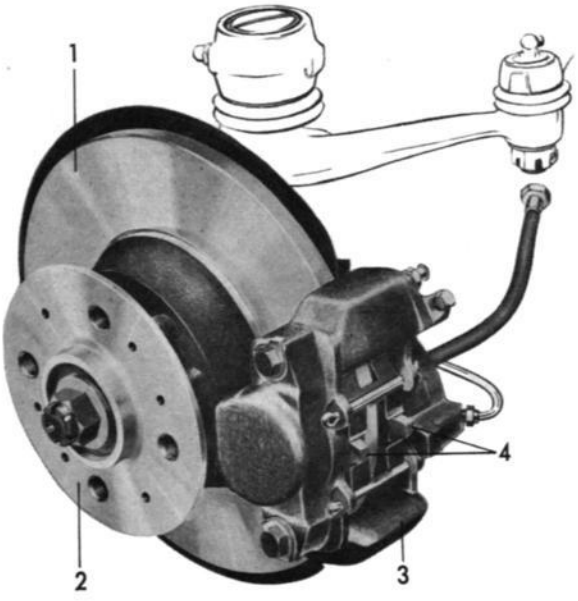
1. Adjustment
2. Spring
3. Handbrake link

Disc brakes, Saab Sport

The disc brakes for the front wheels consist of a brake disc which is attached to the hub and rotates with the wheel. On either side of the brake disc is a friction pad which, when the brakes are applied, is forced against the brake disc by a brake piston, so that the disc is jammed between the two friction pads. The brake pistons are located in a split brake housing which encases the brake disc. In the brake housing, fluid is distributed to the two brake cylinders, and a bleed screw is fitted at the highest point. The brake housing is screwed to a holder which is secured to the steering knuckle.

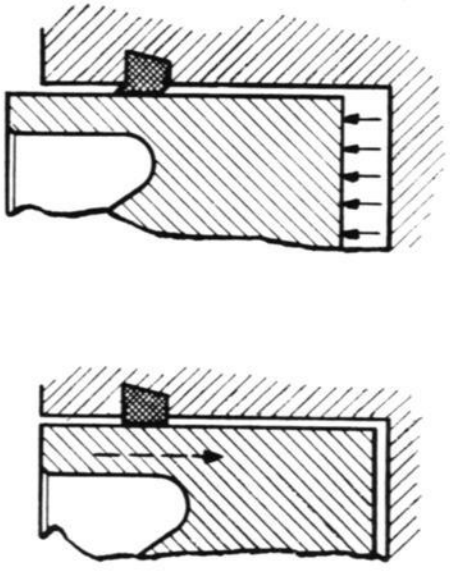
The brake pistons have a large diameter (2 in.). The piston seals are located in grooves in the cylinders, whereas the pistons have an entirely smooth surface. The outer piston seals serve to exclude dust and dirt, while the inner seals serve to prevent leakage of brake fluid. The brake pistons act directly on the friction pads, the latter being held in position by means of two springs and cotter pins. Pads can be changed by removing the springs and pins. There are no pull-off springs for the friction pads, which implies that the disc brakes are self-adjusting.

When the brake pedal is depressed, brake fluid is forced from the master cylinder to the brake cylinders, and the brake pistons press the friction pads against the disc. When the load is taken off the brake pedal, the pistons are returned a few thousandths of an inch because of the springiness in the piston seal (see fig.). This return is sufficient to prevent the friction pads from bearing on the brake disc. Wear on the friction pads is thus compensated for in this manner, as the piston gradually moves further out. Abnormal wear on the friction pads is thus not revealed by excessive pedal travel.



FRONT AXLE ASSEMBLY WITH DISC BRAKE

1. Brake disc
2. Wheel hub
3. Brake housing
4. Friction pads



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THE BRAKE PISTON IS FORCED BACK BY THE INFLUENCE OF THE PISTON SEAL

BRAKE SHOES

Checking the brake linings for wear

As the front wheel brakes are self-adjusting, it is not possible to decide whether or not the linings are worn by the length of the pedal stroke. It is therefore extremely important to remove the wheels at regular intervals in order to check the wear on the brake linings through the holes in the brake drum. See fig. If the linings are less than about 0.1 in. (2.5 mm) thick, replacement is called for.

INSPECTION HOLE IN BRAKE DRUM

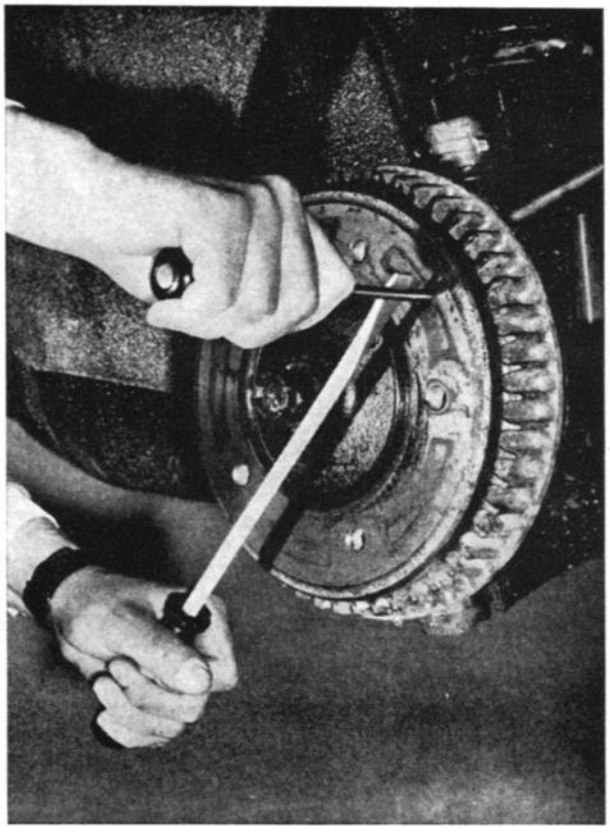
Removal of brake drum for inspection of brake lining

1. Remove the cotter pin and the shaft nut.
2. Jack up the car.
3. Remove the wheel.

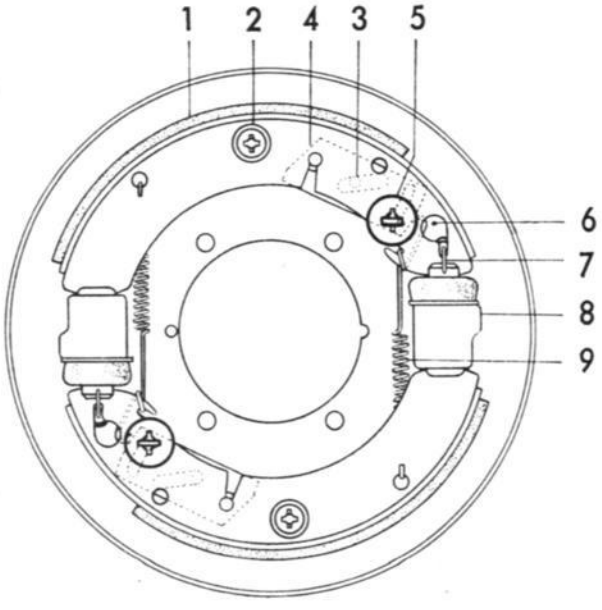
4 a. Rear wheels: Release the handbrake and adjust the rear brake shoes with the adjusting screw.

4 b. Front wheels: The front brake shoes are self-adjusting. Consequently, the following procedure must be adopted for readjusting the shoes:
Pass a screwdriver into the extra hole in the brake drum and then into the hole 6 in the brake shoe. See fig. Bearing against the hub nut (see fig.), press the brake drum and shoe against the normal direction of rotation, until you hear a grating sound, indicating that the shoe has been forced back and the clicker catch lets go. Readjust both shoes before removing the brake drum.

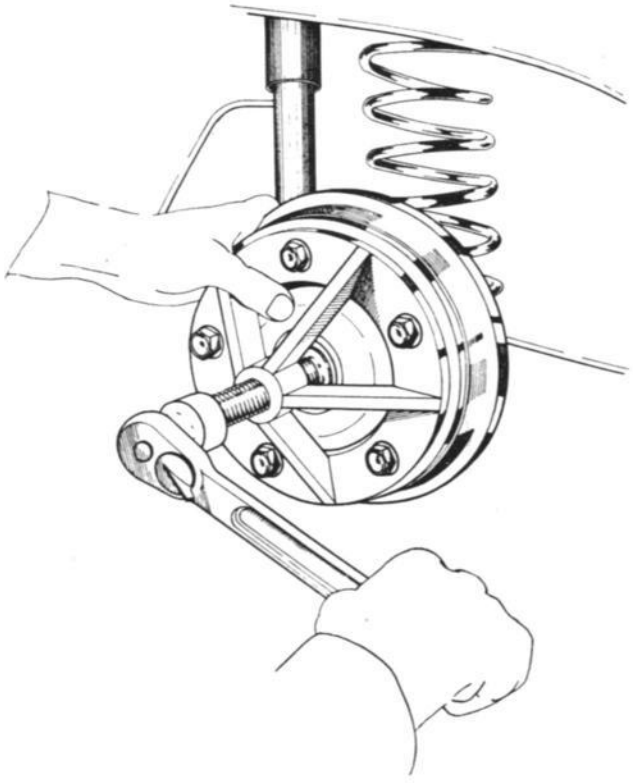
5. Remove the brake drum, using puller No. 784002 for Saab 95 and 96 and 784201 for Saab Sport.
6. Examine the linings on all shoes. If they are worn to a thickness of 0.1 in. (2.5 mm), or unevenly worn, or covered with grease, new linings must be fitted. As a rule, the linings are worn equally on the front brakes, while on the rear brakes the front linings last longer than the rear linings. On rear brakes, then, it may be sufficient to change the two rear linings only. On front brakes, all linings should be renewed simultaneously.



READJUSTING BRAKE SHOES



FRONT BRAKE



WHEEL PULLER 784002

NOTE

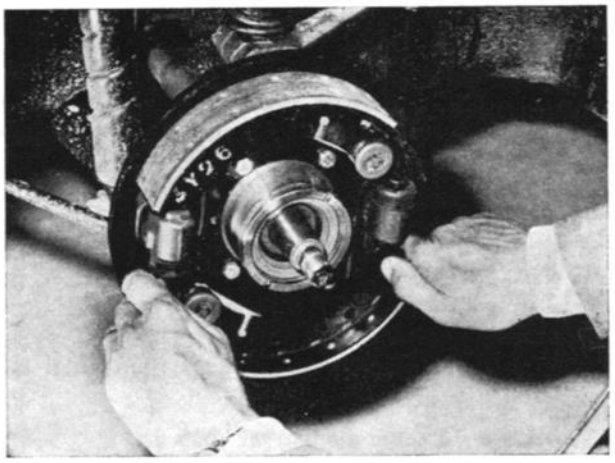
Never fit a new brake lining on one side only.

7. An exchange system is operative for complete brake shoes with fitted automatic adjustment device. Replacement of linings thus calls for exchange of the entire shoe.
   If linings only are replaced, they must be ground in a special machine to a radius of 0.010—0.012 in. (0.25—0.30 mm) less than that of the drum in order to ensure perfect contact. The ends of the linings must not be chamfered; the edge should be left as sharp as possible. See Section 512.

FRONT BRAKE SHOES

Disassembly

1. Remove the locking springs (7) holding the brake piston to the brake shoe. First, unhook the spring off the piston.
2. Remove the steady springs (2) for the brake shoes.
3. Ease the heel of the lower shoe out of the wheel cylinder (see fig.) and then move the shoe carefully



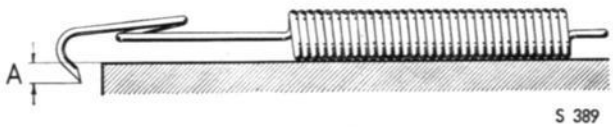
DISASSEMBLING AND REASSEMBLING FRONT BRAKE SHOES

outwards a little way to disengage the backplate peg (3) from the adjuster lever groove so that the toe of the shoe can be removed from the brake piston. Use the fingers only, and do not touch the pull-off springs. Also, take great care not to distort the pull-off springs and clicker catches.

4. Remove the upper shoe in the same way. Wind a piece of wire or some other suitable device round the cylinders to prevent the brake pistons from falling out.
5. Remove the retaining washers, the spring and the pin, whereupon the adjuster lever can be detached from the brake shoe. An exchange system is operative for brake shoes: adjuster levers and retaining washers are included, so that these parts should not be removed.

Reassembly

1. If the adjuster lever and retaining washers have been removed, check them for wear and then locate the adjuster lever in its slot in the brake shoe. Locate the retaining washers on either side of the adjuster lever and refit the spring, retaining pin and spring retainer. Note! Do not lubricate the retaining washers.
2. Check the pull-off springs and, if necessary, adjust the clicker catches to the correct dimension — see fig.



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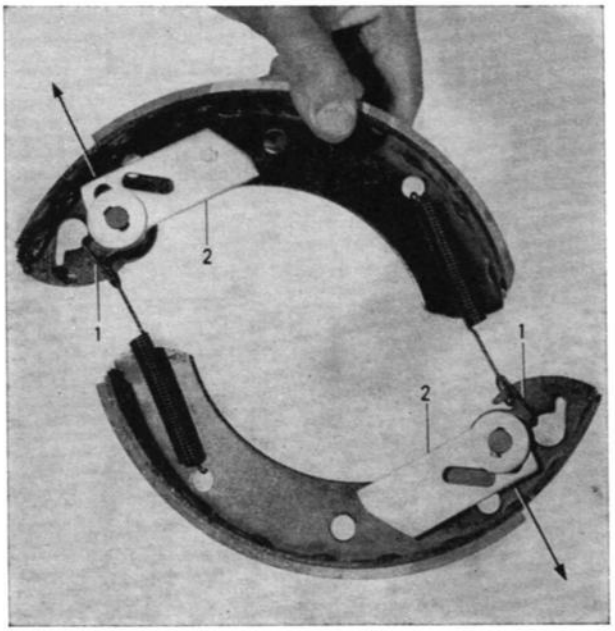
CHECKING THE CLICKER CATCH OF THE PULL-OFF SPRING

Dim. A = 0.157 in. (4 mm)

3. Push the adjuster levers over as far as possible towards the shoe table. Refit both pull-off springs, taking great care to ensure that their clicker catches are correctly positioned in the retaining washers — see fig.
4. Remove the wires used to retain the pistons.
5. Refit the upper shoe first, making sure that the backplate peg (3) engages in the oval hole in the adjuster lever.
6. Next, refit the lower shoe in the same manner, using the hands only, taking care not to touch the springs.



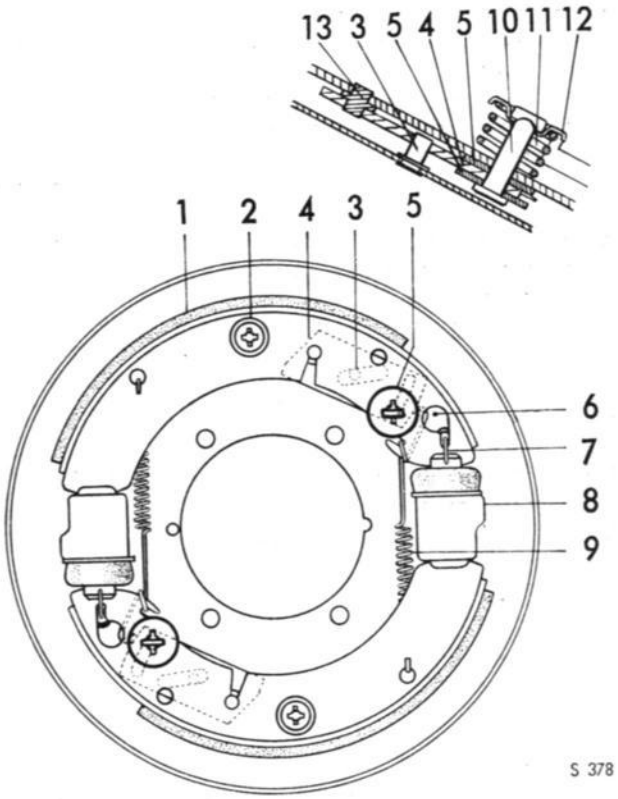
INSERTION OF PULL-OFF SPRINGS

1. Clicker catch, spring
2. Adjuster lever

NOTE

It is of the utmost importance that the clicker catches on the pull-off springs do not get distorted during assembly.

7. Refit the piston-locking springs and the steady springs with retaining pins and washers for the brake shoes.
8. Center the shoes and refit the brake drums.
9. Adjust the front brakes by depressing the brake pedal hard several times.



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FRONT BRAKE

1. Brake shoe
2. Steady pin with spring
3. Backplate peg
4. Adjuster lever
5. Friction washers
6. Hole for locking spring
7. Piston-locking spring
8. Wheel cylinder
9. Pull-off spring
10. Retaining pin
11. Spring
12. Spring retainer
13. Peg

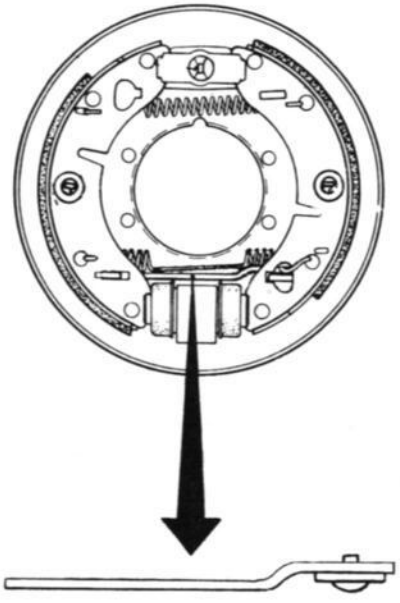
REAR BRAKE SHOES

Disassembly

1. Use a piece of wire or a clamp to keep the brake pistons in the cylinder while carrying out this operation.
2. Remove the springs which hold the brake shoes against the backplate.
3. Lift the brake shoes off from the wheel cylinder and handbrake levers, first at the top and then at the bottom end.

Reassembly

1. Hook on the springs between the shoes.
2. Locate the front shoe with the handbrake lever in the oblong hole.
3. Lift the rear shoe with the handbrake lever into the large hole. Make sure that the spring presses against the lever as shown in the fig.
4. Remove the wire or clamp used to keep the brake pistons in position.
5. Adjust the shoes to a position concentric with the backplate. Refit the springs holding the shoes against the backplate.
6. Refit the wheel hub and the wheel.

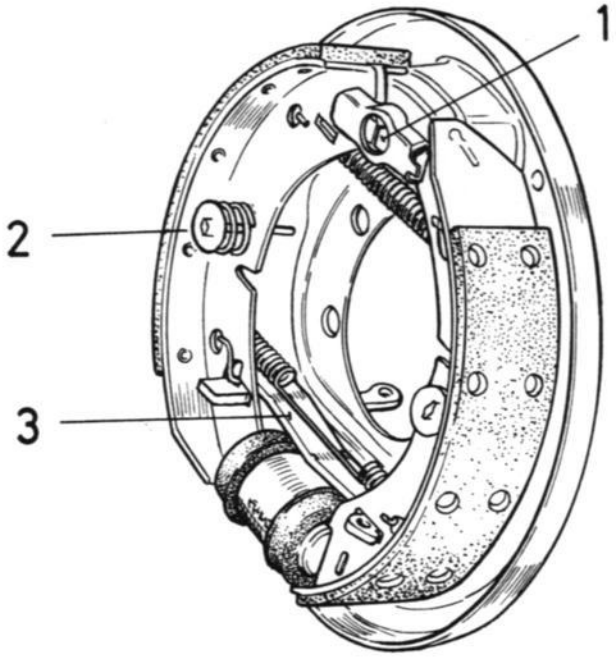


S 714

FITTING THE HANDBRAKE LEVER

WARNING

Do not allow oil or grease to contaminate brake linings or drums.



S 712

REAR-WHEEL BRAKES

1. Adjustment
2. Spring
3. Handbrake link

ADJUSTMENT OF BRAKE SHOES

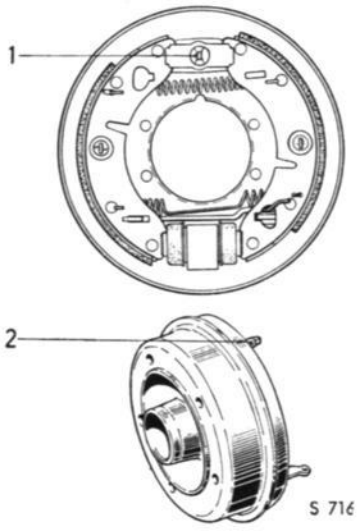
General

Brake-shoe wear is revealed by excessive travel of the brake pedal or handbrake lever before the brakes work. The distance between the fully depressed pedal and the toeboard should not be less than 2 in. (5 cm). See fig. The front wheels have self-adjusting brakes. Consequently, it will only be necessary to adjust the brake shoes on the rear wheel brakes.

THE MINIMUM DISTANCE PERMISSIBLE BETWEEN DEPRESSED PEDAL AND TOE-BOARD
A = 2 in. (5 cm)

Adjustment of rear brake shoes

1. Jack up the car so that the rear wheels are clear of the ground. Be sure to locate the jack in the correct position. It is possible to adjust the brakes without removing the wheels.
2. Release the handbrake and check that the brake levers return all the way. If the cable runs sluggishly in its sheathing, the lever must be pulled off by hand.
3. Depress the brake pedal hard several times in order to center the brake shoes.
4. The adjusting screw for the rear brakes consists of a square peg located on the rear of the backplate. See fig. Turn with a special spanner (included in the tool kit for the car) until the wheel is locked. Then back off one or more steps until the rear wheel again rotates freely.



FOOTBRAKE ADJUSTING SCREW, REAR WHEELS

1. Adjustment device
2. Adjustment point

5. After adjusting, check that the free movement of the pedal is. 0.12—0.24 in. (3—6 mm). See Section 524. If the clearance is less than this measure, the brake shoes don't return when the brake pedal is released.
6. If the adjusting screw cannot be tightened up enough to lock the wheel, the brake linings are worn and must be renewed. Always change brake linings simultaneously on both wheels and never on one wheel only. The reason for this is to ensure that the braking effect will be even. When changing brake linings, always use genuine SAAB replacements or linings recommended by SAAB.

REPLACEMENT OF BRAKE LININGS

An exchange system is operative for complete brake shoes with fitted automatic adjustment device. Replacement of linings thus calls for exchange of the entire shoe.

If linings only are to be changed, they must be ground in a special machine to a radius of about 0.010—0.012 in. (0.25—0.30 mm) less than that of the brake drum in order to ensure perfect contact. The ends of the linings must not be chamfered; the edge should be as sharp as possible.

The procedure is as follows:

1. Remove the old brake linings.
2. Wash the brake shoes in gasoline or kerosene and blow clean with compressed air.
3. Place the new linings on the shoes and fix them with two rivets in the center.
4. Fix the other rivets in turn, proceeding from the center and out towards the ends. Stretch the lining well to secure good contact with the shoe. Any clearance left between the shoe and its lining may jeopardize the function of the brakes and cause unwanted noise.
5. Grind the lining to a radius of 0.01—0.012 in. (0.25—0.30) mm less than that of the drum.

NOTE

To secure perfect contact between the lining and the drum, and speedy running-in, the linings should be ground after riveting to a radius of 0.01—0.012 in. (0.25—0.30 mm) less than that of the drum. This is particularly important when the brake drum has been machined.
Special equipment is required for this grinding operation.

NOTE

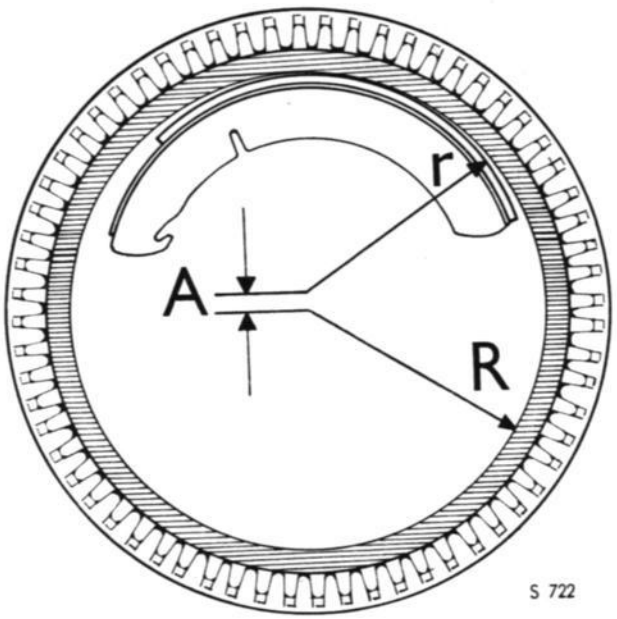
The ends of the linings must not be chamfered, but should have as sharp an edge as possible.

NOTE

To ensure optimal safety, use only genuine SAAB linings or exchange shoes.

WARNING

Do not allow oil or grease to come in contact with brake linings or drums.



CENTERLESS GRINDING OF BRAKE LININGS

R = Radius of brake drum
r = Radius of brake lining. Thus, r to be 0.01—0.012 in. (approx. 0.25—0.30 mm) less than R
A = measurement 0.25—0.30 mm

BRAKE DRUMS

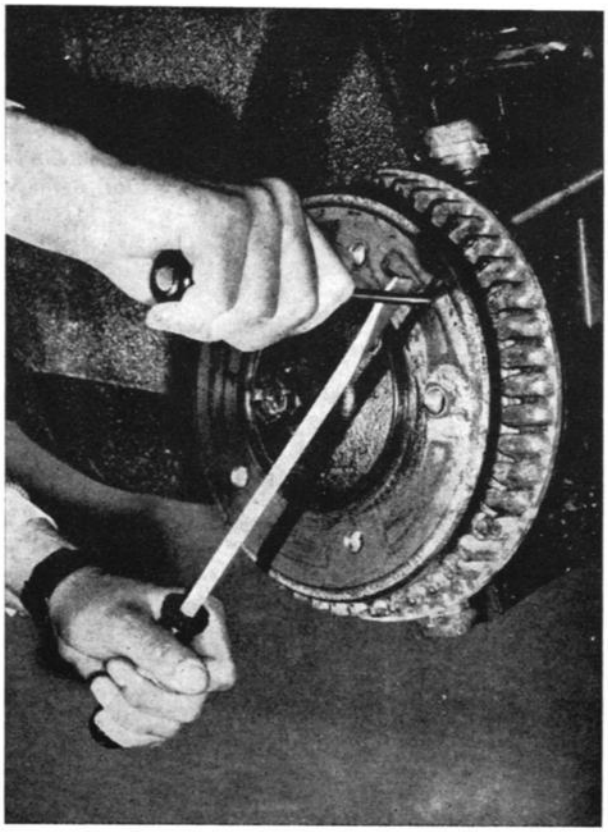
Removal and installation of brake drum

1. Remove the cotter pin and the shaft nut.
2. Jack up the car.
3. Remove the wheel.

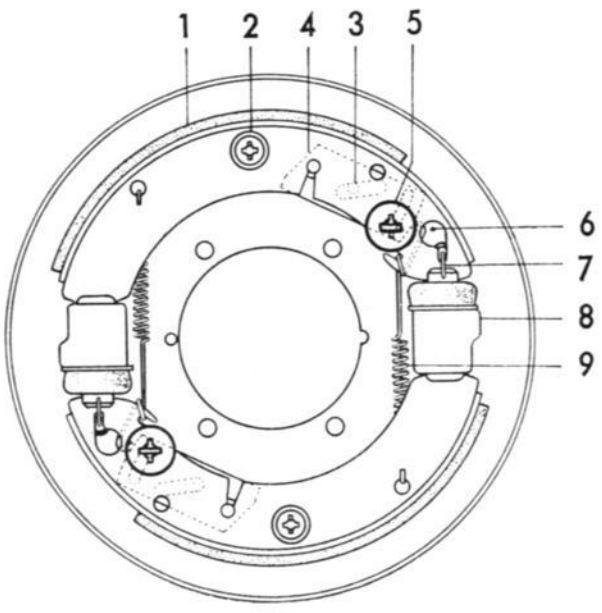
4 a. Rear wheels. Release the handbrake and adjust the rear brake shoes with the adjusting screw.

4 b. Front wheels: The front brake shoes are self-adjusting. Consequently, the following procedure must be adopted for readjusting the shoes:
Pass a screwdriver into the extra hole in the brake drum and then into the hole 6 in the brake shoe. See fig.).
Bearing against the hub nut (see fig.), press the brake drum and brake shoe against the normal direction of rotation, until you hear a grating sound, indicating that the shoe has been forced back and the clicker catch lets go. Readjust both shoes before removing the brake drum.

5. Remove the brake drum, using puller No. 784002 or 784201. See fig page 511-2.
6. After refitting the brake drum, tighten the shaft nut with a torque wrench set at the following values:
Front wheels: 130 ft-lb (18 kgm)
Rear wheels: 65 ft-lb (9 kgm)
Remember to secure the nut with a cotter pin.



READJUSTING BRAKE SHOES



FRONT WHEEL BRAKE

Machining brake drums

If the brake drums are moderately scored, and more or less equally on both left and right sides, this will not influence the braking effect or the life of the brakes. If, on the other hand, only one drum is scored or both drums severely scored, they should be renewed or perhaps machined. Renewal or machining is also necessary if the brake drum is out-of-round, which is betrayed by jerky pedal action when the brakes are applied. The front brake drum may be machined to a maximum diameter of 9.059 in. (230.1 mm) and the rear one to max. 8.059 in. (204.7 mm).

BRAKE DISCS

Replacement of brake disc

When the brake disc shows signs of heavy wear after considerable mileage it must be replaced by a new one. Moderate scoring, on the other hand, does not necessitate replacement.

IMPORTANT

Never separate the two halves of the brake housing except when absolutely essential. All normal service measures can be carried out without dismantling the housing.

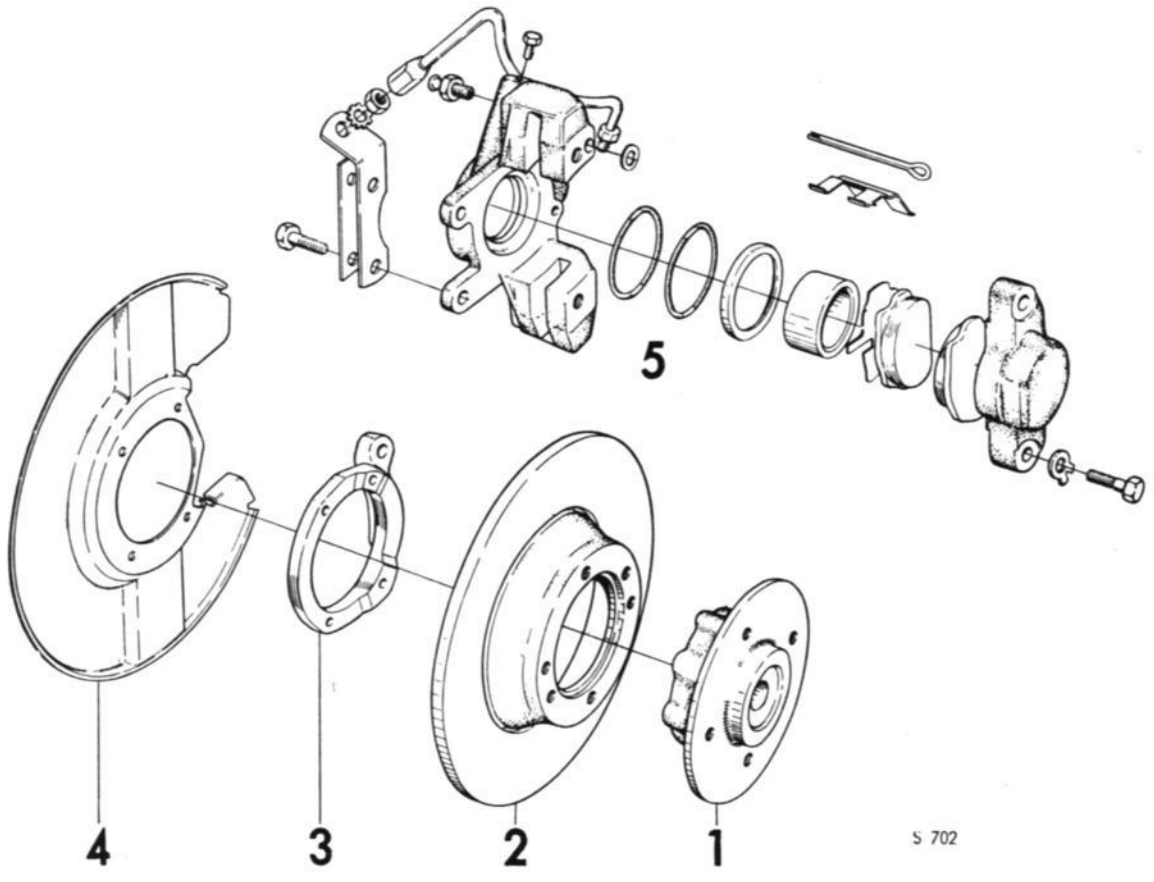
To change the brake disc, proceed as follows:

1. Remove the hub cap and back off the shaft nut.
2. Jack up the front of the car, take off the wheel and remove the shaft nut.
3. Back off and remove the two bolts holding the brake housing to the steering knuckle. These bolts are accessible from the inside of the brake disc.
4. Lift the brake housing clear of the brake disc, but do not disconnect the brake hose. Take great care not to damage or scratch the friction pads. Hang the housing up carefully to avoid damaging the brake hose.
5. Pull off the wheel hub with brake disc attached, using wheel puller No. 784201.
6. Detach the brake disc from the wheel hub.

Reassemble in the reverse order. Always use new retaining plates when refitting the brake housing bolts.

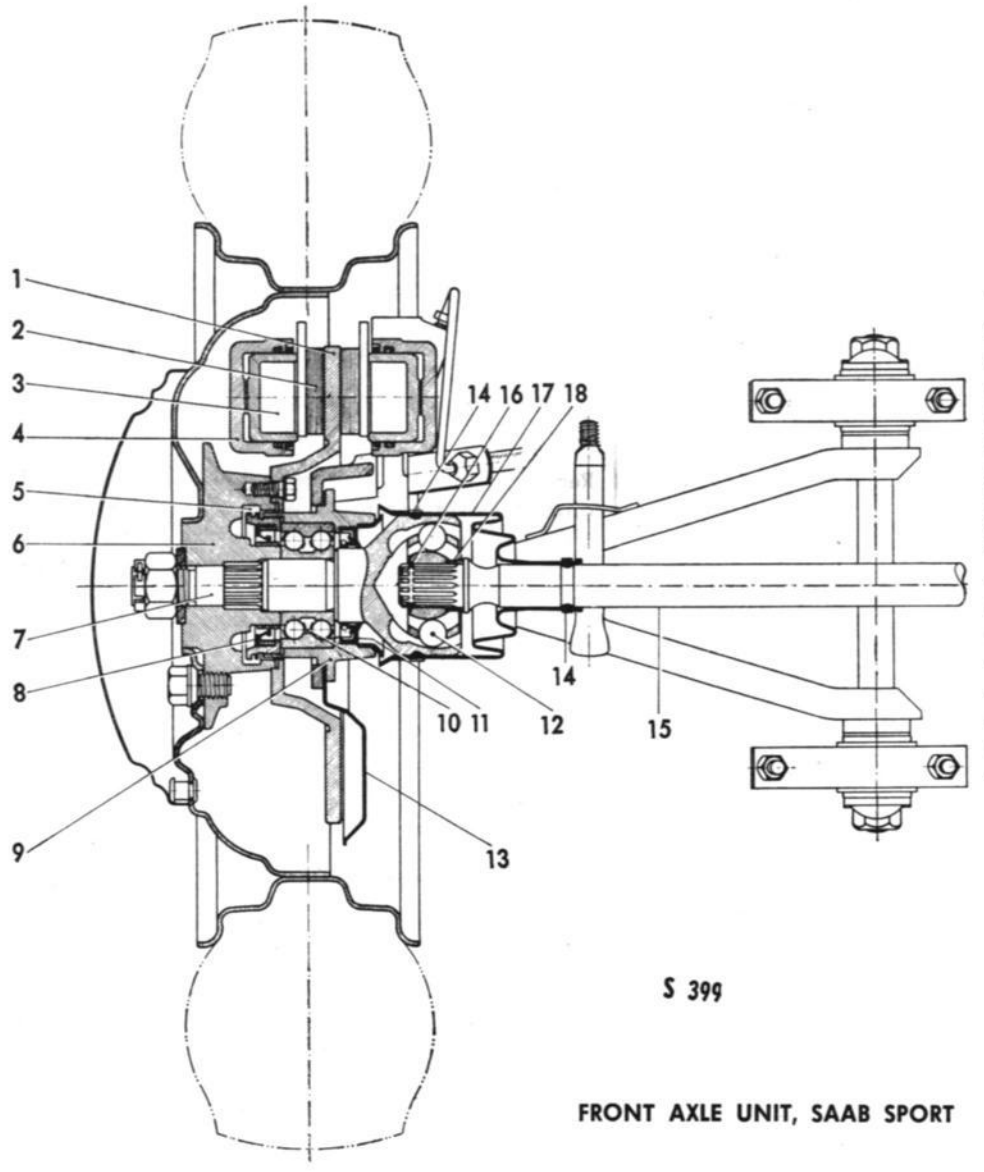
NOTE

Remember to pump repeatedly with the brake pedal after reassembly of the brake disc so that the brake pistons will move out towards the disc.



DISC BRAKE COMPONENTS

1. Hub
2. Brake disc
3. Retainer
4. Backing plate
5. Caliper with pistons and pads



1. Brake disk
2. Brake pad
3. Brake piston
4. Brake housing
5. Nut
6. Wheel hub
7. Outer drive shaft
8. Shaft seal
9. Steering knuckle housing
10. Ball bearing
11. Shaft seal
12. Ball
13. Backing plate
14. Clamp
15. Inner drive shaft
16. Circlip
17. Boot
18. Spacer ring

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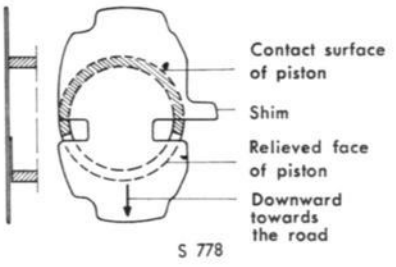
FRONT AXLE UNIT, SAAB SPORT

How to remedy noise from a disc brake

When there is noise in the form of squeak from a disc brake, this can be remedied as follows:

1. Remove the friction pads, and check that the relieved faces of the brake pistons are pointing downwards. If they are not, turn the brake pistons into the right position with a pair of pliers with "angle" tips, for the lock ring. Place pliers inside the piston in order not to affect its damageable, outer contact surface.
2. If — after the adjustment of the position of pistons — there is still noise, place a shim between each brake piston and friction pad. The shim has two recesses, which are to be placed downwards so as to come in front of the ends of the relieved faces of the pistons. See fig. Shims are available as a spare part.



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SHIMMING OF FRICTION PAD

FRICTION PADS, DISC BRAKE

General

As the disc brakes on the Saab Sport are self-adjusting, it is not possible to decide whether or not the brake linings are worn by the length of the pedal stroke. It is therefore extremely important to remove the wheels at regular intervals in order to check the thickness of the linings. The friction pads must be renewed when the thickness of the linings is less than 0.06 in. (1.5 mm).

Replacement of friction pads

1. Jack up the front part of the car and take off the wheel.

> NOTE
>
> It is not necessary to take brake housing out of the car or to separate the two halves thereof in order to change friction pads.

2. Remove the cotter pins and springs holding the friction pads. Remove one friction pad. Twist slightly to facilitate removal.
3. Clean the protruding part of the brake piston thoroughly with brake fluid. Take care not to spoil the surface of the piston by scoring. Check that there is no rust or dirt in the recesses for the friction pad.
4. Drive the piston back into the brake housing with the aid of a screw vise (tool No. 784132).

> NOTE
>
> When the brake pistons are forced back into the cylinders, the brake-fluid level in the reservoir will rise appreciably and it may then be necessary to drain off superflous fluid.

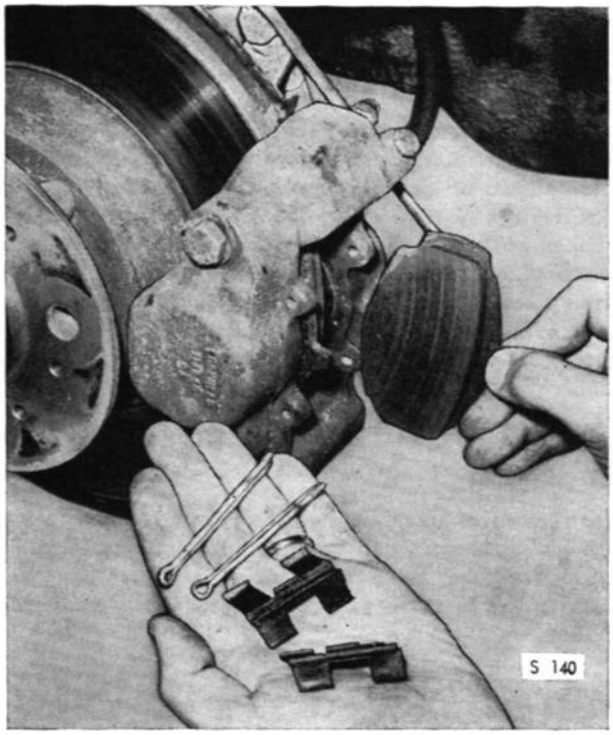
5. Make sure that the brake piston is correctly located, i.e. with the recess in the contact face towards the friction pad directed d o w n w a r d s.

> IMPORTANT
>
> If you have to twist the brake piston into the proper position, take care not to damage its sealing surface.

6. Clean the brake disc thoroughly with trichloroethylene.
7. Fit the new friction pad, making sure that it runs easily in its recess in the brake housing. Possibly, protruding parts of the friction pad will have to be trimmed with a file.
8. Change the other friction pads in the same way (points 3—7).
9. Fit new springs and cotter pins. Secure the cotter pins.
10. Pump repeatedly with the brake pedal so that the brake pistons will move towards the brake disc.

> WARNING
>
> Do not forget to pump repeatedly with the brake pedal, as otherwise the pedal will travel all the way in when the brakes are applied.

11. Top up with brake fluid in the reservoir.



REPLACEMENT OF FRICTION PADS TOOL No. 784199

HYDRAULIC FOOTBRAKE SYSTEM

Overhaul instructions

If it is found necessary to dismantle the brake system, or any part thereof, this must be done under conditions of scrupulous cleanliness. Clean off all dirt and grease before removing any parts. Do not swill a dismantled unit in gasoline, kerosene or trichloroethylene, etc., because these solvents will ruin the rubber parts. Dismantle the units on a bench covered with a sheet of clean paper. Do not touch internal parts with dirty hands, particularly rubber items. After dismantling, place all metal parts in a tray of clean brake fluid to soak. Having done this, dry off with a clean, lint-free cloth and lay the parts out in order on a sheet of clean paper. To ensure unfailing reliability, we would recommend that all rubber parts be replaced by new ones. These are readily available in the form of repair kits containing all the rubber parts required for each particular unit.

The main bodies of units may be swilled in industrial methylated spirit or brake fluid, but if spirit is used all traces must be dried out before reassembly. All internal parts should be dipped in brake fluid according to Spec. S.A.E. 70 R 3 and assembled wet. When assembling rubber parts, use the fingers only. Stores departments should exercise special care in handling spare parts, to ensure that no damage occurs which would adversely affect their correct functioning. Rubber parts should be stored in a cool, dark place, thoroughly cleaned from dirt.

Inspection

For reasons of safety, it is of the utmost importance for the hydraulic system to be checked at regular intervals as prescribed in the service book.

Bearing this in mind, carry out the following measures:

Every 6,000 miles (10,000 km)

1. Check the brake-fluid level (at least once every three months).
2. Adjust the rear foot brake.
3. Check the wear on brake linings or friction pads, as applicable. Brake linings must be renewed when worn to a thickness of 0.1 in. (2.5 mm), and friction pads when worn to a thickness of 0.06 in. (1.5 mm).
4. Take the car out for a test run and check the function of the brakes.

Every 12,000 miles (20,000 km)

1. Check the condition of brake hoses cnd pipes and check the master cylinder, wheel cylinders and unions for leakage.
2. Adjust the handbrake.

After 35,000 miles (60,000 km) or every 3 years

Renew all brake hoses, rubber cups and rubber seals throughout the hydraulic system, and change brake fluid.

BRAKE FLUID

General

Always keep the brake-fluid reservoir properly filled. Check the level every 6,000 miles (10,000 km) or every three months, whichever comes first.

It is essential to use the right brake fluid. Inferior brake fluids can seriously damage the entire brake system. Apart from ruining rubber cups and seals, such fluids may lack lubricating properties and initiate corrosion. Furthermore, they may be excessively viscous at low temperatures or have a low boiling point, which would cause vaporization in the system upon heavy brake applications. This would result in brake failure, the consequences of which could be disastrous.

Even the best brake fluids deteriorate after prolonged use, owing to oxidation and absorption of water, which lowers the boiling point.

For racing and rallying, and for driving in mountainous territory with the Saab Sport, brake fluid should therefore be changed at yearly intervals.

Normally, brake fluid should be changed in all models after any repairs to the brake system and once every three years or every 35,000 miles (60,000 km).

IMPORTANT

Use only brake fluid satisfying the minimum requirements of specification SAE 70 R 3, e.g.:

For Saab Sport: Lockheed HD 328 Brake Fluid.

For Saab 95 and 96: Lockheed Super Heavy Duty Brake Fluid.

Replenishing

Before unscrewing the filler cap, clean the top part of the brake-fluid reservoir to prevent dirt entering when the cap is removed. Be careful not to spill any brake fluid on the paintwork of the car when pouring in brake fluid, as this fluid is injurious to paint. Check that the air vents in the filler cap are not choked.

If brake-fluid consumption is found to be excessive, examine all lines, hoses, connections and cylinders in order to detect and remedy the leak, applying firm pressure to the brake pedal meanwhile.

Changing

To change brake fluid, proceed as described in the following:

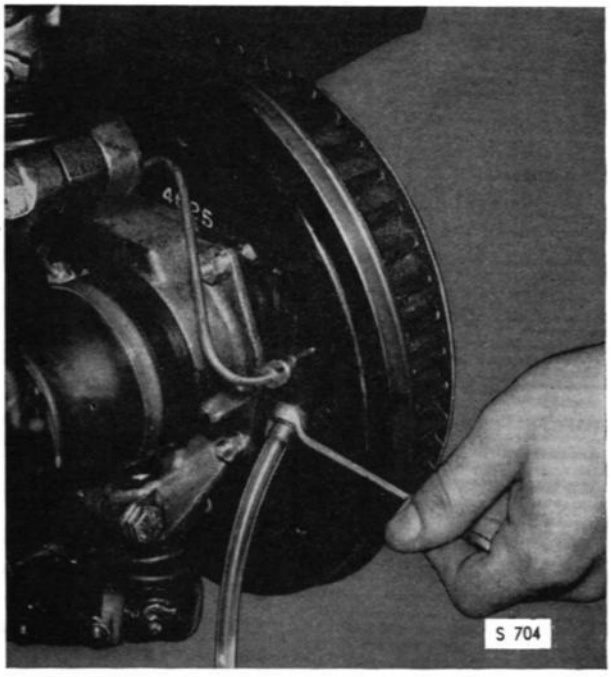
1. Open the bleed nipples for both rear wheels and fit suitable hoses to them in the same way as for bleeding the system. Empty the reservoir and the master cylinder by pumping with the brake pedal until air enters the brake system.
2. Charge with new brake fluid and pump with the brake pedal so that the brake-fluid reservoir is almost completely emptied, bleeding the rear brakes meanwhile.
3. Pour in more fresh brake fluid and open the front bleed nipples. Pump with the brake pedal so that half the reservoir is emptied, bleeding the front brakes meanwhile.
4. Next, tighten the bleed nipples and top up the brake-fluid reservoir.

> NOTE
>
> Make sure that roughly the same amount of brake fluid is pumped out at the left and right wheels respectively.

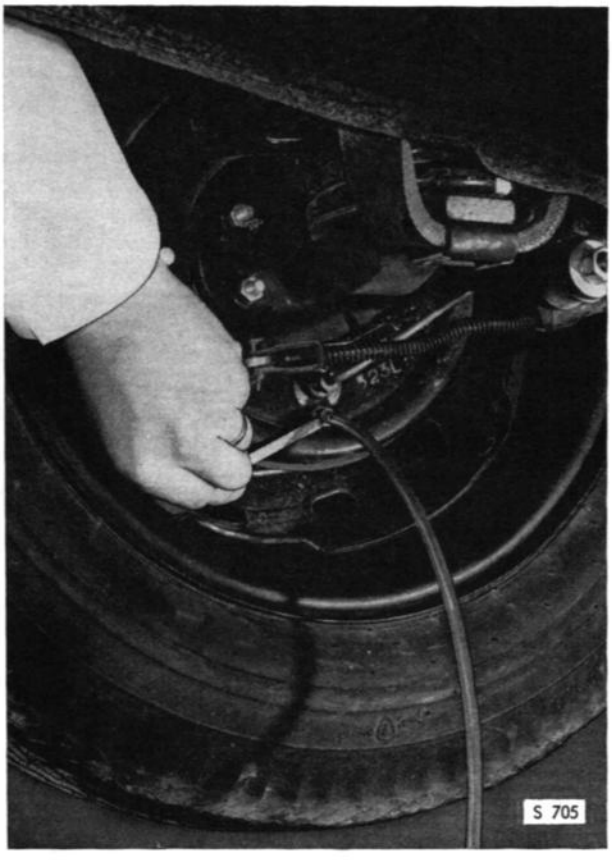
Inferior brake fluid in the system

If inferior brake fluid has been introduced into the system for any reason, the following steps must be taken immediately:

1. Drain the entire brake system.
2. Remove and dismantle the master cylinder and wheel cylinders.
3. Flush the system with methylated spirit.
4. Renew all rubber parts throughout the system.
5. Assemble and refit the cylinders.
6. Charge the system with the recommended grade of brake fluid.



LOCATION OF BLEEDING NIPPLES, FRONT END, SAAB 95 AND 96



LOCATION OF BLEEDING NIPPLES, REAR END, SAAB 95, 96 AND SAAB SPORT

Bleeding the brake system

Bleeding is not a routine service measure and is necessary only when part of the brake system has been disassembled and when the brake fluid has been drained off.
Sure signs that air has entered the system are excessive pedal travel, springy pedal action or absence of braking effect until the brake pedal has been firmly depressed several times.
A bleed nipple is provided for each brake. Bleed nipples for the disc brakes are located on the inner part of the brake housing.

NOTE

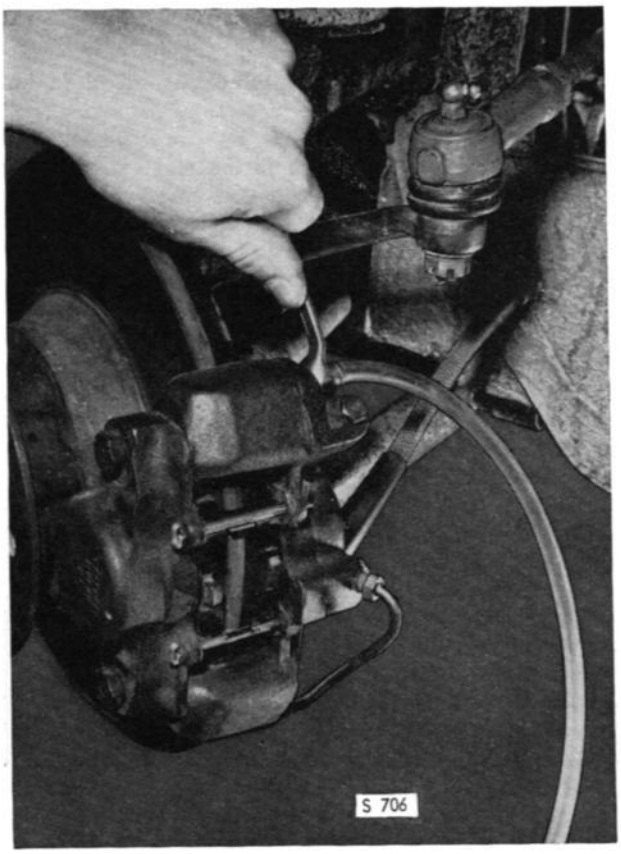
When the rear brakes are being bled, the pressure-regulating valve will cut off the supply of brake fluid to the rear wheels if the brake pedal is depressed too hard before the bleed nipple is opened.

Bleeding of the brake system is facilitated if the car is jacked up. Proceed as follows:

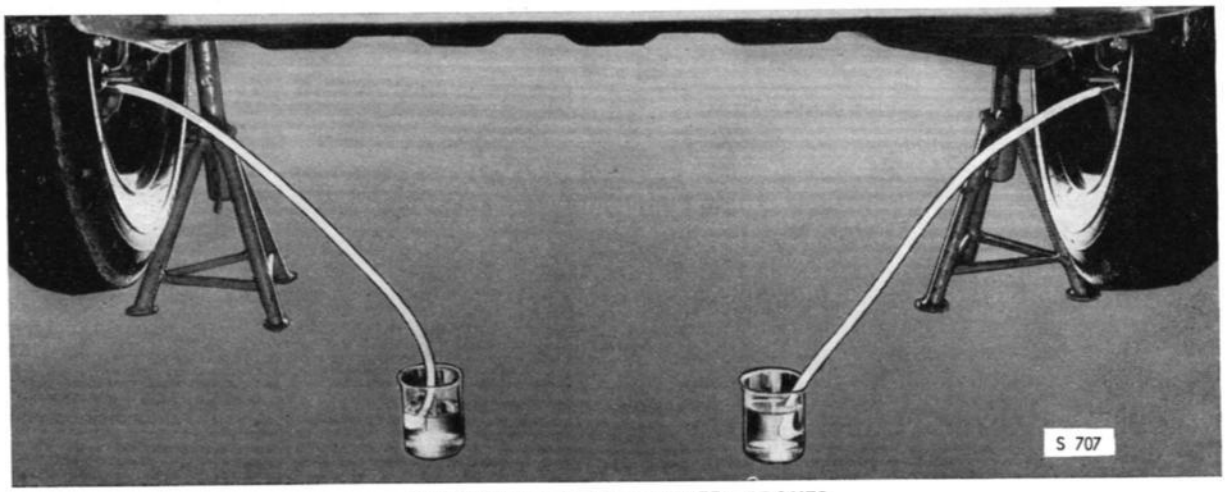
1. Check that the reservoir is completely full of brake fluid and that the air vents in the reservoir cover are not choked.
2. As the master cylinder has tandem pistons, it will be necessary to bleed both rear wheels and both front wheels simultaneously in order to purge the system. Begin with the rear wheels and bleed the front wheels afterwards.
3. Fit suitable hoses to the bleed nipples on both wheels.
4. Dip the hose ends in a glass vessel containing clean brake fluid.
5. Back off both nipples 1/2—1 turn.
6. Have an assistant pump the brake pedal — quickly down and slowly up — and watch until escaping brake fluid is free of air bubbles. Keep the hose ends below the fluid level in the glass vessel the whole time.
7. Close the bleed nipples, keeping the pedal depressed meanwhile.
8. Check that the brake fluid in the reservoir does not run out while the system is being bled.
9. Top up the reservoir with fresh brake fluid after bleeding the rear and front brakes.

NOTE

Roughly in the middle of the pedal stroke, some springiness will be felt in the brake pedal on account of the two pressure-regulating valves in the two-circuit system. This is perfectly normal and should not be confused with the springiness caused by the presence of air in the system.



LOCATION OF BLEEDING NIPPLES, FRONT END, SAAB SPORT



BLEEDING THE REAR-WHEEL BRAKES

MASTER CYLINDER

General

At intervals not exceeding three years or 35,000 miles (60,000 km), or at each third change of a brake lining, whichever occurs first, renew all rubber cups and seals throughout the hydraulic system. If it is necessary to dismantle the brake system, or any part thereof, this must be done under conditions of scrupulous cleanliness. See Section 520.

Removal

1. Disconnect the connections for outlet brake lines from the master cylinder.
2. Remove the rubber boot from the push-rod, or back off the locking nut and unscrew the push-rod from the fork on the brake pedal.
3. Back off and remove the two master-cylinder retaining bolts. The lower one is a stud bolt and the nut is accessible from the engine compartment. The upper one is a screwbolt, accessible from inside the car.
4. Remove the master cylinder.

Installation

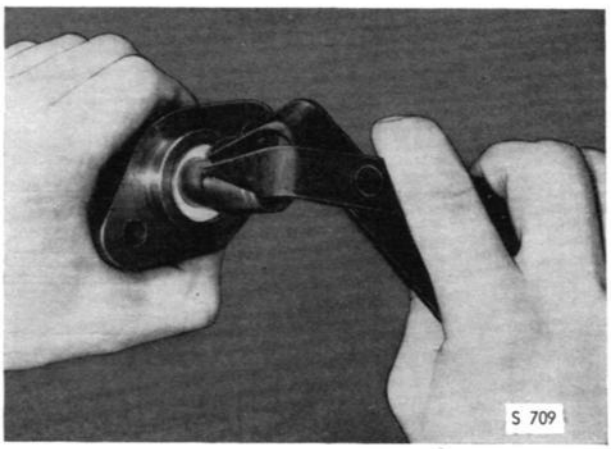
1. Cover all openings to prevent the entry of foreign matter into the cylinder during the installation work.
2. Attach the brake cylinder to the cowl plate by fitting the nuts or bolts, as applicable. (See point 3, above).
3. Refit the rubber boot to the push-rod. Reassemble the push-rod if it has been disassembled.
4. Reconnect the outlet brake lines and refill the system with brake fluid.
5. Adjust the brake-pedal free movement. See Section 524.
6. Bleed the system. See Section 520.

OVERHAUL OF MASTER CYLINDER

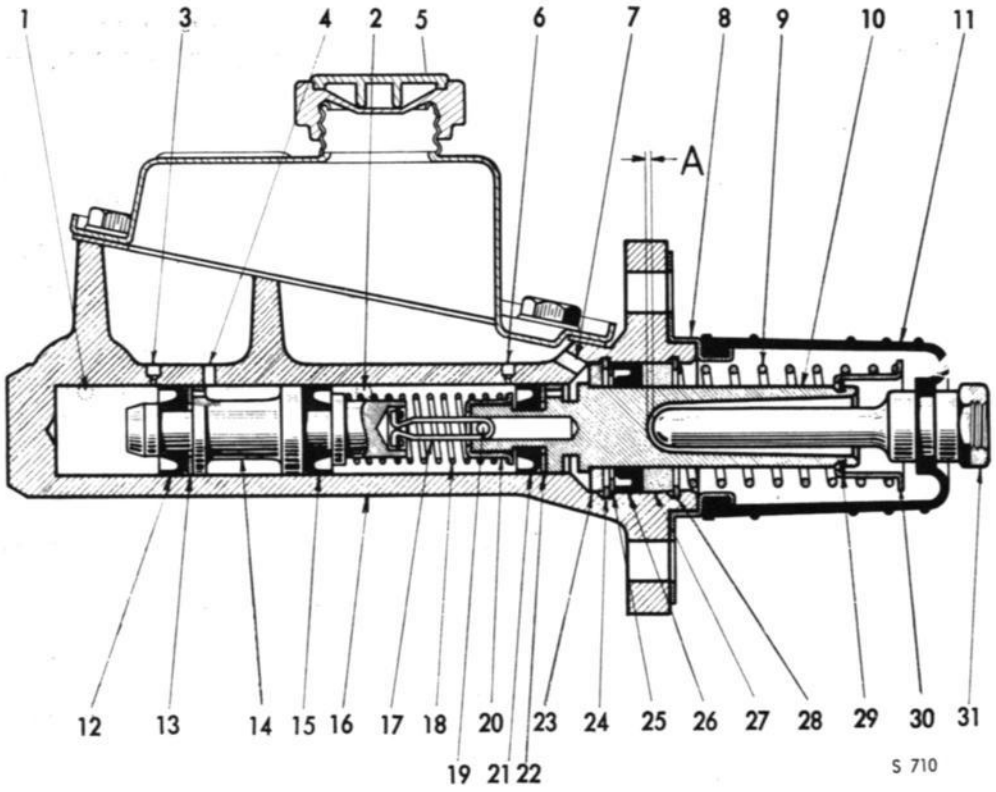
The master cylinder should only be dismantled if there is no exchange system for this unit.

Dismantling

1. Detach the rubber boot (11) from its retaining plate (8) together with the push-rod (31). Bend the four ears of the boot retaining plate away from the mounting flange and remove it from the end of the cylinder.
2. Depress the spring retainer (30) and, using a small screwdriver, unwind the "Spirolox" circlip (29) from the groove of the primary piston, taking care not to distort the coils; remove the spring retainer (30) together with the spring (9).
3. Remove the circlip (28), taking great care not to damage the surface finish of the primary piston (10). Lightly tap the mounting flange of the cylinder body on the bench, and remove the nylon guide bearing (27), the secondary cup (26) and the plain washer (25).
4. Using special circlip pliers with long, narrow jaws, tool 784199 remove the inner circlip (24), again taking great care not to damage the surface finish of the primary piston (10).



REMOVING THE LOCK RING
1. Tool 784199

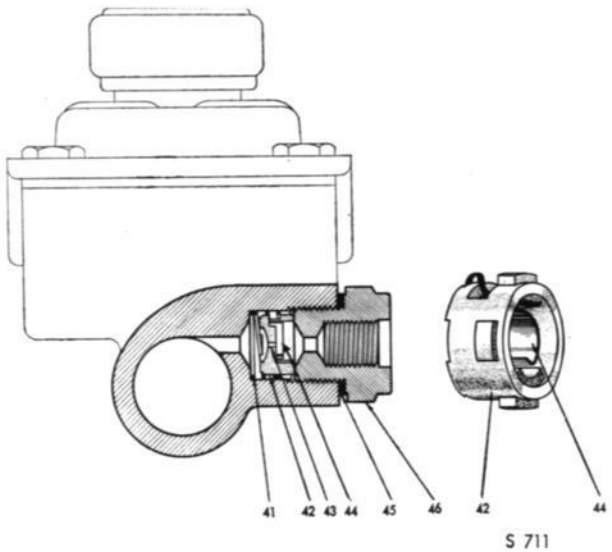


MASTER CYLINDER, SECTIONED

A = 0.024—0.047 in. (0.6—1.2 mm)

MASTER CYLINDER FOR TWO-CIRCUIT BRAKE

1. Outlet to one circuit
2. Outlet to other circuit
3. Bypass port
4. Feed hole
5. Brake-fluid reservoir
6. Bypass port
7. Feed hole
8. Retaining plate
9. Spring
10. Primary piston
11. Rubber boot
12. Primary cup
13. Piston washer
14. Secondary piston
15. Secondary cup
16. Body
17. Clip
18. Spring
19. Retaining pin
20. Spring holder
21. Primary cup
22. Piston washer
23. Piston stop
24. Circlip
25. Washer
26. Secondary cup
27. Guide bearing
28. Circlip
29. "Spirolox" circlip
30. Spring retainer
31. Push-rod



NON-RETURN VALVE IN MASTER CYLINDER

41. Spring
42. Valve body
43. Equalizing hole
44. Spring clip
45. Gasket
46. Adapter

5. Removal of the circlip (24) will allow the withdrawal of both pistons together with the piston stop (23).
6. Compress the intermediate spring (18) together with spring holder (20) and drive out the retaining pin (19), using a suitable pin punch. This will separate the two pistons (10 and 14), and allows the withdrawal of the spring (18) and spring holder (20).
7. Remove the primary cups (12 and 21) together with the piston washers (13 and 22) from the primary and secondary pistons. Remove the secondary cup (15) from the back of the secondary piston. Do not attempt to move the clip (17) from off the secondary piston, as this part is permanently peened in position.
8. Unscrew the outlet adapters (46) and remove them together with the gaskets.
9. Withdraw the non-return valves, comprising the spring (41), valve body (42) and spring clip (44). Take care not to distort the spring clip (44) when removing it from the valve body.
10. Remove the six bolts retaining the cover of the brake-fluid reservoir (5) and take off the cover together with the gasket.

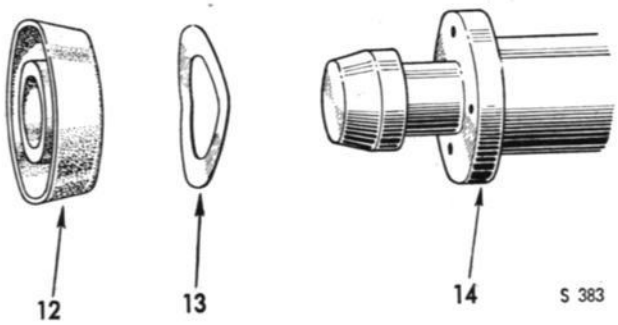
Inspection

1. Check that the cylinder bore is not scored.
2. Check that the bypass holes are clean by probing with a piece of thin steel wire.
3. Check all parts, and renew any defective ones.
   Internal rubber parts should be replaced by new ones, which are available in suitable kits.

Reassembly

Before reassembling the master cylinder, dip all parts in brake fluid.

1. Using the fingers only, stretch the secondary cup (15) over the large end of the secondary piston with the lip pointing towards the peened clip. Gently work round the cup with the fingers to ensure correct bedding.
2. Locate the piston washer on the secondary piston spigot as illustrated in the fig. below, so that the convex edge is towards the back of the cup. Using the fingers only, ease the primary cup (12) over the nose of the spigot and into the groove, with the lip of the cup pointing away from the head of the piston.



FITTING THE PISTON WASHER

12. Primary cup
13. Piston washer (dished)
14. Secondary piston

3. Adopt the same procedure with the primary cup (21) and piston washer (22) of the primary piston. Ease the spring holder (20) into the end of the spring (18) and fit the other end of the spring over the rear of the secondary piston (14).
4. Locate the retaining pin (19) in the hole in the primary piston, but do not push fully home. Compress the spring until the secondary piston clip (17) is visible. Place the clip in position in the primary piston and secure it by pushing the retaining pin fully home. Release the spring and check that the spring holder (20) is correctly positioned.
5. Ease the pistons gently into the cylinder bore and slide the piston stop (23) over the primary piston. Fit the circlip (24) in the inner groove, using special circlip pliers with long, narrow jaws, and check that it is correctly located. Take great care not to damage the surface finish of the primary piston, since this could cause leakage past the secondary cup.

6. Fit the plain washer (25) into the cylinder bore against the circlip, followed by the secondary cup (26).
7. Place the nylon guide bearing (27) in position and secure with the outer circlip (28).
8. Mount the spring retainer (30) with the return spring (9) on the primary piston (10). Compress the spring until the piston circlip groove is visible behind the spring retainer and locate the "Spirolox" circlip.
9. Fit the boot retaining plate (8) in position over the mounting flange of the cylinder and bend the four "ears" over to hold it in position. Before fitting the rubber boot (11), smear the small end of the push-rod (31) and its groove with silicon grease to ensure that the rod will rotate freely when assembled.
10. Ease the push-rod into position in the rubber boot and fit the boot into its groove.
11. Ease the spring clip (44) into the non-return valve body and check that it is correctly positioned. Fit the return spring over the valve body and locate the parts within the outlet port, inserting the spring first.
12. Screw the outlet adapter (46), together with the gasket (45) into the outlet port and tighten to a torque of 28 ft-lb (3,8 kpm). Adopt the same procedure for the remaining outlet port.
13. Place the cover of the brake-fluid reservoir (5) in position together with the gasket, and secure in position with the six bolts, tightening them to a torque of 6 ft-lb (0.7 kgm).

BRAKE LINES

Brake lines and fittings

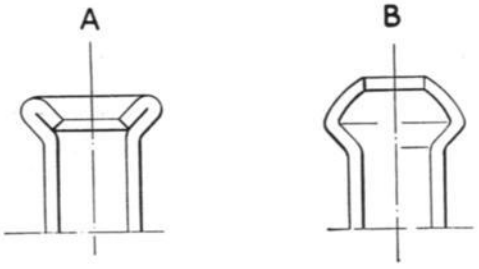
The brake pipes are of 3/16 in. Bundy tube. The ends of all the pipes are flanged and fitted with compression nuts, which must be passed onto the pipes before the ends are flanged. It is important to ensure that the pipes are properly flanged so that there will be no leakage at the joints. See fig. For reasons of safety, it is essential that all pipes, rubber hoses and connections in the brake system be kept in first-class condition at all times. Bearing this in mind, check regularly that the hoses have not been damaged by flying stones or by abrasion. Pipes, too, must be installed so that they cannot rub or chafe against anything. The pipes are attached to the body by means of metal clips and should be protected by rubber grommets where they pass through panels. See fig. The rubber grommets are slit and can be mounted on pipes which have already been flanged and installed.

Make sure that the pipes and handbrake cables on the inclined panel under the rear seat are correctly fitted, so that they cannot rub against each other and so that the pipes cannot get damaged by the seat cushions.

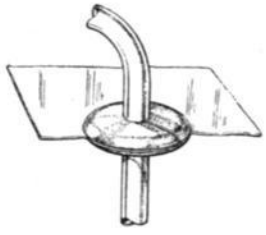
All pipe and hose connections must be properly tightened to ensure leak-free joints. Make sure that the copper gaskets in the pipe connections are flawless, and change any defective ones. Copper gaskets which have become so hard that they no longer seal effectively may, however, be annealed and reused.

Pipes which are to be installed must fit well at both ends and at the clips. Never stretch a badly-fitting pipe by means of the compression nuts or bend an already fitted pipe. Both of these courses could give rise to stresses which may result in leakage, pipe fracture or stripped threads.

Pipes for connection to brake hoses are flanged as per "type A". Other pipes are flanged as per "type B".



FLANGING OF BUNDY TUBE



RUBBER GROMMET FOR BRAKE PIPE

Brake hoses

The brake system incorporates two front and two rear brake hoses, affording the communication between the body and the wheel cylinders. These hoses are of different lengths and must not be confused. Install the hoses with the wheels freely suspended and aligned straight ahead. When tightening the brake pipe, hold the brake-hose nipple (not the locking nut) to prevent the hose from twisting and changing position.

WARNING

When fitting brake hoses it is highly important to position them correctly, thereby ensuring that steering or suspension movements do not bring them into contact with other parts of the car. The brake hoses must not be wrung or twisted but shall be mounted in a neutral position. In addition, see to it that the front hoses form a downward directed curve.

Inspection

All brake hoses and pipes should be inspected every 12,000 miles (20,000 km) for any signs of leakage, chafing or other deterioration. At the slightest sign of damage, renew the hose or pipe concerned. For safety's sake, change all brake hoses every 35,000 miles (60,000 km) or every three years, whichever is first.

STOP-LIGHT SWITCH

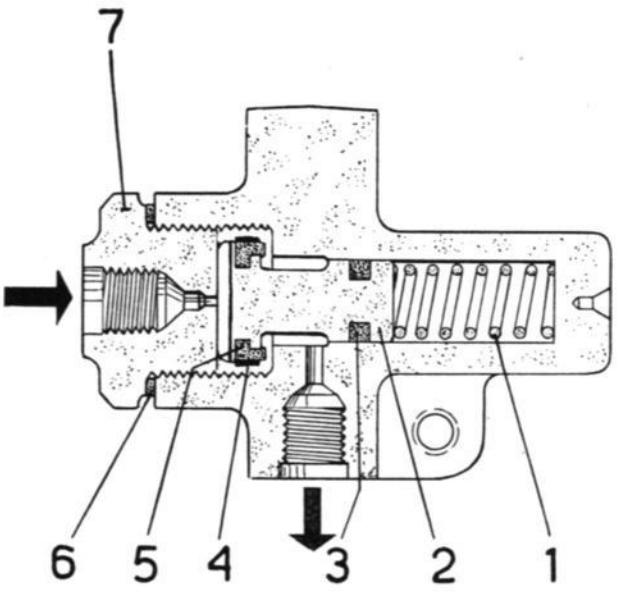
The stop-light switch is connected to the hydraulic system and is actuated by the braking pressure. It is housed in a 4-way coupling on the dash panel beside the master cylinder.

PRESSURE-REGULATING VALVE

Pressure-regulating valve for brake system, Saab 96 and Sport

The Saab 96 and Sport are equipped with two pressure-regulating valves for the rear brakes. The valves are bolted to the floor under the rear seat cushion, and limit the hydraulic pressure transmitted to the rear brakes, so that the braking effect is suitably distributed between the front and the rear wheels. The valve is preset for a given pressure, and cannot be adjusted. When the fluid pressure reaches 425—485 p.s.i. (30—34 kg/cm²), the spring force acting on the piston is overcome, causing the piston to travel and close the passage to the rear brakes. Any additional pressure applied subsequently thus increases the braking effect on the front brakes, while the pressure on the rear brakes remains constant. What has been said above, should be borne in mind when bleeding the brake system and measuring the brake power with a brake tester.

When bleeding a rear wheel brake, the pressure-regulating valve closes the passage to the rear wheels if the brake pedal is depressed too hard before the bleeding nipple has been slackened, i.e. in these circumstances bleeding will be impossible.



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PRESSURE-REGULATING VALVE

1. Spring
2. Piston
3. Piston seal
4. Ring
5. Rubber seal
6. Copper gasket
7. Adapter

When measuring the brake power on the rear wheels, the brake power rises up to a certain value. Once the pressure-regulating valve is closed, the brake power increases on the front wheels only. With a pressure-regulating valve for the rear brakes, there is less risk that the rear wheels will get locked, which might easily cause the rear end to skid. This construction thus contributes to greater traffic safety. Thus, when inspecting or when measuring the brake power with a brake tester, the comparatively low maximum braking effect on the rear wheels must not be regarded as a fault.

WHEEL CYLINDERS

General

All work on the brake system must be done under conditions of scrupulous cleanliness and carefulness. See the instructions in Section 520.
At intervals not exceeding three years or 35,000 miles (60,000 km), or at each third change of a brake lining, whichever occurs first, renew all rubber cups and seals throughout the hydraulic system.

FRONT WHEEL CYLINDERS, SAAB 95 AND 96

General

The front wheel cylinders (see fig.) contain a single piston with a rubber sealing ring and an external rubber boot. The piston is forced towards the brake shoe by the fluid pressure. Each of the rear wheel cylinders has two pistons which actuate separate brake shoes. Each piston is fitted with a rubber sealing ring and an external rubber boot or dust excluder.

Removal

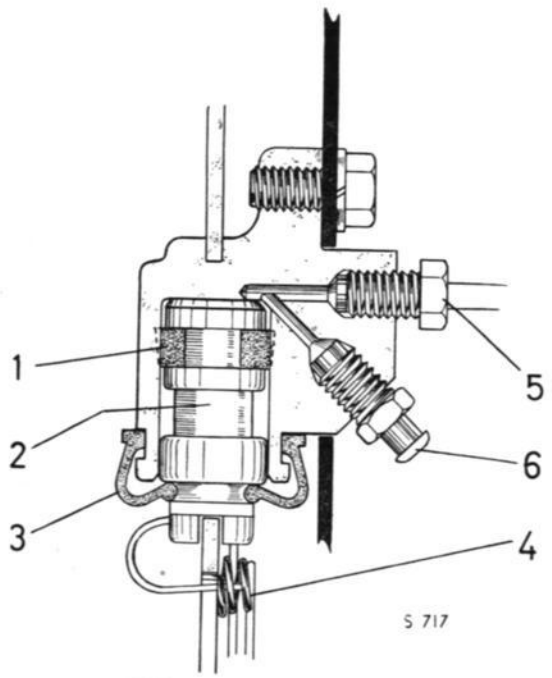
1. Jack up the car and remove the wheel, brake drum, brake shoes and backplate.
2. Disconnect the brake hose from the wheel cylinder.
3. Disconnect the brake hose between the cylinders.
4. Remove the cylinder by backing off the screws on the rear of the backplate.

Disassembly

See the illustration, which shows a dismantled wheel cylinder. Remove the rubber boot from the cylinder. Withdraw the piston and then take the sealing ring off, using the fingers only.

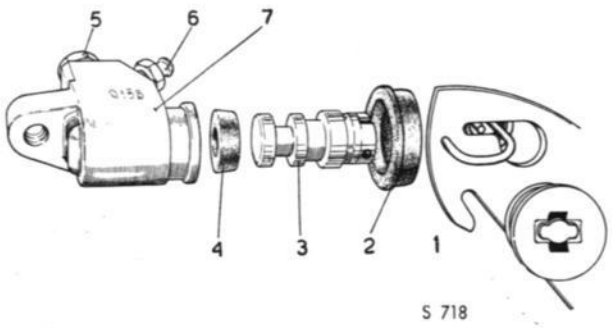
Inspection

1. Clean all parts with brake fluid.



FRONT WHEEL CYLINDER

1. Piston seal
2. Piston
3. Rubber seal
4. Spring
5. Brake-pipe connection
6. Bleed nipple



FRONT WHEEL CYLINDER, EXPLODED VIEW

1. Brake shoe with lock spring
2. Rubber sealing ring
3. Piston
4. Piston cup
5. Brake-pipe connection
6. Bleed nipple
7. Cylinder body

NOTE

Do not allow gasoline or oil to come into contact with the rubber sealing rings or boots.

2. Check that the cylinder bore is unscored.
3. Check that the rubber sealing rings and boots are flawless. The use of unsuitable brake fluids can cause rubber parts to swell by up to 50 %. Any rubber parts that are even slightly damaged or swollen must be renewed.

Reassembly

Lubricate all parts with brake fluid before reassembling. Fit a flawless cup on the piston, taking care to turn it the right way, as illustrated. Use the fingers only. Next, refit the piston in the cylinder and put on the rubber boot.

Installation

1. Attach the cylinders to the backplate by means of the screws. Do not forget the elastic washers.
2. Refit the brake line between the cylinders.
3. Secure the brake hose. Remember to insert a flawless copper gasket in the connection. Preferably, use a new gasket, but it is also possible to anneal and reuse a gasket which has become too hard.
4. Refit the backplate, brake shoes, brake drum and wheel.

REAR WHEEL CYLINDERS, SAAB 95, 96 AND SPORT

Removal

1. Remove the wheel, brake drum and brake shoes.
2. Disconnect the handbrake wire from the levers.
3. Disconnect the brake line from the rear of the backplate.
4. Remove the wheel cylinder retaining ring and the bleed nipple from the rear of the backplate.
5. Remove the wheel cylinder.

Disassembly

1. Remove the rubber boots from the cylinder.
2. Pull out the pistons.
3. Take the rubber seals off the pistons.

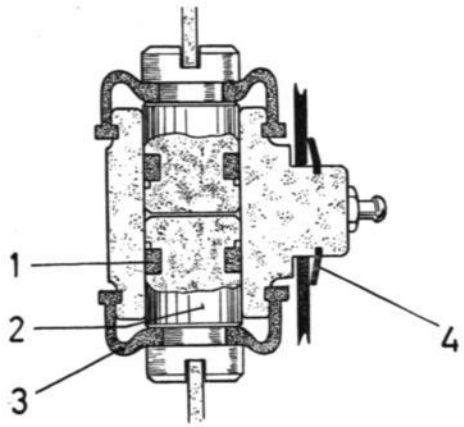
Inspection

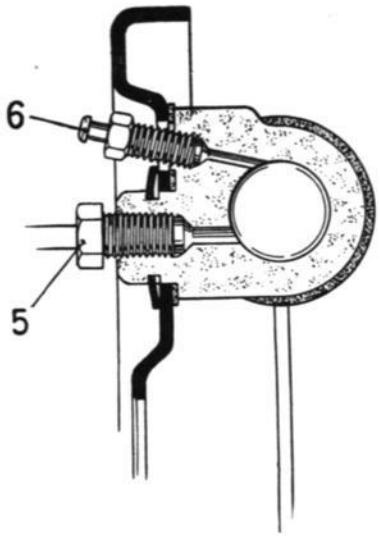
1. Clean and dry all the parts.

NOTE

Do not allow gasoline or grease to come into contact with the rubber seals.

2. Check that the cylinder bore is unscored.





REAR WHEEL CYLINDER

1. Piston cup
2. Piston
3. Rubber boot
4. Retainer
5. Brake hose connection
6. Bleeding nipple

3. Check that all the rubber seals and cups are flawless. The use of an unsuitable brake fluid can cause rubber parts to swell by as much as 50%. Any rubber parts that are even slightly damaged or swollen must be renewed.

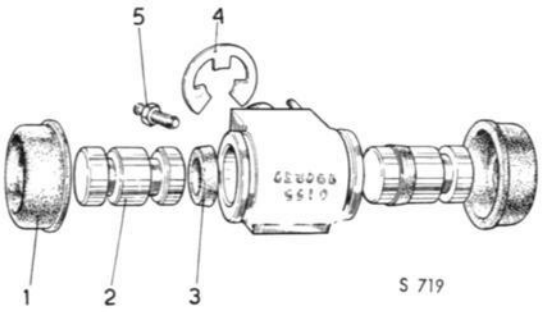
Reassembly

Scrupulous cleanliness must be observed when reassembling the wheel cylinder. Lubricate the cylinder bore, seals, cups and pistons with brake fluid before reassembling. Reassemble as shown in the illustration, making sure that the piston seal is facing the right way. Use the fingers only.

Installation

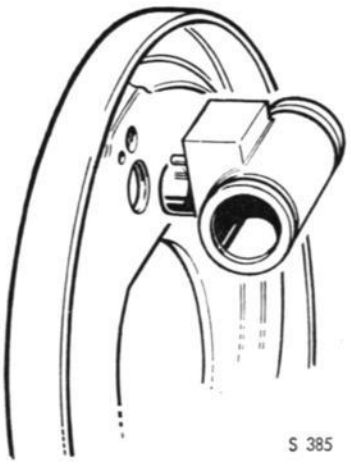
1. Refit the wheel cylinder to the backplate and locate the retaining ring and bleed nipple. The cylinder has a steady pin, a hole to receive this being provided in the backplate.
2. Reconnect the brake line.
3. Refit the brake shoes, brake drum and wheel, taking great care not to damage the axle seal.
4. Reconnect the handbrake wire. Note that the handbrake lever must be installed with the bent part facing upwards. See fig.

Remember to bleed the system whenever a brake line or a wheel cylinder has been removed.

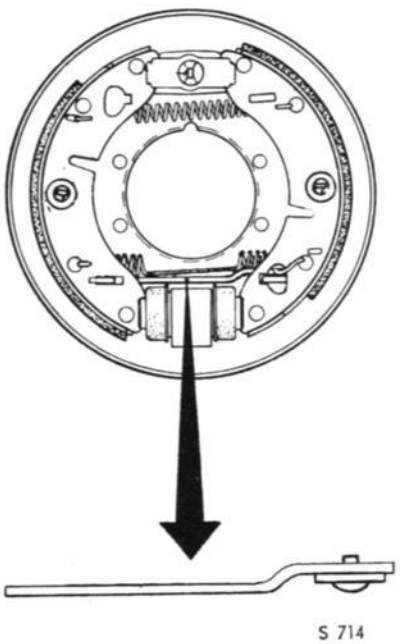


REAR WHEEL CYLINDER

1. Rubber boot
2. Piston
3. Piston seal
4. Locking washer
5. Bleed nipple



ATTACHMENT OF REAR WHEEL CYLINDER



FITTING THE HANDBRAKE LEVER

DISC BRAKES, SAAB SPORT
Removal of brake pistons and seals

For this operation, a special screw vise, No. 784132, will be needed. See fig.

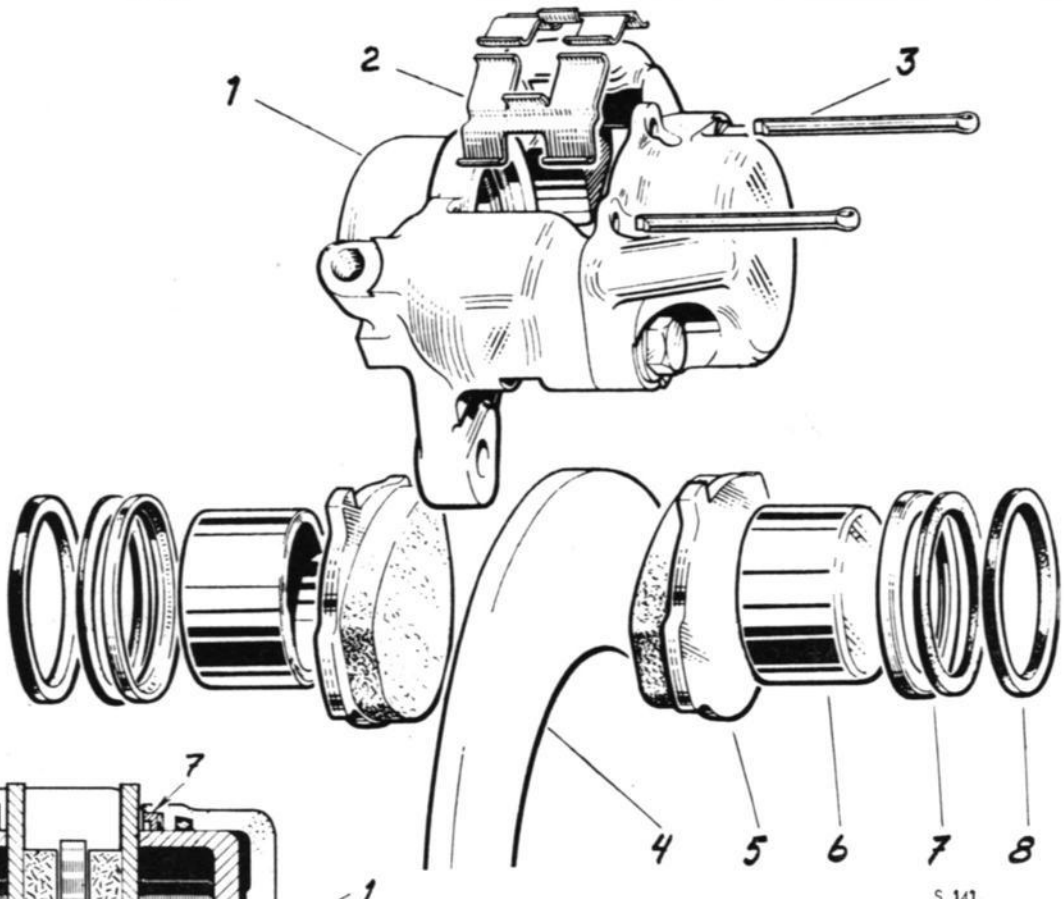
> IMPORTANT
>
> Do not separate the two halves of the brake housing unless absolutely essential. All normal servicing can be done without dismantling the brake housing.

1. Jack up the front part of the car and take off the wheel.
2. Remove the cotter pins and springs holding the friction pads. Remove the friction pads. Twist slightly to facilitate removal.
3. Back off and remove the two bolts holding the brake housing to the steering knuckle, and disconnect the brake-pipe from the brake housing.
4. Lift the brake housing off the brake disc.

> NOTE
>
> It is unnecessary to divide the brake housing.

5. Clean the outside of the brake housing and dry thoroughly.
6. Apply the screw vise, tool No. 784132, to one brake piston, and drive the other piston out carefully with compressed air at the brake-pipe connection. Take great care not to drop and damage the piston.

> NOTE
>
> The brake piston must be removed under conditions of scrupulous cleanliness, to ensure that no dirt or oil can enter the brake system.



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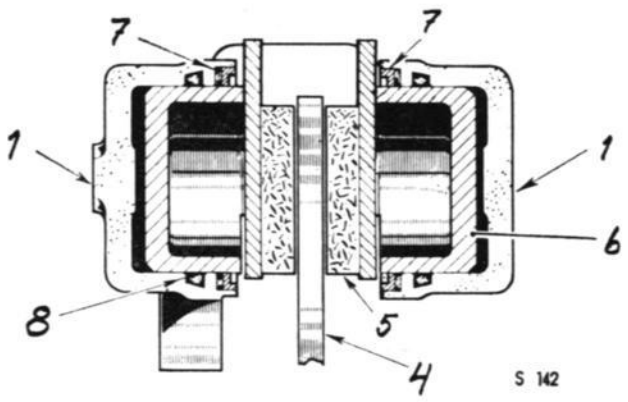

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BRAKE HOUSING WITH PISTONS AND PADS

1. Housing
2. Spring
3. Cotter pin
4. Disc
5. Pad
6. Piston
7. Dust seal with retainer
8. Brake fluid seal

7. Remove the seal from the cylinder, using a blunt tool. Take care not to damage the seal groove or the cylinder.
8. If necessary, the outer dust excluder can now be removed with the aid of a screwdriver.

IMPORTANT

When cleaning the brake cylinder, use only brake fluid or methylated spirit. Other solvents would ruin the seal between the two halves of the brake housing.

9. When the seals and brake piston have been refitted (see "Installation"), the second piston can also be removed. The same procedure is adopted for both brake pistons.

Installation of brake pistons and seals

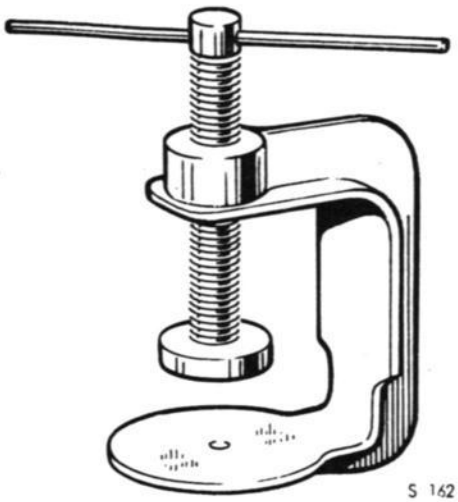
Check that all parts are clean and undamaged.

1. Coat a new seal with special lubricant (Lockheed Disc Brake Lubricant), first making quite sure that the seal is perfectly dry. Place the seal carefully in its groove in the cylinder, and turn it with the fingers to ensure proper fitting.
2. Smear the piston with the special lubricant and position it so that the recess in the surface facing the friction pad is turned downwards. Drive the piston carefully into the cylinder, making sure that it does not tilt. To facilitate refitting of the dust excluder, do not press the piston fully home, but leave about 0.315 in. (8 mm) outside the brake housing.
3. Smear a new dust excluder with the special lubricant, first making quite sure that it is perfectly dry.
4. Place the dust excluder in the cylinder opening and the holder with the countersunk side facing outwards. Press the holder and brake piston home with the aid of the screw vise, tool No. 784132.
5. Refit the brake piston and dust excluder in the other cylinder in the same manner.
6. Reconnect the brake pipe to the brake housing, and secure the latter to the steering knuckle by means of the bolts. Fit a new retaining plate. Clean the brake disc with trichloroethylene.

WARNING

Do not depress the brake pedal until you have opened the bleed screws.

7. Remount the friction pads, using new cotter pins and springs.
8. Bleed the system and depress and pump the brake pedal repeatedly to adjust the friction pads out against the disc.



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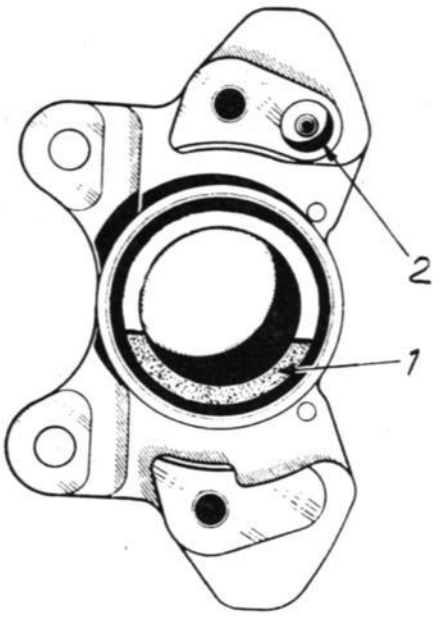
SCREW VISE FOR BRAKE PISTON. TOOL NO. 784132



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LOCATION OF BRAKE PISTON IN BRAKE HOUSING

1. Recess in piston
2. Hole for gasket for brake-fluid passage

Disassembly of brake housing, disc brake

Do not separate the two halves of the brake housing unless new bolts, locking plate, and gasket are available.
The bolts are made of special steel. Never use any other bolts!

> IMPORTANT
>
> Do not separate the two halves of the brake housing unless absolutely essential. All normal servicing can be done without dismantling the brake housing.

Disassembly

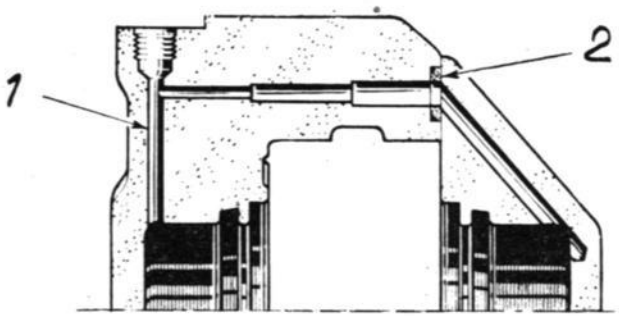
1. Disassembly the brake housing and remove the friction pads and possibly the brake pistons. (See "Removal of brake pistons".)
2. Bend up the locking plates and back off the bolts holding the two halves of the brake housing together. See fig.
3. Divide the brake housing and remove the gasket for the brake-fluid passage.

Reassembly

1. If a brake-housing half has been exchanged or the brake piston removed, refit the seal, brake piston and dust excluder. (See "Installation of brake pistons".)
2. Check that the sealing surface on each half of the brake housing is perfectly clean, and that the threaded bolthole are perfectly dry.
3. Insert a new gasket in the groove at the brake-fluid passage, and place the two halves of the brake housing together, taking care not to disturb the position of the gasket.
4. Fit two new bolts and locking plates. (Note! Use the special bolts only.) Check that the threads are perfectly dry.
5. Tighten the bolts to a torque of 37 ft-lb (5.2 kgm).

> IMPORTANT
>
> It is essential for bolt threads and threads in the brake housing to be perfectly dry. Lubricated threads lead to overloading of the bolts.
> The stipulated tightening torque for the bolts — 37 ft-lb (5.2 kgm) — must be strictly complied to.

6. Bend the flaps of the locking plate as illustrated.
7. Refit the friction pads and secure the brake housing to the steering knuckle by means of the two bolts. Fit a new locking plate.
8. Reconnect the brake line and bleed the brake system. Depress and pump the brake pedal several times in order to adjust the positions of the brake pistons and top up with brake fluid in the reservoir.



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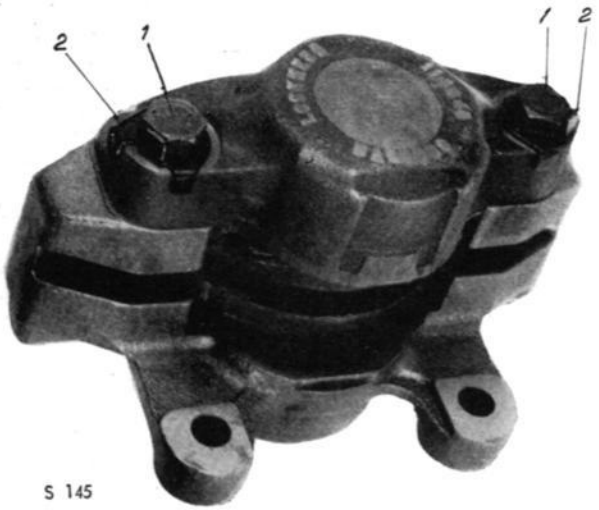
BRAKE HOUSING

1. Passage for brake fluid
2. Gasket in joint between the two halves of the brake housing.



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COMPLETE BRAKE HOUSING

1. Bolts for holding the brake housing together.
2. Locking plates.

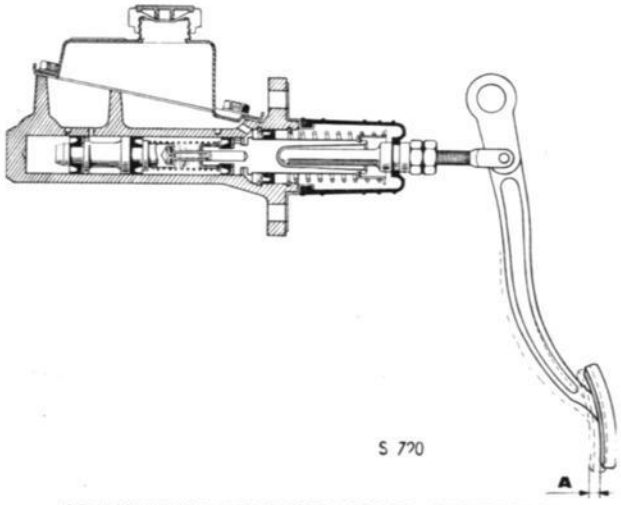
BRAKE OPERATION

Brake pedal

The brake pedal is carried on the same shaft as the clutch pedal and is fitted with self-lubricating bushings.

Removal and installation

1. Remove the steering column and gear-shift shaft.
2. Detach the fork for the clutch cylinder from the clutch pedal.
3. Remove the cotter pins from both ends of the shaft.
4. Remove the clutch pedal and return spring from the shaft.
5. Unscrew the master cylinder push-rod at the adjusting nut.
6. Pull out the shaft leftwards and remove the brake pedal.
7. Check the bearing for wear and fit new bushings if necessary.
8. Reinstall in the reverse order, and then adjust the brake-pedal free movement.



ADJUSTMENT OF BRAKE PEDAL CLEARANCE

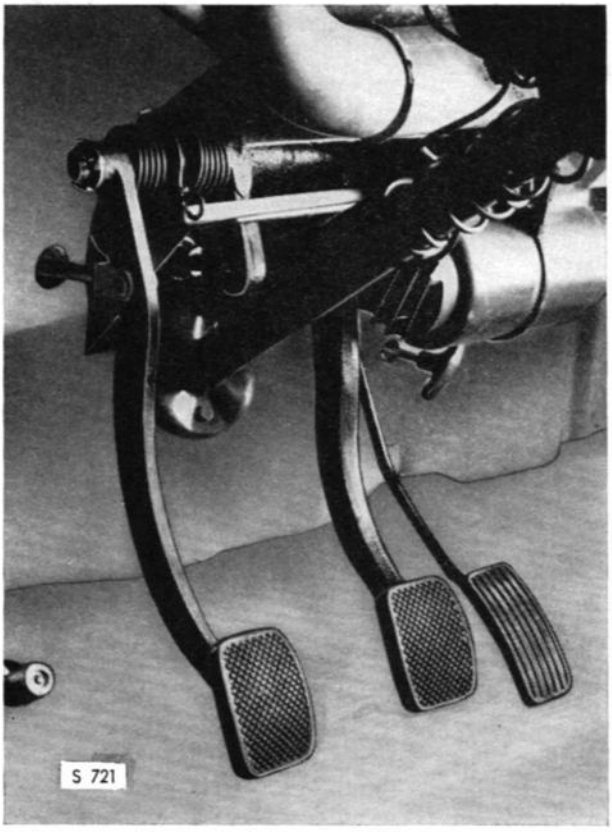
A = 0,12—0,24 in. (3—6 mm)

Adjustment of brake-pedal free movement

In order to ensure that the piston in the master cylinder will return fully every time the brake pedal is released, there must always be a clearance between the master-cylinder piston and the brake-pedal push-rod when the pedal is at rest. This clearance, measured at the tip of the pedal, should be 0.12—0.24 in. (3—6 mm). Measured between the push-rod and the piston, the clearance should amount to 0.024—0.047 in. (0.6—1.2 mm). See fig.

Adjust as follows:

1. Back off the locking nut, see fig.
2. Turn the hexagonal part of the push-rod until the correct clearance is obtained at the tip of the pedal.
3. Tighten the locking nut.



PEDAL STAND

HANDBRAKE OPERATION

General

The mechanical handbrake acts on the rear wheels only. When the handbrake lever is pulled, the movement is transmitted by the handbrake cables to levers on the rear-wheel brakes. These actuate the brake shoes mechanically, and press them against the brake drums.

Handbrake cables

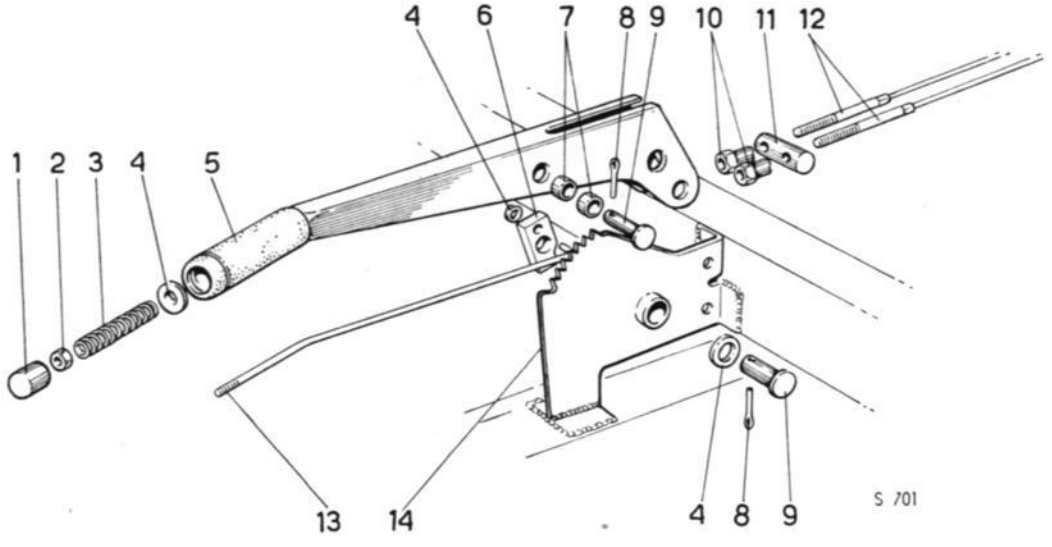
The permanently lubricated handbrake cables comprise inner steel wires in plastic-coated spiral sheathing, led through a sleeve under the backrest cushion of the rear seat. The cables are fitted with protective grommets where they pass through panels. The cables are clamped to the rear axle, the inner wires being attached to the backplate levers by means of clevis-and-pin connections. A return spring is fitted between the clevis and the spiral sheathing.

Removal of handbrake cable

1. Remove one of the front seats and the rear-seat cushions. Jack up the car.
2. Remove the rear wheel.
3. Back off and remove the adjusting nut under the handbrake lever.
4. Pull the cable sheathing out of the sleeve under the rear-seat cushion.
5. Remove the clamps used to hold the cable to the rear axle.
6. Remove the pin holding the clevis on the brake lever.
7. Ease the grommet out of the inclined panel in the rear-axle tunnel.
8. Pull out the entire brake cable rearwards.

Installation of handbrake cable

1. If the grommet in the rear-axle tunnel has been removed, ease it on to the cable.
2. Pass the cable, threaded end first, up through the inclined panel in the rear-axle tunnel and on through the sleeve under the rear seat to the handbrake lever. Make sure that the grommet in the front inclined panel has not been dislocated.
3. Refit the adjusting nut.
4. Reconnect the clevis to the brake lever and secure the pin. See fig.
5. Fit the grommet in the inclined panel in the rear-axle tunnel and secure the cable to the rear axle with two clamps.



HANDBRAKE

1. Release button
2. Nut
3. Return spring
4. Washer
5. Handbrake lever
6. Pawl
7. Spacer sleeves
8. Cotter pin or circlip
9. Pin
10. Adjusting nut
11. Cable pin
12. Threaded wire rods
13. Pawl rod
14. Ratchet

NOTE

Make sure that the spiral sheathing does not touch the brake pipe.

6. Refit the wheel.
7. Put back the cushions and seats and adjust the handbrake as described in Section 551—3.
8. Lower the car to the floor. Finally tighten the wheel nuts and refit the hub caps.
   Instructions for fitting the brake-shoe lever in the backplate are given in Section 511.

HANDBRAKE LEVER

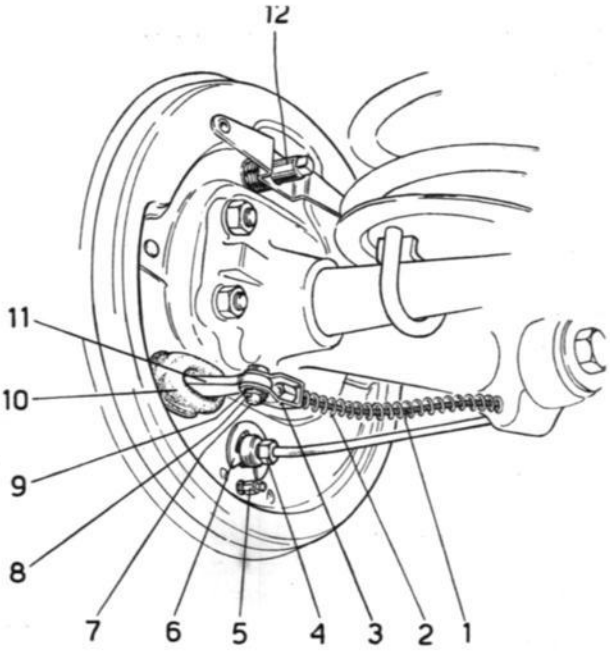
See the illustration, which shows the handbrake lever and all its component parts.

Removal

1. Push back the front seats, possibly removing one of them to provide better accessibility.
2. Remove the rubber boot from the handbrake lever.
3. Back off and remove the adjusting nuts.
4. Remove the locking washer and the lever-bearing pin from the ratchet. Collect the spacer sleeves.
5. Remove the handbrake lever.

Disassembly

1. Remove the cotter pin and the pin for the pawl.
2. Slide the pawl lever out towards the handgrip.
3. Back off the locking nut and remove the release button, locking nut, spring and washer.
4. Remove the pawl rod, the pawl and the washer by the pawl.



REVERSE SIDE OF REAR, LEFT BACKPLATE

1. Handbrake wire
2. Coil spring
3. Clevis
4. Brake-pipe connection
5. Bleed nipple
6. Locking washer
7. Pin
8. Cotter pin
9. Washer
10. Rubber boot
11. Brake lever
12. Adjustment device

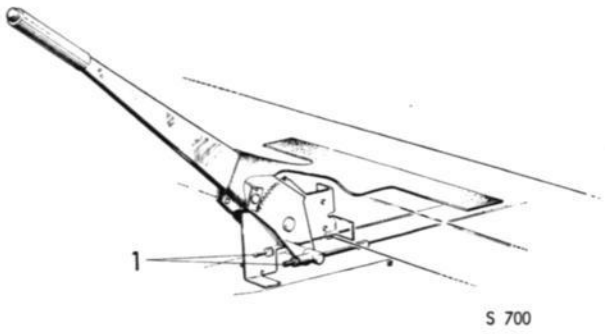
Reassembly

1. Check that the spring, pawl, ratchet and pins are flawless.
2. Refit the ratchet mechanism in the lever. The release button should project about 0.4 in. (10 mm) beyond the brake-lever handgrip when the pawl engages with the ratchet.
3. Refit the lever to the ratchet with spacers, pin and circlip.
4. Reconnect the brake wires to the lever.
5. Adjust the handbrake.

ADJUSTMENT OF HANDBRAKE

Adjustment of handbrake lever travel or of the brake cables, which may be necessary after the car has been driven for a lengthy period or after removal of the handbrake lever, should always be preceded by adjustment of the footbrake. If the handbrake still requires adjustment, this can be done in the manner described below with the adjusting nuts 1, which are accessible from the driver's seat.

1. Jack up the rear part of the car so that both rear wheels are clear of the floor.
2. Remove the right front seat and move the handbrake lever to its bottom position.
3. Tighten the left adjusting nut until the brake shoe presses against the left drum. Use a suitable hex. socket wrench to tighten the nut.
4. Back off the nut enough to allow the wheel to rotate freely and then back off one more full turn.
5. Repeat this procedure with the right adjusting nut.
6. Test by pulling the handbrake lever firmly and then returning it to the bottom position. The wheels should turn freely when the lever has been pulled up two cogs from the off position, but should be locked at the third cog.
7. Check that the braking effect is equal on both wheels.



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HANDBRAKE LEVER AND ADJUSTING NUTS

1. Adjusting nuts

NOTE

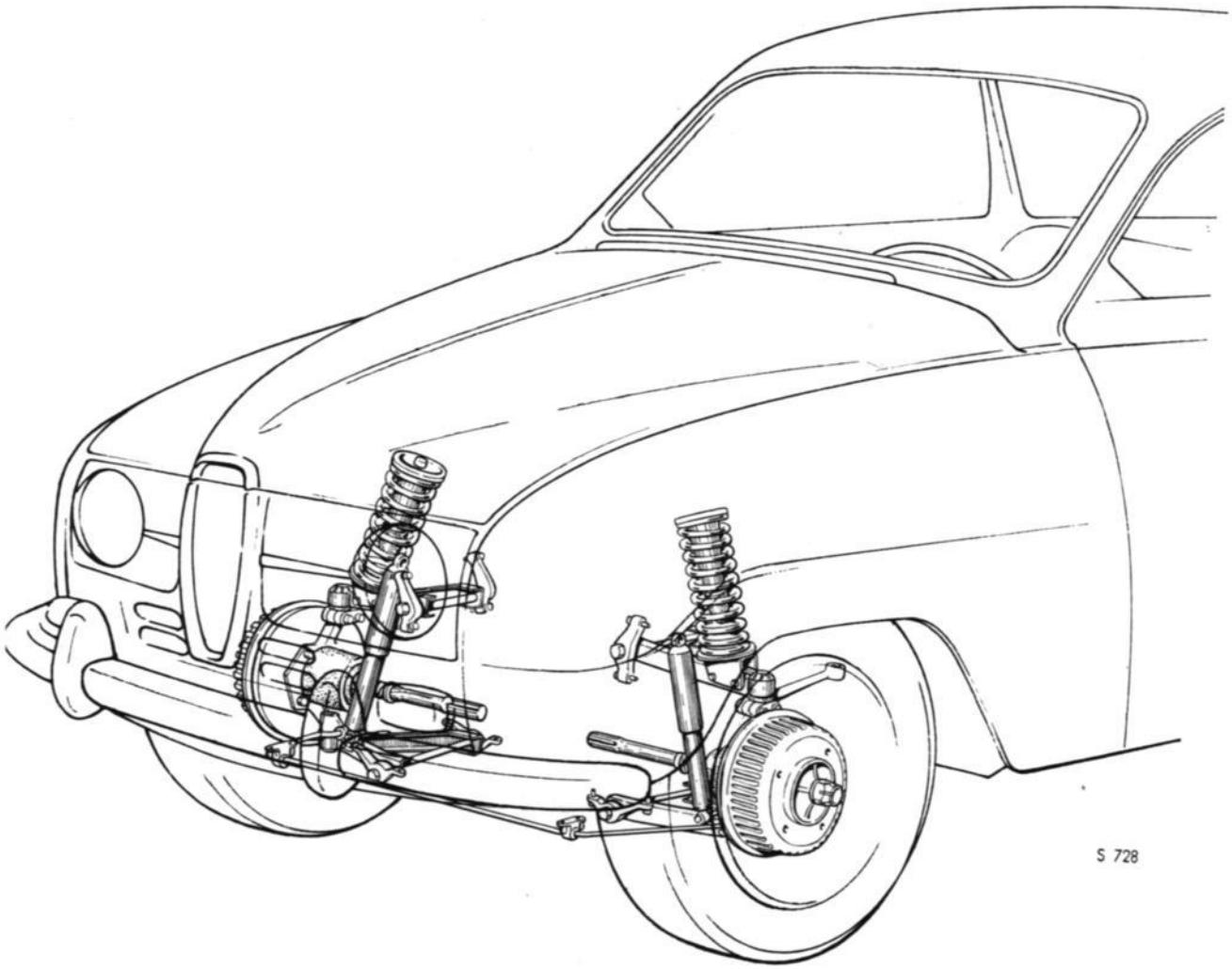
Always adjust the brake shoes before adjusting the handbrake.

CONTENTS

DESCRIPTION

General

All four wheels have coil springs. Each front wheel is attached to the steering knuckle, which is suspended through the medium of ball joints in two vee-shaped, transverse control arms. The inner ends of these control arms are carried in rubber-clad bearings on the body, and the vertical spring travel of the wheels is limited by rubber bumpers.

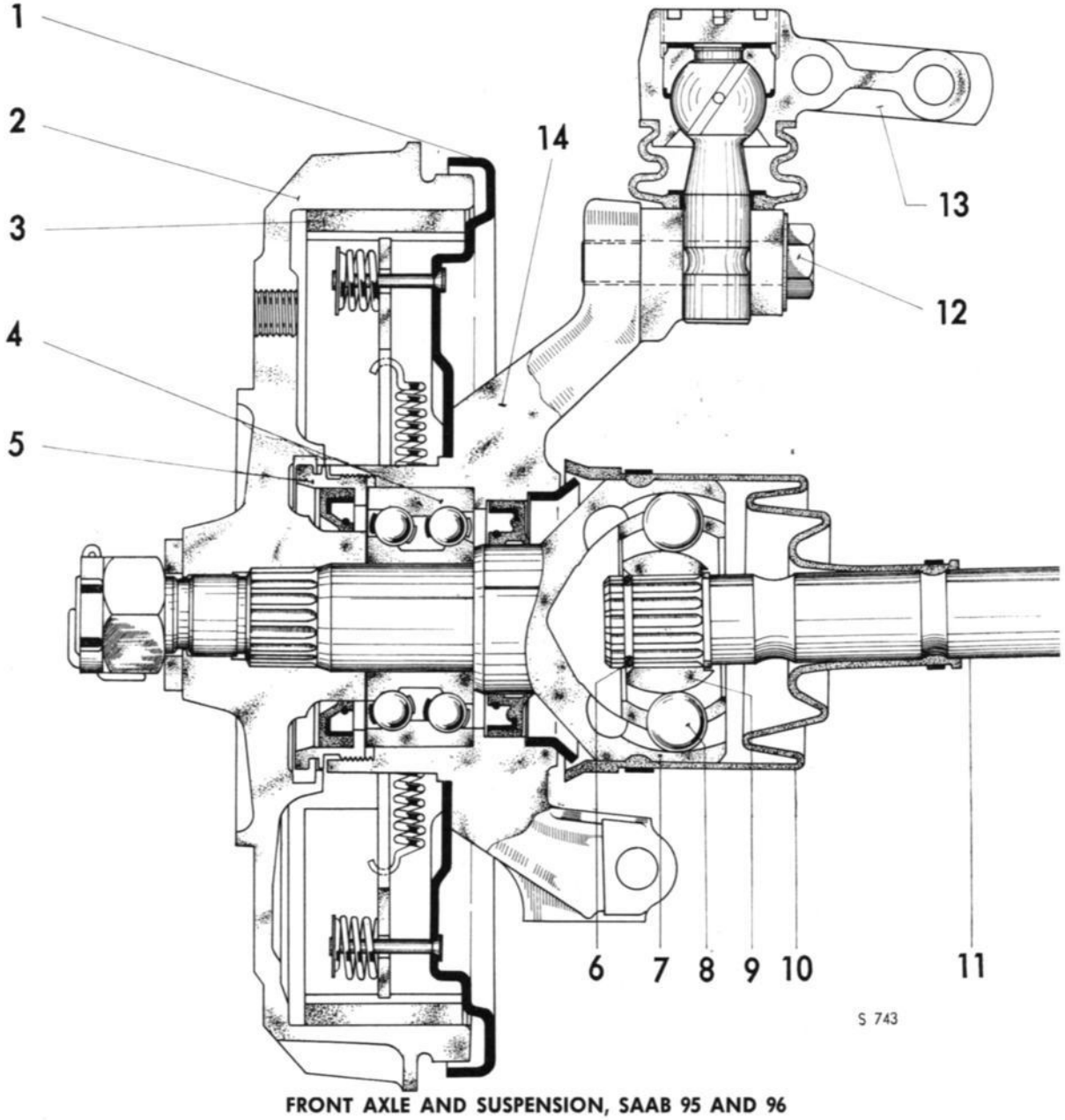


FRONT AXLE AND SUSPENSION, SAAB 95 AND 96

Steering knuckle

The front assembly comprises one lefthand and one right-hand unit. A large, forged steering knuckle forms a frame for the front axle, its principal components being a bearing housing with two inward-inclined arms, an upper and a lower. The outer drive shaft is carried in a ball bearing enclosed in the bearing housing. The wheel hub and brake drum or disc are mounted on the outer end of the drive shaft, while the backplate or brake housing with its front brake assembly is bolted to the steering knuckle.

Ball joints are attached to the steering knuckle arms, where they afford flexible connections for the ends of the control arms. The steering arm, to which the tie-rod is connected, is located on the upper steering knuckle arm. When the steering wheel is turned, the steering knuckle, together with the wheel hub and wheel, turns around an imagined axis — the king-pin axis — passing through the centers of both ball joints and intercepting the ground plane near the center line of the wheel. The outer and inner drive shafts are interconnected through the outer universal joint, the turning center of which is on the aforesaid king-pin axis. A pleated rubber boot prevents dirt and foreign matter from entering the outer universal joint and contains the grease for that joint. The inner end of the inner drive shaft is connected to the inner universal joint which is located on the stub of the differential output shaft.

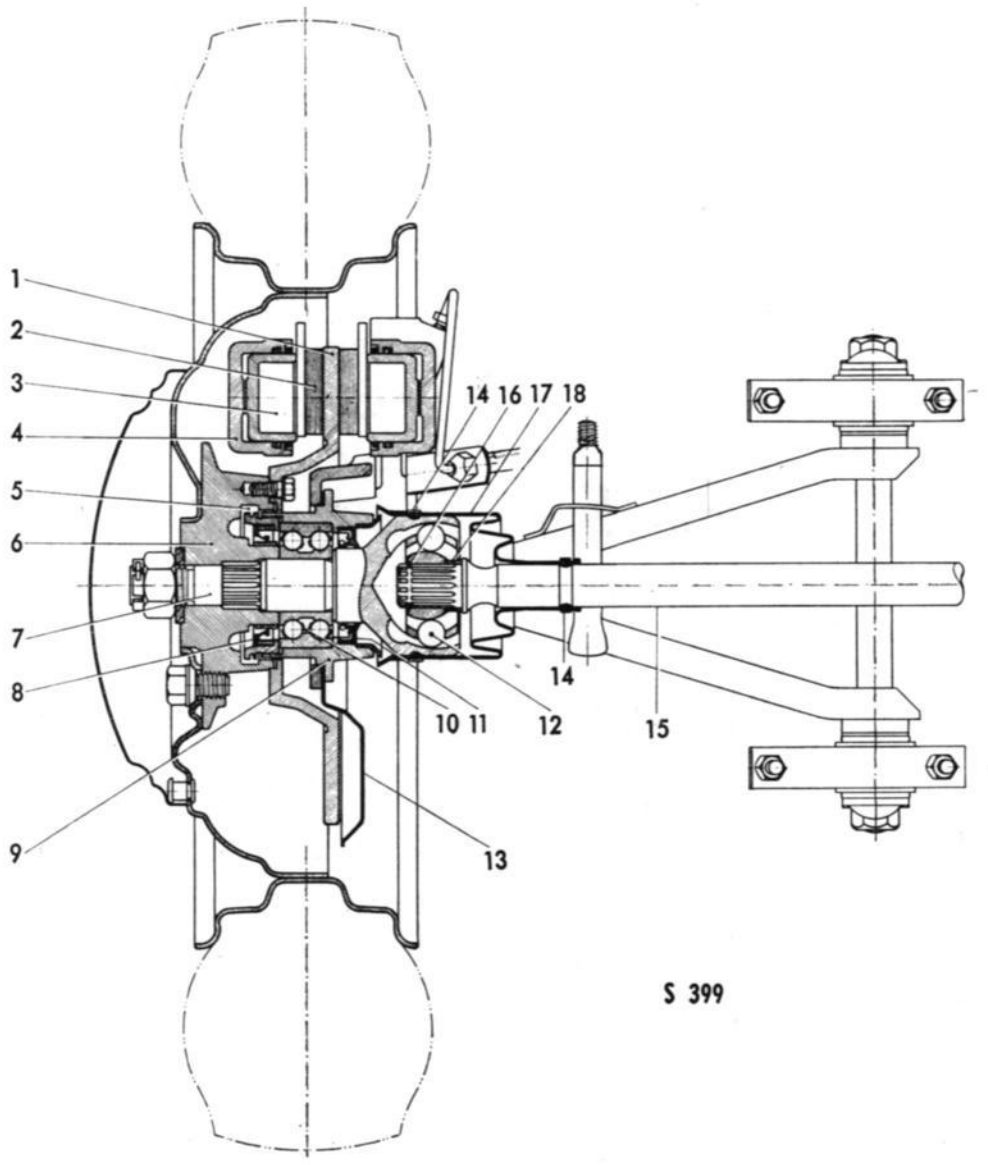


FRONT AXLE AND SUSPENSION, SAAB 95 AND 96

1. Backplate
2. Brake drum
3. Brake shoe
4. Ball bearing
5. Nut
6. Lock ring
7. Outer drive shaft
8. Ball
9. Hub
10. Rubber boot
11. Inner drive shaft
12. Bolt
13. Ball joint
14. Steering knuckle housing

As the Saab Sport car has disc brakes on the front wheels, the wheel hubs and front-wheel bearings on this model are different from those on the Saab 96. Other components, such as the control arms with their ball joints and rubber bearings, the coil springs and rubber bumpers, and the stabilizer bars, are the same as in the Saab 96. The front-wheel alignment is also identical.

Instead of the brake drum, which on the Saab 96 constitutes the wheel hub, the Saab Sport features a special hub, to which the brake disc is bolted. The wheel is secured to the wheel hub by means of only four bolts. The steering knuckle, which is identical with that on the Saab 95 and Saab 96, carries a holder for the brake housing.



FRONT AXLE ASSY, SAAB SPORT

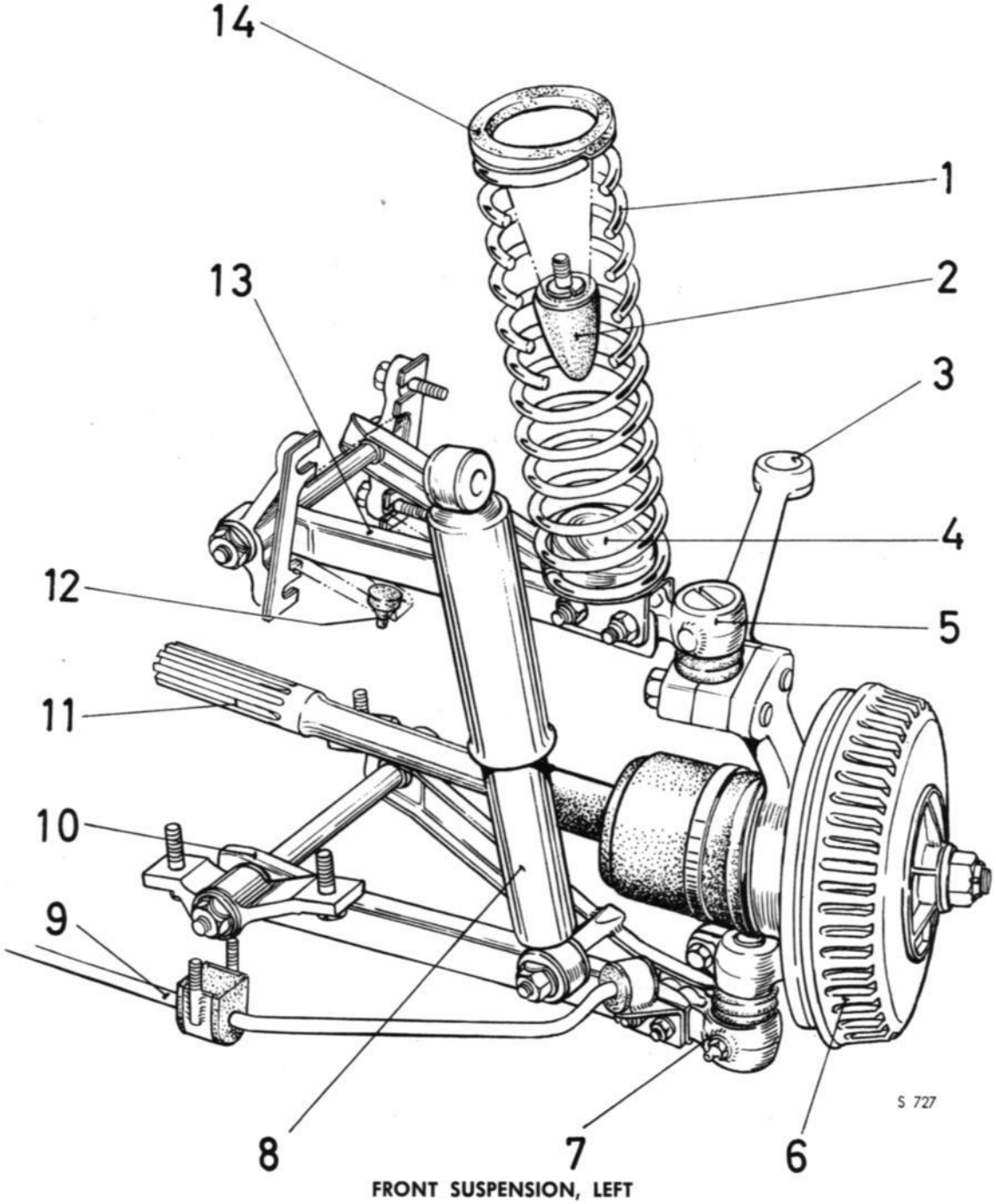
1. Brake disk
2. Brake pad
3. Brake piston
4. Brake housing
5. Nut
6. Wheel hub
7. Outer drive shaft
8. Shaft seal
9. Steering knuckle housing
10. Ball bearing
11. Shaft seal
12. Ball
13. Backing plate
14. Clamp
15. Inner drive shaft
16. Circlip
17. Boot
18. Spacer ring

Control arms

The front axle assembly, which comprises a separate unit on each side, is connected to the ball joints (see fig.) which form the ends of the control arms. There are two control arms on either side, each of them being carried in rubber bushings on two mounting brackets bolted to the body.

The upper control arms are equipped with seats for coil springs and rubber bumpers.

The two lower control arms are interconnected by means of a stabilizer bar.



FRONT SUSPENSION, LEFT

1. Coil spring
2. Rubber bumper
3. Steering arm
4. Spring seat
5. Upper ball joint
6. Brake drum
7. Lower ball joint
8. Shock absorber
9. Stabilizer bar
10. Lower control arm
11. Inner drive shaft
12. Rubber bumper
13. Upper control arm
14. Rubber spacer

Steering, and column shift gear

The steering gear is made in two versions, one for right-hand and one for lefthand steering. In principle, however, the two versions are identical. The steering gear is of rack-and-pinion type, consisting essentially of a spiral pinion meshed with skew teeth on a rack. The gear is enclosed in a light-alloy housing which also carries the toothed rack. Movement of the steering wheel, which is splined to the center stub of the steering column, is transmitted through the column to the pinion. The pinion imparts to the rack 6 — see fig. — a reciprocating movement, which actuates the two tie-rods 8 that are attached to the ends of the rack with ball joints. The tie-rods then transmit the movement to the steering arms 4 which are attached to the steering knuckles and connected to the tie-rods through the outer ball joints 3.

The Saab car is equipped with a column shift gear. The gear-shift shaft is pivoted to the operating rod in the transmission case by means of a universal joint. This joint comprises a short shaft, connected through universal joints to the gear-shift shaft and to the operating rod — see fig. Both 3-speed and 4-speed gears are available.

The cars are equipped with a gear-lever lock in combination with the ignition lock. The gear-lever lock consists of a twist stop secured to the gear-shift shaft by two clamping screws and knurls. The twist stop has a hole into which the lock plunger slides when the gear-shift lever is locked.

The gear-shift mechanism can only be locked when the reverse gear is engaged.

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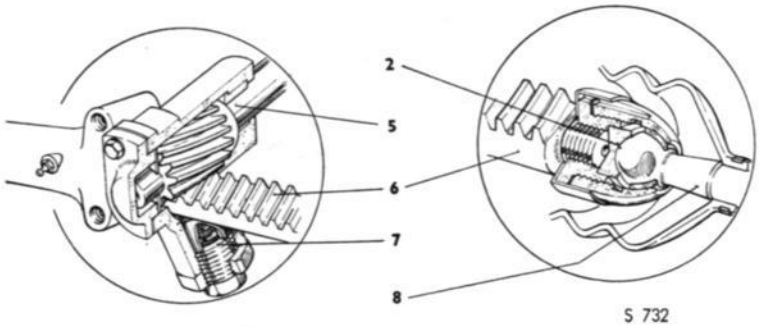

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STEERING AND GEAR-SHIFT MECHANISM

1. Steering gear
2. Inner ball joint
3. Outer ball joint
4. Steering knuckle with steering arm
5. Steering column with pinion
6. Rack
7. Spring and plug
8. Tie-rod

WHEEL ALIGNMENT

General

It is of the utmost importance that the front wheels be correctly aligned, since incorrect steering geometry can cause:

1. Driving fatigue, due to impaired roadability.
2. Difficulty in keeping the car under control.
3. Increased tire and repair costs due to abnormal wear of tires and steering mechanism.

If there is reason to suspect incorrect front-wheel alignment as the result of an accident or of driving into the ditch, for example, or if road behaviour otherwise is noticeably impaired, the car should immediately be taken to an authorized service shop for inspection and adjustment. Even if there is no direct reason to suspect faulty wheel alignment, the car should nevertheless be checked at regular intervals and adjusted whenever necessary.

The angles and dimensions directly affecting the front-wheel alignment, all of which are closely interrelated, are the following:

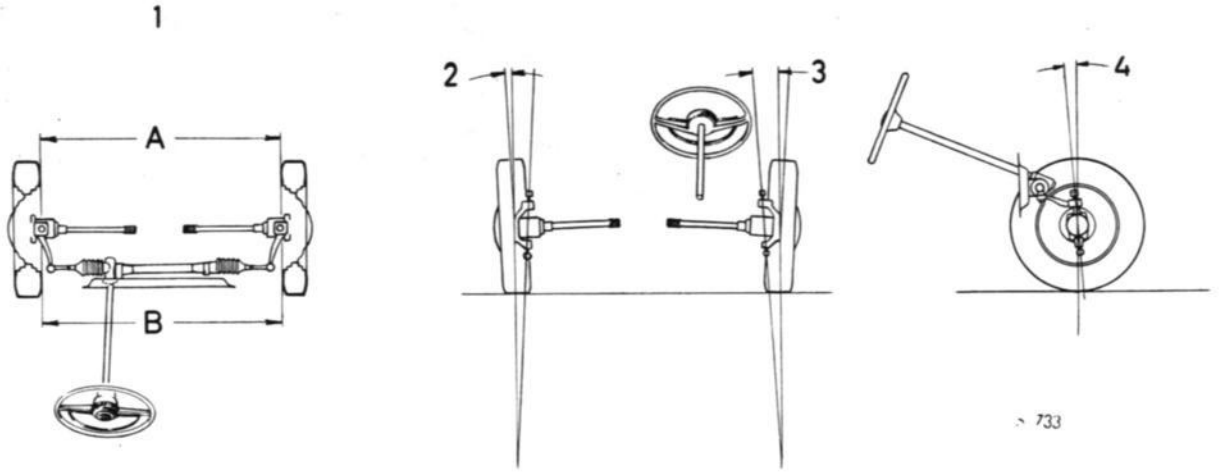
King-pin inclination
Caster
Camber
Toe-in and
Wheel turning angles

The specified angles and dimensions have been arrived at through practical tests and trials over a long period and in highly varying circumstances. These have proved that the recommended values give the car the best driving characteristics, at the same time reducing wear on tires and bearings to a minimum. It is therefore extremely important that the recommendations in respect of checking and adjustment of the dimensions and angles for the front-wheel alignment be carefully followed.

Checking and adjustment

If there is reason to suspect incorrect front-wheel alignment, as indicated by abnormal tire wear, impaired steering and road-holding characteristics, etc., the alignment should be checked and adjusted if necessary. Before carrying out the check, attention should be paid to the following points:

1. Check that the tire pressure is correct on all wheels and that the front tires are not too unevenly worn.
2. Check the front wheel bearings, control arm bearings, ball joints and tie-rod ends, adjusting or replacing as necessary in order to eliminate errors that can be caused by worn parts.



FRONT-WHEEL ALIGNMENT

1. Toe-in
2. Camber
3. King-pin inclination
4. Caster

3. Check the steering gear and adjust any faults — see Section 642.
4. Check the function of the shock absorbers and renew any defective shock absorbers and rubber bushings.
5. If the car has been involved in an accident, driven into the ditch, etc., any damage incurred must be repaired before the alignment check. Distorted steering arms must be rejected and new ones fitted, as restraightening is not permitted.
6. Immediately prior to the check, drive the car with normal suspension movement but without hard cornering in order to avoid deceptive misalignment. For the same reason, the car should also be rocked a few times.

During the alignment check, the car must be unladen and standing on a flat, horizontal floor, as otherwise measurements will not be reliable.

All adjustment with shims must be kept within reasonable limits. Deformation resulting from crash damage, etc., must be corrected by thorough realignment of the body. Distorted control arms must be rejected and new ones fitted.

For checking wheel alignment there are various standard tools, which are fitted either to the rim or directly on the stub axle. Tool handling is described in the instructions for each individual tool.

> NOTE
>
> When using axle-fitted tools on cars with a front-wheel drive, the wheels must stand on turn-tables or similar devices and should be locked with the brakes during the course of the check.

FRONT-WHEEL ALIGNMENT

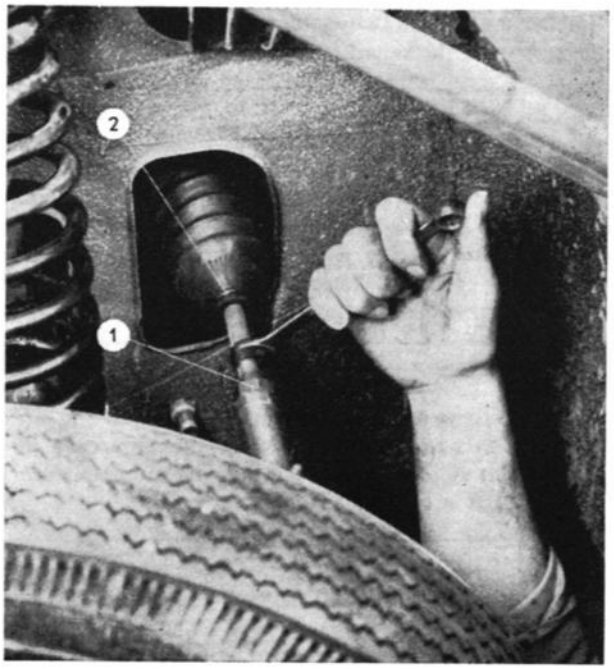
Toe-in

Viewed from above, the wheels should have a certain relationship to each other, expressed as the difference between dimensions A and B, measured rim-to-rim at axle height. See fig.

The setting is called toe-in when dimension A is less than dimension B. When A is greater than B, the wheel setting is referred to as toe-out.

Toe-in or toe-out is expressed in inches or millimeters, being — as stated — the difference between the two measurements A and B. If the wheels are parallel, so that there is neither toe-in nor toe-out, the difference will be 0.

The correct setting is 0.08 in. (2 mm) toe-in, i.e. B—A = 0.08 in. (2 mm) ±0.04 in. (1 mm). Dimension A should be 0.04—0.12 in. (1—3 mm) less than dimension B.



ADJUSTMENT OF TOE-IN

1. Locknut
2. Clamp ring

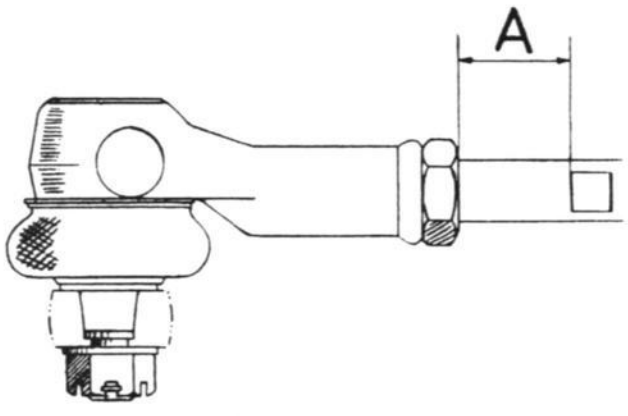
Checking and adjustment

1. Roll the car slowly straight ahead on a level floor and stop it without using the brakes. Do not move the car backwards again.
2. Check the measure A using the special measuring rule 784001, between the edges of the rims at axle height. Make a scribed mark at the measure points. Move the car forward until the scribed mark comes in axle height again. Check measure B.
   If adjustment is called for, alter the lenght of the tie-rods.
3. Back off the locknut on the outer end of the tie-rod.
4. Apply a wrench to the tie-rod flats and turn to right or left, checking until the correct toe-in setting is obtained.

> NOTE
>
> If the rubber boot is so tightly clamped that it accompanies the tie-rod when turned, the clamping ring must first be slackened a little.

If the toe-in is correct, and when both wheels are pointing straight ahead, the two tie-rods should be of equal length, or else be so set that the wheels have the same amount of clearance from fenders and wheel houses when turned hard right or hard left. Check also that the spokes of the steering wheel are horizontal when the wheels are centered. Remember to tighten the tie-rod locknuts after adjustment.

> NOTE
>
> After adjustment of toe-in, dimension A must on no account exceed 1 5/8 in. (40 mm). The difference in dimensions A for the two opposite tie-rods must not exceed 0.08 in. (2 mm).



CHECKING TIE-ROD LENGTH

CAMBER

Camber is understood to mean the deviation of the wheel from the vertical — see fig. If the wheel tilts outwards, camber is positive (+), and if it tilts inwards, camber is said to be negative (—).
The correct camber for a Saab car is 3/4° ± 1/4° positive.

Checking and adjustment

Camber, and thus king-pin inclination also, can be adjusted by inserting shims under the bearing brackets of the upper control arms. The desired result can thus be obtained by the addition or removal of shims.
Increasing the thickness of shims under both brackets by 0.1 in. (2.5 mm) reduces camber by approx. 1/2°.
If, on the other hand, an 0.1 in. (2.5 mm) shim is removed from under each bracket, camber will be increased by approx. 1/2°.
Shims of equal thickness must always be used both brackets.

CASTER

Caster is the deviation of the king-pin axis from the vertical when viewed from the side, and is generally expressed in degrees. Caster varies greatly from car to car. In most cases, the king pin is inclined rearwards, as illustrated, and caster is then said to be positive (+). If the king pin is inclined forwards, caster is said to be negative (—). Finally, the king pin may be perfectly vertical, in which case caster is 0. In the Saab car, caster should me 2° ± 1/2° positive.

Checking and adjustment

If caster adjustment is called for, this can be done by inserting shims under the bearing brackets of the upper control arms.

Transference of shims with a thickness of 0.02 in. (0.5 mm) from under the front bracket to under the rear bracket results in a 1/2° increase in caster.

Transference of shims with a thickness of 0.02 in. (0.5 mm) from under the rear bracket to under the front bracket results in a 1/2° decrease in caster.

The same thickness of shims as is removed from under one bracket must thus always be fitted under the other bracket.

KING-PIN INCLINATION

In point of fact, there is no king pin in the true sense of the term in the Saab car, and the term king-pin inclination is therefore instead applied to the inclination of the imaginary axis which passes through the centers of the two ball joints and meets the ground near the center line of the wheel. The correct inclination is 7°±1°.

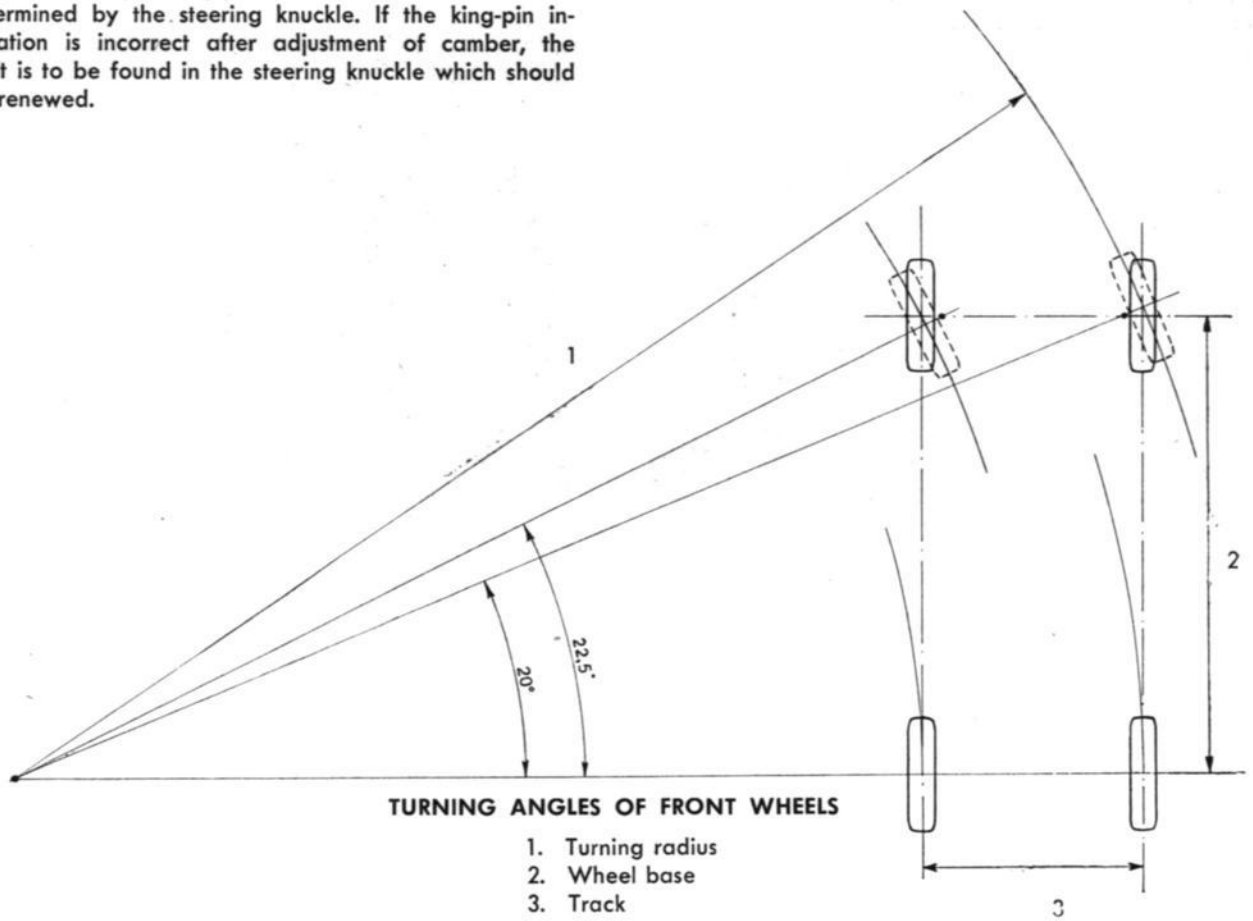
Checking and adjustment

King-pin inclination is adjusted at the same time as camber and is changed by the same angle. It is not possible to adjust king-pin inclination alone, as this is determined by the steering knuckle. If the king-pin inclination is incorrect after adjustment of camber, the fault is to be found in the steering knuckle which should be renewed.

WHEEL TURNING ANGLES

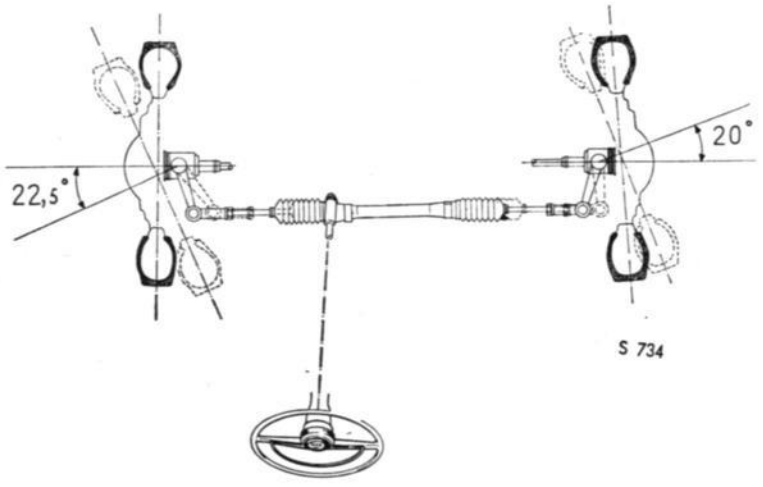
If wheel alignment is correct, all four whee!s will describe circles with a common center when the car takes a curve, and as the rear wheels are fixed this center must lie somewhere on their extended axis. As shown in the figure below, the inner front wheel must be turned more than the outer one when taking a curve, in order for both wheels to move around the same center.

Correct steering geometry depends essentially on the alignment of the steering arms, but the tie-rod alignment also has some bearing on it, particularly when suspension movement occurs — see fig.



TURNING ANGLES OF FRONT WHEELS

1. Turning radius
2. Wheel base
3. Track



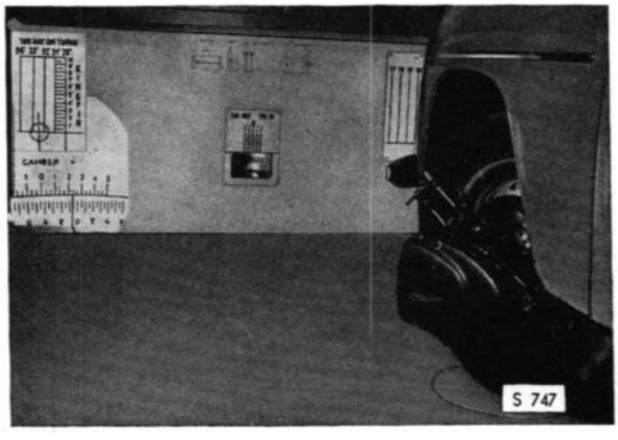
WHEEL TURNING ANGLES

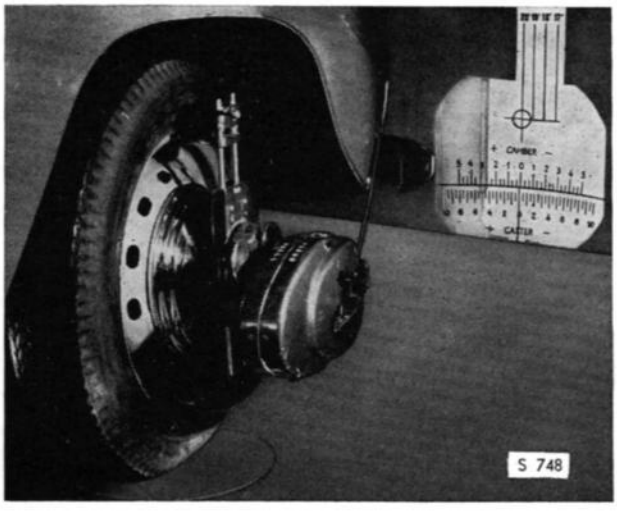
Checking and adjustment

Before checking of turning angles is commenced, the toe-in must be correctly adjusted. To measure the turning angles, use is made of two standard-type turn-tables with arc graduations or optical measuring equipment — see fig. Position the turn-tables as close to the wheel turning center as possible.

Turn the steering wheel to, for instance, the left, until the graduated disc for the front wheel shows a reading of 20°. If the turning setting is correct, the other disc should give a reading of 22 1/2° ± 1 1/2°.

Measure in the corresponding manner when the steering wheel is turned in the opposite direction. If measurement reveals that the turning angles are incorrect, one or both steering arms is deformed. Defective steering arms must not be restraightened but must be changed instead.





WHEEL ALIGNMENT WITH OPTICAL MEASURING EQUIPMENT

Inner wheel = 22.5°

Outer wheel = 20°

WHEEL ALIGNMENT TABLES

The use of the following tables facilitates adjustment of wheel alignment.

Camber – caster

The table is used as described in the following example.

1. In checking the front-wheel angles, the following figures, for example, are noted:
   camber = 1 1/4°
   caster = 2 3/4°
2. Look for these figures in the table, and you will find
   F + 3.5
   B + 1.5
   This means that:

   Shims with a thickness of 0.14 in. (3.5 mm) must be inserted under the front bracket.
   Shims with a thickness of 0.06 in. (1.5 mm) must be inserted under the rear bracket.
3. After adjustment of the shimming, the correct figures for both camber and caster will be obtained at the same time.
4. The framed figures in the table lie within the permissible tolerance limits and thus do not require adjustment.

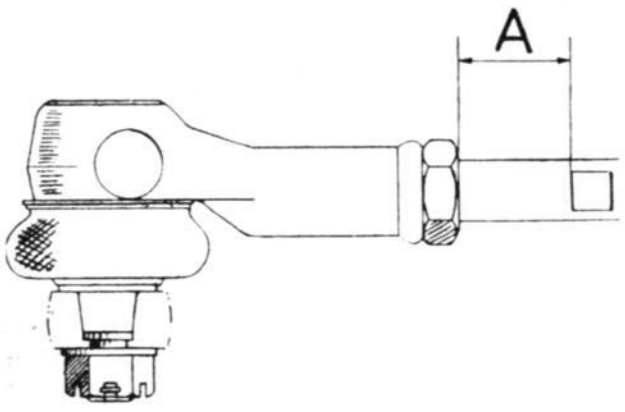
Indicated camber, °	Indicated caster, °												
	½	¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½
2	F+4 B+8	F+4,5 B+7,5	F+5 B+7	F+5 B+7	F+5,5 B+6,5	F+6 B+6	F+6 B+6	F+6 B+6	F+6,5 B+5,5	F+7 B+5	F+7 B+5	F+7,5 B+4,5	F+8 B+4
1¾	F+2,5 B+6,5	F+3 B+6	F+3,5 B+5,5	F+3,5 B+5,5	F+4 B+5	F+4,5 B+4,5	F+4,5 B+4,5	F+4,5 B+4,5	F+5 B+4	F+5,5 B+3,5	F+5,5 B+3,5	F+6 B+3	F+6,5 B+2,5
1½	F+1,5 B+5,5	F+2 B+5	F+2,5 B+4,5	F+2,5 B+4,5	F+3 B+4	F+3,5 B+3,5	F+3,5 B+3,5	F+3,5 B+3,5	F+4 B+3	F+4,5 B+2,5	F+4,5 B+2,5	F+5 B+2	F+5,5 B+1,5
1¼	F+0,5 B+4,5	F+1 B+4	F+1,5 B+3,5	F+1,5 B+3,5	F+2 B+3	F+2,5 B+2,5	F+2,5 B+2,5	F+2,5 B+2,5	F+3 B+2	F+3,5 B+1,5	F+3,5 B+1,5	F+4 B+1	F+4,5 B+0,5
1	F—1 F+3	F—0,5 B+2,5	F±0 B+2	F±0 B+2	F+0,5 B+1,5	F+1 B+1	F+1 B+1	F+1 B+1	F+1,5 B+0,5	F+2 B±0	F+2 B±0	F+2,5 B—0,5	F+3 B—1
¾	F—2 B+2	F—1,5 B+1,5	F—1 B+1	F—1 B+1	F—0,5 B+0,5	F±0 B±0	Correct setting	F±0 B±0	F+0,5 B—0,5	F+1 B—1	F+1 B—1	F+1,5 B—1,5	F+2 F—2
½	F—3 B+1	F—2,5 B+0,5	F—2 B±0	F—2 B±0	F—1,5 B—0,5	F—1 B—1	F—1 B—1	F—1 B—1	F—0,5 B—1,5	F±0 B—2	F±0 B—2	F+0,5 B—2,5	F+1 B—3
¼	F—4,5 B—0,5	F—4 B—1	F—3,5 B—1,5	F—3,5 B—1,5	F—3 B—2	F—2,5 B—2,5	F—2,5 B—2,5	F—2,5 B—2,5	F—2 B—3	F—1,5 B—3,5	F—1,5 B—3,5	F—1 B—4	F—0,5 B—4,5
0	F—5,5 B—1,5	F—5 B—2	F—4,5 B—2,5	F—4,5 B—2,5	F—4 B—3	F—3,5 B—3,5	F—3,5 B—3,5	F—3,5 B—3,5	F—3 B—4	F—2,5 B—4,5	F—2,5 B—4,5	F—2 B—5	F—1,5 B—5,5
—¼	F—6,5 B—2,5	F—6 B—3	F—5,5 B—3,5	F—5,5 B—3,5	F—5 B—4	F—4,5 B—4,5	F—4,5 B—4,5	F—4,5 B—4,5	F—4 B—5	F—3,5 B—5,5	F—3,5 B—5,5	F—3 B—6	F—2,5 B—6,5
—½	F—8 B—4	F—7,5 B—4,5	F—5 B—5	F—7 B—5	F—6,5 B—5,5	F—6 B—6	F—6 B—6	F—6 B—6	F—5,5 B—6,5	F—5 B—7	F—5 B—7	F—4,5 B—7,5	F—4 B—8

Toe-in (toe-out) at wheel rim

When adjusting toe-in (toe-out), remember that:

1. Dimension A must not exceed 1 5/8 in. (40 mm).
2. The difference between dimensions A for left and right sides must not exceed 0.08 in. (2 mm).

The framed values are within the permissible tolerances, and thus do not need to be adjusted.



CHECKING TIE-ROD LENGTH

Reading, value of toe-in		Screw tie-rod in or out, the following 1/4 turns
Toe-in mm and in.	6 0.24 in.	8 out
	5 0.19 in.	7 out
	4 0.16 in.	6 out
	3 0.12 in.	5 out
	2 0.08 in.	4 out
	1 0.04 in.	3 out
	0	2 out
Toe-out in mm and in.	1 0.04 in.	1 out
	2 0.08 in.	Correct value
	3 0.12 in.	1 in
	4 0.16 in.	2 in
	5 0.19 in.	3 in
	6 0.24 in.	4 in
	7 0.28 in.	5 in
	8 0.31 in.	6 in
	9 0.35 in.	7 in
	10 0.39 in.	8 in

REAR-WHEEL ALIGNMENT

Checking

If the rear axle has been subjected to abnormal stresses, for instance in connection with a collision or other accident, it must be carefully checked for signs of fracture or deformation.
Normally, rear-wheel alignment does not require adjustment. If, however, the rear axle has been subjected to such abnormal stresses that faulty alignment of the rear wheels is suspected, the wheel angles should be checked.

If the wheels are correctly aligned, the angles should be within the following limits:

Camber	0°±1°
Toe-in (toe-out) must not exceed:	
per wheel	0°±3/4°
both wheels together	0°±1°
both wheels together measured rim-to-rim	0±0.28 in. (7 mm)
Max. difference in wheelbase, left and right (front wheels pointing straight ahead):	0.6 in. (15 mm)

On condition that the wheel angles are within the values stipulated above, the difference in wheelbase between the left and right sides may amount to a maximum of 0.6 in. (15 mm).

NOTE

Special wheel-angle measuring equipment is needed to establish faults in toe-in (toe-out).

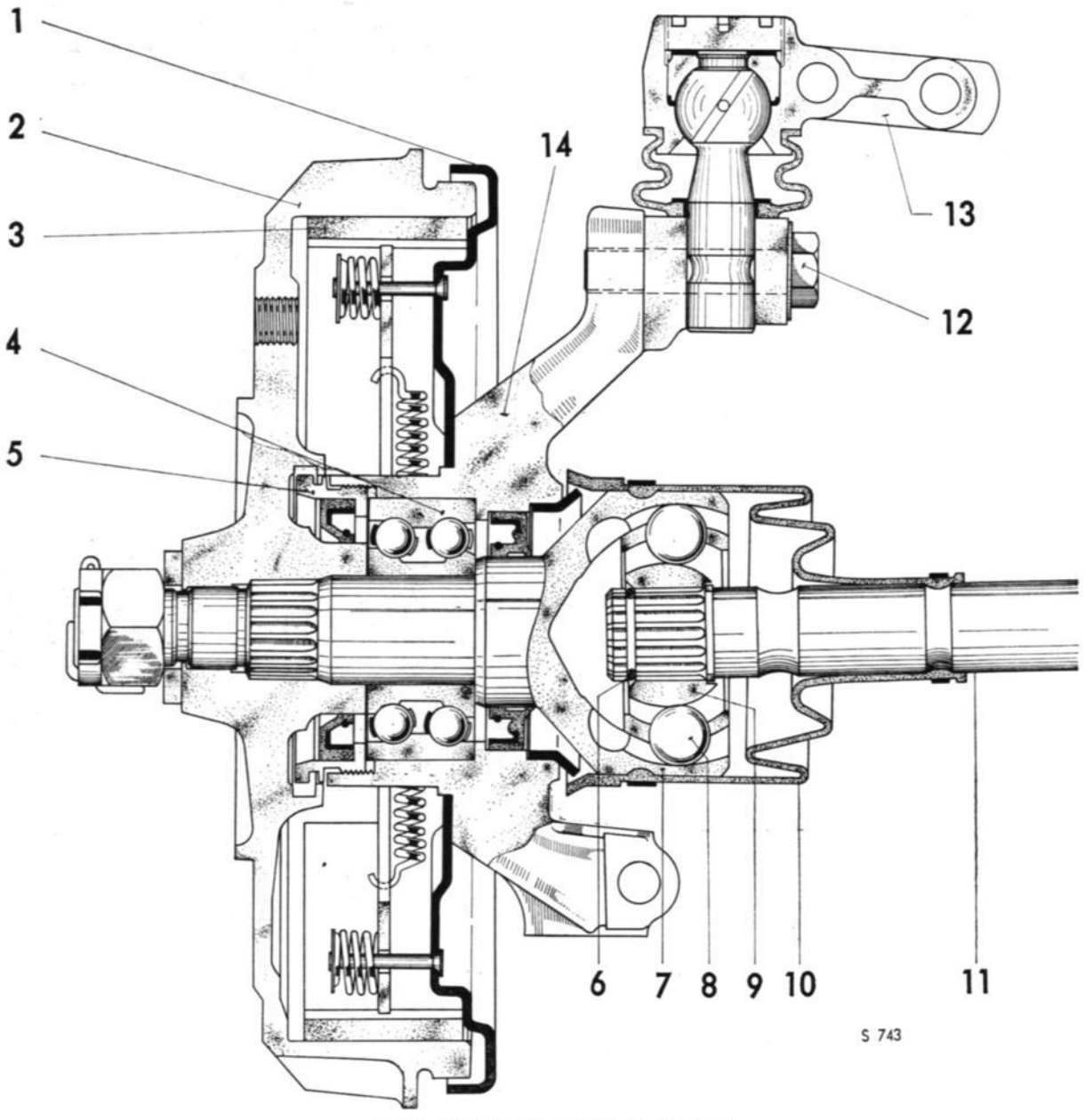
NOTE

If the difference in wheelbase exceeds 0.2 in. (5 mm), the wheel alignment must be checked.
Wheel alignment can be incorrect without this affecting the wheelbase.

STEERING KNUCKLE AND BALL JOINTS

Replacement of front-wheel bearings

After considerable mileage, especially if lubrication has not been satisfactory, the wheel bearings may become worn and play will develop. Since this has a detrimental effect on the steering characteristics, the bearings must be renewed. Bearing play is easily checked if the car is jacked up. Hold the wheel at top and bottom and try to wiggle it: this will immediately reveal any unwanted play. If any existing play, measured at the rim, exceeds 0.08 in. (2 mm), the bearing must be changed. Note that an arbor press will be needed for removal and installation of wheel bearings. Do not subject the bearings to blows under any circumstances, as such treatment could easily damage them. Always use genuine replacement bearings, as these have tolerances specially adapted for the axle and steering knuckle.



FRONT AXLE ASSY, SAAB 95 AND 96

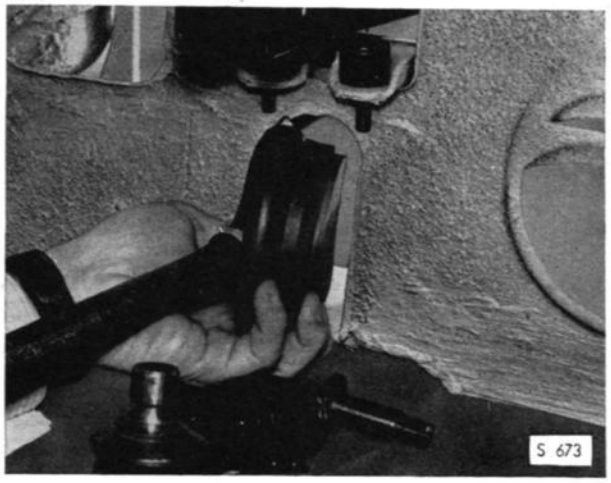
1. Backplate
2. Brake drum
3. Brake shoe
4. Ball bearing
5. Nut
6. Lock ring
7. Outer drive shaft
8. Ball
9. Hub
10. Rubber boot
11. Inner drive shaft
12. Bolt
13. Ball joint
14. Steering knuckle housing

Removal

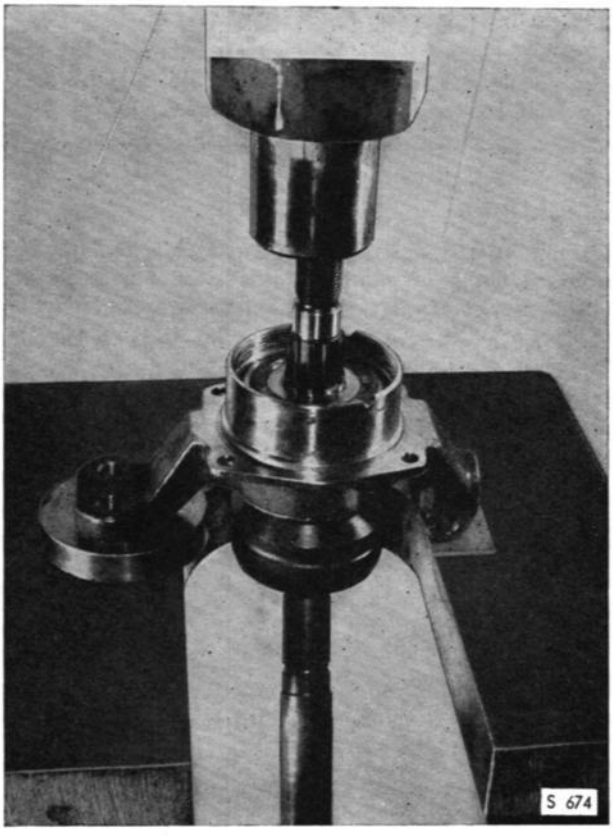
1. Jack up the front part of the car and remove the wheel and brake drum.
   Saab 95/96:
   Remove the backplate and hang it up near the wheel house in order to prevent damage to the brake hose.

   Saab Sport:

   Remove the brake housing and hang it up near the wheel house in order to prevent damage to the brake hose. Then remove the hub and the brake disc.
2. Remove the steering arm and upper ball joint from the steering knuckle.
3. Back off the clamping screw which holds the lower ball joint to the steering knuckle.
4. Saab Sport:
   Remove the large clamp for the rubber boot on the inner universal joint and open up the joint. Fit the cover, No. 731762, in the rubber boot to keep the needle bearings in and dirt out. Fit protective cover 783846 on the inner driver.
5. Pull the drive shaft out through the wheel house and remove the front-axle assembly. Wash this unit thoroughly.
6. Remove the nut and shaft seal from the steering knuckle. Use the pegged key, No. 784020. First prise up the nut retainer with an arbor or other suitable tool.
7. Remove the outer drive shaft by applying pressure to its outer end. The outer drive shaft will be accompanied by the universal joint, rubber boot and middle drive shaft. See fig.
8. Press the bearing out of the steering knuckle from the inside.
9. Remove the two sealing rings from their seats in the steering knuckle and nut if they need to be changed.

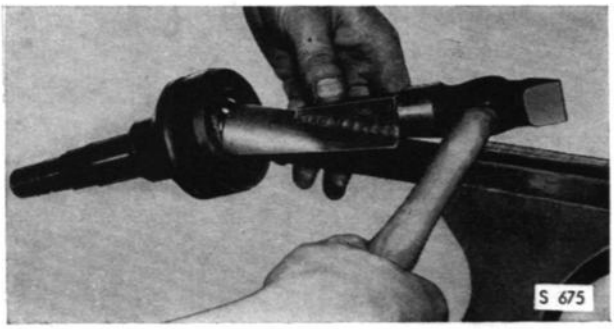


REMOVAL OF MIDDLE DRIVE SHAFT



PRESSING OUT THE OUTER DRIVE SHAFT

10. Secure the middle drive shaft in a vise and strike the hub off the shaft, using arbor No. 784165. See fig.



REMOVAL OF HUB WITH ARBOR 784165

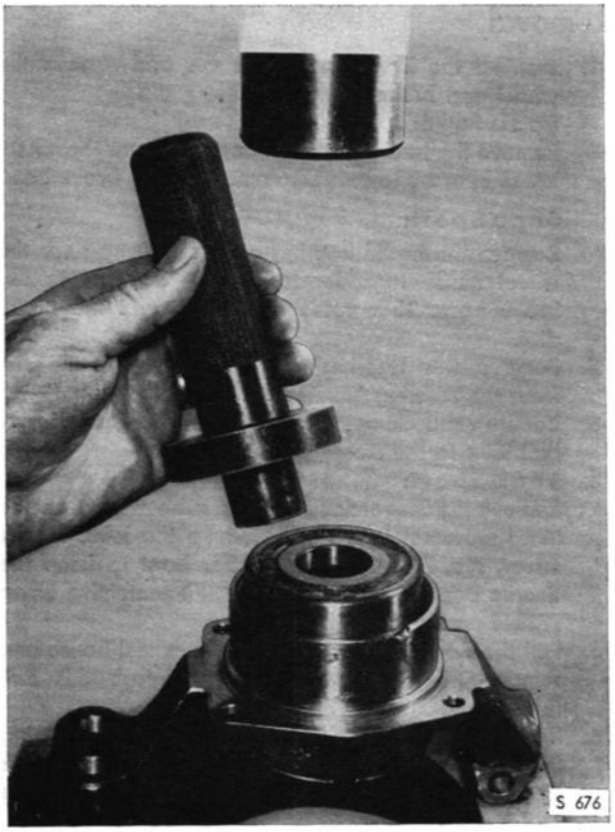
NOTE

The hub, ball holder and balls can be removed from the dome if the hub is turned through 90° in a certain position. These items should only be removed, however, if absolutely essential.

Installation

Clean all the component parts thoroughly, and replace worn or damaged parts by new ones. Pay particular attention to shaft seals and rubber boots.

1. Press a new sealing ring into the steering knuckle.
2. Pack the ball bearing with SAAB Special Grease. Always use genuine bearings.
3. Drive the ball bearing into the steering knuckle, using tool No. 784075, with the number stamped on the outer race facing outwards. See fig.
4. Screw on the nut with a new shaft seal and secure the nut.

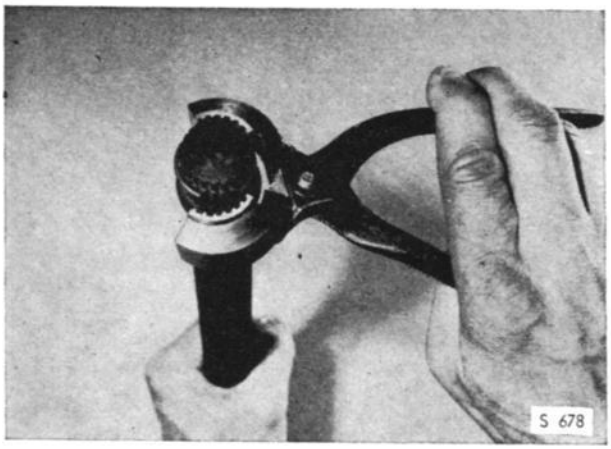


PRESSING IN THE BALL BEARING, TOOL 784075

5. Fill the space between the lips of the sealing ring with chassis grease and drive the shaft in until it butts against the bearing.
6. Lubricate the universal joint with SAAB Special Grease. The correct amount of grease (1.75 oz. = 50 grammes) will be obtained if you fill the dome, with hub and balls inserted, with grease. This operation must be carried out in conditions of scrupulous cleanliness in order to prevent dirt and foreign matter from entering the universal joints and bearings.
7. Ease on the rubber boots and clamps to the middle drive shaft.
8. Fit a new elastic washer on the middle drive shaft and compress it with the aid of tool No. 784161. See fig.

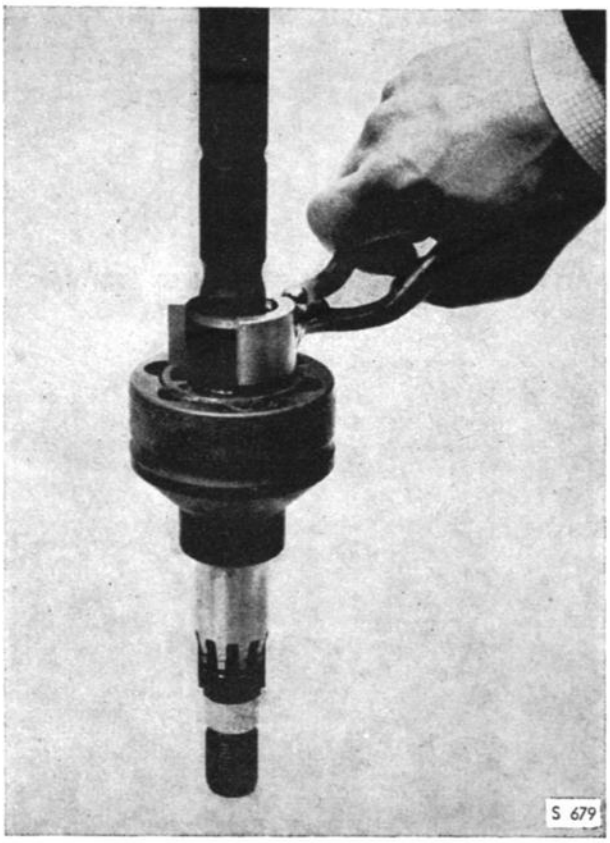
NOTE

Place the ends of the circlip under one of the plier jaws. The ends must not be free when the pliers are closed.



PLACING OF LOCK RING IN TOOL 784161

9. Insert the shaft in the hub and tap the end of the shaft lightly so that the circlip engages. Detach the pliers and slide the shaft fully into the hub.



ASSEMBLY OF MIDDLE DRIVE SHAFT IN THE HUB

10. Fit the two clamps on the outer rubber boot and the clamp for the inner boot at the shaft.
11. Saab 95 and 96:
    Lubricate the splines of the inner drive shaft with SAAB Special Grease. Pass the shaft through the wheel house and into the inner universal joint.

    Saab Sport:
    If the needle bearings have been removed, lubricate them with SAAB Special Grease and mount them on their journals. Fit the cover, No. 731762, to protect the needle bearings, and pass the drive shaft in through the wheel house. Make sure that the inner driver is clean and that it has been packed with SAAB Special Grease — see "Inner universal joint". Then reassemble the inner universal joint and tighten the clamp round the rubber boot.
12. Refit the steering knuckle to the steering arm and lower ball joint. Remember to provide lock plates at the screws, and to secure these.
13. Saab 95 and 96:
    Refit the backplate and brake drum.

    Saab Sport:
    Refit the hub and the brake disc, followed by the brake housing and friction pads. Secure the bolts with lock plates.
14. Refit the wheel and lower the car to the floor. Tighten the axle nut to a torque of 130 ft-lb (18 kgm), and secure.
15. Refit the hub cap.

WARNING

The friction pads in the Saab Sport must be returned to their positions near the brake disc. To ensure correct positioning, pump repeatedly with the brake pedal. Neglect in this respect will result in brake failure.

BALL JOINTS

Replacement of ball joints

1. Jack up the car and remove the wheel. Wash the ball joint ana adjacent parts carefully.

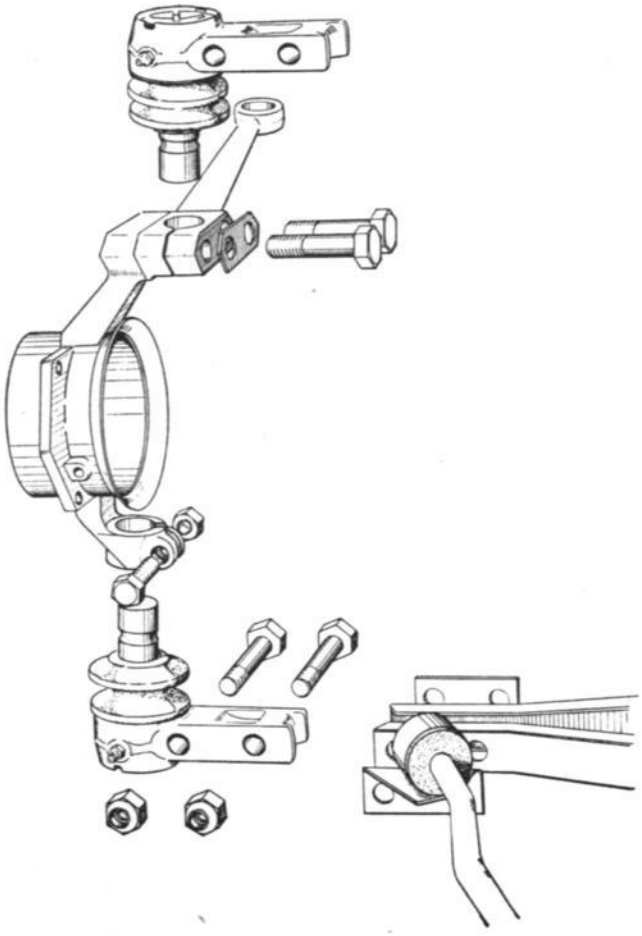
> WARNING!
> Unconditionally, the spring clamp must be fitted with the retainers fitted in the way shown by the fig.

2. If the upper ball joint is to be changed, compress the spring with the aid of the spring vise, tool No. 784082.

DISASSEMBLY OF FRONT COIL SPRING, USING TOOL No. 784082

3. Remove the ball joint from the steering knuckle. The upper ball joint has two screws and the lower ball joint one.
4. Remove the ball joint from the control arm.
5. Fit a new ball joint and attach the pivot pin to the steering knuckle. Secure the screws.
6. Fit the ball joint to the control arm and release the spring vise.
7. Refit the wheel and lower the car to the floor.

> NOTE
> Ball joints must never be dismantled but should be renewed as complete units.



ATTACHMENT OF STEERING KNUCKLE AND BALL JOINT

Replacement of ball joint dust excluders

To protect the ball joints from wear by foreign matter, they are fitted with rubber dust excluders (boots). Damaged boots must be replaced by new ones.

Tightening of control arm ball joints

If play develops in the control arm ball joints, adjustment is called for, as such play adversely influences the steering characteristics of the car and gives rise to unwanted noise.

1. Jack up the car and remove the wheel. Wash the ball joint and adjacent parts carefully.
2. Detach the ball joint from the steering knuckle. The upper ball joint has two screws and the lower ball joint one. Clean the ball joint and remove the rubber dust excluder.
3. Release the securing flange on the tightening cap, using an arbor.
4. Turn the cap with a suitable implement until the ball joint begins to feel slightly stiff.

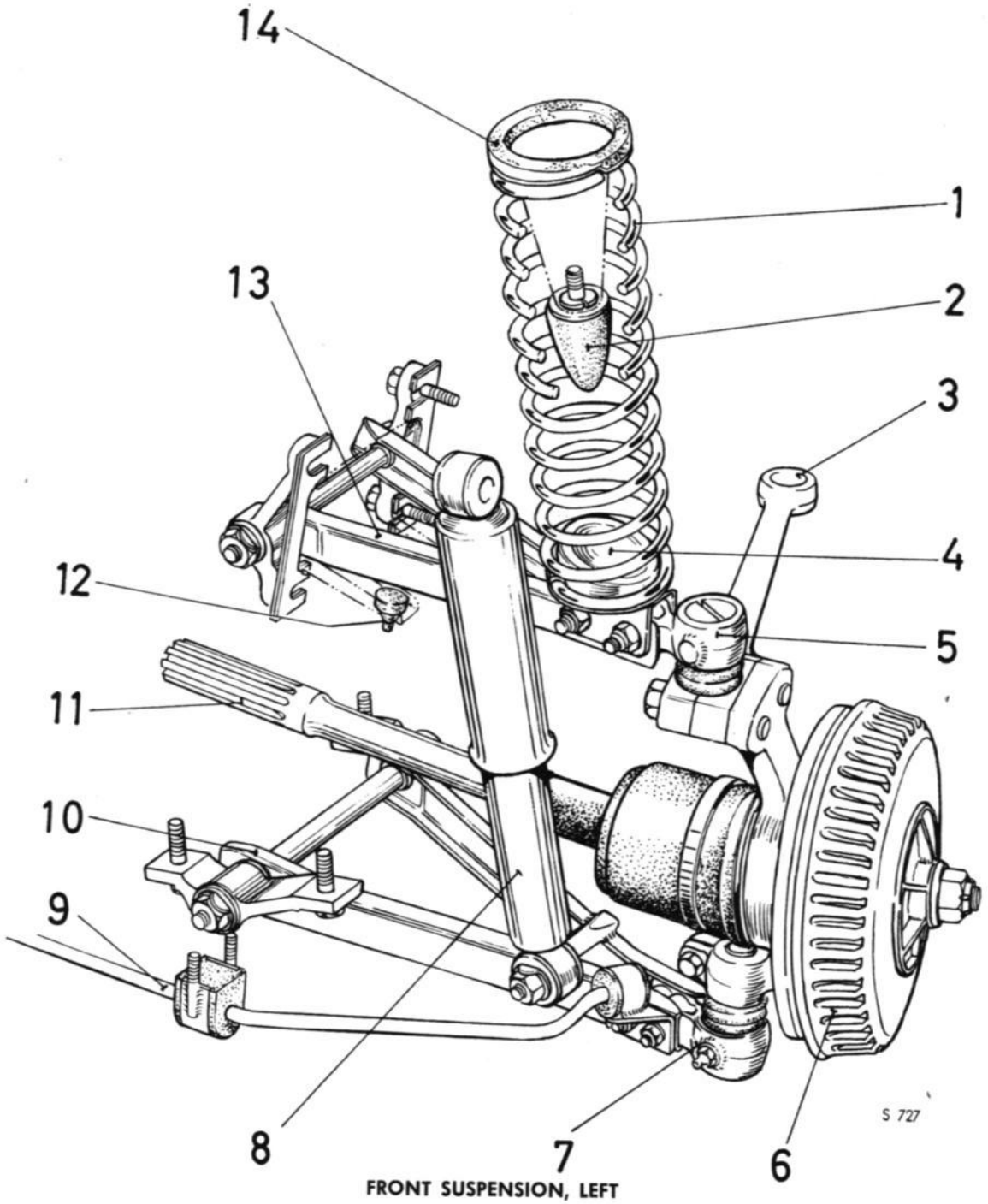
> NOTE
>
> Do not tighten the ball joint excessively: it should be possible to move it all the way in all directions by hand.

5. Secure the tightening cap by bending down the flange into the grooves on both sides with an arbor. Take great pains to secure effectively, making new retaining grooves if the old ones cannot be used. Lubricate the ball joint copiously.
6. Fit a new rubber dust excluder and connect the ball joint to the steering knuckle. Secure the screws.
7. Refit the wheel and lower the car to the floor.

CONTROL ARMS

Removal of control arms and steering knuckle

1. Jack up the front part of the car and remove the front wheels.
2. Remove the shock absorbers.
3. Detach the tie-rod ends from the steering arms, using tool No. 784004.
4. Detach the brake hose from the body.
5. Detach the steering arm and upper ball joint from the steering knuckle.
6. Back off the clamping screw which holds the lower ball joint to the steering knuckle.



FRONT SUSPENSION, LEFT

1. Coil spring
2. Rubber bumper
3. Steering arm
4. Spring seat
5. Upper ball joint
6. Brake drum
7. Lower ball joint
8. Shock absorber
9. Stabilizer bar
10. Lower control arm
11. Inner drive shaft
12. Rubber control arm
13. Upper control arm
14. Rubber spacer

7. Pull the drive shaft out of the inner universal joint (or, on the Saab Sport, open up the inner universal joint) and remove the entire front-axle assembly. Clean the drive shaft thoroughly.
8. Remove the coil springs as described in Section 631.
9. Remove the upper and lower control arms.
10. Remove the stabilizer bar by undoing its brackets on the body. The nuts can be reached from inside the engine compartment. Detach both body brackets and end brackets from the stabilizer bar, thus enabling it to be pulled out to the right.
11. Remove the lower rebound rubber bumpers.
12. If necessary, remove the steering gear.

NOTE

In conjunction with overhauls of the front suspension, it is also appropriate to disassemble and adjust the steering gear.

Installation of control arms and steering knuckle

Clean all parts thoroughly. After careful examination, reject all worn or damaged parts and fit new ones in place of them, unless they can be adjusted in accordance with the description. The steering gear should be adjusted as described in Section 642.

1. Pass the stabilizer bar in from the right and bolt it to the body.
2. Reinstall the steering gear, if this unit has been removed. See Section 642.
3. Refit the upper and lower control arms.
4. Refit the coil springs, see Section 631.
5. Refit the front-axle assemblies, lubricating the splines of the inner drive shaft with graphite grease or chassis grease. Remember to secure the upper clamping screws for the ball joints with lock washers.
6. Refit the shock absorbers.
7. Refit the wheels, lower the car to the floor and adjust the brake shoes.
8. Take the car out for a test run. Check the wheel alignment and adjust if necessary. See Section 601.

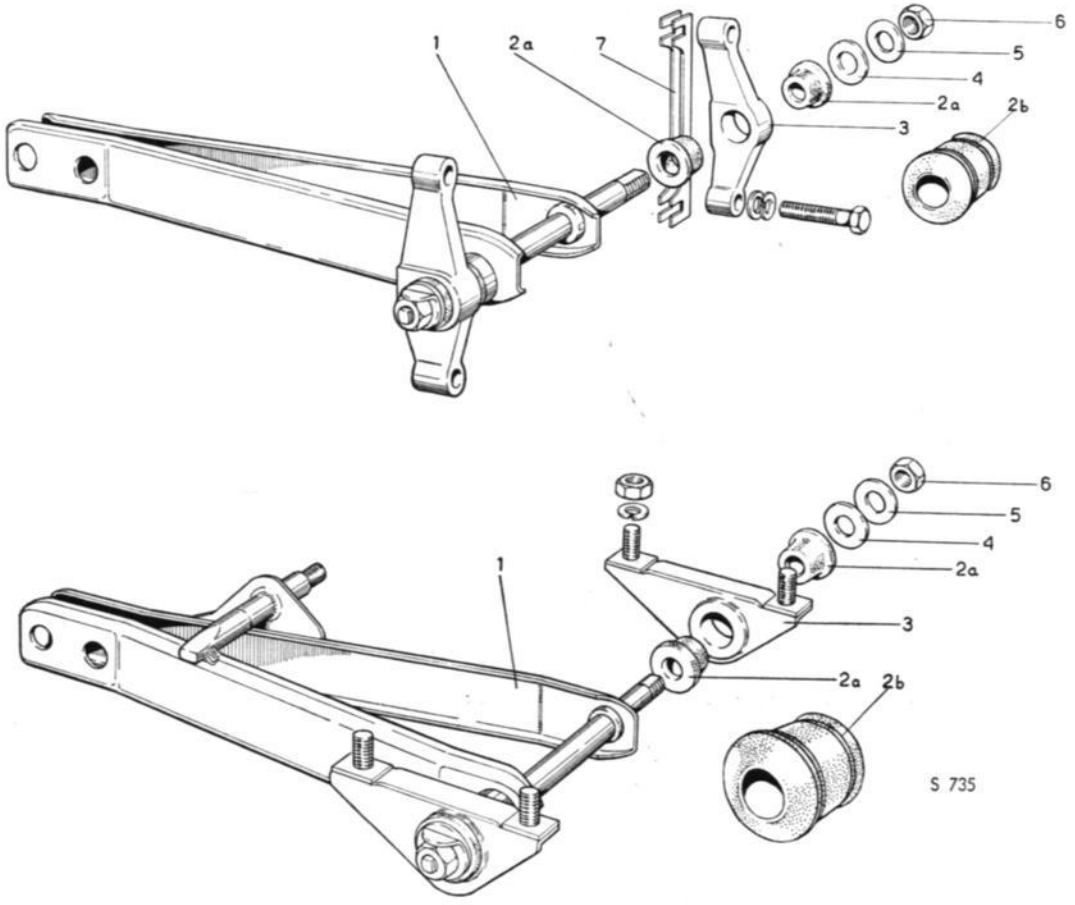
NOTE

1. Take great care to protect rubber bushings from rubber solvents such as grease, gasoline, etc.
2. If a rubber bushing has got rusted on, it must be rejected, but when removing it great care must be taken to avoid damaging shafts and stays. This is particularly important in the case of the bushings in the control arm bearings. After removal of bushings, clean the bearing surfaces with fine-grade emery cloth.
3. Elastic stop nuts tend to lose their grip after repeated slackening and retightening. Weak nuts should be rejected and replaced by new ones.

Replacement of upper control arms

Removal

1. Jack up the front part of the car and remove the wheel.
2. Remove the shock absorber
3. Compress the coil spring, using the spring vise, tool No. 784082. See section 631.
4. Back off and remove the two screws holding the ball joint and lower spring seat to the upper control arm. See fig.
5. Back off the bolts holding the control arm bearing brackets.
6. Remove the compressed coil spring.
7. Remove the control arm and the bearing brackets. Collect the shims from under the brackets.
8. Back off and remove both nuts from the bearing, thus enabling the brackets and bushings to be taken off the control arm. See fig.
9. As alternatives, there are either two split bushings or one whole bushing in the bracket. To remove the whole bushing, use tool No. 784133 for the upper one and 784134 for the lower one.



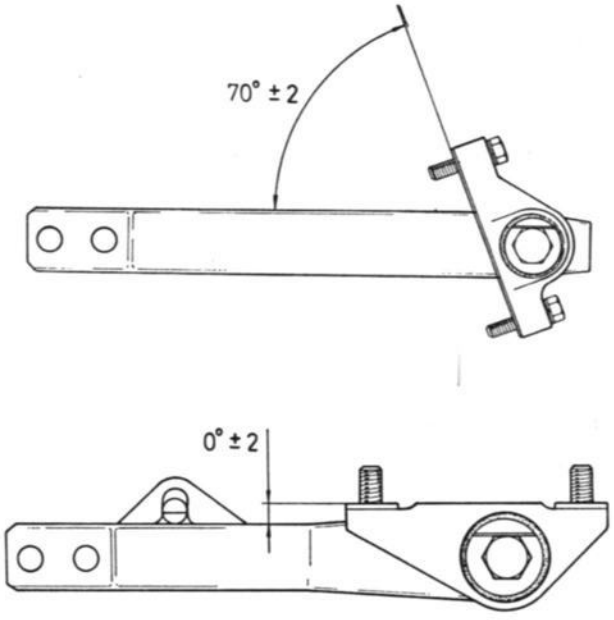
UPPER AND LOWER CONTROL ARMS, FRONT SUSPENSION

1. Control arm
2a. Rubber bushing, split
2b. Rubber bushing, whole
3. Bracket
4. Washer
5. Lock washer
6. Nut
7. Shim

Reassembly

All components must be thoroughly cleaned before refitting and new parts should be provided in place of any worn or damaged ones.

1. Refit the rubber bushings in the brackets. Note that there are two types of bushings, viz. split ones and whole ones. If the whole type is used, drive it into the bracket with the aid of tool No. 784133 (upper bushing) or 784134 (lower bushing). Lubricate the bushing with soft soap and water before fitting.
2. Refit the bearings, complete with bushings, to the control arm. When the two nuts have been tightened and secured, the angle between the control arm and the brackets should be 70° ± 2°. See fig.

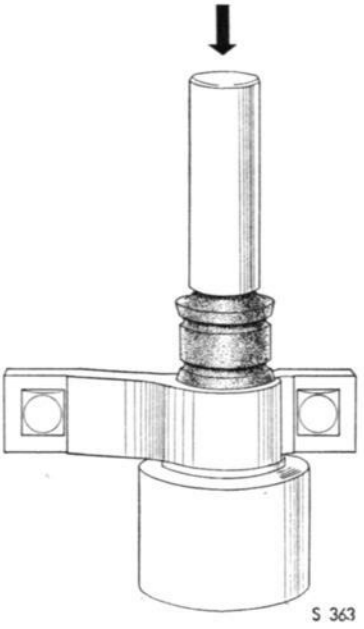


ANGLE BETWEEN THE UPPER AND LOWER CONTROL ARMS, RESPECTIVELY, AND THEIR BEARING BRACKETS

NOTE

In no circumstances may oil or grease be used to facilitate insertion of rubber bushings. If lubrication is needed, use soft soap and water.

3. Put the control arm in position, but do not insert the bracket bolts.
4. Check that the rubber and metal washers in the upper spring seat are in place, and that the rubber bumpers have been fitted under the control arm.
5. Insert the compressed coil spring in its position and refit the ball joint and lower spring seat to the arm.
6. Tighten the bolts of the control arm bearing brackets. Remember to insert the shims.
7. Slacken the screws of the spring vise successively, until the tool can be removed.
8. Refit the shock absorber.
9. Refit the wheel and lower the car to the floor.
10. Take the car out for a test run and then check the wheel alignment, adjusting if necessary as described in Section 601.



DRIVING IN A WHOLE RUBBER BUSHING

Tool 784133 for upper bushing
Tool 784134 for lower bushing

Replacement of lower control arm

Removal

1. Jack up the car and take off the wheel.
2. Detach the lower shock absorber bracket.
3. Back off and remove the two bolts holding the ball joint to the control arm, thus releasing also the stabilizer bar bearing. See fig.
4. Back off from inside the engine compartment the nuts holding the bearing brackets to the floor pan, whereupon the control arm and brackets can be removed.
5. Back off and remove the two nuts from the control arm bearing and remove the brackets and bushings. See fig.

Reassembly

All components must be thoroughly cleaned before refitting and new parts should be provided in place of any worn or demaged ones.

1. Refit the rubber bushings and brackets to the control arm. When the two nuts have been tightened and secured, the angle between the control arm and the contact surface of the brackets should be 0° ± 2°. See fig.
2. Refit the control arm by bolting the bearing brackets to the body.
3. Attach the ball joint and stabilizer bar bearing to the control arm. Remember to insert stiffeners on the rear of the control arm.
4. Refit the lower shock absorber bracket.
5. Refit the wheel and lower the car to the floor.
6. Take the car out for a test run.
7. Check the wheel alignment, adjusting if necessary as described in Section 601.

NOTE

In no circumstances may oil or grease be used to facilitate insertion of rubber bushings. If lubrication is needed, use soft soap and water.

Adjustment of control arms

If the control arms have been subjected to severe stresses on account of a collision or other accident, they should be carefully examined for signs of fracture or deformation. Distorted arms must be rejected and new ones fitted in their place.

STEERING WHEEL AND COLUMN SHIFT GEAR

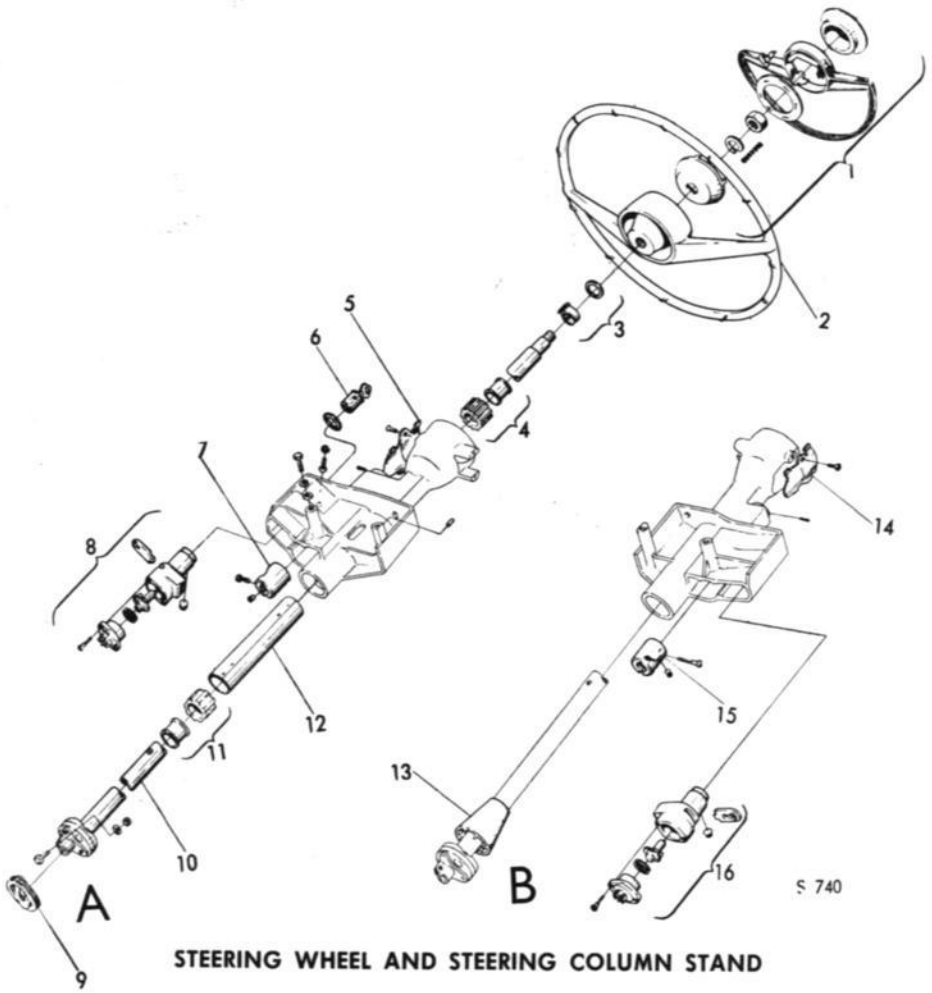
General

Saab cars are made for both righthand and lefthand steering, and with both 3-speed and 4-speed transmissions. The steering mechanism is the same for all models, except that the steering wheel fitted to the Saab Sport differs from the one fitted to the Saab 95 and 96.

Steering wheel: horn button assembly

Removal

1. Disconnect the horn wire at the connector under the instrument panel.
2. Remove the central button by prying gently with a knife or other suitable implement under the edge of the button — see fig.
3. Disconnect the horn wire from the contact plate.
4. Back off the nut and remove the retaining washer.
5. Remove the horn ring.
6. Lift away the steering wheel.
7. The return yoke for the directional signal switch can now be removed.



STEERING WHEEL AND STEERING COLUMN STAND

A. L. H. D. CAR

1. Horn button assy
2. Steering wheel
3. Washer and return yoke
4. Bushings
5. Cover
6. Lock cylinder
7. Twist stop
8. Gear lever lock
9. Rubber grommet
10. Steering wheel shaft with universal joint
11. Bushings
12. Cardboard sleeve

B. R. H. D. CAR

13. Plastic cone
14. Cover
15. Twist stop
16. Gear lever lock

Reassembly

1. Refit the return yoke if this item has been removed.

> NOTE
>
> Fit the return yoke so that its center axis coincides with the center axis of the switch housing.

2. Fit the steering wheel on the column. Make sure that the front wheels are aligned straight ahead and push the steering wheel on the column center pin so that the spokes of the wheel are aligned horizontally.
3. Refit the horn ring and retaining washer. Tighten the nut.
4. Reconnect the horn wire to the contact plate.
5. Fit the center button so that the four projections on the horn ring pass into the notches in the bottom of the button.
6. Connect up the horn wire.
7. Check the clearance between the return yoke and the projection on the directional indicator switch. The correct clearance is 0.008—0.024 in. (0.2—0.6 mm) with the switch at neutral. Adjust by inserting shims between the switch and the column stand.

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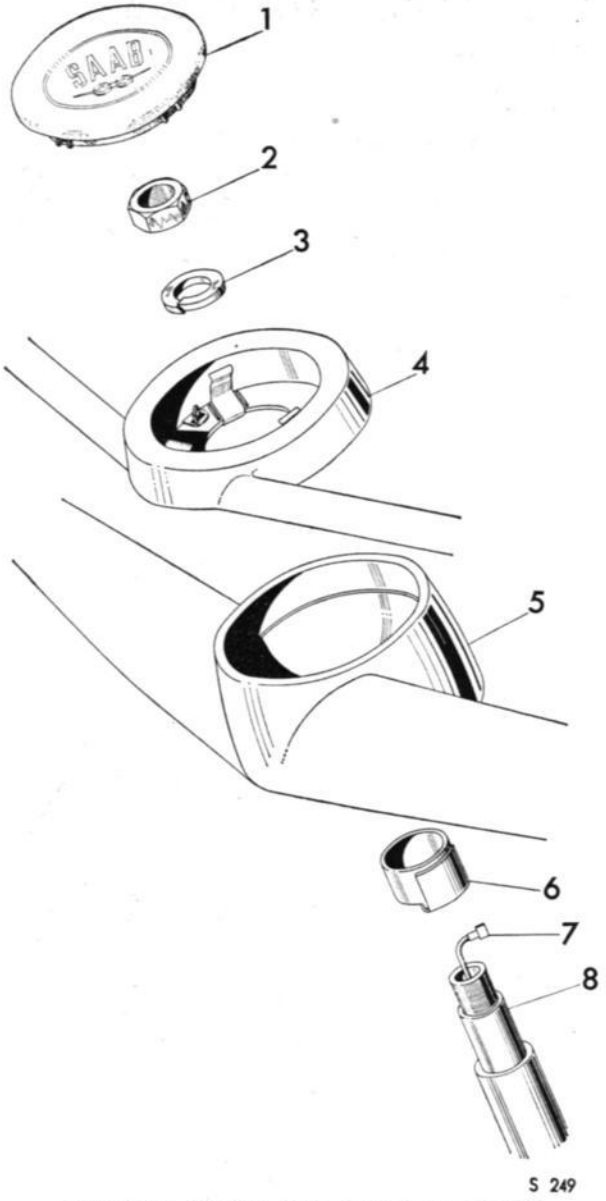
REMOVAL OF HORN BUTTON



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STEERING WHEEL AND HORN ASSEMBLY

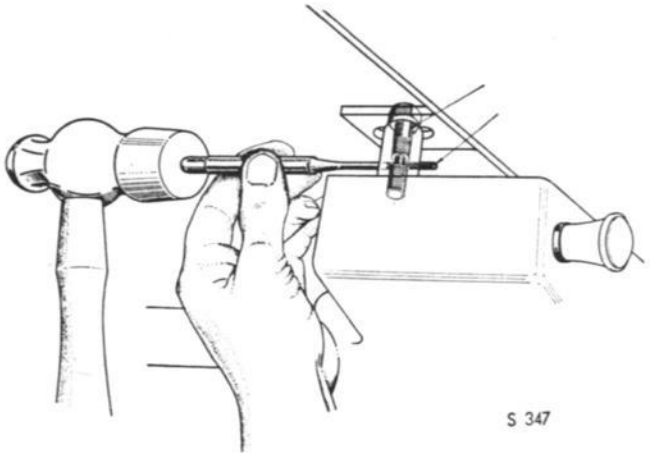
1. Horn button
2. Nut
3. Retaining washer
4. Horn ring
5. Steering wheel
6. Return yoke
7. Horn wire
8. Steering column

STEERING COLUMN AND BEARINGS

Disassembly

Disassembly of the steering column also involves removal of the gear-shift mechanism, since these two units are mounted on the same stand.

1. Remove the steering wheel and horn-button assembly as described above.
2. Back off and remove the clamping screw at the column connection to the steering-gear pinion.
3. Back off and remove the nut from the upper end of the gear-shift shaft universal joint and drive out the taper pin, using tool No. 784083.
   If the taper pin is threaded at both ends, proceed as follows: Remove the nut and place it on the other end of the taper pin. Tighten the nut, thus loosening the pin. Collect the return spring if there is one above the joint.
4. Undo the two screws for the steering-column stand after having driven out the locking pins. The stand and steering column, together with the gear-shift shaft and lever, are now loose, and can be removed from the car. Collect the return spring and the spring retainer, if there are any behind the cowl plate.
5. Draw the column out of its bearing.
6. Remove the two rubber bushings together with the steering-column bushings.
7. Remove the cardboard sleeve between the bushings and if necessary the electric cables.

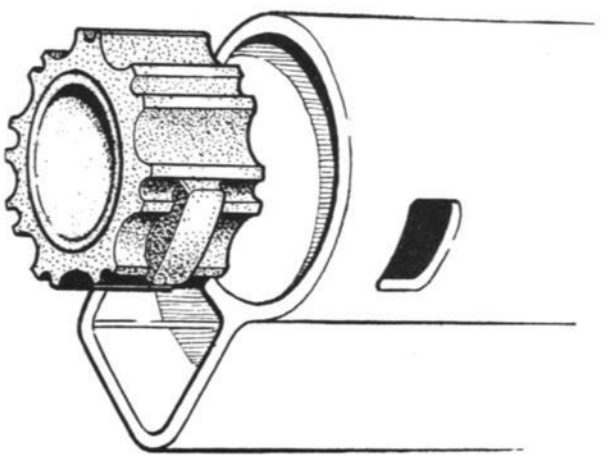


REMOVING LOCKING PINS ON STEERING-COLUMN STAND

Reassembly

1. Refit the rubber bushings together with the steering-column bushings. See fig.

Between the bushings fit the protective sleeve and the cables to the direction indicator switch.



BUSHINGS, STEERING-COLUMN STAND

> NOTE
>
> The upper rubber bushing is thinner than the lower one. Moreover, both bushings are tapered and must therefore be fitted so that the arrow on the locating lug points towards the steering wheel.

2. Pass the steering column into its bearing. On R.H.D. cats first put the plastic cone on the steering column.
3. Install the spring retainer and the spring on the gear shift rod if there were any at the removal.
4. Refit the assembly in the car. Adjust the position as described under "Adjustment of steering column stand" and secure the stand by tightening the two screws. Drive in the locking pins.
5. Refit the return spring and connect the gear-shift shaft to the universal joint with the taper pin.
   Reconnect the steering-column joint to the steering-gear pinion and tighten the clamping screw.
6. Refit the steering wheel and horn-button assembly as described above.

Adjustment of steering column stand

The steering-column stand is secured by means of two screws to a bracket under the instrument panel. These screws have waists and are locked with roll pins. They can be slackened enough to allow adjustment of gear positions; but if the steering-column stand is to be removed, the roll pins must first be knocked out with an arbor.

The gear-lever lock consists of a twist stop secured to the gear-shift shaft by means of two clamping screws, one stop screw and knurls. The twist stop has a hole into which the lock plunger slides when the gear-shift lever is locked.

Make sure that the steering column stand is correctly adjusted in the vertical direction, since this entirely determines the gear-shift positions. The gear-shift lever play in the plane of the gear-shift shaft axis should be checked in the following manner:

Engage top gear and move the gear-shift shaft firmly but not roughly in both axial directions. When this is done the lever knob should move by the amounts indicated in the table below.

Type of gearing	Gear-shift lever movement in plane of shaft axis
3-speed, lefthand drive	0.8 — 1.0 in. (20—24 mm)
3-speed, righthand drive	0.5 — 0.6 in. (11—15 mm)
4-speed, lefthand drive	0.3 — 0.5 in. (8—12 mm)
4-speed, righthand drive	0.3 — 0.5 in. (8—12 mm)

NOTE

Readjustment of the twist stop for the lock plunger is essential whenever the gear-shift mechanism has been dismantled and after adjustment of gear positions.

GEAR-SHIFT MECHANISM

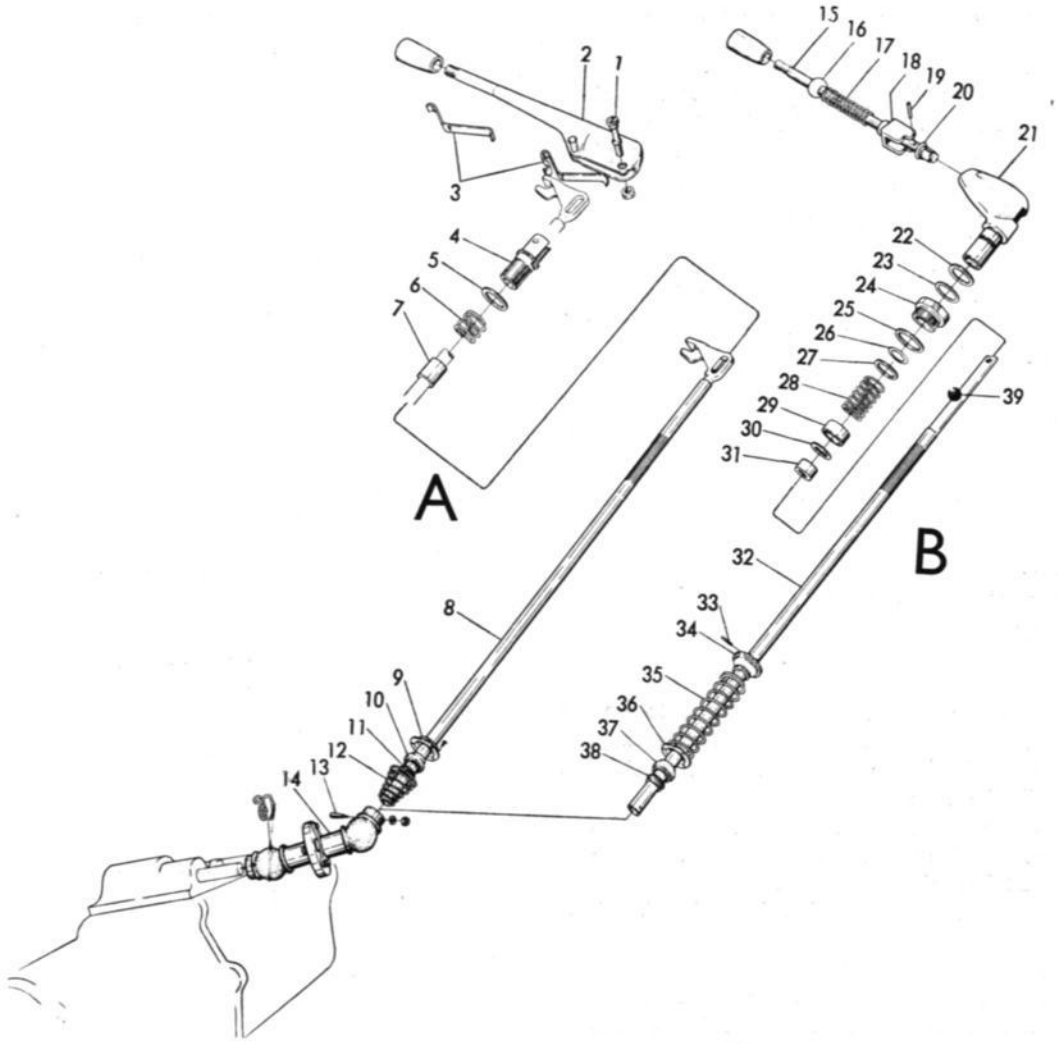
Lefthand drive, 3-speed
Righthand drive, 4-speed
Diassembly

1. If the complete gear-shift mechanism is to be removed from the car, disassemble the steering-column stand with column and gear-shift mechanism av described above.
   If only the gear-shift lever and gear-shift shaft are to be removed, separate the gear-shift shaft universal joint from the shaft, collecting the spring for the return movement. Then remove the steering wheel and the directional signal switch with its plastic cover.
2. Back off the nut and remove the screw passing through the gear-shift lever. The lever can now be removed.
3. Back off the three screws which hold the twist stop of the gear-shift lever lock. These screws are accessible through the three holes in the steering-column stand.
4. Pull the gear-shift shaft out of the stand.
5. Back off the clevis nut and remove the washer, the spring and the felt bushing from down inside the stand.

As righthand drive, 4-speed models are equipped with a special reverse catch, the following additional steps must be taken for these cars: Before pulling the gear-shift shaft out of the column, remove the yoke sleeve on the gear-shift shaft by driving out the pin. At the same time as the gear-shift shaft is pulled out of the stand, insert a pipe about 9.85 in. (250 mm) long and 0.63 in. (16 mm) in diameter up through the casing for the reverse catch, thus preventing the spring from moving out of its position. The casing containing the spring and the washers can now be removed from the steering-column stand. If the spring is to be removed, pull the pipe downwards so that the upper washer can be extracted sideways. Note that the spring must be compressed while this is being done. After having removed the washer, release the spring carefully. Collect the plastic washer, the pipe and the metal washer from under the spring.

Reassembly

1. Insert a new felt bushing in the stand. Lubricate the bushing with SAAB Special Chassis Grease.
2. Place the spring and the washer on the clevis nut.
3. Screw in the clevis nut far enough to leave about 0.04 in. (1 mm) clearance between the clevis flange and the edge of the stand.
4. Pass the gear-shift shaft into the stand and, at the same time, slide on the twist stop for the gear-shift lever lock with the marking turned upwards to face the steering wheel. Turn the ignition key to the locked position so that the lock plunger slides into the recess in the twist stop.
5. Refit the gear lever, making sure that the three leaf springs are correctly positioned.
6. Pass the bolt through the gear-shift lever and the oval hole in the gear-shift shaft. Tighten the nut to eliminate all play but without impairing free lever movement.
7. Refit the directional signal switch with its plastic cover.
8. Reassemble the complete steering-column stand with column and gear-shift mechanism if previously removed. Reasemble the gear-shift shaft universal joint and the spring for the return movement.
9. Refit the steering wheel and horn-button assembly.
10. Adjust the steering-column stand in the vertical direction to ensure correct gear-shift positions and then adjust the twist stop for the gear-shift lever lock. See the description in the section concerned.



GEAR-SHIFT MECHANISM

A. L. H. D., 3-SPEED CAR
R. H. D., 4-SPEED CAR

1. Screw
2. Gear shift lever
3. Spring
4. Fork nut
5. Washer
6. Spring
7. Felt ring
8. Gear shift rod
9. Bracket
10. Bushing
11. Bushing
12. Return spring
13. Tapered pin
14. Universal joint

B. L. H. D., 4-SPEED CAR
R. H. D., 3-SPEED CAR

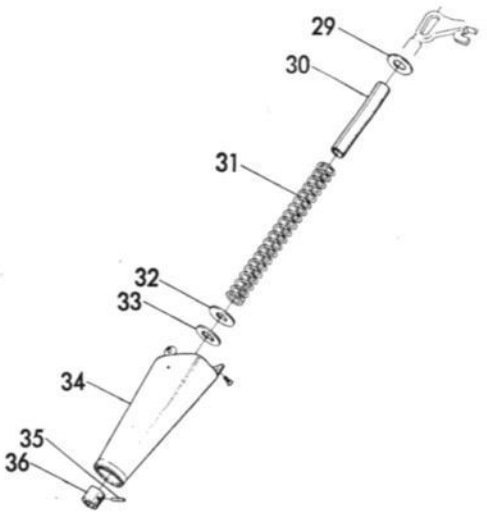
15. Gear shift lever
16. Ball
17. Spring
18. Turn stop
19. Pin
20. Plastic bearing
21. Lever housing

22 and 23. Washers

24. Nut
25. Fiber washer
26. Snap ring
27. Washer
28. Spring
29. Bushing
30. Washer
31. Felt ring
32. Gear shift rod
33. Pin
34. Spring retainer
35. Spring
36. Bracket
37. Rubber bushing
38. Bushing
39. Rubber ball

As righthand drive, 4-speed models are equipped with a special reverse catch, the following additional steps must be taken for these cars: Refit the casing for the reverse stop by passing through it a pipe or other suitable implement with a length of about 9.85 in. (250 mm) and 0.63 in. (16 mm) in diameter. Then pass onto the pipe the metal washer and the plastic washer forming the lower seat for the spring as well as the plastic collar. Next, pass the spring onto the pipe. Compress the spring and mount the upper metal washer from the side in order to lock the spring and then slide the pipe up through the washer. Now screw the casing, complete with spring and washers, to the stand.

While the gear-shift shaft is being passed into the stand and the casing for the reverse catch, pull the pipe used for assembly of the spring out gradually. When the gear-shift shaft has been passed through the casing, secure the yoke sleeve to the shaft by driving in the pin.



REVERSE CATCH R. H. D., 4-SPEED CAR

29. Washer
30. Plastic hose
31. Spring
32. Plastic washer
33. Washer
34. Casing
35. Pin
36. Carrier sleeve

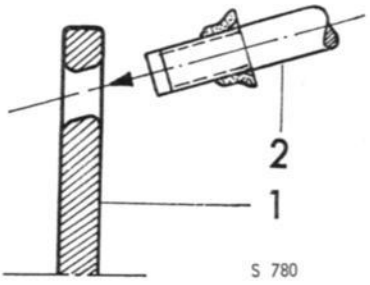
Lefthand drive, 4-speed
Righthand drive, 3-speed
Disassembly

1. If the complete gear-shift mechanism is to be removed from the car, disassemble the steering-column stand with column and gear-shift mechanism as described above.
   If only the gear-shift lever and gear-shift shaft are to be removed, separate the gear-shift shaft universal joint from the shaft.
2. On the rear of the gear-shift lever housing is a square hole through which an arbor or other suitable implement can be passed and pressed against one shank of the turn guard at the same time as the gear-shift lever is pressed in and rotated through 1/4 turn.
3. Pull the gear-shift shaft downwards past the gear-shift lever so that it can be passed out through the square hole.
4. Screw the knob off the lever and remove the lever entirely. The plastic ball, spring and turn guard will now be released. Collect the plastic bearing from the end of the lever.
5. Back off and remove the stop screw on the bottom of the steering-column stand and unscrew the bright chromed nut. The gear-lever head can now be removed from the stand. Collect the fiber washer and the rubber grommet located between the gear-shift shaft and the gear-shift lever housing.
6. After removal of the retaining ring, the nut can be removed from the gear-shift lever housing. Collect the fiber washer and any shims.

7. If the gear-shift shaft is to be removed, take away the locking pin for the return spring on the lower end of the shaft.
8. Now move the gear-shift shaft downwards until it is released from the stand.
9. Remove the turn guard from the gear-shift lever lock, if fitted, and collect the return spring and the spring holder.
10. Remove the washer, spring, bushing, washer and felt ring from the steering-column stand.

Reassembly

1. Refit the felt ring, washer, bushing, spring and washer in the steering-column stand. The felt ring is to be smeared with SAAB Special Chassis Grease.
2. Fit the return spring, spring holder and gear-shift lever twist stop on the gear-shift shaft. with the marking on the latter facing upwards. Then slide the gear-shift shaft into the steering-column stand from underneath.
3. Refit the pin above the spring holder.
4. Put the fiber washer and the nut on the gear-shift lever housing and insert the retaining ring in its groove. Check the clearance between nut and retaining ring and fit the necessary number of shims under the fiber washer. The nut should have no clearance and be slightly stiff to turn. Note! Apply a moderate coating of SAAB Special Chassis Grease to the fiber washer and the internal bearing surfaces of the nut.
5. Refit the gear-shift lever housing in the steering-column stand. Be sure to turn the shaft so that its slanted hole comes in the right direction as shown in the fig. While the lever head is being passed down towards the stand, refit the rubber grommet between the gear-shift shaft and the lever housing. Place the grommet on the same side as the gear-shift lever.
6. Tighten the bright chromed nut and secure it with the stop screw.
7. Check that the plastic bearing with plastic ring and the roll pin are mounted on the gear-shift lever.
8. Pass the turn guard, the spring and the plastic ball onto the gear-shift lever.
9. Press the gear-shift shaft downwards and pass the gear-shift lever in through the square hole in its housing. Then screw on the knob.
10. Pull the gear-shift lever outwards in the knob, at the same time releasing the gear-shift shaft so that the lever enters the hole. Make sure that the plastic ring is not pulled off the lever in course of assembly.
11. Using an arbor or other suitable implement, press against one shank of the turn guard, at the same time turning the gear-shift lever through 1/4 turn, thus locking the lever.
12. Reassemble the complete steering-column stand with column and gear-shift mechanism if previously removed.
13. Refit the gear-shift shaft universal joint to the shaft.
14. Adjust the steering-column stand in the vertical direction to ensure correct gear-shift positions and then adjust the twist stop for the gear-shift lever lock.



LOCATION OF GEAR-SHIFT LEVER IN THE GEAR SHIFT ROD

1. Gear shift rod
2. Gear shift lever

GEAR-SHIFT SHAFT UNIVERSAL JOINT

Disassembly and reassembly

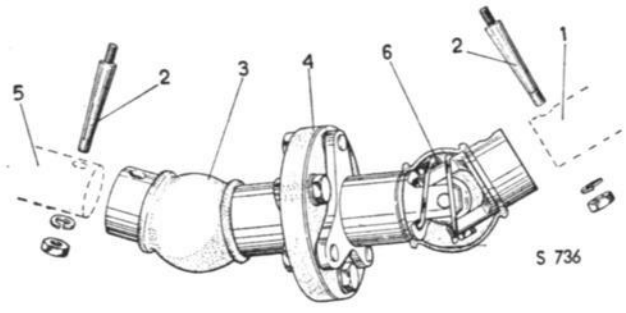
The universal joints can be lubricated without being disassembled if the rubber dust excluders are turned aside.

1. Remove the fastener and drive out the taper pin, using tool No. 784083. See fig.
   If the taper pin is threaded at both ends, proceed as follows: Remove the nut and place it on the other end of the taper pin. Tighten the nut, thus loosening the pin.
2. Release the universal joint from the gear-shift shaft, collecting the gear-lever return spring which is located on the gear-shift shaft.
3. Remove the fastener and drive out the other taper pin in the same way.
4. Pull the joint off the transmission operating rod. Check the joint for excessive play or stiffness. If new dust excluders are to be fitted, remove the old grease and pack the joints with SAAB Special Grease before fitting the new dust excluders.
5. Refit the universal joint to the operating rod and drive in the taper pin. Make sure that the tapers in the joint and operating rod are properly aligned.

NOTE

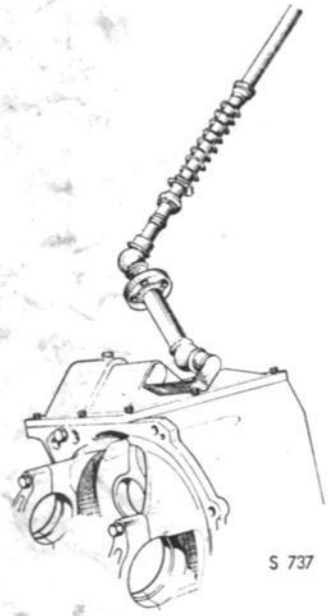
The gear-shift shaft universal joint has on a 4-speed L. H. D. car displaced joints. The universal joints' color-marked end should be turned against the gear box.

6. Refit the return spring to the gear-shift shaft if it has been removed. Then pass the universal joint onto the shaft and drive in the taper pin.
7. Refit the taper pin fastener.



GEAR-SHIFT SHAFT UNIVERSAL JOINT, L. H. D. CAR

1. Gear shift rod
2. Conical pin with lock nut
3. Rubber boot
4. Rubber disc
5. Operating shaft, gear box
6. Spring



GEAR-SHIFT SHAFT UNIVERSAL JOINT, R. H. DRIVE CAR

GEAR-LEVER LOCK, IGNITION LOCK

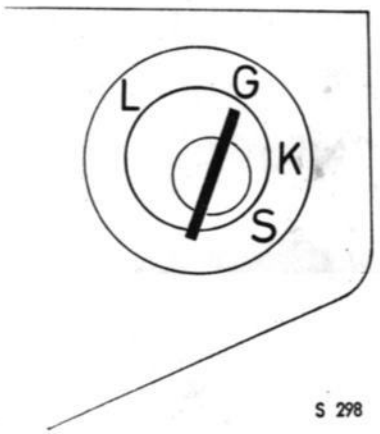
General

The Saab cars are fitted with a combined ignition and gear-lever lock. The gear-shift lever is locked when the reverse gear is engaged and the key is removed. The gear-lever and ignition lock has the following positions:

L. Locked. The key can be taken out only when reverse gear is engaged.

G. Garage. Ignition, etc., is switched off but the gear-shift lever is unlocked. The key cannot be removed in this position.

K. Driving. Ignition is on. Current is supplied via the ignition switch to the fuel tank guage directionindicating flashers, fan motor, windshield wipers, horn and charge indicator light.



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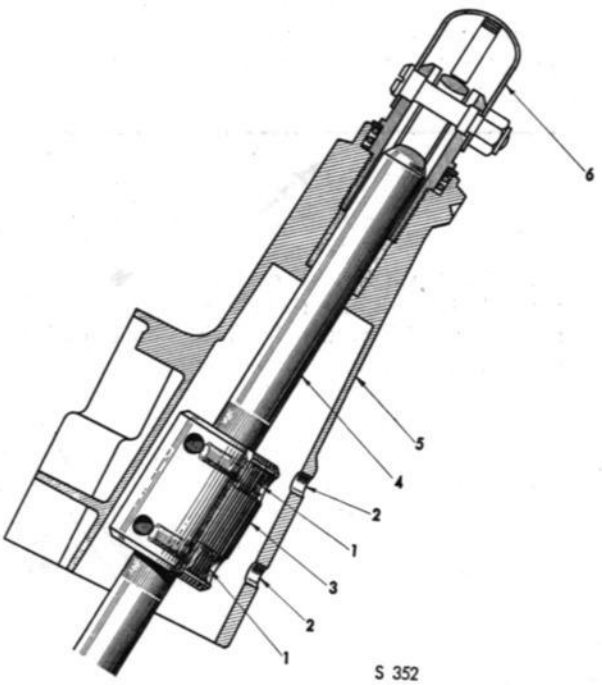
GEAR-LEVER AND IGNITION LOCK

S. Starting. This position has a spring return action. To prevent engagement of the starter while the engine is running, position S has a catch. Consequently, the ignition key must always be turned back to position G before making a fresh attempt to start or if the engine stalls.

The steering-column stand is secured by means of two screws to a bracket under the instrument panel. These screws have waists and are locked with roll pins. They can be slackened enough to allow adjustment of gear positions, but if the steering-column stand is to be removed, the roll pins must first be knocked out with an arbor.

The gear-lever lock consists of a twist stop secured to the gear-shift shaft by means of two clamping screws, one stop screw and knurls. The twist stop has a hole into which the lock plunger slides when the gear-shift lever is locked.

> NOTE
>
> Readjustment of the twist stop for the lock plunger is essential whenever the gear-shift mechanism has been dismantled and after adjustment of gear positions.



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GEAR-LEVER LOCK, CUT-AWAY VIEW

1. Clamping screw
2. Adjusting hole
3. Twist stop
4. Gear-shift shaft
5. Steering-column stand
6. Gear-shift lever

Removal of twist stop

1. Engage 1st gear, thus providing access to two clamping screws on the twist stop through the holes (2) on the bottom of the steering-column stand — see fig. Undo these internal-hexagon screws with a 3/16" spanner.
2. Engage reverse gear and turn the ignition key to the locked position (L), enabling the stop screw which holds the twist stop to be backed off through one of the holes (2) in the steering-column stand. Which hole to use depends on whether the car has 3-speed or 4-speed drive.
3. The gear positions can now be adjusted by moving the steering-column stand in the ordinary way. If the ignition key is turned to position G, thereby releasing the twist stop, the gear-shift mechanism can then be dismantled.

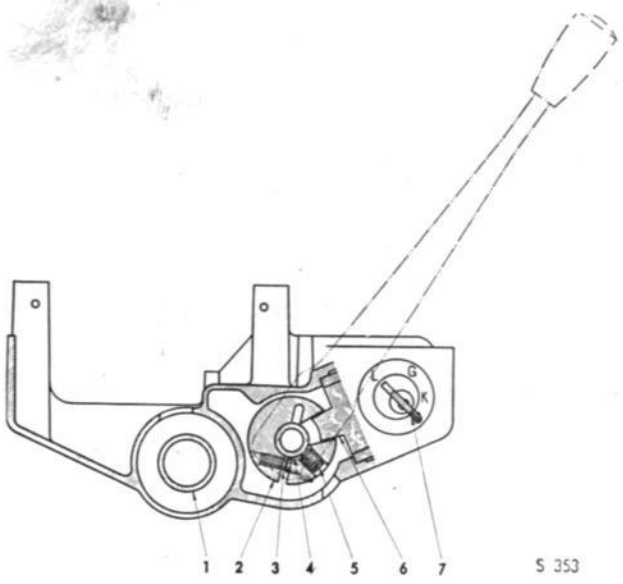
NOTE

The clamping screws of the twist stop are always accessible when 1st gear is engaged and the stop screws when reverse gear is engaged.

Adjustment of twist stop

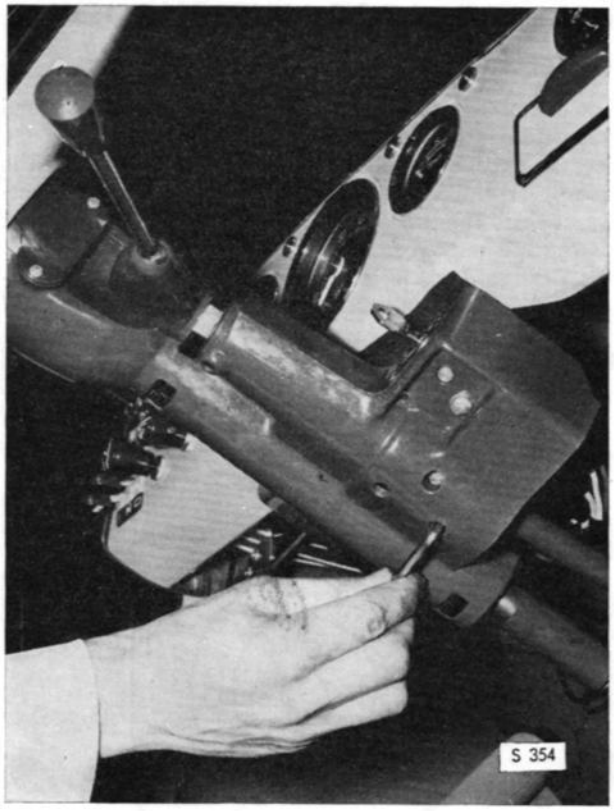
After adjustment of gear positions, readjustment of the twist stop is called for. The procedure is the following:

1. The twist stop is marked on the side that is to face upwards towards the steering wheel. The marking shows for which version the twist stop is designed, e.g. V-4 means left-hand drive, 4-speed.



TWIST STOP AND LOCK PLUNGER

1. Steering column
2. Twist stop
3. Clamping screw
4. Gear-shift shaft
5. Stop screw
6. Lock plunger
7. Lock cylinder with key



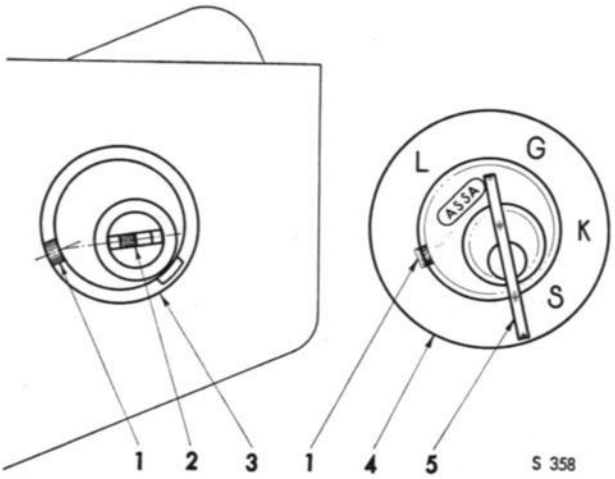
ADJUSTMENT OF TWIST STOP

2. Engage reverse gear and push the twist stop up. At the same time, turn the ignition key to the locked position (L) and check that the lock plunger finds its position in the twist stop.
3. The twist stop now hangs on the lock plunger. Move the twist stop up about 0.08 in. (2 mm) and tighten the stop screw slightly. NOTE! Do not tighten the screw up too hard, its purpose being merely to hold the twist stop during adjustment.
4. Turn the ignition key to position G and engage 1st gear, enabling two clamping screws on the twist stop to be tightened. Then engage reverse gear and slacken the stop screw. Return to 1st gear and tighten the clamping screws permanently. Now engage reverse gear again and tighten the stop screw enough to prevent it from working loose.
   Note! On righthand drive, 4-speed cars there is a spring on the gear-shift shaft which serves as a reverse catch. This spring must be in place when the twist stop is adjusted.

IGNITION LOCK
Disassembly

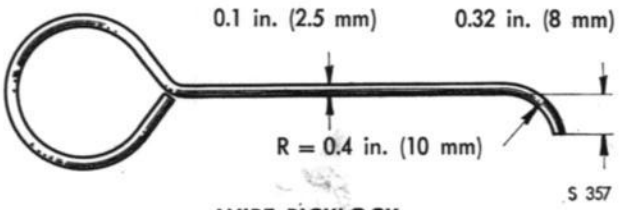
1. Insert the ignition key and turn to righthand edge of the "ASSA" mark. (See fig.).
2. When the key is in this position, the catch pin in the lock cylinder can be pressed in by inserting a wire picklock in a hole on the underside of the steering-column stand. See figures.
3. Pull out the lock cylinder and remove the lock plug through the cylinder hole.
4. The gear-lever lock can now be removed, after removal of the retaining screw.

> NOTE
>
> When the lock cylinder is removed the key has no stop positions and can thus be turned a complete revolution. If the key takes up an incorrect position, the locking pins inside the cylinder may get in the way so that the key cannot be returned to the working position. To remedy this, tap the key and lock cylinder lightly against a wooden object with the retainer on the outside of the cylinder turned upwards.

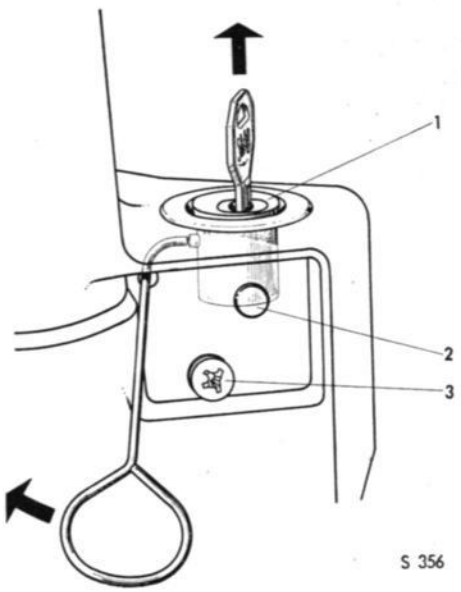


POSITION OF KEY AND LOCK PLUNGER DURING ASSEMBLY OR DISASSEMBLY

1. Catch pin
2. Position of locking pin during assembly of lock cylinder.
3. Gear-lever lock
4. Sign plate
5. Position of key during assembly of lock cylinder.



WIRE PICKLOCK

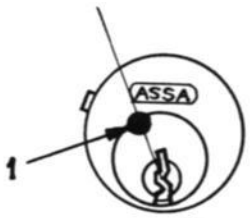


REMOVING LOCK CYLINDER

1. Lock cylinder
2. Lock plug
3. Retaining screw

Disassembly when key is missing

If the key has been lost or if it is necessary to remove the lock or the lock cylinder, the cylinder must be drilled before the catch pin can be pressed in. Drill an 0.12 in. (3 mm) hole in the cylinder to a depth of about 0.4 in. (10 mm) as illustrated.



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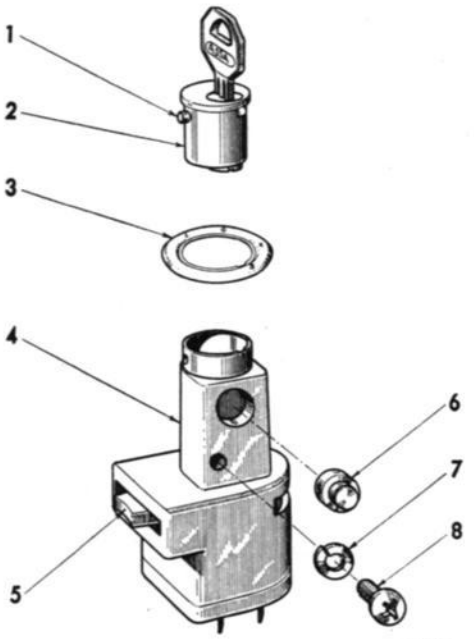
DRILLING LOCK CYLINDER FOR REMOVAL WHEN KEY IS MISSING

1. Hole, diameter 0.12 in. (3 mm), depth 0.4 in. (10 mm)

Reassembly

1. Slide the lock plunger into the gear-lever lock and then fit the lock into the steering-column stand.
2. Insert the screw and drive it in slightly. Insert the lock plug.
3. Using flat-nose pliers, turn the pin in the lock until it enters the groove in the end of the lock cylinder — see fig.
4. Turn the key so that it comes to the right-hand part of the "ASSA" mark, see fig, and press the catch pin in.
5. Now place the sign plate over the pin so that it is held in the pressed-in position. Adjust the sign plate so that it fits against the retaining lug on the outside of the cylinder.
6. Insert the lock cylinder with the sign plate in the gear-lever lock and tighten the screw permanently.



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LOCK CYLINDER AND GEAR-LEVER LOCK

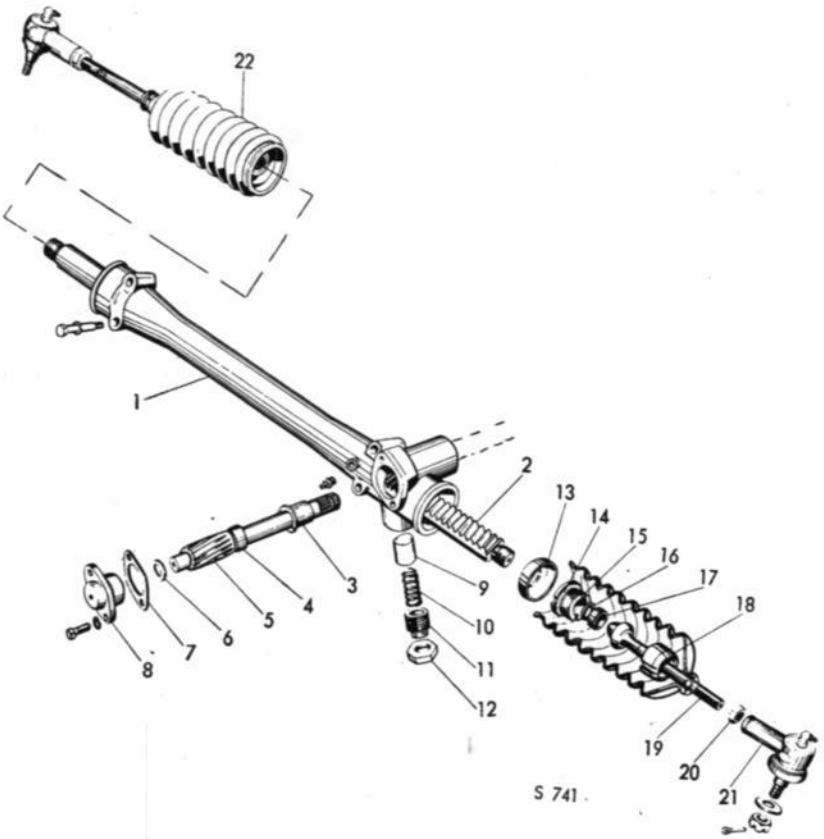
1. Catch pin
2. Lock cylinder
3. Sign plate
4. Gear-lever lock
5. Lock plunger
6. Lock plug
7. Retaining washer
8. Cross-recess screw

STEERING GEAR

General

The steering gear is accurately adjusted ex-works and should never be disassembled unnecessarily. To ensure satisfactory function, the steering gear must be lubricated copiously, but not so excessively that the steering-gear housing is completely filled with grease.

To lubricate the steering gear, turn the steering wheel as far as it goes to the left. Use SAAB Special Grease. Unwanted noise in the steering gear is a sign that adjustment is necessary — see below. Worn or damaged parts should be replaced by new ones.
The illustration shows a steering gear for a car with lefthand drive, but as the steering gear for cars with right-hand drive is similar in principle, the following instructions are equally applicable to both versions.



STEERING GEAR, L. H. D. CAR, DISASSEMBLED

1. Steering-gear housing
2. Rack
3. Bushing
4. Spacer sleeve
5. Pinion
6. Washer
7. Shim
8. Bearing
9. Piston
10. Spring
11. Screw
12. Nut
13. Lock washer
14. Shim
15. Nut
16. Flat spring
17. Bearing cup, inner
18. Bearing cup, outer
19. Tie-rod
20. Nut
21. Tie-rod end
22. Rubber boot

Removal of steering gear

The folloing description is applacable on left hand drive cars and right hand drive cars as well. Text in brackets ( ) is applicable on right hand drive cars.

1. Remove the hood.
2. Disconnect one of the battery cables.
3. Jack up the front part of the car so that both wheels are clear of the floor.
4. Take off the front wheels.
5. Disconnect the tie-rod ends from the steering arms. Use tool No. 784004 for the tie-rod end.
6. Back off the nut and remove the tie-rod end from the left tie-rod on a L.H.D. car (on a R.H.D. car the right).
7. Remove the lower taper pin from the gear-shift shaft universal joint and release the joint from the transmission case shift fork. Use tool No. 784083.
   If the taper pin is threaded at both ends, proceed as follows:
   Remove the nut and place it on the other end of the taper pin. Tighten the nut, thus loosening the pin.
8. Release the freewheel control from the transmission.
9. Detach the slave cylinder from the clutch housing and hang it up on the hoses for the fresh-air heater.
10. Release the throttle return spring and attach it in some suitable way so that the throttle spindle is fully deflected.
11. Disconnect the speedometer drive cable from the transmission case.
12. Turn the steering wheel to full left lock on a LHD car (and full right lock on a RHD car). Back off and remove the clamping screw in the steering-column yoke and lift the steering wheel to pull the column out of the yoke. Remove the dash-panel cardboard lining where the steering-gear stub passes through the dash panel.
13. Back off and remove the four steering-gear retaining bolts.
14. Remove the rubber grommet in the dash panel. Lift the side of the steering gear forwards over the gear-shift fork shaft until the stub axle on the steering gear is clear of the dash panel.
15. Pass the steering gear out a little through the right-hand, (resp left-hand) wheel house until the left tie-rod clears the wheel-house wall. Lift the steering gear out forwards and upwards between the wheel-house stay and the lefthand wheel house. See fig.

REMOVAL OF STEERING GEAR

Installation of steering gear

1. Remove the tie-rod end from the lefthand tie-rod. (righthand on a R.H.D. car)
2. Slide the rack over so that lefthand (resp. right-hand) tie-rod takes up its inner position.
3. Insert the steering gear beteen the lefthand. (resp. righthand) wheel house and the wheel-house stay in the opposite way to removal.
4. Pass the steering gear in towards the dash panel in the opposite way to removal and place the rubber seal on the stub axle to avoid damaging it.
5. Pass the stub axle through the dash panel and refit the rubber seal in the dash-panel hole.
6. Refit the four retaining bolts in the steering gear. Before tightening these bolts, make sure that the speedometer drive cable is not caught between the steering gear and the dash panel.

7. Refit the lefthand (resp. righthand) tie-rod end.
8. Reconnect the tie-rod ends to the steering arms. Tighten the nuts and secure with cotter pins.
9. Put on the wheels and lower the car to the floor.
10. Refit the freewheel control and gear-shift shaft universal joint.
11. Reconnect the speedometer drive cable to the transmission case.
12. Refit the slave cylinder to the clutch housing.
13. Reconnect the throttle return spring.
14. Refit the engine hood.
15. Align the wheels straight ahead, refit the cardboard dash-panel lining and reconnect the steering column.
16. Check the toe-in and tighten the locknuts at the tie-rod ends.
17. Check the alignment of the steering wheel and refit the clamping screw in the yoke on the steering column.
18. If necessary, grease the tie-rod ends.
19. Reconnect the battery cable.

Disassembly of steering gear

1. Back off and remove the locknuts (see fig.) and remove the tie-rod ends.
2. Release the clamps and take off the rubber boots.
3. Bend up the tabs on the retaining washers.
4. If the gear pinion has been removed, put it back in place.
5. Release both tie-rod ball joints, using tool No. 784071.
6. Remove the pinion.
7. Disassemble the ball joints and collect the shims, the inner ball seats and the retainer.
8. Withdraw the rack from the steering-gear housing.
9. Remove the pinion spacer. If the pinion bushing is to be changed, drive it out of the steering-gear housing.

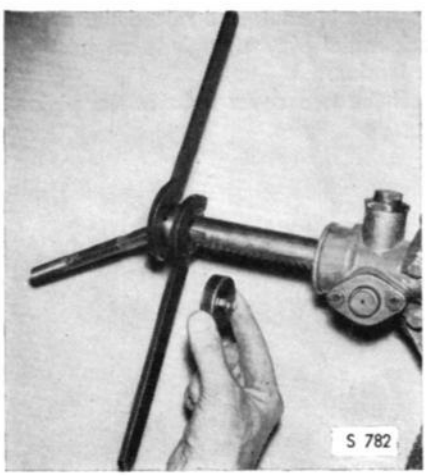
Reassembly of steering gear

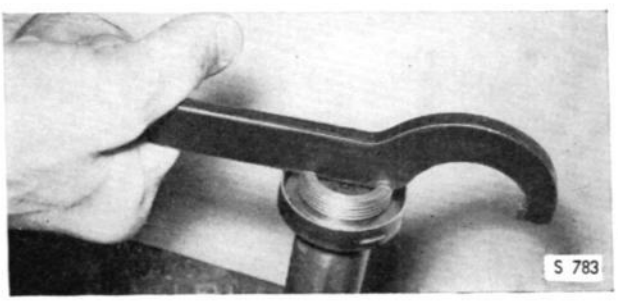
The steering gear must be reassembled under conditions of scrupulous cleanliness. Lubricate the rack and pinion, bearing points and other sliding surfaces with SAAB Special Grease.

1. Drive the pinion bushing 3 into the steering-gear housing.
2. Place a new retaining washer 13 on the pinion end of the rack and screw on the nut 15 with tool No. 784071.
3. Locate the shims on the nut and place the inner ball seat and retainer inside the nut. Position the retainer with its concave side facing the ball seat.
4. Pass the rack and pinion into the steering-gear housing.

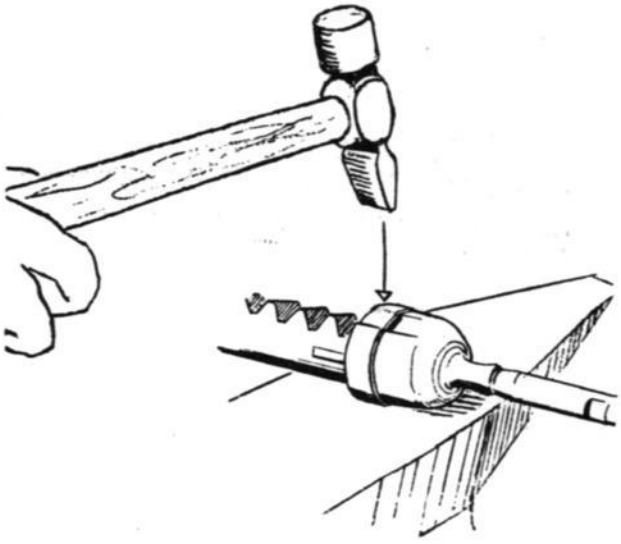
> NOTE
>
> In assembling the steering gear, the pinion spacer must be refitted before the rack is passed into the housing.

5. Pass the outer seat onto the tie-rod and secure it to the nut with the aid of the special tool, No. 784071.
6. Check that the ball joint is correctly shimmed. If not, release the ball seat and alter the shim combination as indicated below under "Adjustment".
7. After proper adjustment of the ball joint, bend the tabs of the retaining washers down into the grooves on the outer ball seat and into the notches in the nut. See fig.
8. Refit the other ball joint and adjust in the same way. Remember to refit the pinion first.
9. First adjust the axial play of the pinion and then the radial play of the rack. See below under "Adjustment".
10. Ease the rubber boots over the tie-rod (see fig.) and clamp them to the steering-gear housing and tie-rods. Do not tighten hard enough to prevent rotation of the tie-rods.
11. Refit the locknuts and screw the tie-rod ends to the tie rods.





DISASSEMBLY AND REASSEMBLY OF INNER BALL JOINT, STEERING GEAR, TOOL 784071



SECURING INNER BALL JOINT

Inspection of steering-gear components

After considerable mileage, and especially if lubrication is unsatisfactory, the rack may wear unevenly. If there is appreciable wear on its cylindrical part, the rack should be rejected and a new one fitted. Also check the rack bearing in the steering-gear housing, appropriately by comparison with a new rack. If wear is excessive, the bushing which is pressed into the housing can be changed. Examine the teeth of both the rack and the pinion for wear. All the teeth do not get worn uniformly, and those which are in mesh when the car is driven straight ahead will be worn the most. However, if lubrication is satisfactory there will be very little wear even on the most affected teeth.

If the rack teeth are abnormally worn the function of the steering gear will deteriorate and adjustment becomes more difficult. In these circumstances a new rack should be fitted.

Moderate wear on the pinion, on the other hand, may be corrected by rotating this item through half a turn, so that the teeth worn the most will be farthest away from the rack when the car is being driven straight ahead. Nevertheless, the provision of a new pinion is advocated. Check the outer and inner tie-rod ball joints. The outer ones are self-adjusting for moderate amounts of wear, but if free play has developed the entire ball joint must be rejected and a new one fitted. The components of the inner ball joints are subjected to but little wear if lubrication is satisfactory. However, if noticeable wear has occurred, the affected parts should be changed.

Adjustment

The following adjustments may be necessary:

1. Pinion axial play.
2. Rack radial play.
3. Tie-rod inner ball joints.

Adjustment number 3 necessitates removal of the steering gear, but the other adjustments can be done quite simply in the car, unless removal of the steering gear is necessary for some other reason. The inner ball joint very seldom requires adjustment, since there is very little wear here and the ball joint is to some extent self-adjusting.

Adjustment of pinion axial play

The occurrence of noise, knocking, etc., in the steering mechanism indicates the advisability of examining the pinion for axial and radial play.

Excessive play may occur after a new part has been fitted or as the result of wear. Normally, wear is very slight and adjustment on this account is very seldom called for, provided that lubrication is satisfactory.

Excessive axial play in the pinion (the column) can be corrected by inserting shims under the pinion cover. The clearance between the pinion and the cover should amount to 0.004—0.008 in. (0.1—0.2 mm). This can be provided by a suitable combination of shims, these being available in thicknesses of 0.004 and 0.012 in. (0.1 and 0.3 mm).

1. To carry out the adjustment, which can be done without removing the steering gear, jack up the front part of the car so that both wheels are clear of the floor.
2. Back off the locknut, and retard the adjusting screw for rack radial play enough to completely relax the spring tension.
3. Back off the two cover bolts at the pinion end. See fig.

4. Remove the cover, together with the shims located under it.
5. Change the shims to give the correct combination.
6. Check that the washer is in position, and apply a blob of SAAB Special Grease around the pinion stub. Refit the cover and shims, and tighten the bolts. Remember to fit the retaining washers.
7. After adjustment, check that the pinion moves freely. If the pinion is stiff, the thickness of the shim combination is too small, and readjustment is called for.
8. Adjust the radial play of the rack as described in the following section.

Adjustment of rack radial play

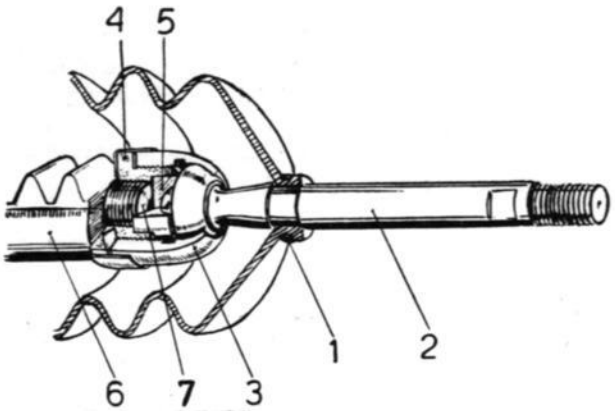
After adjustment of the axial play of the pinion, the radial play of the rack must be adjusted, using the adjusting screw located underneath the steering gear. This adjustment, too, is most easily carried out without removing the steering gear from the car.

1. Back off the locknut.
2. Advance the adjusting screw until the rack moves stiffly.
3. Back off the screw 1/8 turn.
4. Tighten the locknut.
5. Turn the steering wheel as far as it goes in both directions and check that rack movement is not stiff in any position.

Adjustment of tie-rod inner ball joints

The tie-rods, as illustrated, are identical for the right and left sides. The rack end of the tie-rods is made with double balls, while at the other end the tie-rods are threaded for connection to the outer ball joints.

1. The steering gear must be removed before the inner ball joint can be adjusted.
2. Release the clamps and remove the rubber dust excluders.
3. Pull the rack out to one side first. Bend up the tab on the retaining washer and detach the outer ball seat and nut with the aid of tool No. 784071.
4. Fit a new retaining washer and then tighten the nut, using tool No. 784071.



INNER BALL JOINT

1. Clamp
2. Tie-rod
3. Outer ball seat
4. Nut
5. Inner ball seat
6. Rack
7. Washer

5. Place a suitable combination of shims on the nut, and insert the inner ball seat and locating washer inside the nut. Position the washer with the concave side facing the ball seat.
6. Pass the outer ball seat onto the tie-rod and tighten with tool No. 784071.

7. Check that the shimming is correct. The ball joint should not have any play at all, but nor should it move stiffly in any direction. If the rack and tie-rod are held vertically, the ball joint should be tightened so much that the tie-rod, with tie-rod end attached, can be set at any angle whatsoever without falling down of its own weight.

> CAUTION
>
> The tie-rod must not on any account be excessively stiff in any position. It should be possible to move it fully in all directions by light manual pressure.

8. If shimming is unsatisfactory, the outer ball seat must be removed again and the number of shims increased or decreased as necessary. After this, secure the retaining washer.
9. Repeat the adjustment procedure for the other tie-rod.
10. Refit the rubber dust excluders and install the steering gear in the car.

> NOTE
>
> Removal of the steering grear from the car provides a convenient opportunity for checking and adjusting the axial play of the pinion and then the radial play of the rack.

Other measures

If the steering gear is still stiff in any position after adjustment of the rack and pinion, this is probably due to stresses incurred when tightening the bolts. Back off the two retaining bolts at the end farthest away from the pinion and insert a spacer under the steering gear at the bolt where it does not lie flush. On some cars, a spacer has already been fitted at the works.

Replacement of steering-gear dust excluder

If the rubber boots on the steering gear are damaged, they should be renewed without delay, as otherwise dirt and foreign matter may enter the steering gear and cause seizing.

1. Jack up the front part of the car and take off the wheel.
2. Remove the tie-rod ends as described in this Section.
3. Release the rubber-boot clamps at the steering gear housing and tie-rod, and remove the boot.
4. Remove all old grease and put on a new rubber boot. Tighten the clamps.
5. Refit the tie-rod end and reconnect it to the steering arm.
6. Refit the wheel and lower the car to the floor.
7. Grease the steering gear and adjust the toe-in as described in Section 601. Tighten the locknut.

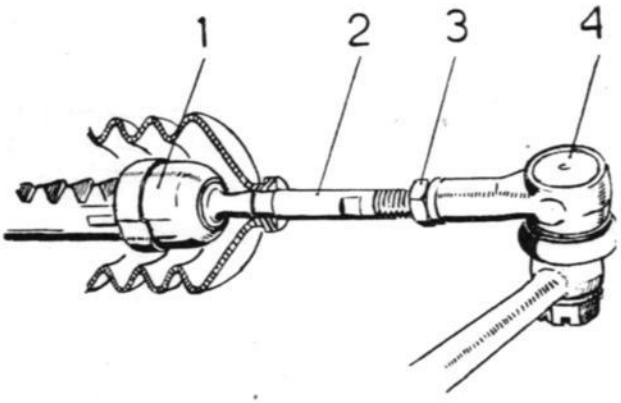
TIE-ROD ENDS

General

The outer ball joints, or tie-rod ends, are screwed to the tie-rods and secured with the locknuts 3. The total length of the tie-rod can be reduced or increased by slackening the locknuts and turning the tie-rod to the right or left with a wrench applied to its flats. This is necessary in order to adjust the toe-in.

The tie-rod is connected to the steering arm of the steering knuckle by means of a tapered pivot, which fits into correspondingly tapered holes in the steering arm. The pivot is secured by a castle nut and cotter pin. The tie-rod ends cannot be dismantled. They are self-adjusting for moderate wear, and consequently seldom need changing.

Damage arising through external influences, such as a collision or other accident, may, however, make it necessary to change both tie-rods and tie-rod ends. As a safety measure, damaged tie-rod ends should be changed as soon as possible after the damage is discovered.



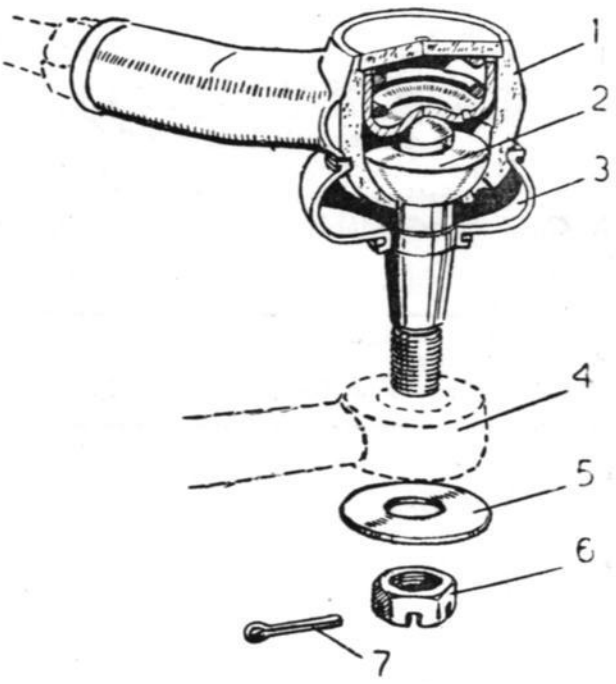
TIE-ROD ASSEMBLY

1. Inner ball joint
2. Tie-rod
3. Locknut
4. Tie-rod end

Replacement of tie-rod ends

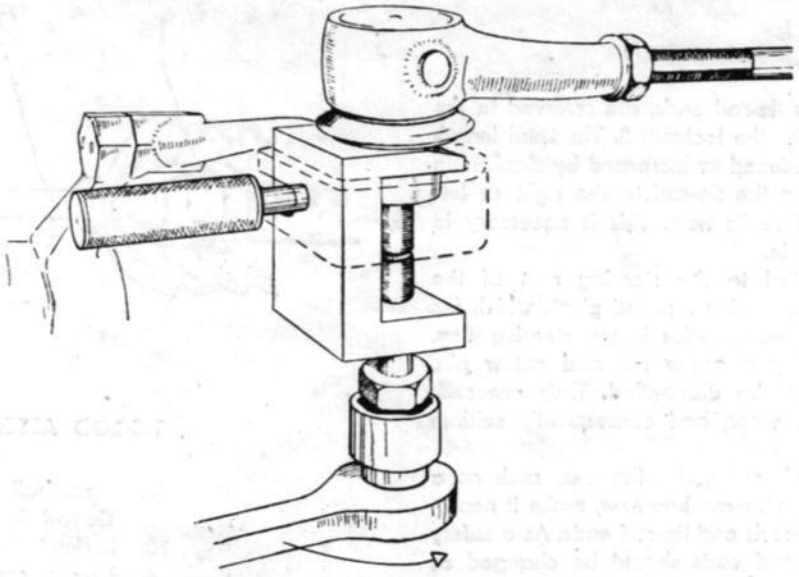
The tie-rod ends cannot be disassembled. Consequently, if excessive play develops the tie-rod ends must be renewed.

1. Jack up the front part of the car and take off the wheel.
2. Remove the cotter pin 7, the castle nut 6 and the washer 5. See fig.
3. Apply the puller, tool No. 784004, and release the pivot from the steering arm. See fig. Do not strike the pivot, since this could damage both the pivot itself and other parts of the unit.



TIE-ROD END

1. Body
2. Pivot
3. Rubber seal
4. Steering arm
5. Washer
6. Castle nut
7. Cotter pin



RELEASING THE TIE-ROD END WITH TOOL No. 784004

4. Back off the nut which secures the tie-rod end to the tie-rod.
5. Screw the tie-rod end off the rod.
6. Screw a new tie-rod end onto the rod, but do not secure it by tightening the locknut.
7. Connect the pivot to the steering arm. Tighten the castle nut to a torque of 25—36 ft-lb (3.5—5 kgm), and fit a new cotter pin.
8. Refit the wheel and lower the car to the floor.
9. Check and adjust toe-in as described in section 601.

IMPORTANT
Remember to retighten the locknut after adjustment.

Replacement of rubber seal

A rubber seal is fitted to each ball joint. If this is damaged so that it no longer affords an effective seal, it must be rejected and a new one fitted. The procedure is as follows:

1. Jack up the car and remove the wheel.
2. Remove the cotter pin, the castle nut and the washer from under the tie-rod end pivot.
3. Apply the puller, tool No. 784004, and release the pivot from the steering arm. See fig.
   Do not attempt to strike off the pivot, since such action could damage both the pivot itself and other parts.
4. Remove the damaged rubber seal from the pivot and fit a new seal.
5. Refit the pivot in the steering, arm, put the washer in place and tighten the castle nut with a torque of 25—36 ft-lb (3.5—5 kgm). Secure the nut with a new cotter pin.
6. Refit the wheel and lower the car to the floor.

1 cup soy
1 lbs salt water
~~cook~~ cook in water until soft
3 tbsp oil
2 tbsp onion powder
1 powdered veg bullion cubes
1/2 cup tomato juice

1 tbsp tamari or soy sauce
3 cups cooked grounds
~~add~~ brown onion
add tomato paste
soy beans
cook until almost dry

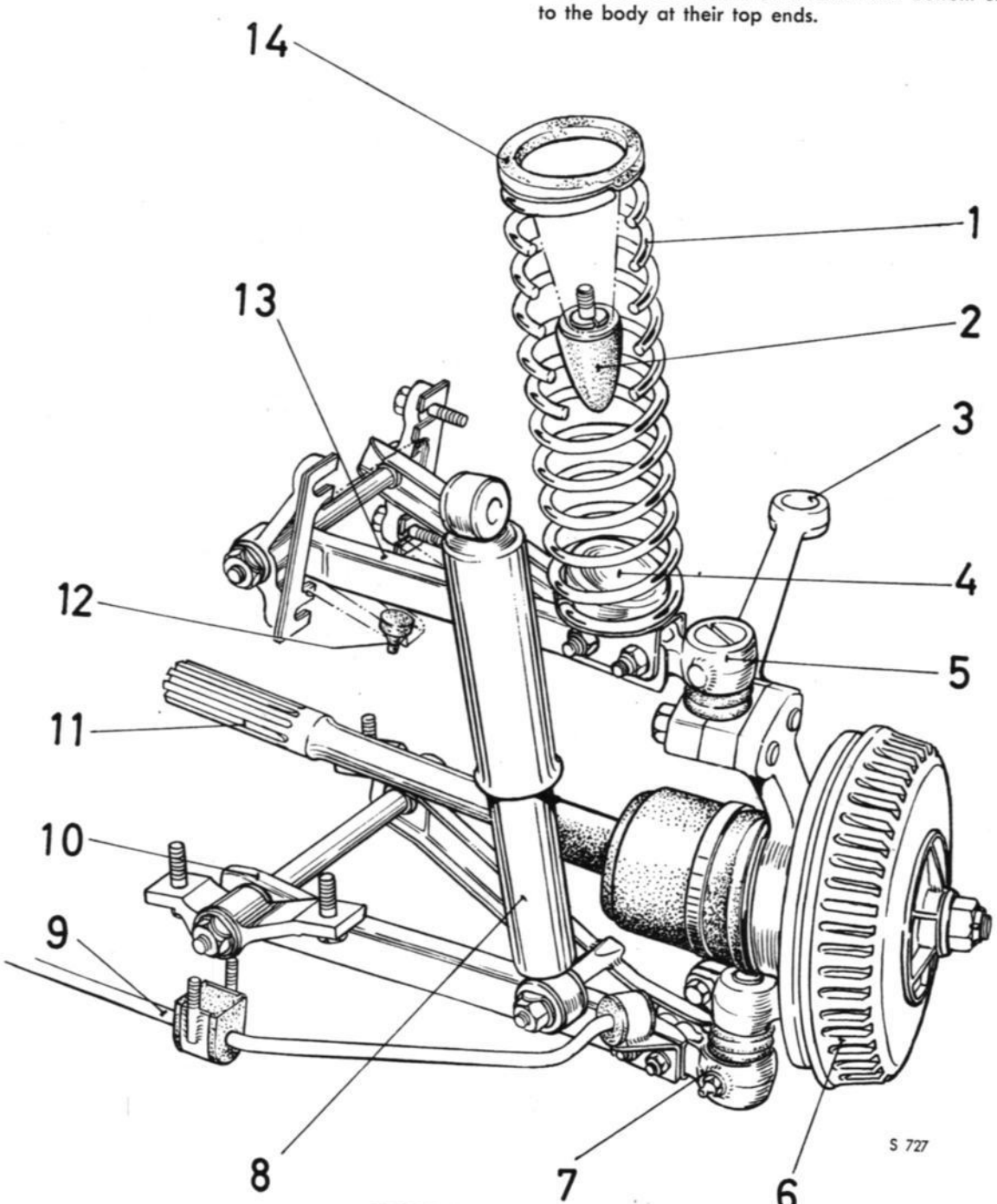
CONTENTS

Front suspension

The upper control arms are provided with seats for the coil springs which are fitted between these seats and similar ones on the body. These latter seats are fitted with rubber bumpers, see fig., which act as stops and limit upward suspension travel. Rebound travel is limited by two rubber bumpers attached to the body under the upper control arms.

The two lower control arms are interconnected by means of a stabilizer bar — see fig. The stabilizer bar is held to the body by two rubber-bushed mounting brackets under the floor of the engine compartment and to the two lower control arms by rubber-bushed bearings on the front of these arms.

The shock absorbers are of hydraulic, telescopic type. They are attached by means of rubber-bushed connections to the lower control arms at their bottom ends and to the body at their top ends.



FRONT SUSPENSION, LEFT

1. Coil spring
2. Rubber buffer
3. Steering arm
4. Coil seat
5. Upper ball joint
6. Brake drum
7. Lower ball joint
8. Shock absorber
9. Stabilizer
10. Lower control arm
11. Inner drive shaft
12. Rubber buffer
13. Upper control arm
14. Rubber shim

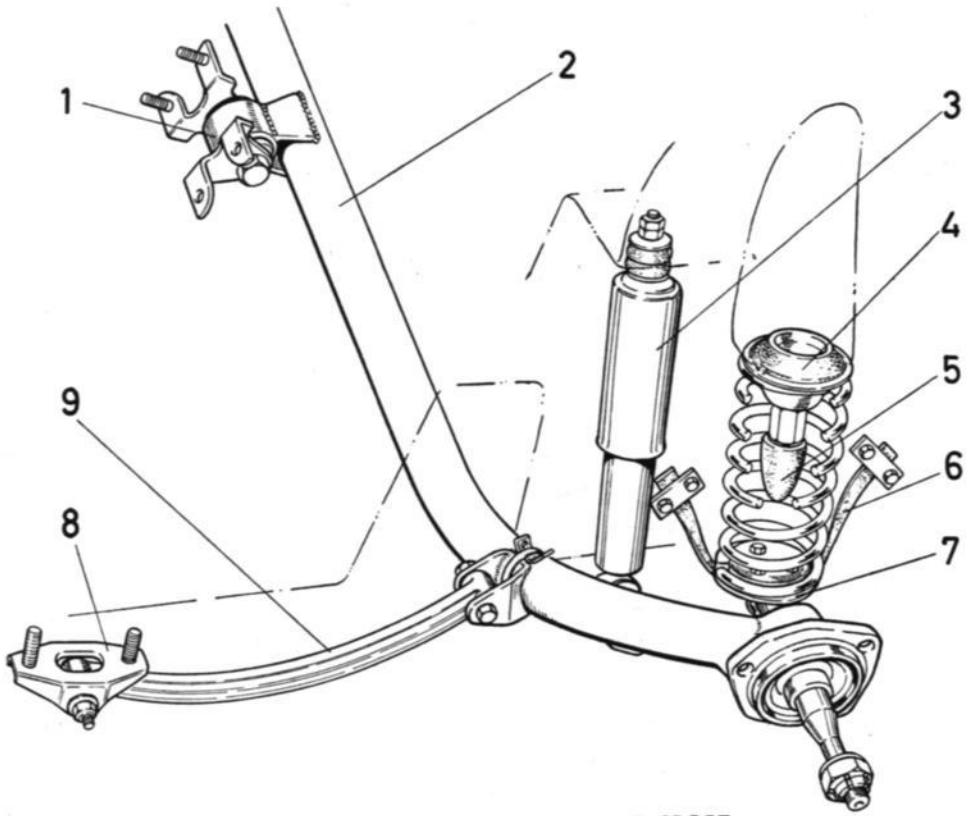
Rear suspension

The rear axle consists of a rigid U-shaped shaft, movably attached to the body at three points by means of rubber-bushed bearings. It comprises a unit consisting of a tube 2 with swept-back ends fitted with end plates to carry the press-fitted stub axles. The wheel hubs and brake drums are carried in ball bearings on the stub axles, while the backplates and appurtenant rear brakes are bolted to the outside of the end plates. At its center, the rear axle is attached to the body by means of a rubber-bushed bearing bracket 1. In addition, it is braced to the body at the sides through the medium of longitudinal side links, attached to both the body and the rear axle by means of rubber-bushed bearings.

The lower coil-spring seats are bolted to the stub axle extension on the inside of the rear-axle end plates. The upper seats for these springs are attached to the body by means of spring isolators 4 and combined with the rubber buffers 5 which limit upward travel of the rear axle and thus also of the wheels. Rebound wheel travel is restricted by the stop straps 6.

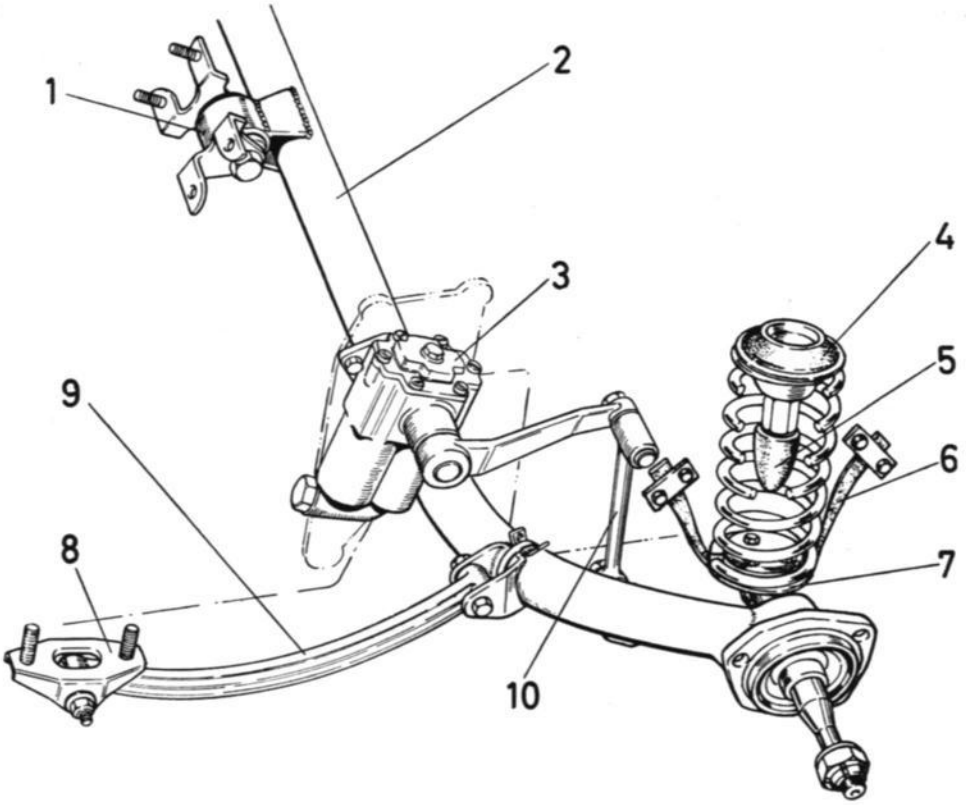
The rear shock absorbers for the Saab 95 are of arm type. They are bolted to the body and connected to the rear axle by links.

The rear shock absorbers 3 for the Saab 96 are of telescopic type. They are connected by means of rubber-bushed bearings to the body at the top and to the rear axle at the bottom.



REAR SUSPENSION, SAAB 96 AND SPORT

1. Center bearing
2. Rear axle tube
3. Shock absorber
4. Upper spring seat
5. Rubber bumper
6. Stop strap
7. Lower spring seat
8. Body bracket
9. Side link



AXLE ASSEMBLY, SAAB 95

1. Center bearing
2. Rear axle tube
3. Shock absorber
4. Upper spring seat
5. Rubber bumper
6. Stop strap
7. Lower spring seat
8. Body bracket
9. Side link
10. Shock-absorber link

Wheels and hubs

Wheels

The dished wheels and wide-base rims are manufactured of pressed sheet steel and riveted or welded together to form an integral unit.

A pierced hole 1 in the rim accommodates the air valve, while five pressed and countersunk holes 2 in the wheel itself are intended for the wheel bolts. The hole 3 is used when adjusting the brakes, and when the wheel is assembled this hole should be located opposite the corresponding hole in the brake drum. The rim is also fitted with three pegs 4 to retain the hub cap. Four depressions in the circumference of the wheel form gaps between the wheel and the rim and are used in the application of snow chains. In addition to these gaps, there are twelve ventilation and lightening holes in the wheel.

Hubs

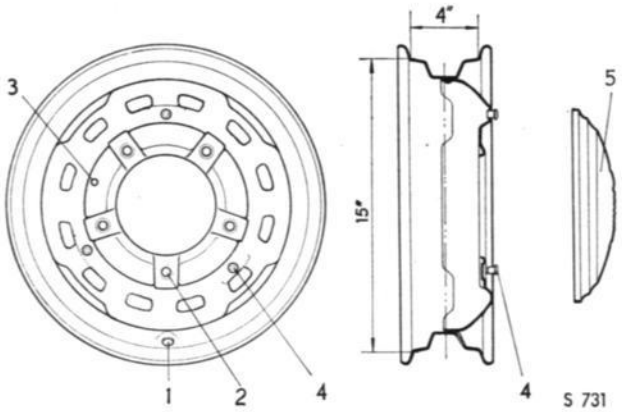
The wheel hubs also serve as brake drums, except on the front wheels of the Saab Sport which is fitted with disc brakes. The hubs are shaped to form an annular seal against the backplate, thus preventing water, sand and other foreign matter from entering the hubs and brakes.

The front wheel hubs are also provided with cooling flanges.

On the Saab 95 and 96 the hubs have five threaded holes for the wheel bolts while the Saab Sport hubs have four holes.

Tires

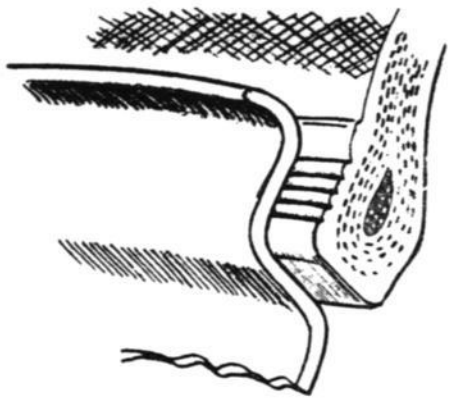
The tubeless tires are of size 5.20 × 15″ or 5.60 × 15″. The Saab Sport, however, is fitted with speed tires of size 155 × 15″; these are designed for use with inner tubes. Most tires are provided with balancing marks, generally in the form of a colored circle or of one or more triangles on one tire wall — see fig. A round mark indicates the lowest degree of accuracy. One or more triangular marks indicates increasing degrees of accuracy in the balancing of the tire. The marking shows the lighter side of the tire, and when the tire is fitted the mark should be by the valve. The illustration below shows how the externally corrugated wall and bead of the tubeless tire seals against the inside of the rim (the bead seat).



ROAD WHEEL AND HUB CAP

1. Valve hole
2. Wheel-bolt hole (on Saab Sport four holes)
3. Adjustment hole
4. Hub cap button
5. Hub cap

BALANCING MARKS IN TIRES



SEAL OF TIRE TRIM

FRONT SPRINGS

Replacement of coil springs and rubber bumpers

All four wheels are fitted with coil springs. The front and rear springs must on no account be confused as the rear ones are shorter and much softer than the front ones. The two types of coil springs are most easily distinguished by their length.
When supplied, the springs have undergone thorough surface treatment which affords adequate protection against corrosion. If the finish is imperfect it should be touched up before the spring is fitted.

Removal

1. Jack up the front part of the car and remove the wheel.
2. Insert a suitable gripping tool (a Polygrip or the like) in the spring and unscrew the rubber buffer from the rubber bumper, allowing it to drop down inside the spring. See also note below.

NOTE

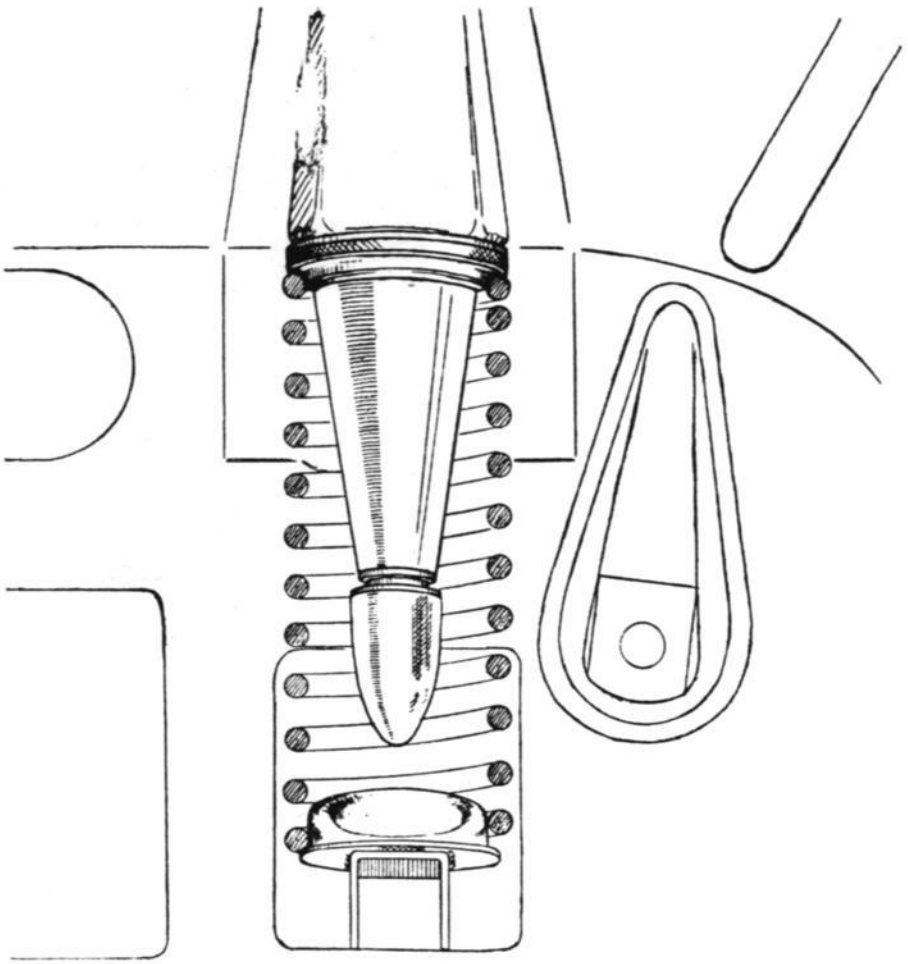
If the upper rubber bumper cannot be removed because the bolt has rusted on, the spring can be taken out by cutting off the lower bumper, thereby allowing the control arm to drop down towards the support plates.

3. Remove the shock absorber.
4. Compress the spring with the aid of the spring clamp, tool No. 784082. See fig.

WARNING!

Unconditionally, the spring clamp must be fitted with the retainers fitted in the way shown by the fig.

5. Back off and remove the two bolts holding the ball joint to the upper control arm, and remove the lower spring seat.

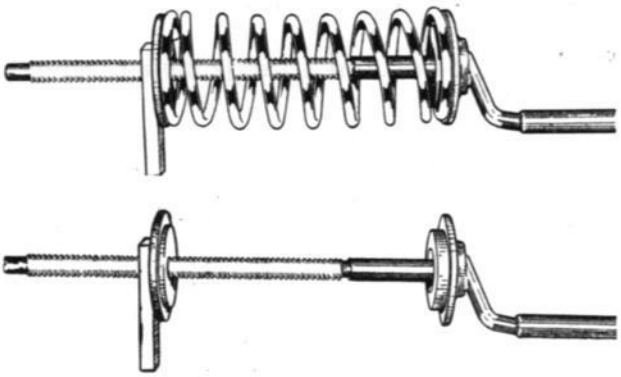


FRONT SPRING SEAT AND RUBBER BUMPER R. H. SIDE

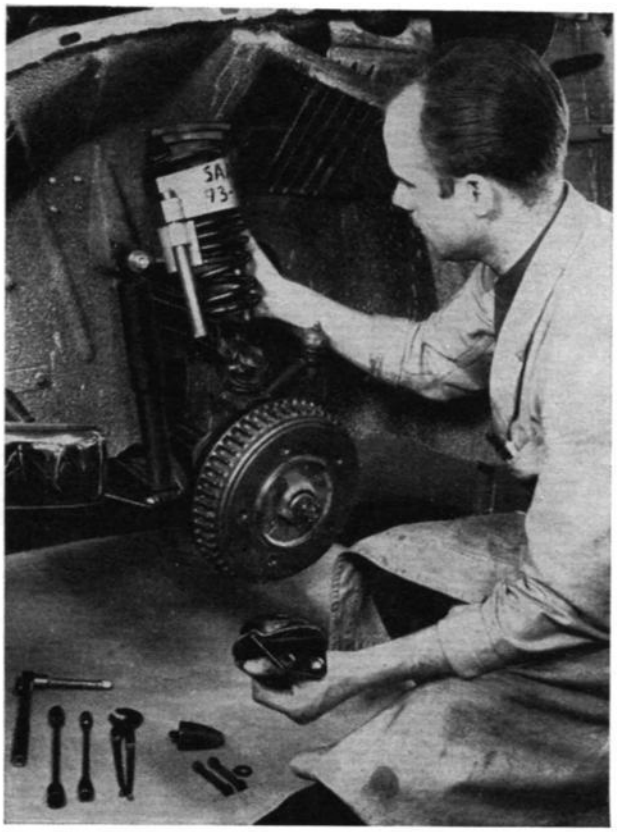
6. Remove the compressed spring.
7. Carefully examine the rubber sealing ring in the upper spring seat and fit a new one if necessary.
8. Examine the two rubber buffers under the upper control arm which form the rebound travel limit, and fit new ones if necessary.

Reassembly

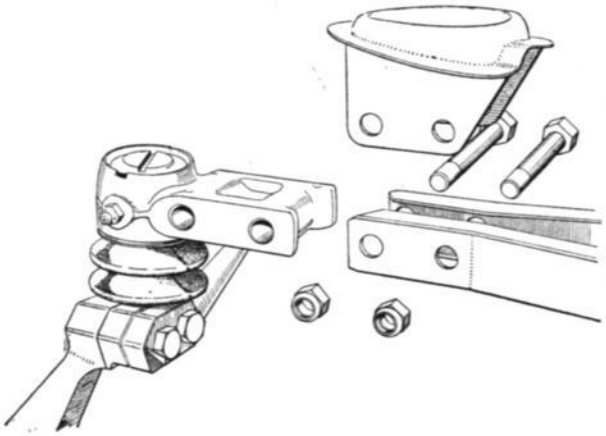
1. Compress the coil spring with the spring compressor, tool No. 784081. See fig.
2. Apply the spring clamp, tool No. 784082, to the spring and withdraw the spring from the compressor.
3. Check that the rubber sealing ring and metal washer are fitted in the upper spring seat and that the rubber buffers are mounted under the upper control arm.
4. Place the spring against its upper seat, at the same time inserting the previously removed upper bumper in the spring.
5. Locate the lower spring seat between the spring and the control arm and refit the ball joint.
6. Back off the spring-clamp screws successively until this tool can be removed.
7. Screw on the upper rubber bumper.
8. Refit the shock absorber.
9. Refit the wheel and lower the car to the floor.



SPRING COMPRESSOR, TOOL NO. 784081, WITH AND WITHOUT SPRING



REMOVAL OF FRONT COIL SPRING WITH TOOL NO. 784082



REMOVAL OF UPPER BALL JOINT AND LOWER SPRING SEAT

REAR SPRINGS AND RUBBER BUMPERS

Replacement of rear coil springs and/or rubber bumpers

Removal

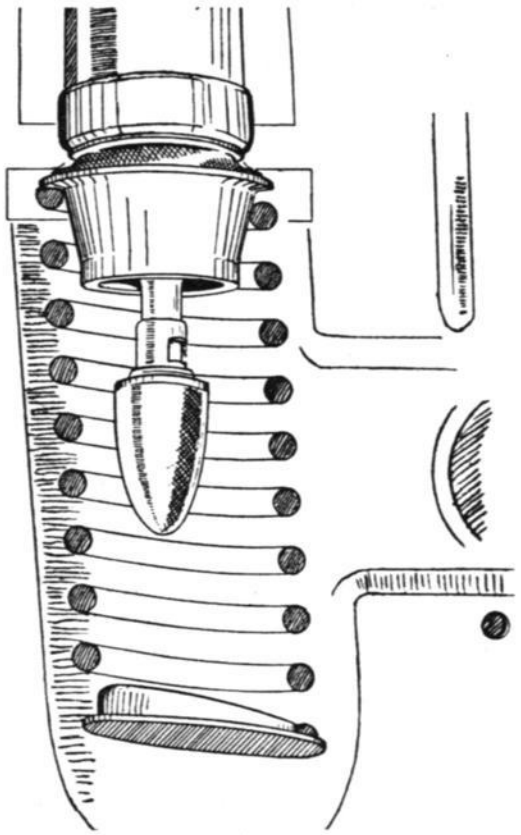
1. Jack up one side of the car, applying the jack under the rear end of the sill.
2. Remove the rear wheel.
3. Unfasten the stop strap at its rear bracket and allow the axle to fall down, thus enabling the spring to be removed without the use of tools. On the Saab 95 first remove the shock-absorber link.
4. If the rubber buffer needs changing, unscrew it with a suitable pair of pliers, gripping the steel washer at the thick end.
5. Check the condition of the stop strap to see if a new one is required.

Reassembly

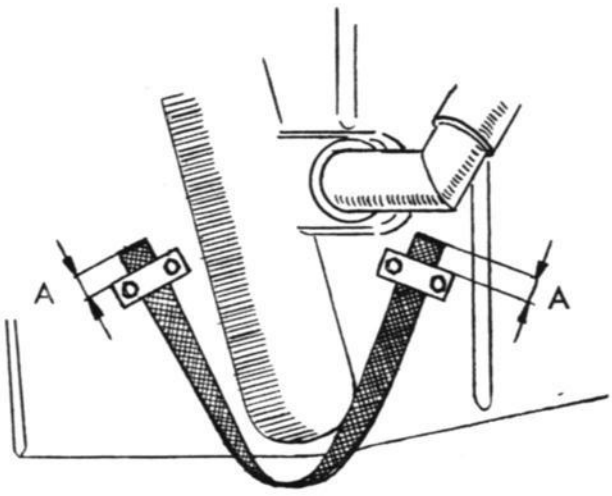
1. If the rubber buffer has been removed, screw a new one in place. Remember to fit the retaining washer between the buffer and its seat.
2. Refit the spring.
   Fit the spring with the unground end facing downwards and turn until it is correctly located in the lower spring seat.
3. If the stop strap has been removed, fix a new one to the front bracket, bearing in mind that the end should project 0.6 in. (15 mm) beyond the bracket.
4. Refit the wheel and lower the car to the floor.
5. Secure the stop strap at the rear end, again bearing in mind that the end of the strap should project 0.6 in (15 mm) beyond the bracket. See fig.

Replacement of stop strap

When fitting a new rear-axle stop strap, make sure that the ends project 0.6 in. (15 mm) beyond the brackets. See fig.



REAR COIL SPRING SEATS AND RUBBER BUMPERS



FITTING THE REAR-AXLE STOP STRAPS

A = Max. 0.1 in. (2.5 mm)

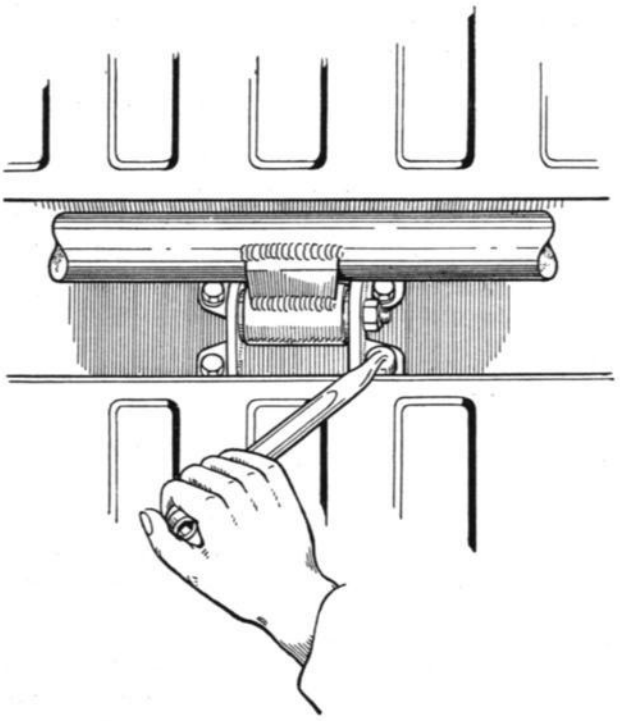
REAR AXLE

Removal of rear axle

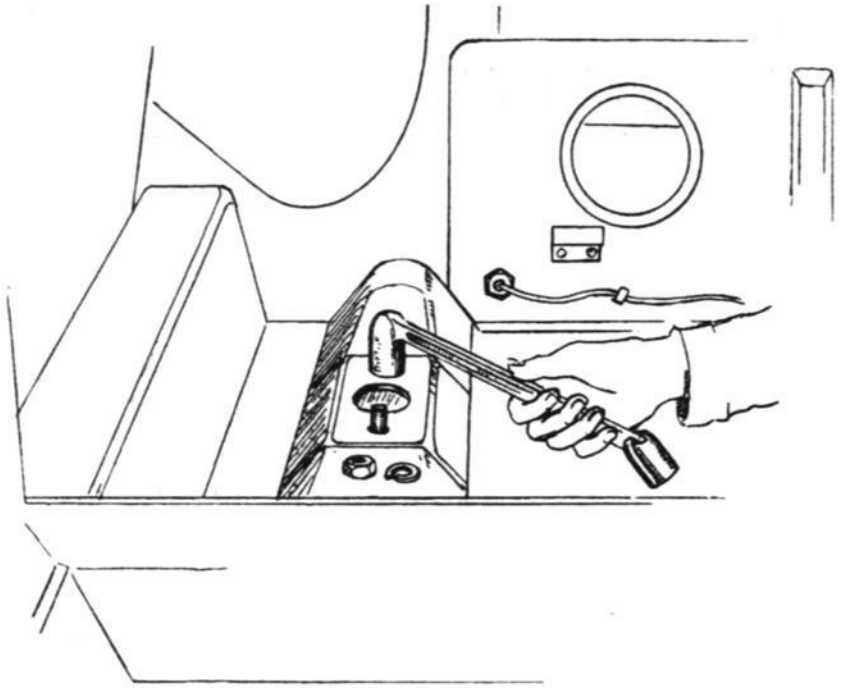
1. Remove the rear seat and back cushions.
2. Jack up the rear part of the car and remove the wheels.
3. Disconnect the exhaust pipe and rear muffler from the floor and wheel house.
4. Disconnect the brake hoses from the body.
5. Unscrew the rear brackets for the stop straps and remove the coil springs, which can be done without the use of tools.
6. Hang the axle up provisionally in the stop straps.
7. Disconnect the shock absorbers. On the Saab 95, unfasten at the rear axle. For the Saab 96, disconnect at the upper connection.
8. Detach the brake-cable clamps from the shaft and the wire connections from the rear-brake levers.
9. Disconnect the rear-axle bearing from the body.
10. Unfasten the side-link body brackets. The nuts are accessible from inside the car under the rear seat cushion.
11. Unfasten the stop straps again and remove the entire rear-axle assembly.

Installation of rear axle

Clean all parts thoroughly and, after a careful check, renew all worn or damaged parts. Installation is carried out in the reverse order to removal. Bear in mind, however, that the rubber-bushed bearings must be fitted in such a way that no stresses are incurred when the car is resting on the wheels, i.e. such bearings must not be tightened at the axle and body brackets until the car has been lowered to the floor and is unladen.
The ends of the stop straps should project 0.6 in. (15 mm) beyond the brackets.



DISCONNECTING THE REAR-AXLE CENTER BEARING BRACKET



NUTS FOR SIDE-STAY BODY BRACKET, UNDER THE REAR SEAT

NOTE

1. Take pains to protect the rubber bushings against contact with rubber solvents such as grease, gasoline, etc.
2. If a rubber bushing has rusted on, it must be rejected, but great care must be taken when removing it to avoid damage to shafts and stays. After removal of the bushing, clean the bearing surfaces with very fine emery cloth.
3. Elastic retaining nuts which have lost their grip after repeated backing off and retightening must be rejected and replaced by new ones.

CENTER BEARING

Replacement of rubber bushings in rear-axle center bearing

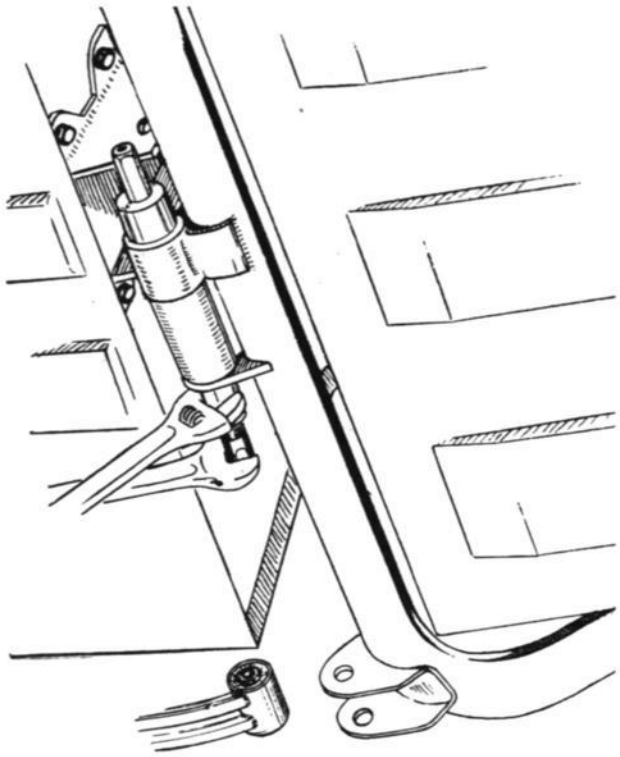
If the bushing in the center bearing is to be changed, the entire rear-axle assembly should be removed. It is, however, possible to change the bushing while the axle remains in place.

Replacement of bushing without removing the rear axle

1. Jack up the rear part of the car.
2. Disconnect the brackets for the rear muffler and exhaust pipe from the wheel house and floor respectively.
3. Back off and remove the bolt through the center bearing.
4. Pull the rear axle down and place an assembly bar across the tunnel between the body and the axle on either side of the center bearing.
5. Apply tool No. 784073 and remove the rubber bushing.
6. Drive a new bushing in, using the same tool. Locate the bushing in the center of the bearing.
7. Refit the center bearing, but do not tighten the nut until after the car has been lowered to the floor.
8. Refit the rear muffler and exhaust pipe to their brackets on the wheel house and floor respectively.
9. Lower the car to the floor.
10. Tighten the nut on the rear-axle center-bearing bolt.

Replacement of bushing on a removed axle

Change the bushing with the same tools and in the same manner as described above.

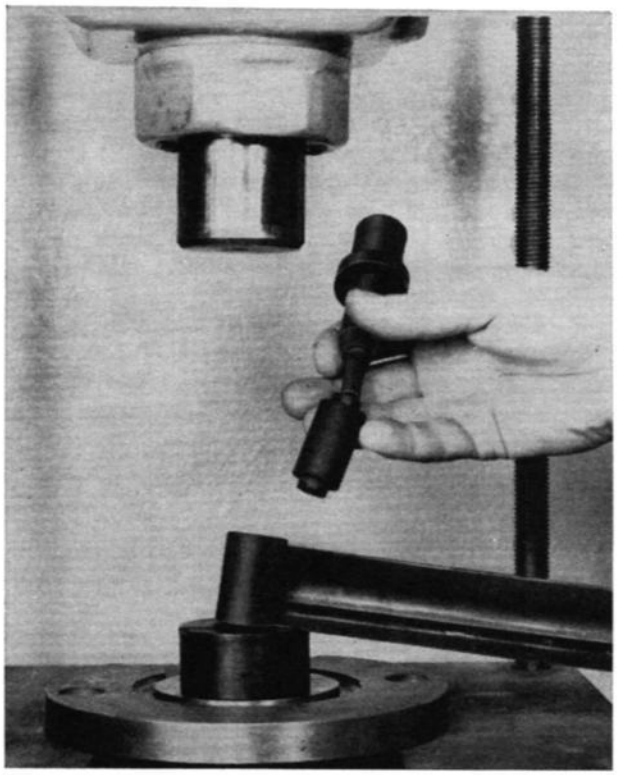


EXTRACTION AND INSERTION OF CENTER-BEARING RUBBER BUSHING WITHOUT REMOVING THE REAR-AXLE ASSEMBLY

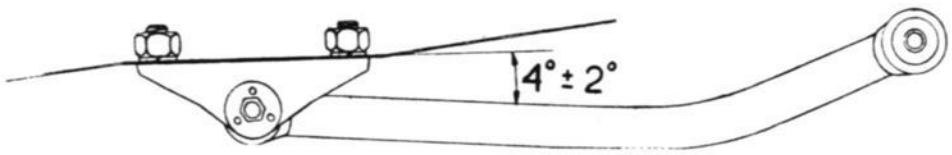
SIDE LINKS

Replacement of side-link rubber bushings

1. Remove the rear axle from the car.
2. Disconnect the links from the brackets on the rear axle.
3. Detach the body brackets from the links.
4. The bushings are best removed by gently heating the link bearing sleeves with a burner flame or other suitable source of heat, whereupon the bushings may be eased off with the driver, tool No. 784076, a special tool which is also used to fit the new bushings.
5. Refit the body brackets to the links, noting that the angle between the link and the bracket should be 4° (see fig.) when the bushing has been tightened.
6. Refit the links to the rear axle but do not tighten the nuts. These nuts must never be tightened until the car is resting on the wheels. Insert the bolts from the outside towards the center bearing.
7. Refit the rear axle.
8. Lower the car to the floor and tighten the nuts on the side-link rear bearing brackets.
   Check the elastic retaining nuts for fatigue, and fit new ones if necessary.



PRESSING IN RUBBER BUSHINGS, USING TOOL NO. 784076



CORRECT ANGLE BETWEEN SIDE LINK AND BODY BRACKET

SHOCK ABSORBERS

General

Defective shock absorbers must be rejected, and new ones fitted. This is a matter of the utmost importance, since the shock absorbers have a pronounced effect on the roadability and steering qualities of the car.

FRONT SHOCK ABSORBERS

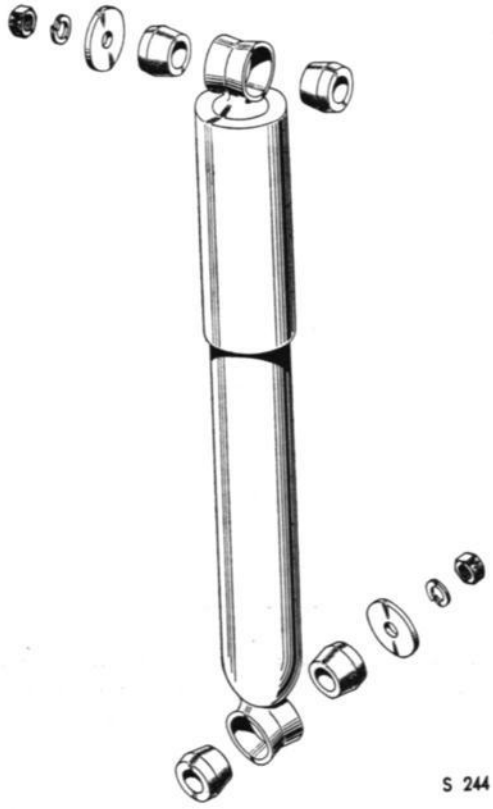
Removal

1. Jack upp the car and remove the wheel.
2. Remove the shock absorbers, collecting the washers and rubber items.

Reassembly

Before reassembling, provide new rubber items in place of any defective ones.
When a shock absorber is to be refitted, be sure to use only genuine rubber bushings at the upper and lower seats, as the use of wrong parts may give rise to noise. Before a shock absorber is fitted, any air in it must be expelled. To do this, hold the shock absorber in the same position as it has on the car and pump it up and down several full strokes. Now fit the shock absorber to the car immediately — if it is put down, air may re-enter its valve system.

1. Put on the rubber bushings and washers and refit the shock absorber on the car. Smear the pin threads with grease before screwing on the nuts. Tighten the nuts hard.
2. Refit the wheel and lower the car to the floor.



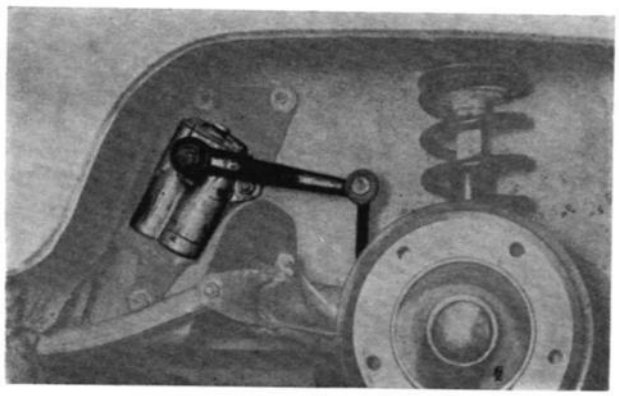
FRONT SHOCK ABSORBERS AND CONNECTING PARTS

REAR SHOCK ABSORBERS

Saab 95

Removal

1. Jack up the car and remove the wheel.
2. Disconnect the shock absorber from the body and the rear axle.
3. Remove the shock absorber, collecting the washers and rubber items.



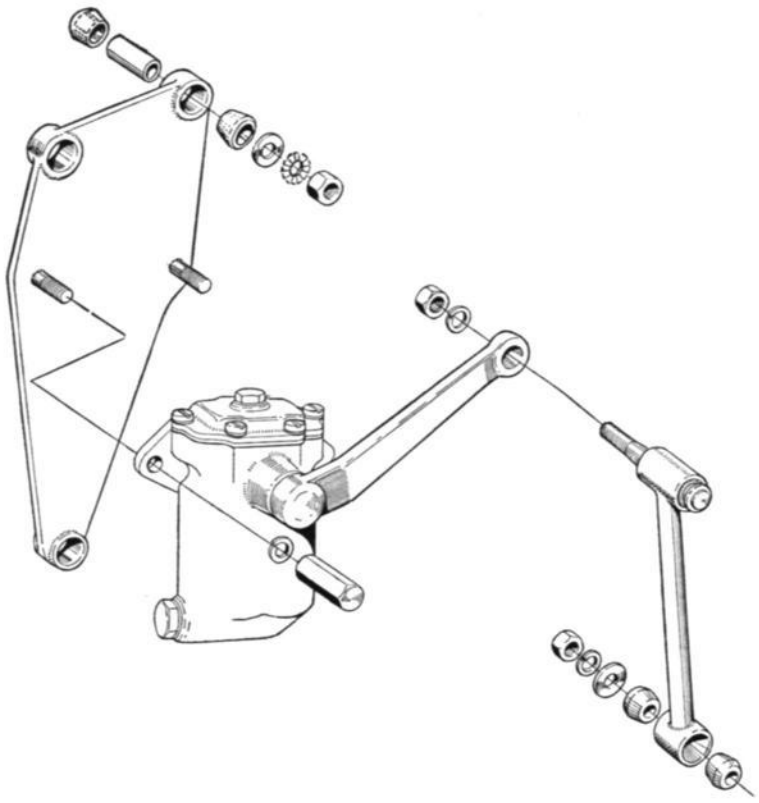
REAR SHOCK ABSORBER, SAAB 95

Reassembly

Fit new rubber items in place of any defective ones. Always use genuine replacement parts. Refit the shock absorber and its connecting parts, smear the pin threads with grease and tighten the nuts hard. The connecting parts belonging to the shock absorber are shown in the figure below.

Topping up shock absorbers

The rear shock absorbers on the Saab 95 must be inspected every 12.000 miles (20.000 km) and topped up as necessary with shock-absorber fluid of good quality.



REAR SHOCK ABSORBER, SAAB 95, WITH CONNECTING PARTS

REAR SHOCK ABSORBERS

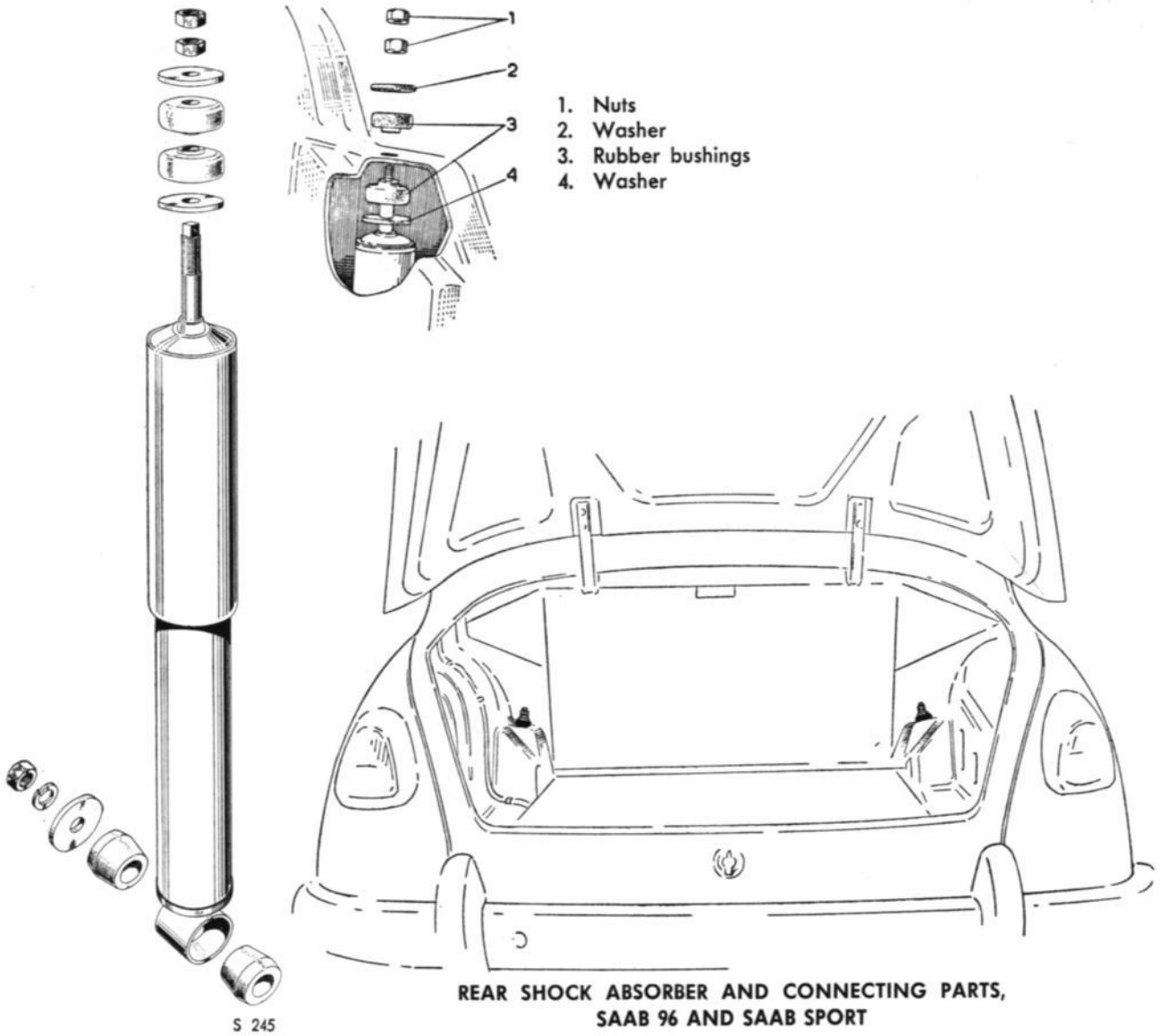
Saab 96 and Saab Sport

Removal

1. Jack up the car and remove the wheel.
2. Disconnect the shock absorber from its upper and lower brackets.
3. Remove the shock absorber, collecting the washers and rubber items.

Reassembly

Provide new rubber items in place of any defective ones, but be sure to use only genuine replacement parts, as otherwise noise may develop in the bearings. Bleed the shock absorber prior to refitting, by pumping several full strokes with the shock absorber held in the same position as when on the car. Do not put the shock absorber down after bleeding, since this could lead to the re-entry of air into the valve system. Put back the rubber bushings and washers, and refit the shock absorber to the car — see fig. Make sure that the rubber bushings in the upper connection are correctly located: the bushing flange should be eased into the hole in the body so that the shock absorber is properly centered in the hole. Negligence in this respect may result in noise. Smear the pin threads with grease before screwing on the nuts. Tighten the nuts hard.



1. Nuts
2. Washer
3. Rubber bushings
4. Washer

S 245

REAR SHOCK ABSORBER AND CONNECTING PARTS, SAAB 96 AND SAAB SPORT

STABILIZER BAR

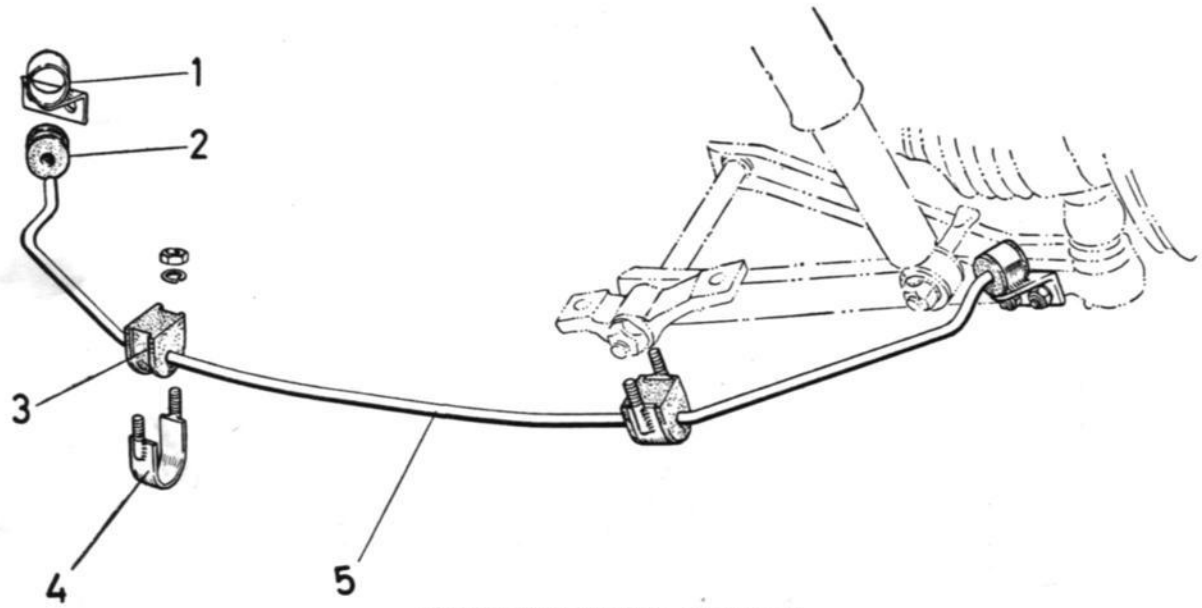
Replacement of stabilizer bar

1. Jack up the front part of the car and remove both front wheels.
2. Remove the stabilizer bar by disconnecting its mounting brackets from the body. The nuts are accessible from inside the engine compartment. Detach the bar from both body, end bearings and brackets, then remove the bar towards the right.
3. Pass the new stabilizer bar in from the right and secure it to the body with its bearings.
4. Refit the two end bearings to the control arms.
5. Refit the wheels and lower the car to the floor.

Replacement of rubber bushings on stabilizer bar

If renewal of the rubber bushings on the stabilizer bar is called for, this is best done without removing the bar itself from the car.

1. Jack up the front part of the car and remove both front wheels.
2. Back off and remove the two bolts on either side that hold the ball joints and stabilizer-bar brackets to the lower control arm.
3. Detach the stabilizer-bar brackets from the control arms.
4. Turn the stabilizer bar downwards and remove its two end bearings, in which the rubber bushings are pressed.
5. Back off the nuts and remove one stabilizer-bar mounting bracket from the body. These nuts are accessible from inside the engine compartment.
6. Fit a new bushing in the mounting bracket and refit the bracket.
7. Repeat the procedure according to points 5 and 6 above with the opposite mounting bracket.
8. Fit new rubber bushings in both end bearings.
9. Refit the two end bearings on the stabilizer bar.
10. Reconnect the stabilizer-bar end bearings and ball joints to the lower control arms and tighten up the bolts. Do not forget the stiffener on the rear of the control arm.
11. Refit the wheels and lower the car to the floor.



STABILIZER BAR AND BEARINGS

1. Bracket, control arm
2. Rubber bushing
3. Rubber bushing
4. Bracket, body
5. Stabilizer bar

WHEELS

Changing wheels

Removal

1. Apply the handbrake and take out the spare wheel.
2. Remove the hub cap.
3. Slacken the wheel bolts.
4. Jack up the car.
5. Remove the wheel bolts and take off the wheel.

Installation

1. Allow the wheel to rest on the rim of the hub and turn until the bolt holes are in line.
2. Steady the wheel at bottom with one hand or foot until the two lowest bolts have been screwed in.
3. Screw in the remaining bolts but do not tighten them permanently as yet. Instead, tighten them successively a couple of times in the sequence shown in the figure below. The correct tightening torque is 65 ft-lb (9 kgm). Before tightening the bolts finally, the car should be lowered to the floor.
4. Put on the hub cap. This is done most easily by resting the inside of the hub-cap flange against two of the three pegs and knocking the cap onto the third peg with the hand.

Adjustment and repair of wheels

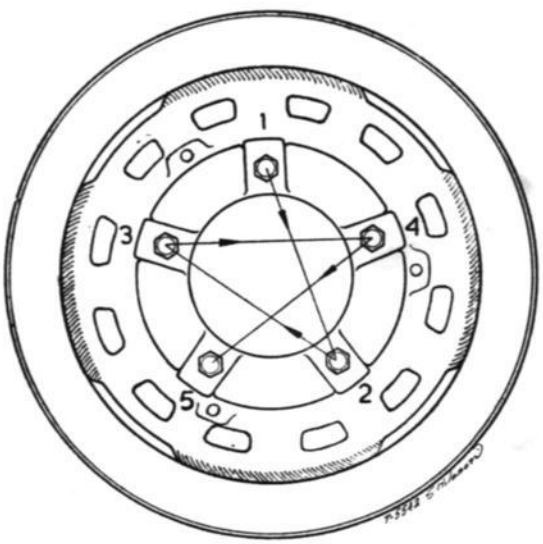
Wheels may be damaged in collisions or if the car leaves the road, or as the result of driving with too low a tire pressure. Tubeless tires which seal against the rim will leak if the rim is deformed or otherwise damaged.

If air leakage occurs on account of a deformed rim, the tire should be removed and the wheel examined and adjusted as necessary. Any rust on the inside of the rim flange should be removed with a steel-wire brush or steel wool. If corrosion has pitted the rim, a file should be used. Any minor pits remaining after adjustment should be coated with a thick solution, which should also be applied to the bead of the tire. The tire should then be refitted before the solution has had time to dry.

Check that the rim is not out-of-true or buckled, and adjust any such defects. See fig. Badly deformed or damaged rims must be rejected, and new ones fitted.

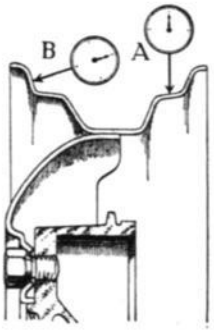
Check that the rim does not contain any cracks which could cause air leakage. Minor cracks can be repaired by welding, but it is important that any rim-flange-welds that are in contact with the tire be carefully cleaned and filed flush. Bear in mind that the rim must never be soldered in any circumstances.

STRAIGHTENING A WHEEL RIM



TIGHTENING SEQUENCE FOR WHEEL BOLTS

Check that no rivets are loose. Loose rivets may be refastened with a ball hammer, applying counter-support at the underside of the rivet. The application of a few drops of quick-drying solution on the inside of the rivet further improves the seal.
Never attempt to weld leaky rivets.
After straightening a rim, check that out-of-round and run-out are within reasonable limits. On a correctly fitted, rotating wheel, the difference between the highest and lowest points of the rim, measured at A (see 0 fig.), must not exceed 0.06 in. (1.5 mm).
The run-out B, see fig., is measured in the corresponding manner and must not exceed 0.06 in. (1.5 mm).
When measuring these figures, the wheel should be fitted in the normal manner, either on a hub or on a special rig permitting free rotation of the wheel.



MEASURING OUT-OF-ROUND AND RUN-OUT

Interchange of wheels and tires

Front-wheel drive causes greater wear on front tires than on the rear ones. After considerable mileage, the tires can be changed round, so that those which are least worn are fitted at the front. Always make sure that the tires retain their original direction of rotation: a left front wheel should thus change places with a left rear wheel. Such interchange of wheels ensures that all the tires will last roughly the same time.

TIRES

Removal of tire

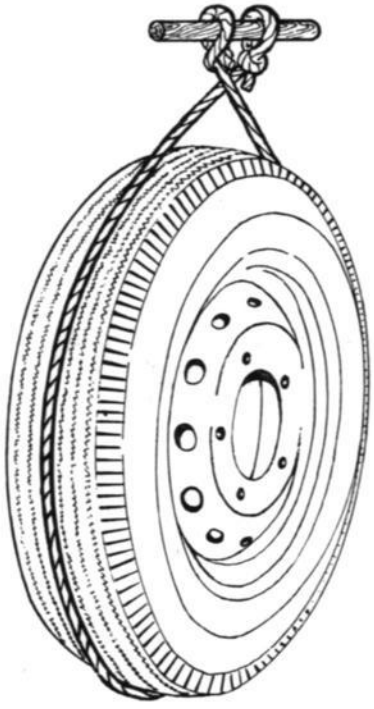
1. Take off the wheel and let the air out of the tire. If the wheel is balanced and the tire is to be refitted, mark the tire, for instance at the valve, before removing it.
2. Work the tire beads off both sides of the rim, using a special tool (see fig.) which does not damage the tire-wall corrugations. Alternatively, tread the tire free of the rim with the foot.
3. Place the wheel on a level surface and press the bead at the valve to the center of the rim so that the opposite side of the tire can be prized over the flange of the rim. Use your knee or foot to keep the depressed part of the tire down.
4. Insert two tire levers about 8 in. (20 cm) apart opposite the depressed point.
   Pry the bead over the flange of the rim with the levers.
5. Leave one tire lever in position and move the other one successively round the rim until the bead is entirely free.
6. Turn the wheel over and press part of the bead to the center of the rim.
7. Insert the tire levers on the opposite side and press them down to force the lower rim flange up over the tire.
8. Leave the tire levers in place and lift the rim clear.

Refitting of tire

1. Clean the tire and the rim. It is absolutely essential for the concentrical corrugations round the tire wall at the bead to be perfectly clean. Use a cloth moistened with clean water.
2. Prize one tire bead over the flange of the rim. Check if the tire is marked for direction of rotation.
3. Turn the tire until the balancing mark is at the valve.
4. Place the wheel on a level surface and press the tire bead down into the rim recess at the valve, retaining it there with your knee or foot.
5. Insert one tire lever at either side where the bead crosses the flange of the rim. Prize the bead successively down over the flange with this lever, keeping the other one still.

FREEING THE TIRE BEAD

PRESSING IN TIRE BEAD



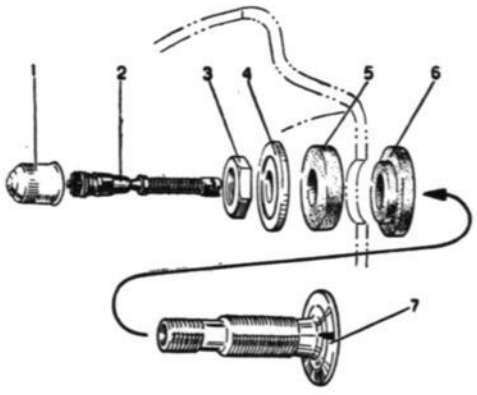
USE OF ROPE TO SPREAD TIRE BEADS

6. Inflate the tire as follows:
   a. Remove the valve needle.
   b. Stand the wheel at an angle of 45° against a wall and press the rim in with the foot (see fig.), so that the tire bead is forced against the flange of the rim. Then turn the wheel over and proceed in the same manner on the other side. Next, inflate the tire by pumping powerfully until the beads take up their correct position against the flange.
   If no other equipment is available, a rope and stick will serve the purpose — see fig. The best method, however, is to use a special tool, known as a tire bead spreader.
   c. When the tire seals against the rim, insert the needle valve and inflate the tire to a pressure of about 57 psi (4 kg/cm²), subsequently reducing the pressure to the correct value.
   d. Don't forget to refit the valve cap.

Replacement of tire valve

Two different types of air valves are available, viz. metal clamp-in valves and rubber snap-in valves with a metal stem. See fig.

After having taken off the tire, fit a new valve as follows:



METAL CLAMP-IN VALVE

1. Valve cap
2. Valve insert
3. Nut
4. Washer
5. Outer rubber washer
6. Inner rubber washer
7. Valve stem

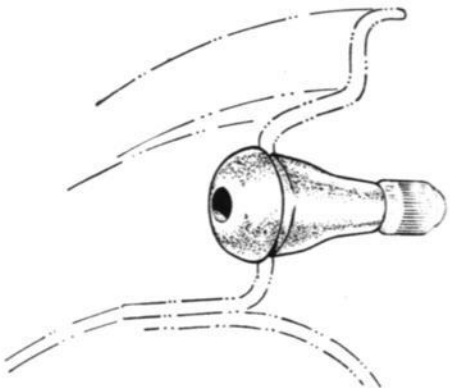
Metal clamp-in valve

Removal

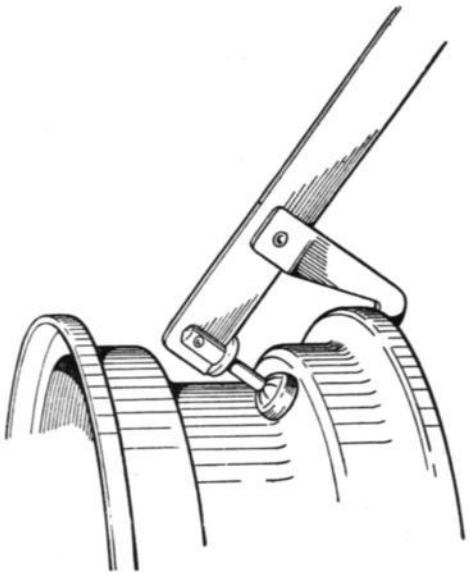
1. Back off the nut on the outside of the rim.
2. Remove the metal washer and outer rubber washer.
3. Remove the valve, together with the inner rubber washer.

Installation

1. Thoroughly clean the inside of the rim round the valve hole with emery cloth or steel wool, and wipe the outside with a damp cloth. Also check that the edge of the valve hole is smooth.
2. Place the collared rubber washer on the valve stem with the collar outwards.
3. Insert the valve, complete with rubber washer, into the valve hole.
4. Place the outer rubber washer round the valve on the outside of the rim.
5. Put on the metal washer with its concave side against the rubber washer.
6. Screw on the nut and tighten it until the outer rubber washer is pressed about 0.04 in. (1 mm) out under the metal washer.



RUBBER SNAP-IN VALVE



FITTING A RUBBER SNAP-IN VALVE

Rubber snap-in valve

Removal

If the rubber snap-in valve is to be removed, it must be cut away from the rim.

Installation

1. Thoroughly clean the inside of the rim at the valve hole with emery cloth or steel wool, and wipe the outside with a damp cloth. Also check that the edge of the valve hole is smooth.
2. Fit the valve, using the special tool as illustrated. Drive the valve into its hole by pressing the tool handle upwards. Drive the valve in so far that its inner flange fits snugly against the inside of the rim and the outer flange is entirely on the outside of the rim.

Care of tires

Tire life is highly dependent on proper care and on how the car is driven. The tire account represents a substantial portion of the total maintenance costs, and proper tire care is therefore well worthwhile. If tire wear is abnormal, the wheel alignment should be checked.

Advice and instructions for proper tire care

1. Correct wheel alignment: check toe-in especially. See Section 601.
2. Same brake effect on all four wheels. See Section 511.
3. Moderate speed in curves.
4. Avoid fierce acceleration, violent braking and hard driving in general, as the resultant high tire temperatures lead to increased wear.
5. Balanced wheels.
6. Avoid driving over or into sharp objects, stones, kerbs, etc.
7. Make sure that tires are not fouled by oil or grease from garage or workshop floors.
8. Protect the tires from exposure to strong sun or severe cold.
9. Use chains only when absolutely essential.
10. Always entrust tire repairs to a specialist shop.

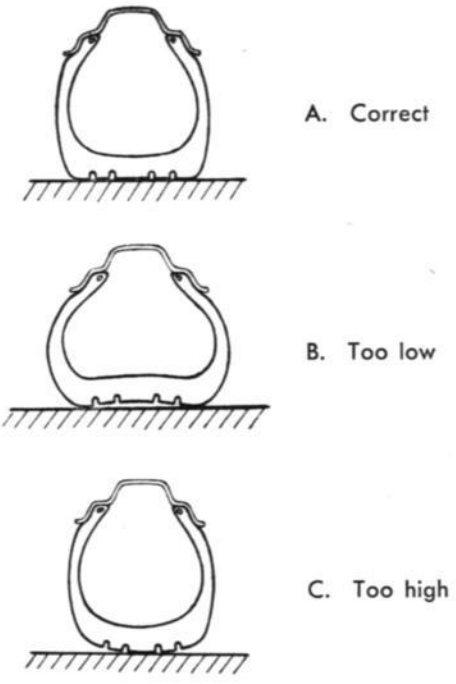
Tire pressure

One of the basic prerequisites of long tire life is the maintenance of correct pressures. Check tire pressures every week.

A. When the tire pressure is correct, the entire tread is in contact with the road, giving a good grip and even wear.

B. If the tire pressure is too low, the tire sinks down so that the tread is subject to most wear on the sides. The tire walls are flexed excessively and may crack as a result. Cord breakage, which is difficult to repair, may be incurred and there is also a risk that cord plies and theads will be separated. Too low a tire pressure also increases the tendency to roll in curves.

C. Excessive tire pressure, in contrast, counteracts unevenness in the road surface unsatisfactorily and causes the tire to swell so that only the middle part of the tread remains in contact with the road. This results in rapid tire wear, and the tread tends to crack, especially at the bottom of the lengthwise grooves in the thread pattern, thus increasing the risk of blow-outs.



TIRE PRESSURE

Wheel balancing

To avoid vibration (shimmying) and resultant excessive wear, it is essential for the wheels to be properly balanced both statically and dynamically.

A statically balanced wheel should be able to stop in any position when suspended and able to rotate freely. Static balance is achieved by fitting the wheel on a spindle rotating in a low-friction bearing or rolling on horizontal rails. All the parts must be thoroughly cleaned and the tire correctly inflated.

A dynamically balanced wheel will run in a plane at right-angles to the axis of rotation, i.e. it must not tend to be thrown out of line.

Special equipment is required for wheel balancing. Some types of equipment balance wheels separately, others balance them while fitted. If the latter type is used, take pains when balancing front wheels to apply the jack under the ball joint nearest the wheel to ensure horizontal positioning of the drive shaft. Lock the opposite wheel. New wheels should not be balanced until after 600—900 miles (1,000—1,500 km), so that the tires have time to accommodate themselves to the rim.

Wheels should be rebalanced after considerable mileage, since tire wear affects weight distribution.

> NOTE!
>
> When using a wheel balancing apparatus that allows the wheel to remain on the car it is very important that the speedometer does not show more than 40 mph (70 km/h).

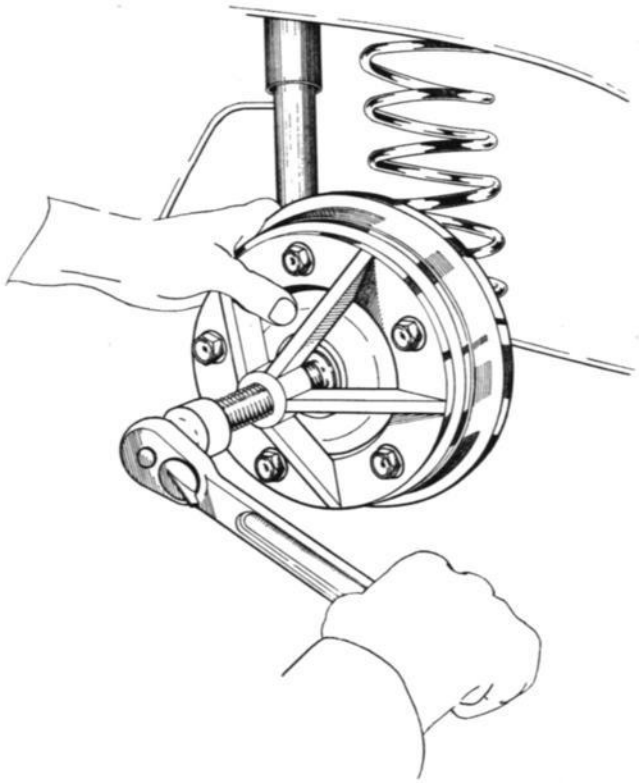
HUBS

General

The hub and brake drum on the Saab 95 and 96 are made as an integral casting, while the Saab Sport features a special hub for the front wheels.
After considerable mileage, especially if lubrication has not been satisfactory, the wheel bearings may become worn and play will develop. Since this has a highly detrimental effect on the steering characteristics, the bearings must be renewed. Bearing play is easily checked if the car is jacked up. Hold the wheel at top and bottom and try to wiggle it: this will immediately reveal any unwanted play. If the play, measured at the edge of the rim, exceeds 0.08 in. (2 mm), the bearing must be changed. Do not subject the bearings to blows under any circumstances, since such treatment could easily damage them. In addition to the tools mentioned in the instructions, an arbor press will be needed for removal and installation of wheel bearings.

Removal of hub

1. Before starting work, make sure that the car is thoroughly cleaned under the fenders. Scrape off all dirt that might loosen and enter the bearings.
2. Remove the hub cap and back off the wheel bolts.
3. When the rear hub is involved, remove the dust cap, followed by the cotter pin, the castle nut and the washer.
4. Jack up the front or rear part of the car, as appropriate.
5. Take off the wheel.
6. If dealing with the rear wheel hub, check that the handbrake is released and back off the brake adjusting bolts. On a front hub, set back the brake shoes with the aid of an arbor or similar implement inserted through the hole in the brake drum. Apply the hub puller — see fig. — and secure it with the ordinary wheel bolts.
7. Pull off the hub.
8. Prevent sand and other foreign matter from entering the hub seals and bearings by covering these items over with clean cloths.



HUB PULLER

Installation of hub

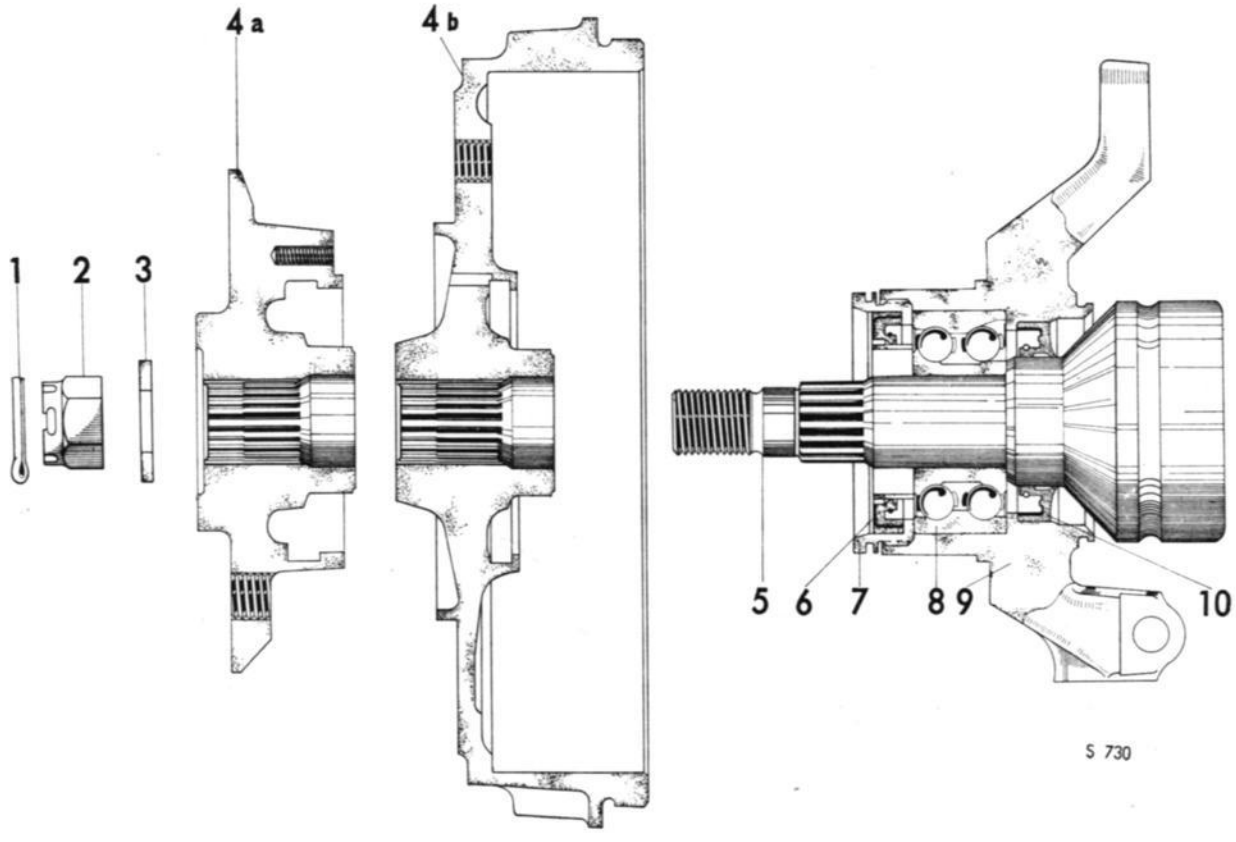
Clean the hub thoroughly and make sure that there is no dirt in the shaft seal.

1. Before installing, grease the tongue and sliding surface of the shaft seal.
2. Fit the hub on the shaft. Put on the washer and tighten the castle nut using a torque of 130 ft-lb (18 kgm) for the front hub and 68 ft-lb (9.5 kgm) for the rear hub.
3. Secure the castle nut with the cotter pin. Refit the wheel and the hub cap.

Front wheel hub

The front wheel hub is splined to the outer drive shaft and secured by means of a castle nut and cotter pin. The sliding surface on the inside of the hub must be well protected against scratches and blow marks when the hub is removed. It must seal properly against the shaft seal, and its rounded edge towards the end face must also be protected. If the sliding surface is scratched or otherwise damaged it must be trimmed and polished. This job should be done in a lathe, but great pains must be taken to avoid appreciable reduction of the diameter of the sliding surface.

Due attention to these precautionary measures is of the utmost importance, as neglect in this respect results in rapid wear of the shaft seal: grease from the ball bearings may enter the wheel hub and be carried to the brake drum where it will ruin the brake linings. Instructions for replacement of front-wheel bearings and seal are given in chapter 6.

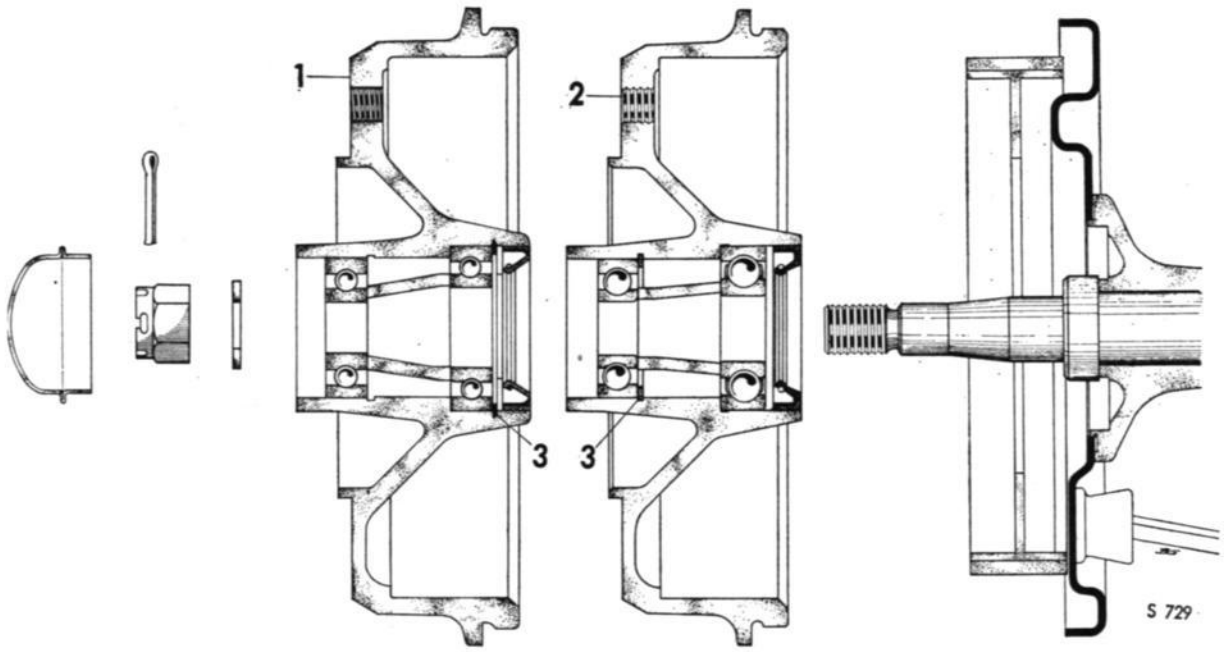


FRONT WHEEL HUB

1. Cotter pin
2. Castle nut
3. Washer
4a. Hub, Saab Sport
4b. Hub, Saab 95/96
5. Drive shaft
6. Shaft seal
7. Nut
8. Ball bearing
9. Steering knuckle housing
10. Sealing ring

Rear wheel hub

Ball bearings are fitted in the rear wheel hubs. These, together with the shaft seal, accompany the hub when it is removed. There are two different types of attachments for the ball bearings — one is used for the Saab 95 and the other for the Saab 96 and Saab Sport.
The axle stubs are also different.



REAR WHEEL HUB

1. Hub, Saab 95
2. Hub, Saab 96 and Sport
3. Lock ring

Replacement of ball bearings in rear wheel hub, Saab 96 and Saab Sport

Removal

Before starting work, make sure that the car is thoroughly cleaned under the fenders. Scrape off all dirt that might loosen and enter the bearings.

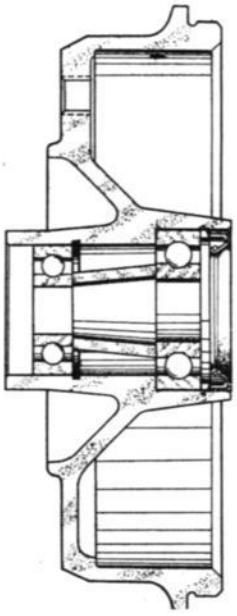
1. Jack up the car and remove the wheel.
2. Remove the dust cap, using a screwdriver.
3. Remove the cotter pin, castle nut and washer.
4. Check that the handbrake is fully released.
5. Pull off the brake drum, using puller No. 784002 or 784201. See fig.
6. Insert a suitable arbor in the tapered spacer sleeve from the inside and press out the outer bearing.
7. Press out the inner bearing and remove the circlip if appropriate.

Installation

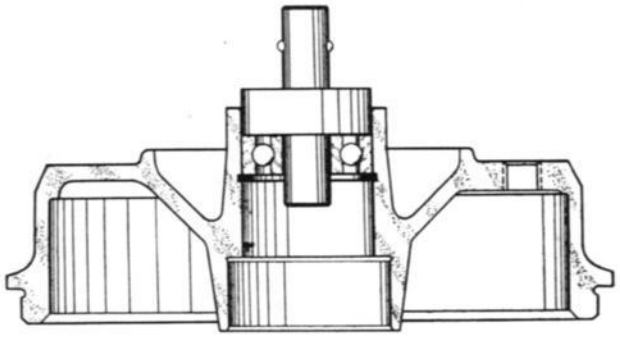
Clean all the components thoroughly, and replace worn or damaged parts by new ones. Pay particular attention to the shaft seal, and fit a new one at the slightest sign of damage or wear.

> IMPORTANT
>
> The bearings and tapered sleeve included in a bearing set must always be installed together to ensure a correct fitting. The bearings must always be located with their markings outwards, i.e. away from each other, so that the markings are visible after assembly.

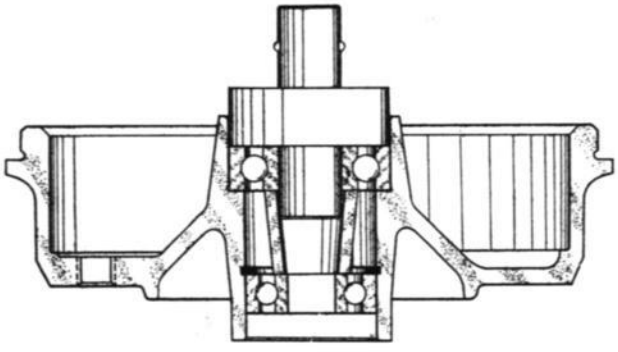
1. Fit the circlip in the hub.
2. Press in the small bearing, using tool No. 784033. See fig.
3. Insert the tapered spacer sleeve and half fill the space with SAAB Special grease. Note: if too much grease is applied, it may ooze out and ruin the brake linings.
4. Press in the big bearing, using tool No. 784032. See fig.
5. Refit the shaft seal in the hub.
6. Check that the sliding surface of the shaft seal is flawless. If damaged, adjust it and polish with a very fine emery cloth. Grease the sliding surface with SAAB Special grease.
7. Refit the brake drum and tighten the castle nut with a torque of 65 ft-lb (9 kgm). Secure with the cotter pin.
8. Refit the dust cap, using tool No. 784036.
9. Refit the wheel and lower the car to the floor.



COMPONENTS OF REAR WHEEL BEARINGS, SAAB 96 AND SPORT



PRESSING IN THE SMALL BEARING WITH TOOL 784033, SAAB 96 AND SPORT



PRESSING IN THE BIG BEARING WITH TOOL 784032, SAAB 96 AND SPORT

Replacement of ball bearing in rear wheel hub, Saab 95

Removal

Before starting work, make sure that the car is thoroughly cleaned under the fenders. Scrape off all dirt that might loosen and enter the bearings.

1. Jack up the car and remove the wheel.
2. Remove the dust cap, using a screwdriver.
3. Remove the cotter pin, castle nut and washer.
4. Check that the handbrake is fully released.
5. Pull off the brake drum, using puller No. 784002. See fig.
6. Remove the shaft seal and the circlip.
7. From outside the brake drum, press out both bearings.

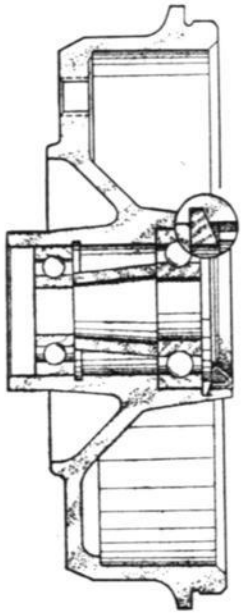
Installation

Clean all the components thoroughly, and provide new parts in place of any worn or damaged ones. Fit a new shaft seal.

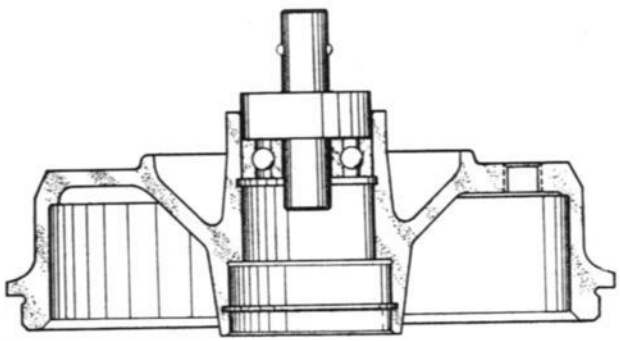
1. Pack the ball bearings with SAAB Special grease. See the chapter on "Lubrication".
2. Press in the small bearing 0.5 in. (12 mm) from the edge, using tool No. 784033. See fig.
3. Turn the hub over and fill the brake drum with enough grease to occupy about half the space between the bearings. Note: if too much grease is applied, it may ooze out and ruin the brake linings.
4. Insert the spacer sleeve and press in the big bearing, using tool No. 784032. See fig.
5. Refit the circlip.

> NOTE
>
> The circlip is of a special type and must always be mounted as shown in the figure.

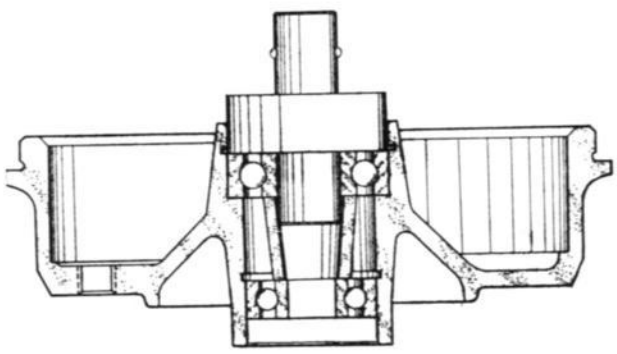
6. Fit a new shaft seal.
7. Check that the sliding surface of the shaft seal is flawless. If damaged, adjust it and polish with a very fine emery cloth. Grease the sliding surface with SAAB Special grease.
8. Refit the brake drum and tighten the castle nut with a torque of 65 ft-lb (9 kgm). Secure with the cotter pin.
9. Refit the dust cap, using tool No. 784036.
10. Refit the wheel and lower the car to the floor.



COMPONENTS OR REAR WHEEL BEARINGS, SAAB 95



PRESSING IN THE SMALL BEARING WITH TOOL NO. 784033, SAAB 95



PRESSING IN THE BIG BEARING WITH TOOL NO. 784032, SAAB 95

CONTENTS

Nov. 1964

DESCRIPTION

Body assembly

The Saab 95, 96 and Sport models all have bodies of unit construction, i.e. without a separate chassis frame. Fenders, doors, hood and luggage-compartment lid are removable. The body is composed of a relatively small number of pressed steel parts which are joined together by spot-welded or tack-welded overlapping seams. In addition, all vital junctions are solid-welded. The illustrations below show those parts of the body which together form the welded body assembly.

As fas as the body is concerned, the Saab Sport is practically identical with the Saab 96, the only essential difference being that the Saab Sport has two moldings low down along the sides instead of the fender moldings on the Saab 96.

The Saab 95 differs from the Saab 96 in that the rear end and the roof are different.

The roof panel is a single pressed steel part, extending from the dash panel to the leading edge of the luggage-compartment lid. Pressed reinforcement frames are fitted round the windshield and rear window. Tubular reinforcement is provided in the windshield pillars, while steel-section roof rails add rigidity to the sides of the roof.

The cowl section of the roof panel terminates in front of the windshield with a vertical reinforcement panel which, together with the dash panel and the windshield reinforcement frame, forms a closed compartment. The space thus enclosed serves as a collecting chamber for ventilation air, which flows in through the opening in the upper side of the chamber and which can be admitted to the car either through a flap on the righthand side of the dash-panel or through the fresh-air heater.

The floor consists of a single smooth panel, with longitudinal channels affording the necessary stiffening. At the sides, rigidity is provided by the sills, to which the jack supports are welded. At the front, the center floor adjoins the dash panel, and at the rear the rear-axle tunnel. The engine-compartment floor pan is joined to the center floor at the dash panel, and the luggage-compartment floor pan behind the rear-axle tunnel.

The wheel-house walls are of pressed steel, channeled for reinforcement. The two front wheel houses are pierced for the control arms and tie-rods, as well as to allow evacuation of the current of air passing through the radiator. Some of the air outlets are fitted with gills. The brackets for the front control arms are welded to the inside of the wheel-house walls and to the engine-compartment floor.

One of the rear wheel-house walls is pierced for the fuel filler pipe, the other being fitted with a bracket for fitting the rear muffler. The upper spring seats and shock-absorber brackets are welded to the wheel houses at both front and rear.

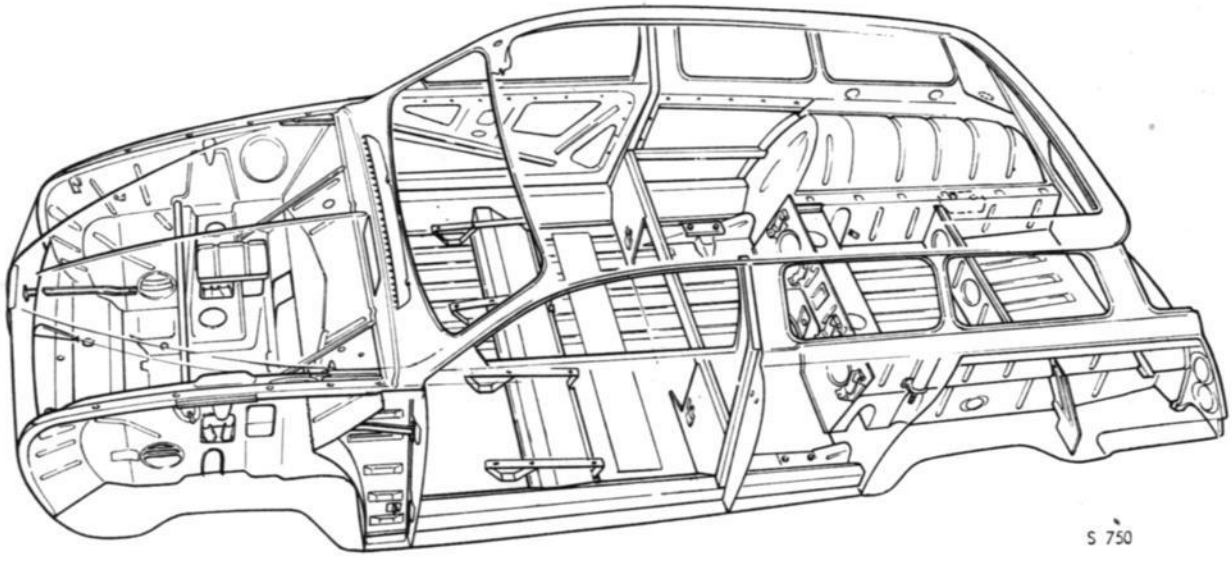
The luggage compartment of the Saab 96 and Saab Sport comprises the rearmost part of the body and is limited at the front end by the removable back cushion of the rear seat. The compartment floor consists of a sheet of plywood, divided into two parts, under which the fuel tank and spare wheel are housed. The luggage-compartment lid is carried on two hinges and fitted with a counterbalanced check device.

In the Saab 95, the whole of the space behind the front seats may be utilized for baggage by folding back the rear seats.

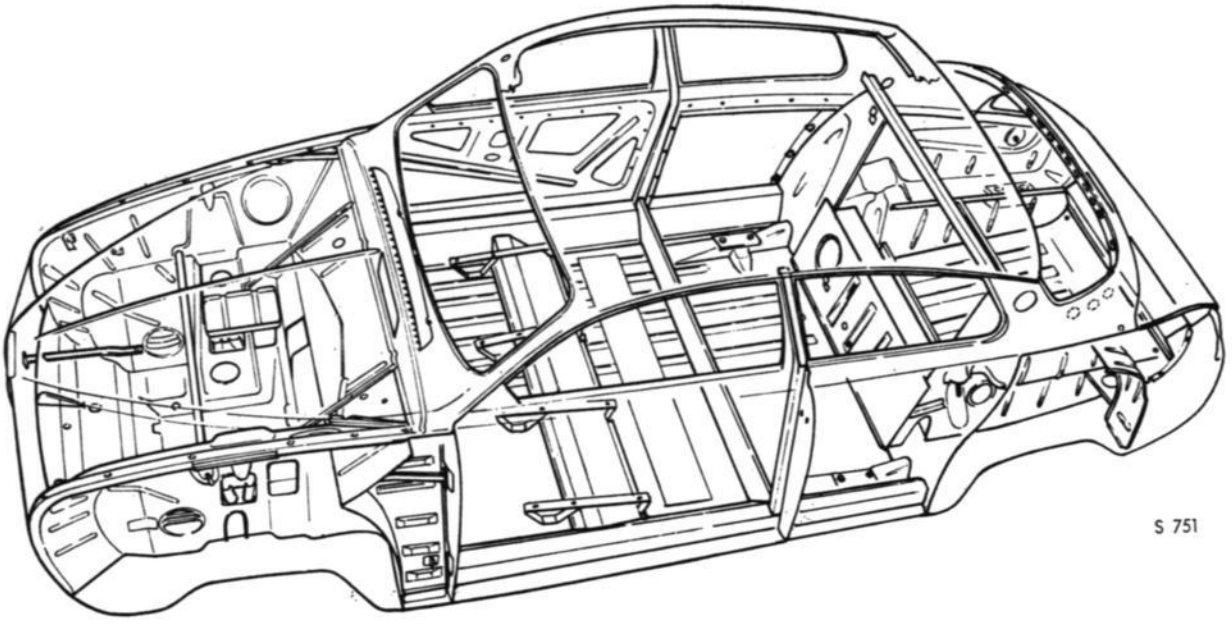
Body insulation

Passenger and rear compartments are internally insulated with waffle-pattern paperboard.

A layer of insulation compound has also been sprayed on the underside of the body assembly and inside the wheelhouses. This compound affords protection against flying stones and corrosion, besides having certain sound absorbing properties. When cleaning the car, never scrape the inside of the wheelhouses.



BODY, SAAB 95

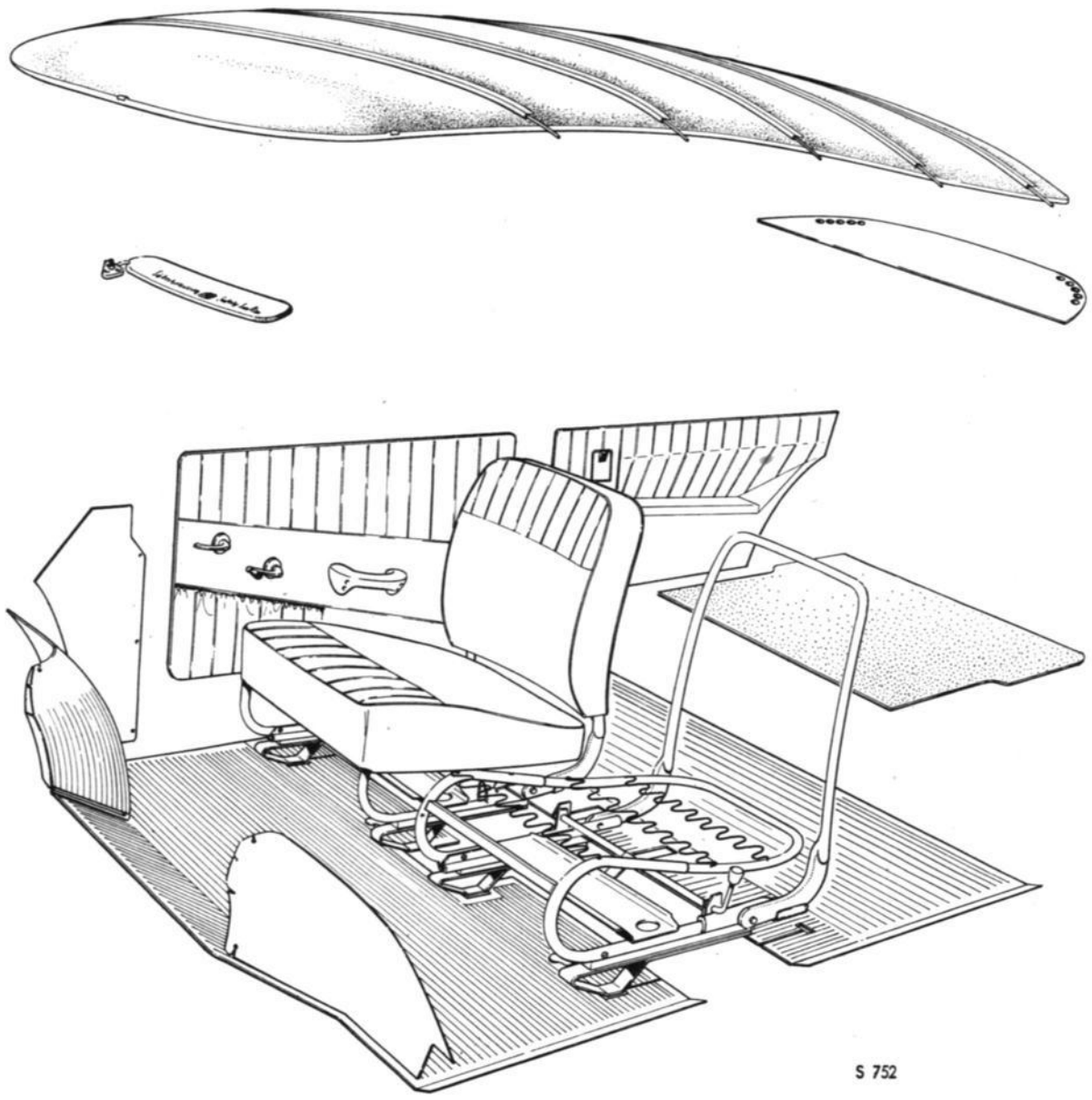


BODY, SAAB 96

Body fitments

Apart from the seats, the interior fitments of Saab cars comprise trim panels and mats, retained by quick-release spring clips, and the headlining, which is stretched on piano-wire bows and retained by wire spirals along the roof rails. Because of the simplicity of the retaining devices, all parts are easy to remove.

The fitments provided in the Saab 95 and 96 are identical, except for the rear seat cushions, the headlining and the mats behind the door pillars. The fitments of the Saab Sport, on the other hand, differ appreciably from those in the other models, and only the headlinings, front wheelhouse mats and dash-panel trim are fully exchangeable.



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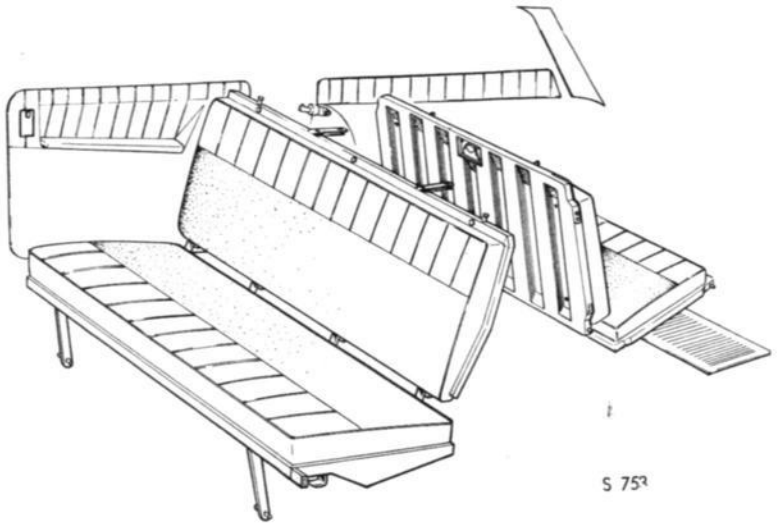
FITMENTS, SAAB 96



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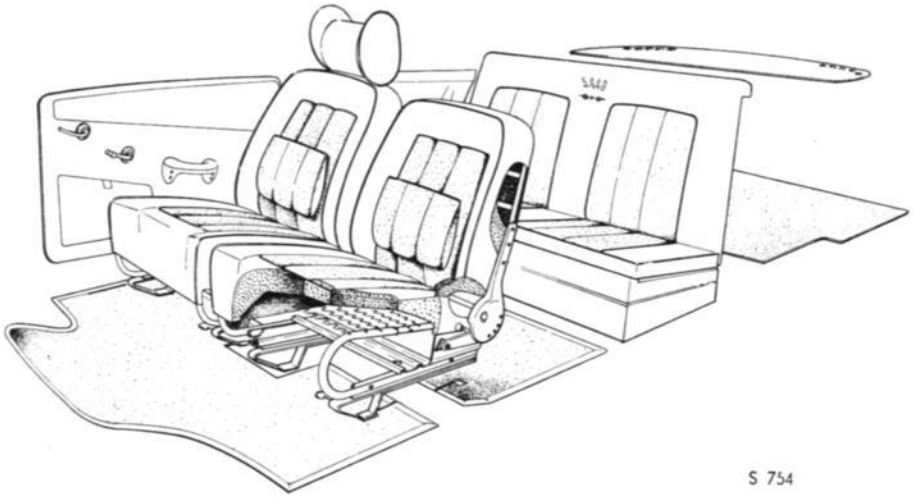
REAR SEAT, SAAB 95



S 754

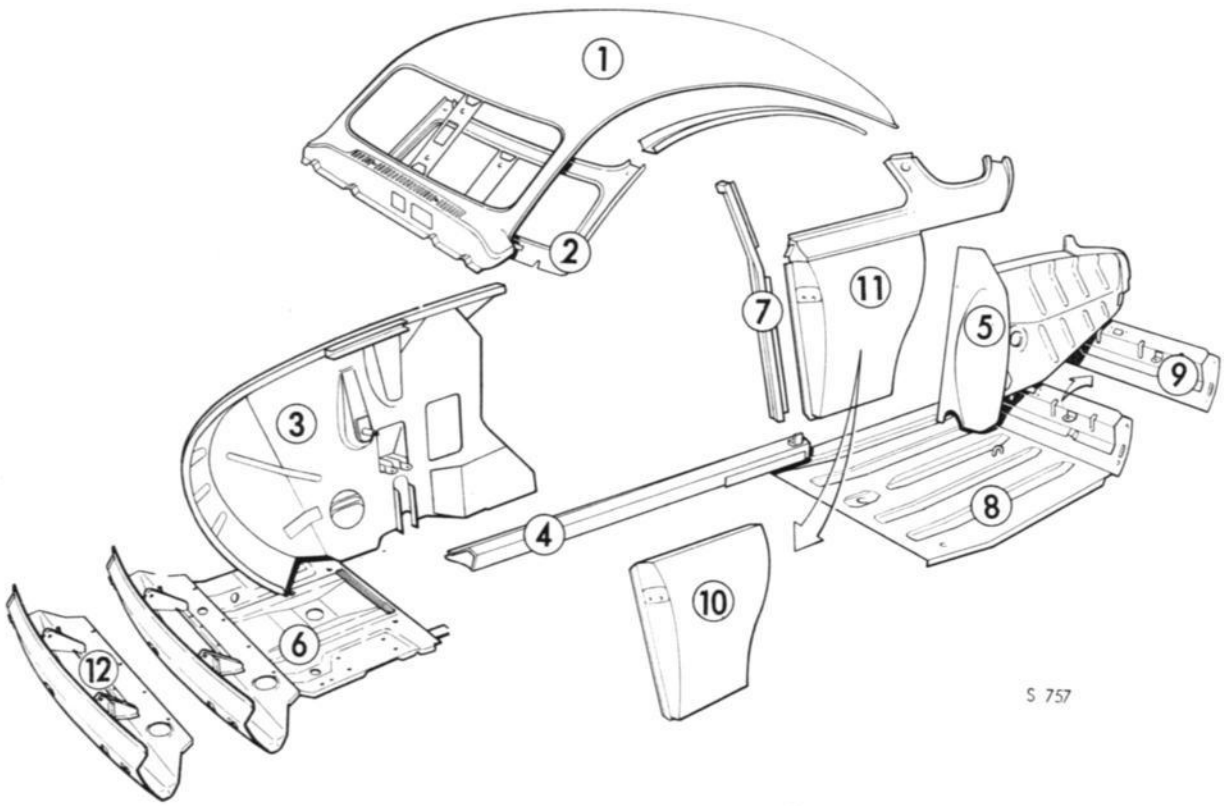
FITMENTS, SAAB SPORT

BODY ASSEMBLY

General

Any parts of the body assembly that have been so seriously damaged as the result of a collision or other accident that correction by beating or realigning is not suitable should be replaced by new ones. In many cases, even minor damage may be more quickly and cheaply repaired, and with better results, if the affected parts are replaced rather than repaired.

Some of the body panels available as spare parts are shown in the illustration below.



BODY ASSEMBLY COMPONENTS AVAILABLE AS SPARE PARTS

1. Roof sheet, water channel
2. Windshield frame
3. Front wheelhouse
4. Sill
5. Rear wheel house
6. Front floor
7. Rear pillar
8. Floor sheet, rear floor
9. Rear part
10. External valance, lower
11. External valance, complete
12. Front sheet

Removal of damaged body panels

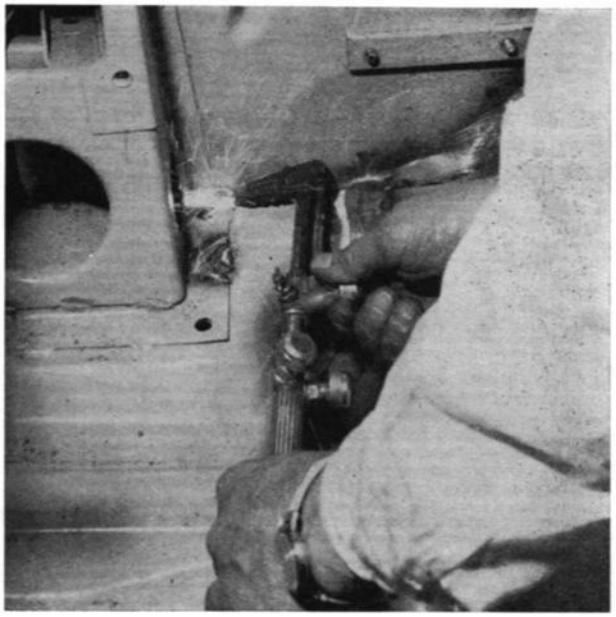
When removing damaged body panels, great care should be exercised if burner tools are used, since this method readily causes heat stresses in the panels, resulting in distortion. Instead, panels should be removed with shears, saws or pneumatic chisels.

A method which often simplifies work is to cut the panel away with a burner at a distance of at least 1.2 in. (30 mm) from the scribed line, and then make the final trim with shears or a saw.

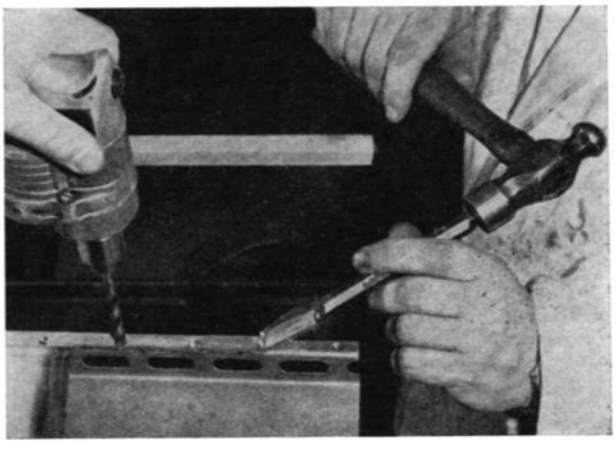
Tack-welded body panels must be removed with a burner, working as close to the weld point as possible, but not so close as to cause heat deformation of the undamaged panel.

Break off the remaining metal strip, and grind or chisel off any weld remains. See fig.

Spot-welded body panels are removed in a similar manner with a burner, so that a metal strip with the weld itself remains. Avoid cutting too near the actual weld. After burning, drill through each weld, using a bit with a diameter slightly bigger than the diameter of the spot weld, and drill through only the strip of metal that is to be removed. As the spot welds are pierced, roll and prize away the metal strip. Then grind off any weld remains. See fig.



REMOVING TACK-WELDED BODY PANELS

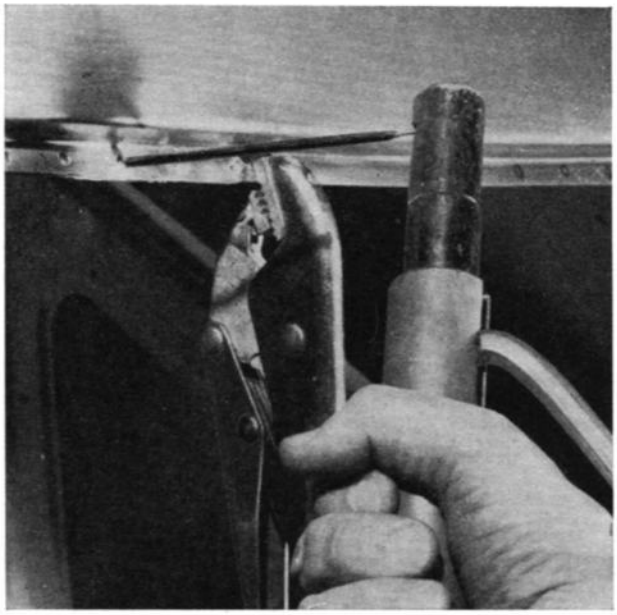


REMOVING SPOT-WELDED BODY PANELS

Welding new body panels

If the damaged panel was spot-welded, the replacement part should also be spot-welded. This is particularly important in the case of roof rails and other visible parts. A wide range of welding rods for this purpose is available on the market. If a spot-welding rod is not available, however, plug welding may be resorted to. Drill 0.2-in. (5-mm) holes in the overlying panel at the same center-to-center distances as the previous spot welds. Place the two panels together and fill the holes with the electric welding tool. On visible parts, it is difficult to obtain a neat finish by this method. See fig.

Originally tack-welded seams should be remade by electric welding in the same manner as the original weld. If only part of a panel has been replaced (the damaged section having been cut off), the new piece must be joined by acetylene welding. Locate the parts flush with the new joint in close contact. If double sheet is involved, weld on both sides. To avoid distortion, first join the parts with a few tack welds. Then finish welding, dealing with only short lengths at a time. Hammer the weld immediately, before it has had time to cool, in order to avoid residual stresses.

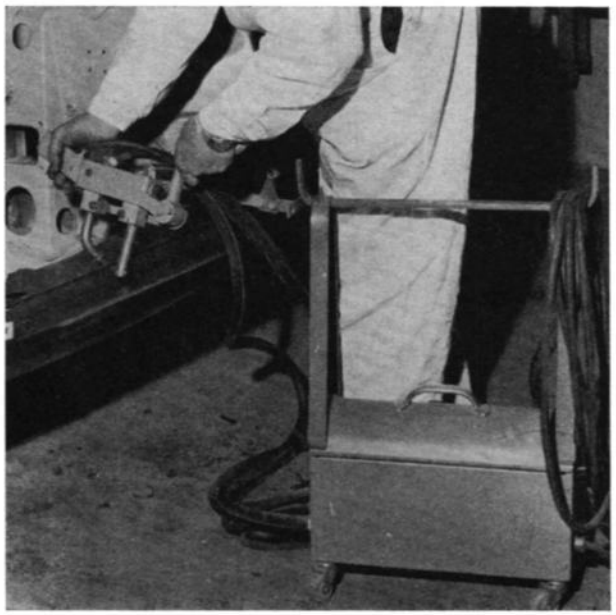


PLUG WELDING

Sealing and finishing

It is of the utmost importance for new body panels to be effectively degreased after welding. After that, the panel can be primed and enamelled.

Coat the outsides of wheel houses, sills and floor panels with underseal composition. Panel seams through which water can enter the car must be closed with body sealing putty. Important joints in this category are found between, for instance, the roof panel and roof rail and between the upper and lower side panels.



SPOT WELDING

REPAIRS TO FRONT END OF BODY

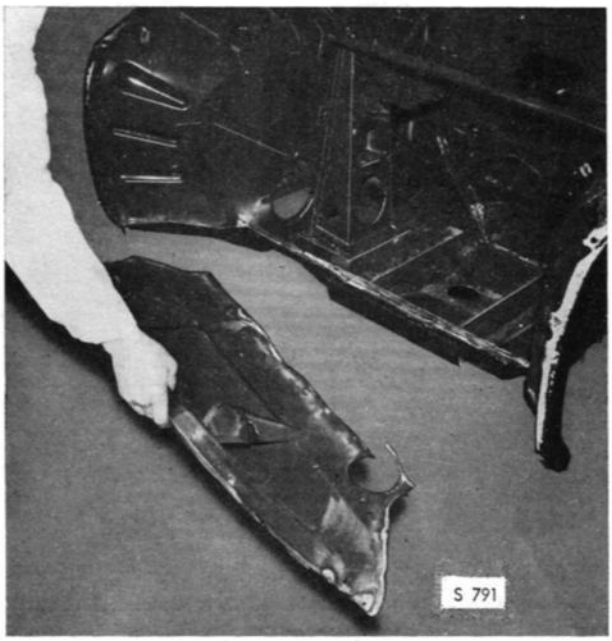
Disassembly

Work is simplified if all parts affected by the repair job in hand, such as hood, fenders, engine, transmission, chassis items and insulation and wiring inside the car, are first removed. If only one wheel house is damaged, it may suffice to remove the engine and the chassis items on the damaged side. Proceed in accordance with the disassembly instructions, which are to be found in the chapter dealing with the unit concerned.

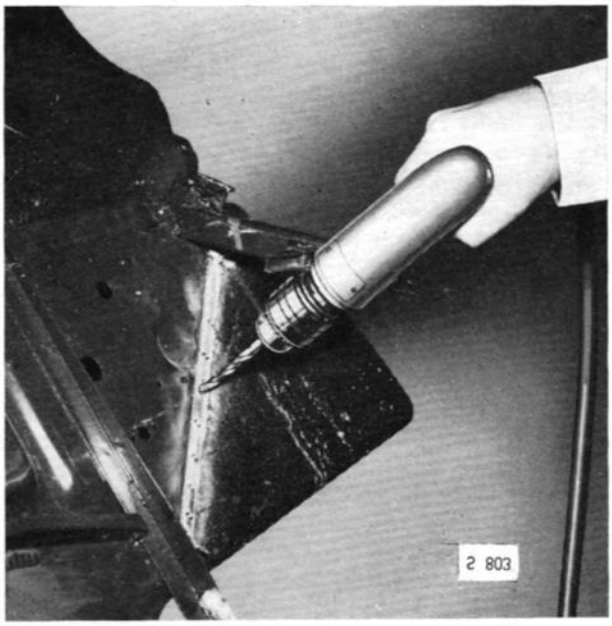
Front cross-member

Whereas minor damage to the front cross-member can be repaired by straightening, this item is generally changed, as it is relatively simple to replace.

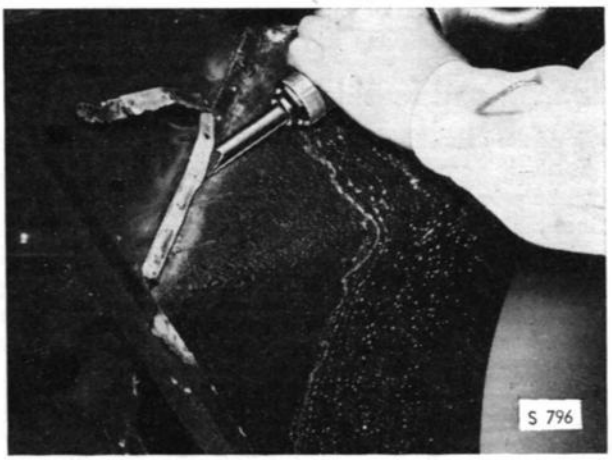
1. Cut or chisel off the front cross-member from the wheel house and floor panel.
2. Next, drill away the spot welds. These will be easier to find if you first grind with emery cloth.
3. Chisel off the remaining strip of panel and trim with a grinding disc.



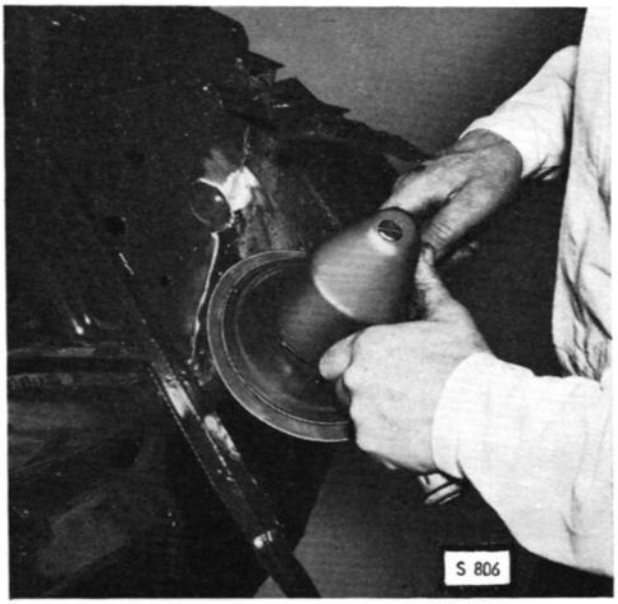
REMOVAL OF FRONT CROSS-MEMBER BY CUTTING OR CHISELING



REMOVING SPOT-WELDS BY DRILLING



CHISELING OFF REMAINING METAL STRIPS

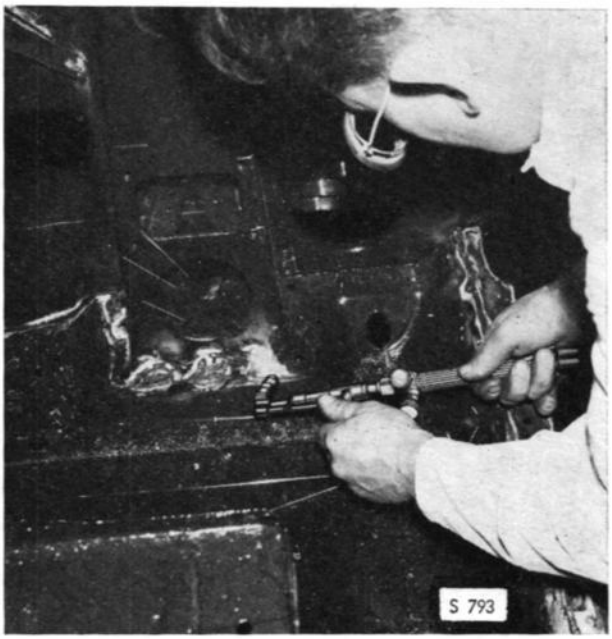


GRINDING AWAY WELD REMAINS

Wheel house

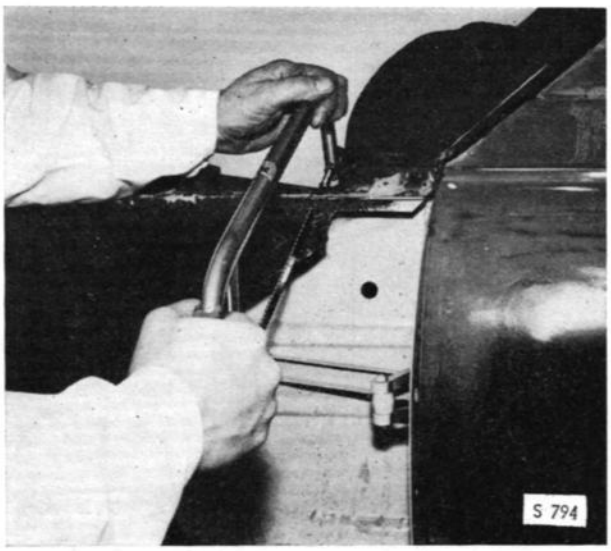
A slightly damaged wheel house can be repaired by straightening. The simplest way of doing this is to screw a support onto the front part of the wheel house, pressing the wheel house out with a jack fitted against the end of the sill. A second jack may possibly be fitted at the opposite wheel house and a support applied between the wheel houses to prevent them from giving.
If the damage is serious, and especially if sections behind the control-arm bracket are damaged, the wheel house must be replaced as described in the following:

1. Drill or cut away the wheel house from the front cross-member and floor panel.
2. Cut off the control-arm bracket as close to the floor panel as possible, but take care not to damage the floor panel.



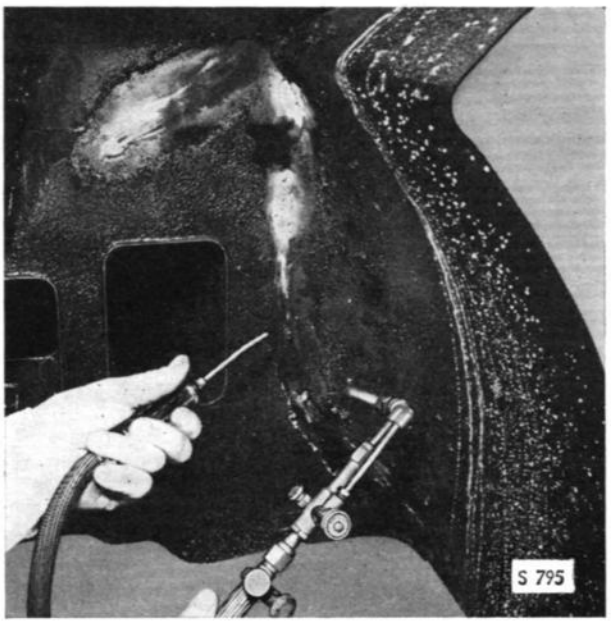
CUTTING AWAY THE WHEEL HOUSE AND CONTROL-ARM BRACKET

3. Cut the transverse stay pipe close to the reinforcement at the wheel house.
4. Drill off the hood-lock rail from the wheel-house flange.
5. Cut off from the wheel house the stay which goes up towards the dash panel.
6. Using a hacksaw, cut off the wheel-house flange at the dash panel.



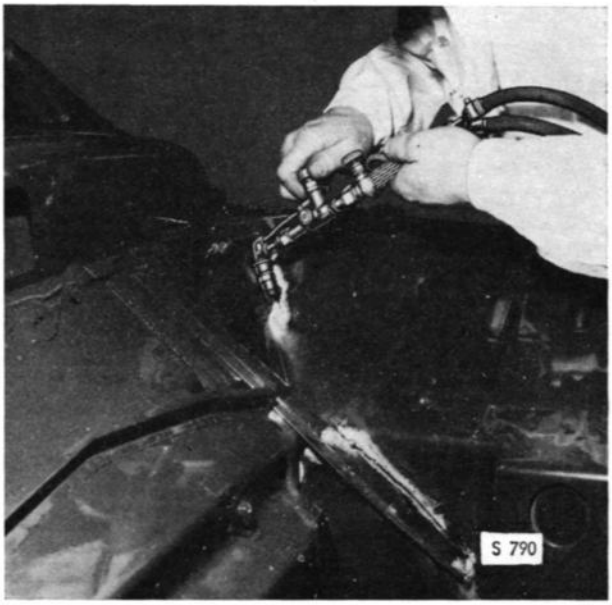
CUTTING THE WHEEL-HOUSE FLANGE BY THE DASH PANEL

7. Remove the underseal composition from the joint at the dash panel. The simplest way of doing this is to heat with a welding torch, blowing with compressed air at the same time.

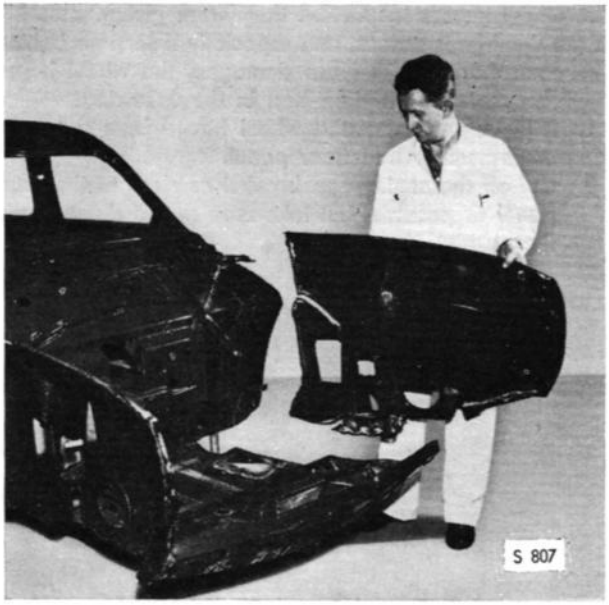


REMOVING UNDERSEAL COMPOSITION WITH A WELDING TORCH AND COMPRESSED AIR

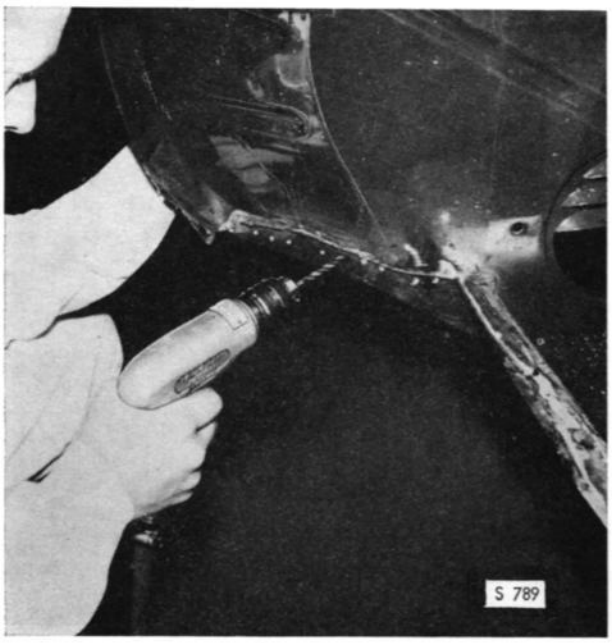
8. Cut or chisel off the wheel house from the dash panel.
9. Drill away all spot welds and chisel off the remaining strips of sheet metal.
10. Grind off all weld residues, etc., with a grinding disc.



REMOVAL OF WHEEL HOUSE FROM DASH PANEL, CUTTING OR CHISELING

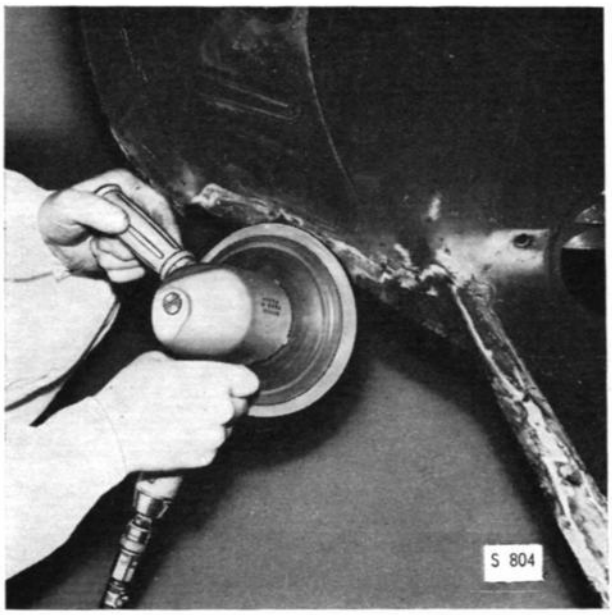


REMOVING THE WHEEL HOUSE



REMOVING SPOT-WELDS BY DRILLING

CHISELING OFF REMAINING METAL STRIPS



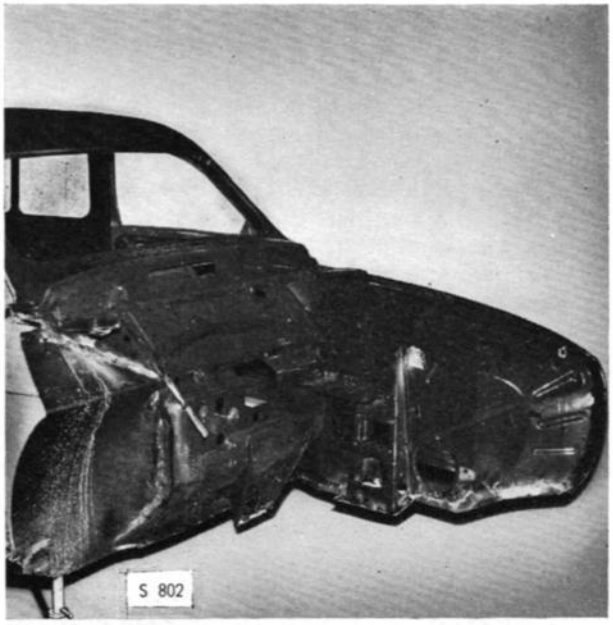
GRINDING AWAY WELD REMAINS

Floor panel

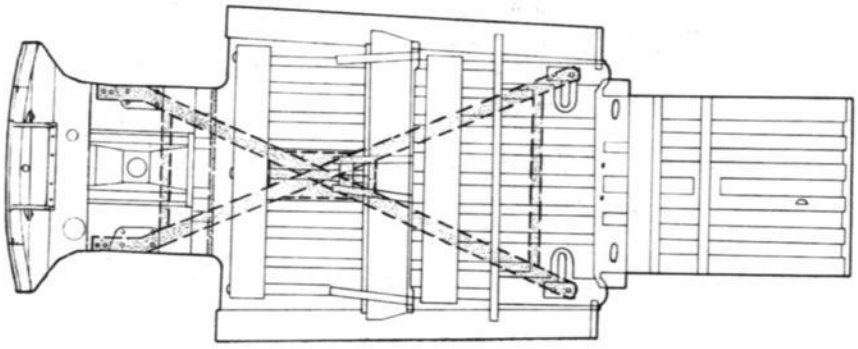
The floor panel can be replaced entirely or partly, or be straightened out, depending on the extent of the damage. If the floor panel is to be repaired by straightening, it is advisable to place a beam or similar object across the floor and to apply a jack on both sides between the end of the sill and the beam. The floor panel can then be pulled forwards into the correct position. This procedure is also used for straightening out damage to the center floor panel behind the dash panel, in which case it must be done before the front floor panel is removed.

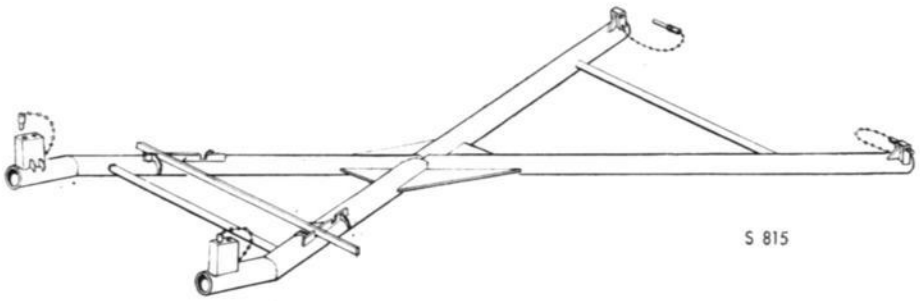
If only the front part of the floor panel, for example, is damaged, it will only be necessary to replace this part. The joint should then be commenced from the existing holes. Remove the damaged part with a cutting torch or pneumatic chisel and then fit in the corresponding new part. The job of ensuring a good fit is facilitated by commencing from the original holes in the floor panel. To change the entire floor panel, proceed as follows:

1. Cut off the front cross-member and floor from the wheel house and control-arm bracket.
2. Cut off the floor from the rear engine bracket and at the joint by the dash panel.
3. Drill of the spot welds from the remaining strips of sheet metal and then chisel of these strips.
4. Grind clean at spot-weld joints and grind away tack welds at the control-arm bracket and rear engine bracket.



CUTTING THE FLOOR LOOSE FROM THE REAR ENGINE BRACKET AND AT THE DASH PANEL, WHEEL HOUSE AND CONTROL-ARM BRACKET



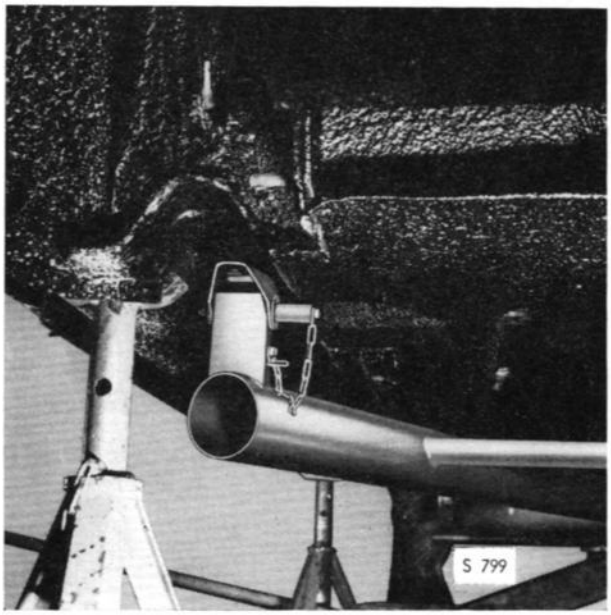


LOCATION OF TOOL No. 784077 FOR DIAGONAL ALIGNMENT OF BODY ASSEMBLY

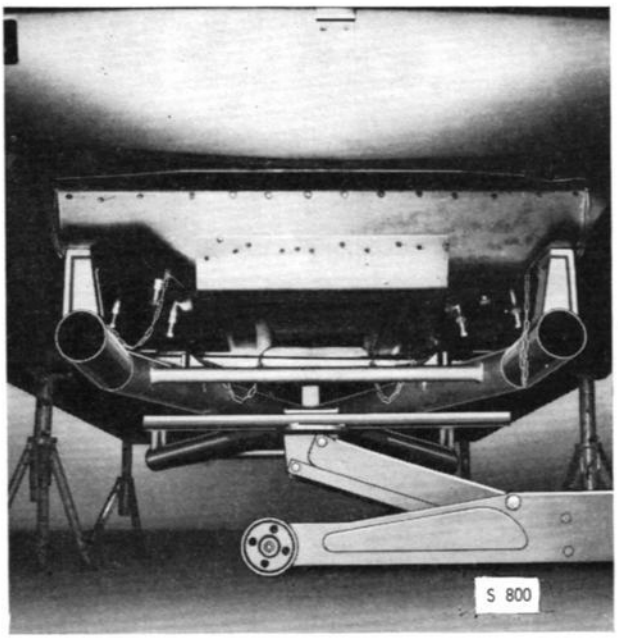
REASSEMBLY

Floor panel

1. Straighten the rear engine bracket and dash panel if these parts have been distorted. Straighten and grind off weld remains at joints against the wheel house and dash panel.
2. Fit the new front floor panel, using tool No. 784077. Fit the tool under the body, in the brackets for the rear-axle side links. At the front, locate the guide studs of the tool in the rear hole of the cleat and the rear hole for the stabilizer-bar bearings in the floor panel. (For earlier models, use the corresponding front holes in the tool and the floor panel.)
3. Place a jack under the tool and lift the floor panel into position against the control-arm brackets.
4. Fit a new wheel house also, if this item is to be changed. See below.
5. Bolt the floor panel to the control-arm brackets on the wheel houses.

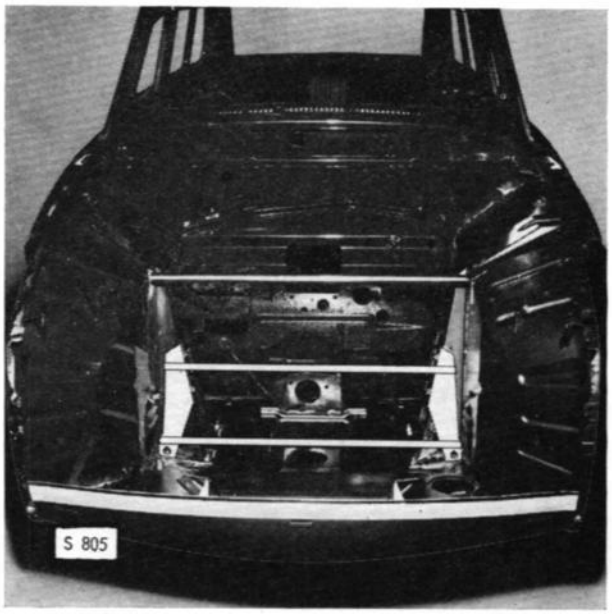


FITTING TOOL No. 784077 IN THE BRACKETS FOR THE REAR-AXLE SIDE LINKS



FITTING THE FLOOR PANEL WITH THE AID OF TOOL No. 784077 AND USING A JACK

6. Screw tool No. 784145 to the control-arm brackets on the wheel houses, whereupon the correct relative position is obtained between the wheel houses.



BOLTING THE WHEEL HOUSE TO THE FLOOR AND FITTING OF TOOL No. 784145.

7. Using the jack located under tool No. 784077, lift the floor panel to the correct height, according to the dimensions indicated in the dimensional sketch.
8. If the wheel house has also been replaced, fix it to the dash panel with electric welding.
9. Electrically weld the floor panel at the rear edge. Meanwhile, press the floor panel up into position against the center floor with the aid of a jack fitted under the loose steel straight edge on tool No. 784077.
10. Tack-weld the wheel-house brackets to the floor and hammer the weld before is has cooled. Use a support on the opposite side.
11. Spot-weld or plug-weld the floor panel to the wheel houses.

If the above-mentioned tools, No. 784077 and 784145, are not available, the floor panel can be fitted according to the dimensional sketch.

Wheel house

1. Straighten and grind off weld remains at the joints against the dash panel and floor panel.
2. Fit the upper, rear corner of the wheel house by cutting with a hacksaw.
3. Tighten the wheel house to the floor panel with bolts through the holes in the control-arm bracket.
4. Screw tool No. 784145 to the control-arm brackets of the wheel houses to ensure the correct relative positions between the wheel houses.

5. Jack up the floor panel to the correct height, see dimensional sketch and check that the hood fits.
7. If necessary, fit a new side stay and weld it on.
8. Tack-weld the wheel-house brackets to the floor and, using a support on the opposite side, hammer the weld before it has cooled.
9. Spot-weld or plug-weld the floor panel to the wheel house.

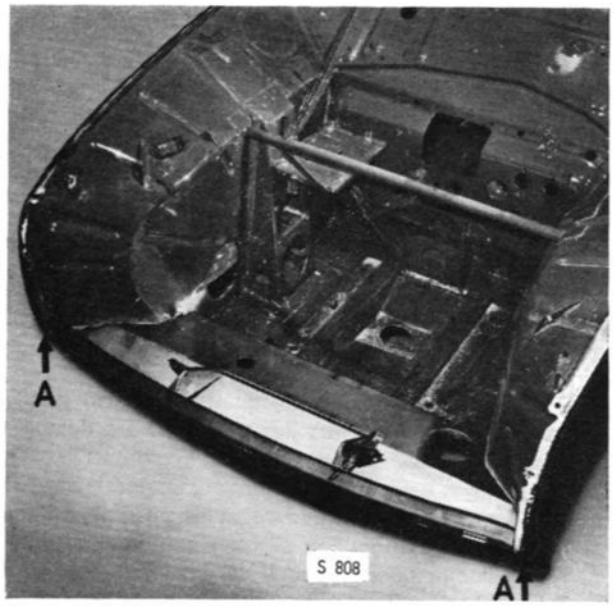
Front cross-member and engine bracket

1. Locate the front cross-member with clamps and bolts through the holes for the front panel.
2. Fit tool No. 784143 to check that the distance between the engine brackets is correct.
3. Spot-weld or plug-weld at the wheel houses and tack-weld by electric welding on both sides at the floor panel and on the inside against the wheel houses.
4. If necessary, tack-weld the rear engine bracket to the floor panel.

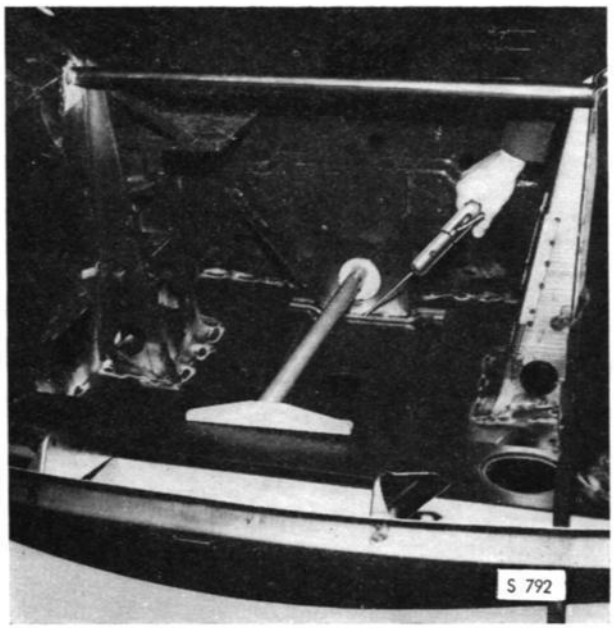
Other operations

1. Finish-weld wheel houses and front cross-member joints at the floor panel and the rear floor-panel seam at the dash panel. Check that shock-absorber brackets, etc., are adequately welded.
2. Apply surface finishes and paint.
3. Refit the rear-axle side links, front suspension, power unit, etc.

As the various items are reassembled in accordance with the instructions in the chapters concerned, make sure that damaged parts are replaced by new ones before being fitted. Particular attention should be devoted to steering-gear parts, steering arms and control arms.



ALIGNMENT OF FRONT CROSS-MEMBER — SECURED WITH BOLTS AT "A".



USE OF TOOL No. 784143 TO CHECK CORRECT DISTANCE BETWEEN ENGINE BRACKETS WHEN WELDING

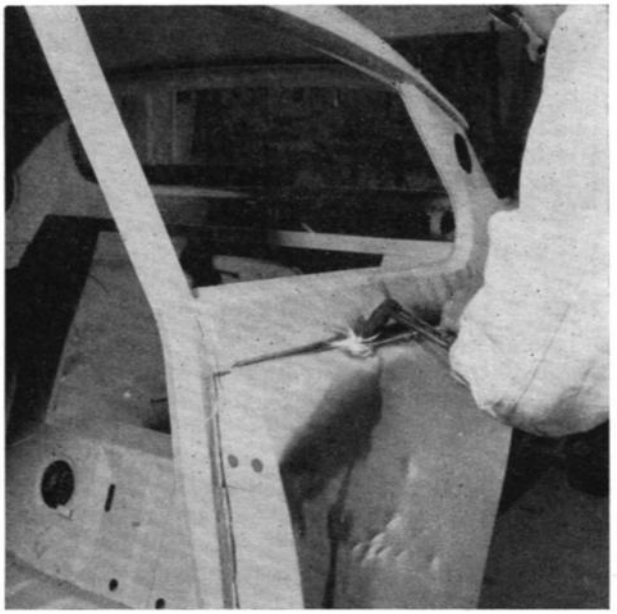
REPAIR OF BODY SIDES

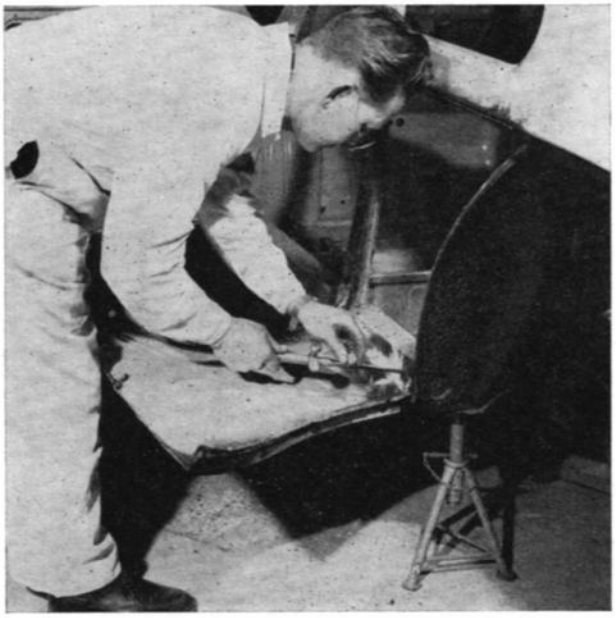
In a collision involving a blow from the side not only the door but also the external valances, rear pillar and scuff plates may be distorted. Any noticeable distortion of the rear pillar is reason for replacement.
External valances may be replaced in their entirety, while damaged parts of scuff plates may be cut for replacement.

DISASSEMBLY

Side panel assy

1. Remove door, rear fender, quarter window, quarter trim and any other trim items likely to be damaged during the following operations.
2. Using a gas cutting tool, remove damaged lower side panel as close to welded seam as possible, without risking heat deformation of wheelhouse, scuff plates, rear pillar or quarter panel.
3. Drill out spot welds and break away remaining sheet-metal strip, as shown.
4. Grind away remains of welds.





REMOVAL OF EXTERNAL VALANCES LOWER

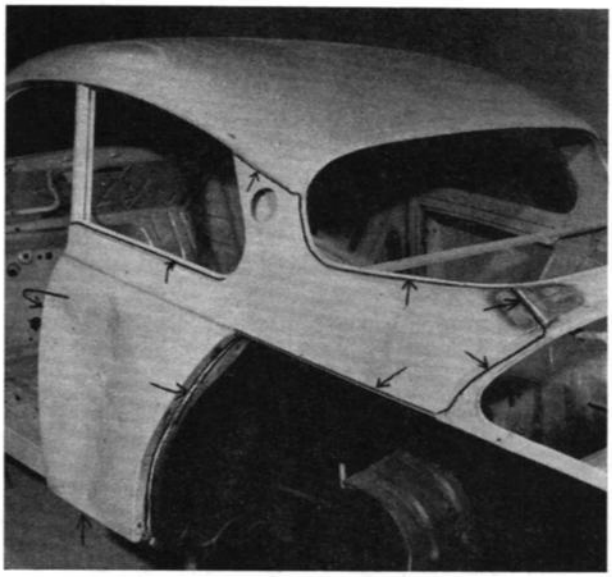
5. If damaged, the quarter panel may be removed in the same manner as the side panel. On the Saab 96 the quarter panel is joined to the quarter-window and rear-window reinforcement panels, roof panel, rear compartment surround and wheel house. There is a tinned seam at the lower side of the rear window, see fig.

Rear pillar

1. Saw through pillar at roof.
2. Chisel away welded joint between pillar and scuff plate, and pull away pillar.
3. Grind off weld remains at water channel and scuff plate.

Scuff plate

Partial damage to the scuff plate may be repaired by sawing out the affected part and welding in a new piece.



REMOVAL OF EXTERNAL VALANCES

REASSEMBLY

Scuff plate

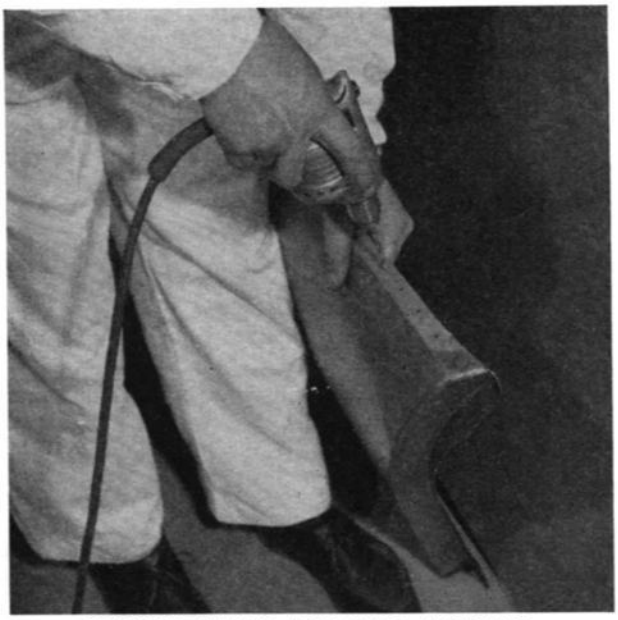
1. Fit and align new panel and weld in place.
2. Tidy up welds and fill with tin at visible points.

Rear pillar

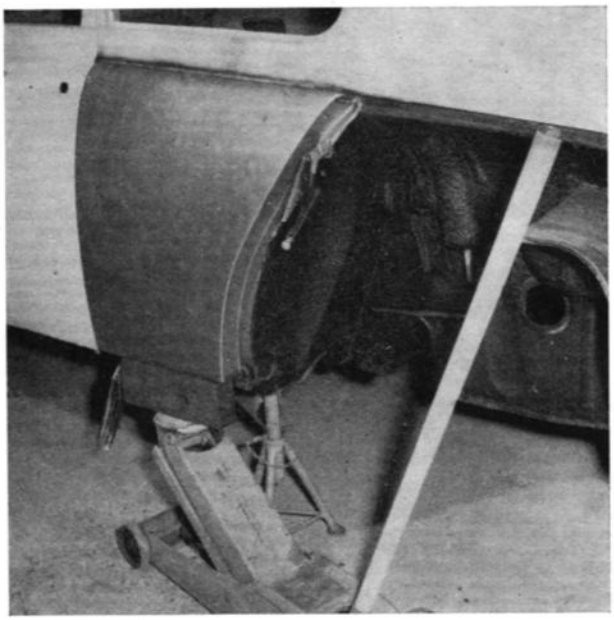
1. Align rear pillar to conform to dimension shown on illustrations. Weld temporarily in place.
2. Test fit new or realigned door.
3. Adjust to secure correct clearances round door by correcting pillar alignment.
4. Remove door and weld rear pillar finally.

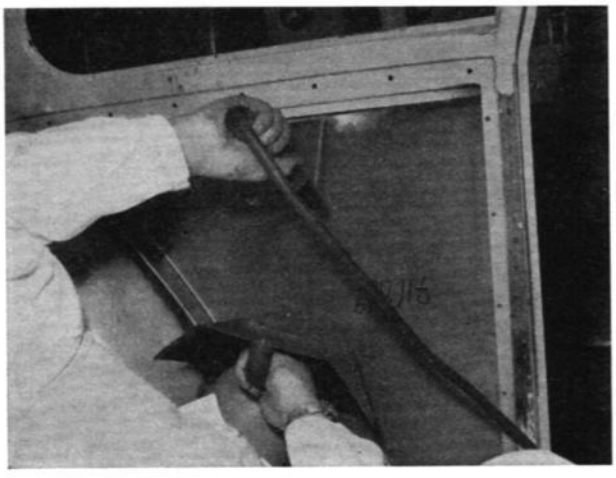
Side panel assy

1. If only lower external valance has been removed, drill holes for plug welding in upper flange of new panel. See fig.
2. If no spot-welding equipment is available, also drill holes for plug welding in flanges adjoining rear pillar, scuff plate and wheelhouse.
3. Fit external valance and align with the aid of clamps.
4. Plug weld top flange to quarter panel and spot or plug weld other joints.
5. If entire external valance assy has been removed, it may be replaced as a single part, in the case of the Saab 96 and Saab Sport. Weld the assembly to rear pillar, reinforcement panels and wheelhouse, using plug or spot welding as described in (4), above. At roof and below rear window use acetylene welding, and smooth the weld below the rear window by tin filling.



DRILLING HOLES FOR PLUG WELDING





WELDING OF EXTERNAL VALANCE

REPAIR OF ROOF ASSY

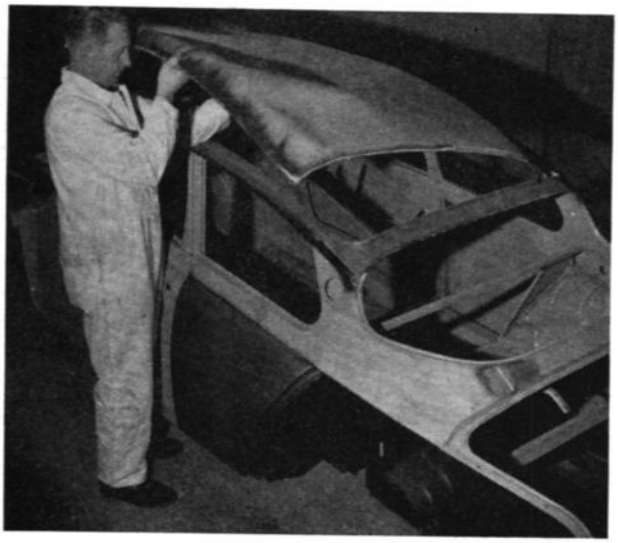
If the roof is so badly damaged that bumping is not economically feasible, the entire roof sheet including water channels and drip moldings, may be replaced.

Disassembly

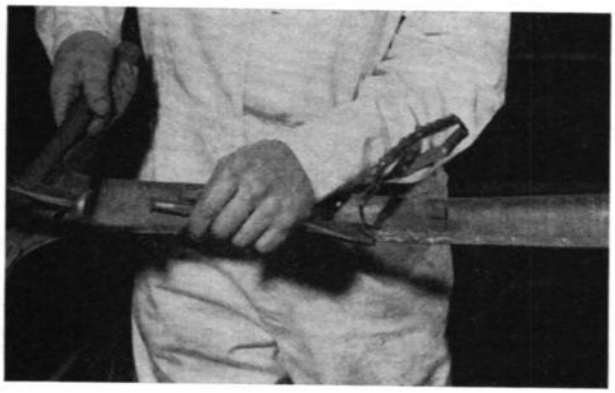
1. Jack up car and support on blocks under scuff plates and wheelhouses, on a level floor, to ensure that body will not change shape when roof is removed.
2. Remove doors, trim and wiring, and protect instrument panel and steering wheel against damage.
3. Burn away damaged roof parallel with water channels, windshield and rear window as shown in illustration, leaving a narrow strip of metal at welded joints. Then drill out spot welds and break away remaining strip.
4. After removing electrical wiring in windshield pillars, saw through pillars immediately below curve of upper corner. Allow windshield reinforcement panel to remain undisturbed if not damaged.

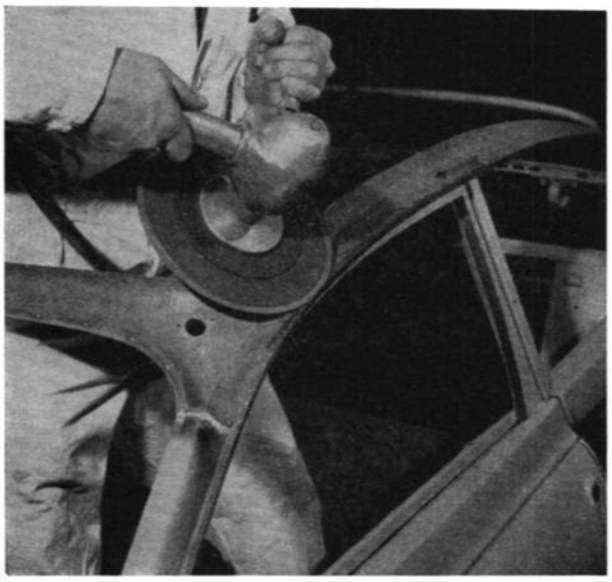
> WARNING
>
> Do not cut pillars too low down, as this will result in loss of roof support provided by tubular steel reinforcements.

5. Saw away any damaged sections of water channels, drip moldings, window reinforcements, and glass channels.
6. Grind off weld remains.



CUTTING AWAY ROOF PANEL

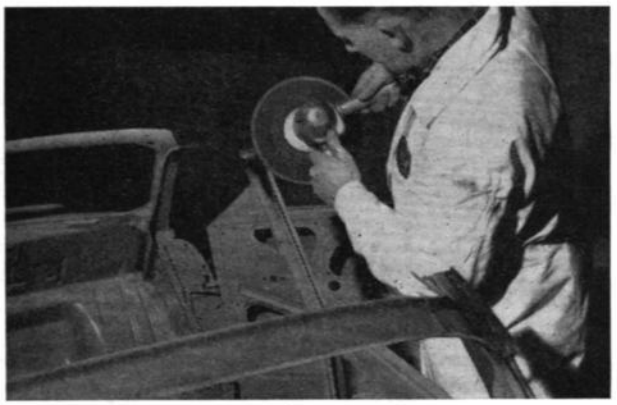




REMOVING WELD REMAINS. NOTE POINT AT WHICH PILLARS ARE CUT.

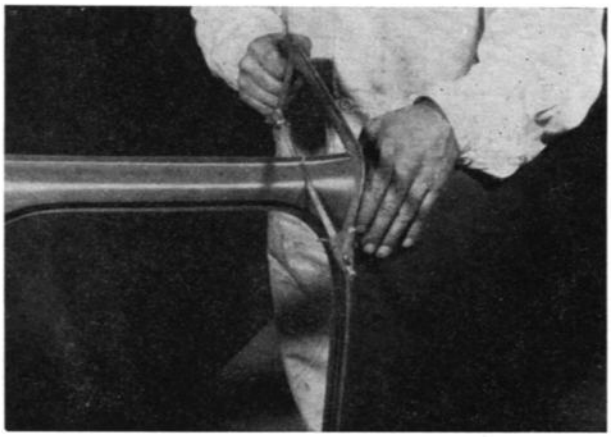
Reassembly

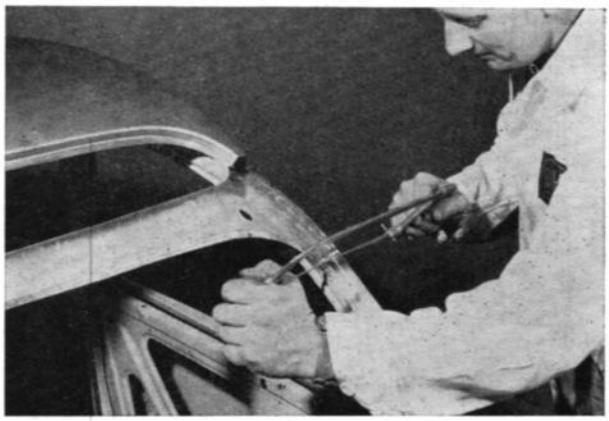
1. Fit new windshield reinforcement if required, using a windshield glass as templet for opening.
2. Replace any damaged parts of water channels and mouldings. Doors must be try-fitted to ensure correct clearance.
3. Measure diagonally location of upper end of rear pillars, to ensure symmetry and correct distance between pillars.
4. Adjust fit of new roof sheet at front edge, between windshield pillars. Use a spare glass to check size of windshield opening.
5. Attach roof sheet with a few tack welds at windshield reinforcement. Simultaneously clamp sheet at rear edge.
6. Spot or plug weld roof along water channels, starting at front end and working alternately on left and right sides.
7. Complete welding by spot or plug methods at windshield and rear window.
8. Weld roof sheet to windshield pillars and smooth off joint by tin filling.

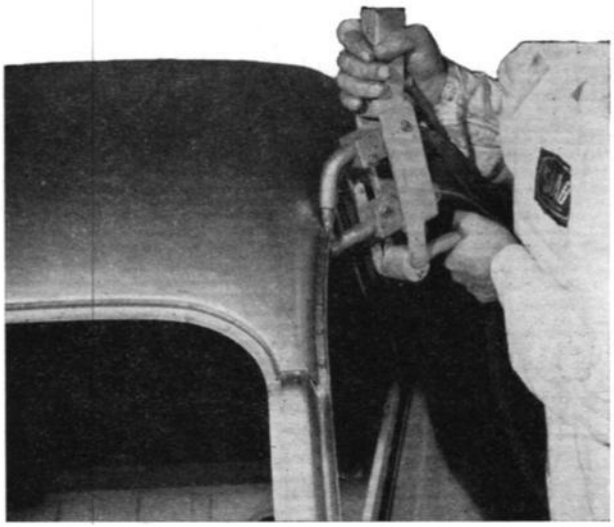


FITTING NEW ROOF RAIL AND MOULDING

DIAGONAL MEASUREMENT OF CENTER PILLAR







FITTING AND WELDING OF ROOF SHEET

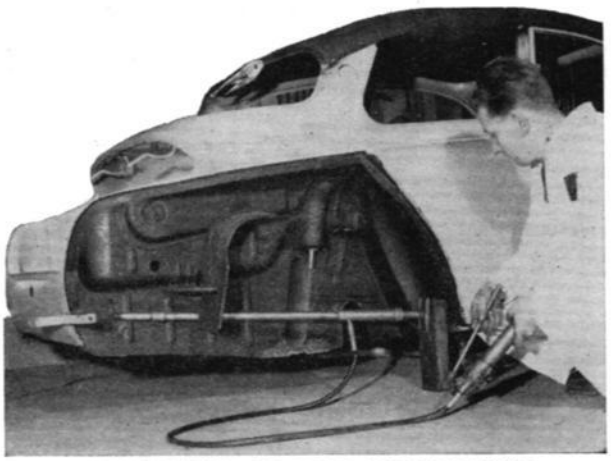
REPAIRS AT REAR END OF BODY ASSY

If a rear wheel has been struck in a collision the wheels and rear axle should be checked. If the rear axle bearings are misaligned remove the axle and correct the center bearing bracket. Also remove lower suspension arms at front end and release stabilizer bar from body attachments to permit fitting of tool No. 784077 for checking of rear axle side-link attachments. See fig. Check furthermore that the center bearing bracket is located exactly midway between side-link brackets on underside of floor panel.

The rear compartment floor pan, rear body panels and rear wheelhouses are available as service parts and may be replaced if damaged, this being resorted to if warranted by shortage of time or expence of realignment of existing panels.

A rear end which has been compressed abreast the rear axle tunnel may be restored to shape by removing the rear fenders and bolting a strong beam between the rear bumper brackets.

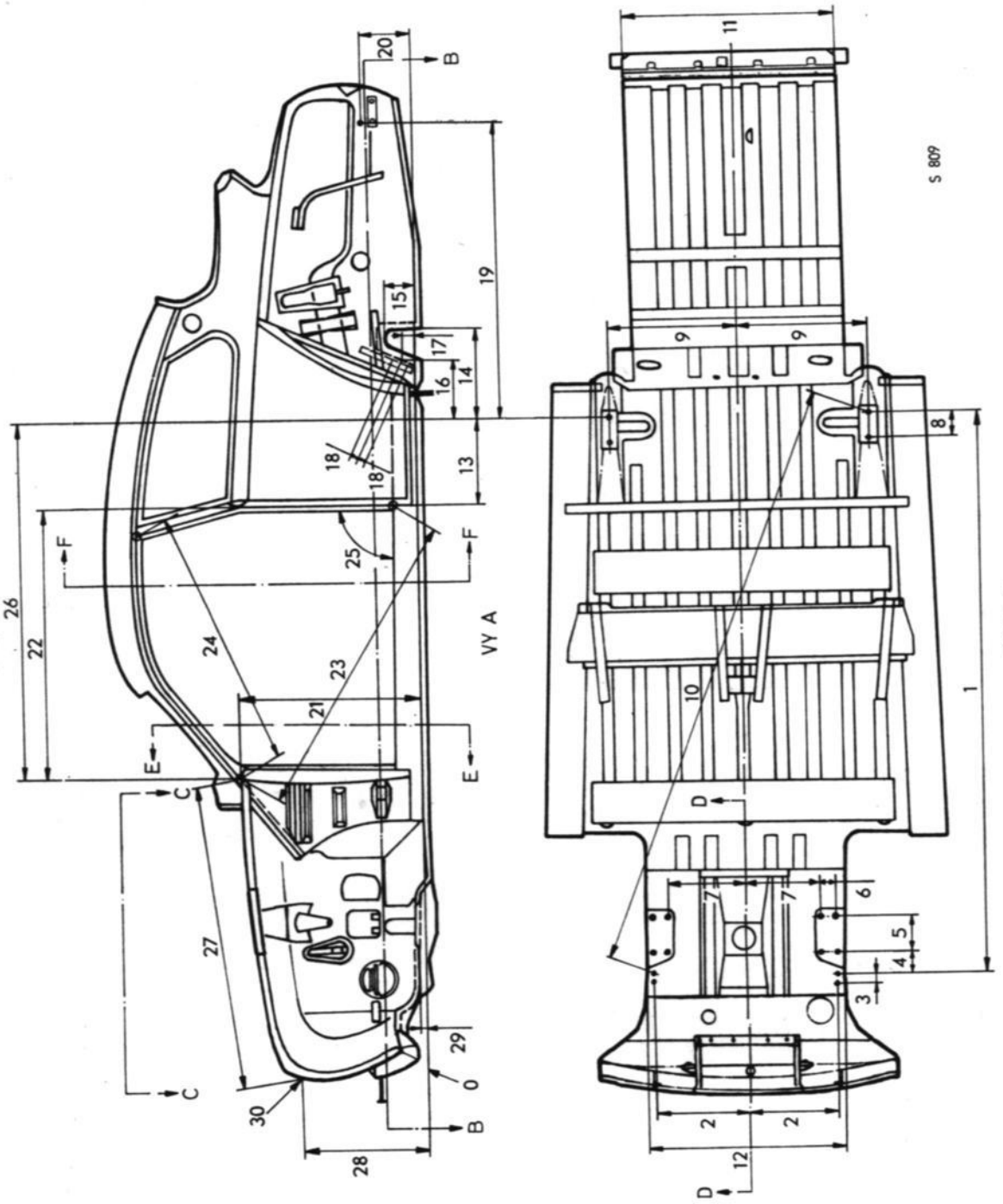
With a jack fitted on each side between this beam and the scuff ends the body may then be pressed out to correct shape.



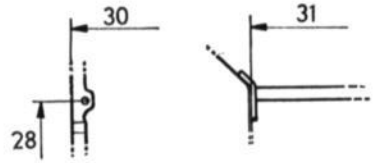
REALIGNMENT OF REAR WHEELHOUSES

CHECKING BODY DIMENSIONS

After the replacement of body panels or realignment jobs it is important that checks be made of door openings, and fixtures for suspension and power assembly. Check also body diagonal measurements to ensure that the body assembly is symmetrical and correctly aligned.

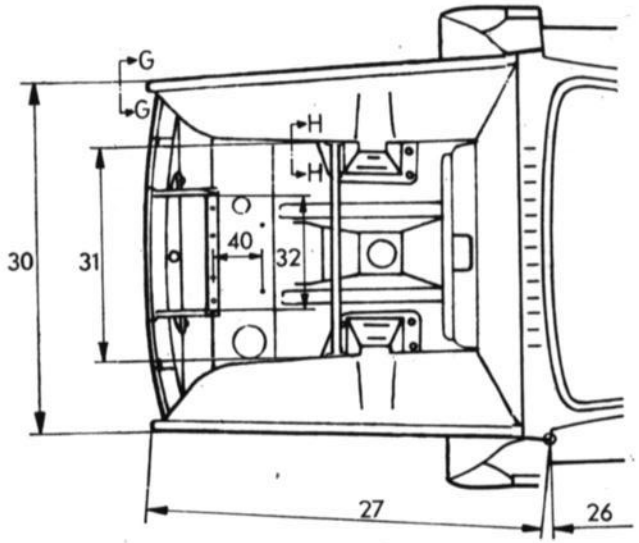


BASIC BODY MEASUREMENTS, SAAB 96

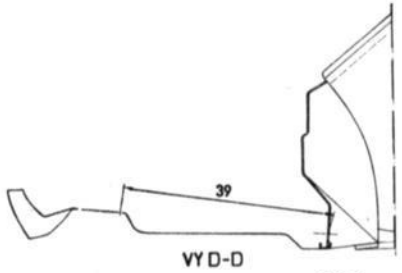


VY G-G

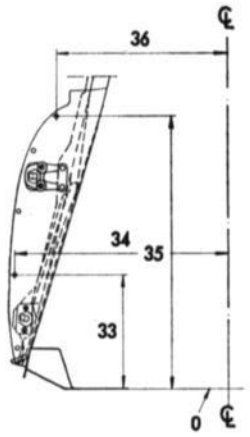
VY H-H



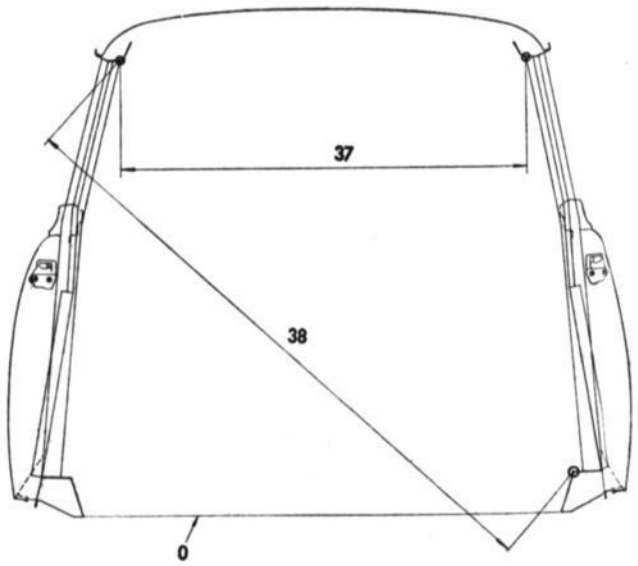
VY C-C S 810



VY D-D S 812



VY E-E

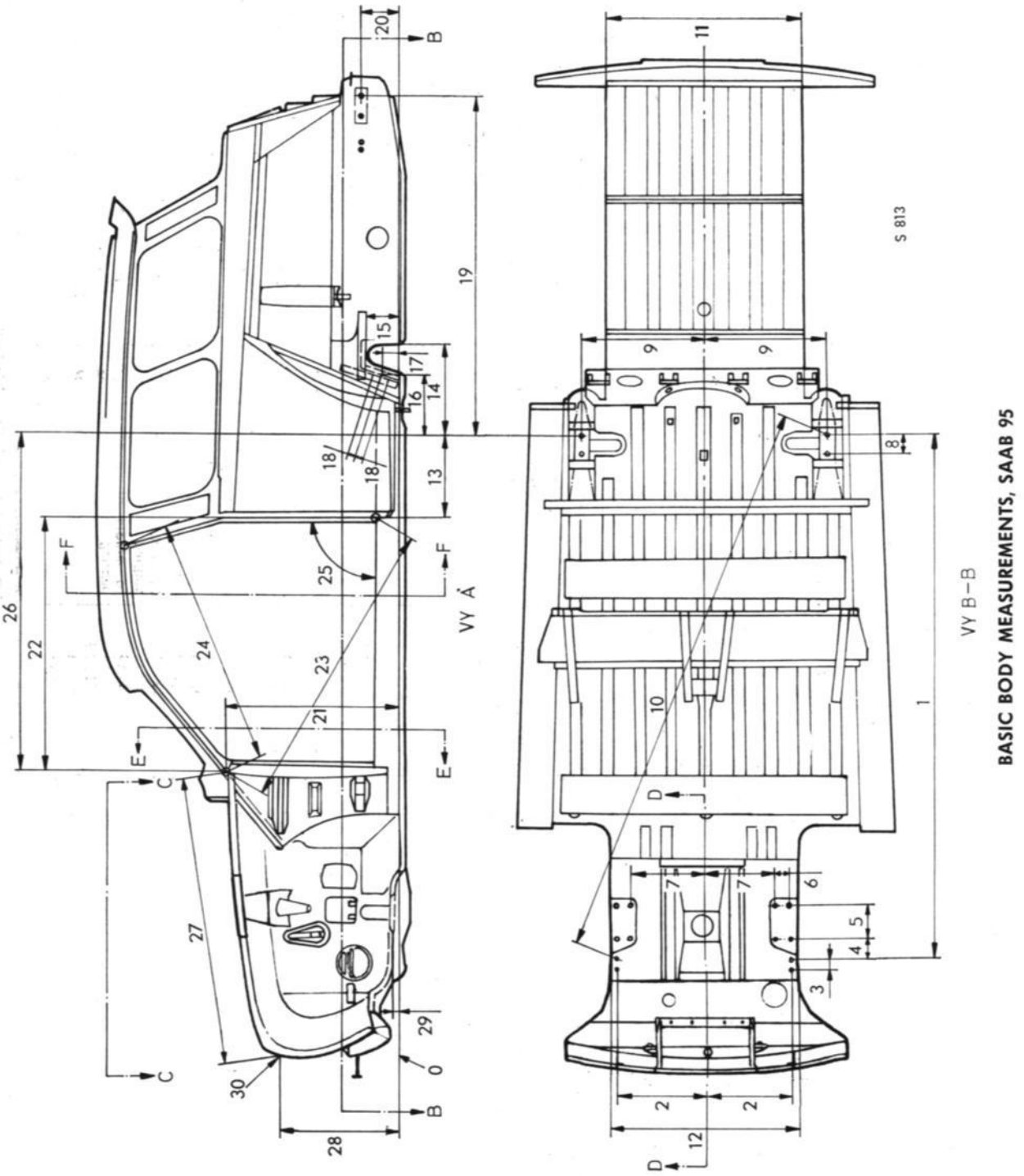


VY F-F S 811

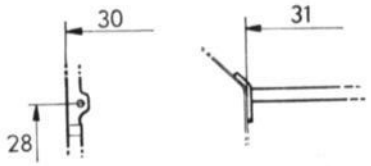
Body measurements SAAB 96 The same table with English measures on page 810-22

Item	mm.	Remarks	Item	mm.	Remarks
0	—	Underside of sill	22	1050±3	To leading edge of pillar reinforcement tube
1	**2138±2**				
2	**347±1**		23	1207±4	
3	**38±0,5**		24	1023±4	
4	**84,5±1,5**		25	90°	
5	**210±1**		26	1377±5	Tongue of cowl plate view A and C-C
6	**99±0,5**		27	**1256±3**	Measured parallel to wheelhouse. See C-C
7	**249,5±1,5**				
8	**100±0,5**		28	**420±2**	
9	**485±1,5**		29	**25±2**	
10	**2294±3**		30	**1084±2**	See view A, view C-C and view G-G
11	784±3				
12	730±2		31	**730±2**	See view C-C and view H-H
13	327±3	To leading edge of pillar reinforcement tube	32	**348±2**	See view C-C
14	365±3		33	271±3	
15	139±3		34	760±2	
16	**237±1**	To middle of center bearing	35	643±3	
			36	663±2	
17	**53±3**	To middle of center bearing	37	1006±3	To upper edge of pillar
			38	1504±4	
18	30±0,5		39	**609,5±2**	Holes for engine suspension pads
19	1161±4				
20	203±4		40	120±1	
21	706±3				

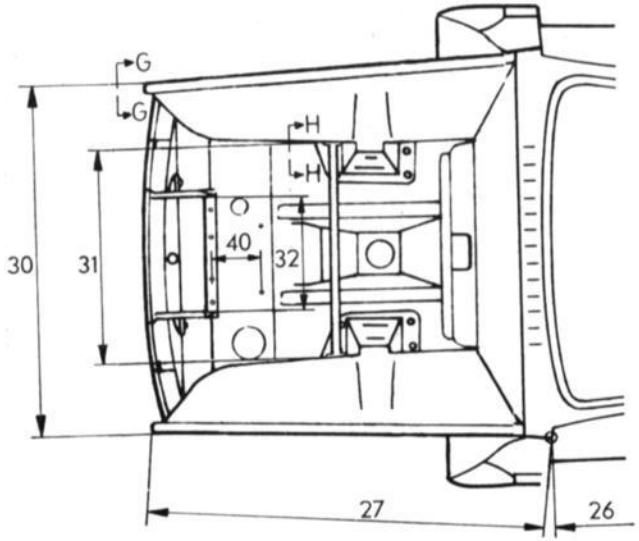
Note! The most important measurements are indicated in bold type.



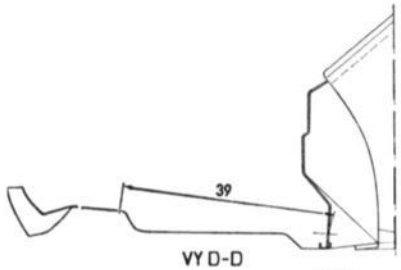
BASIC BODY MEASUREMENTS, SAAB 95



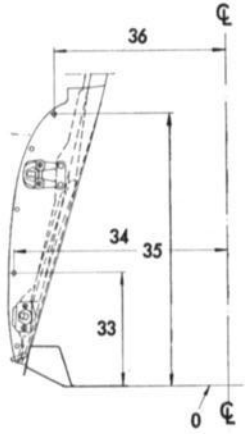
VY G-G VY H-H



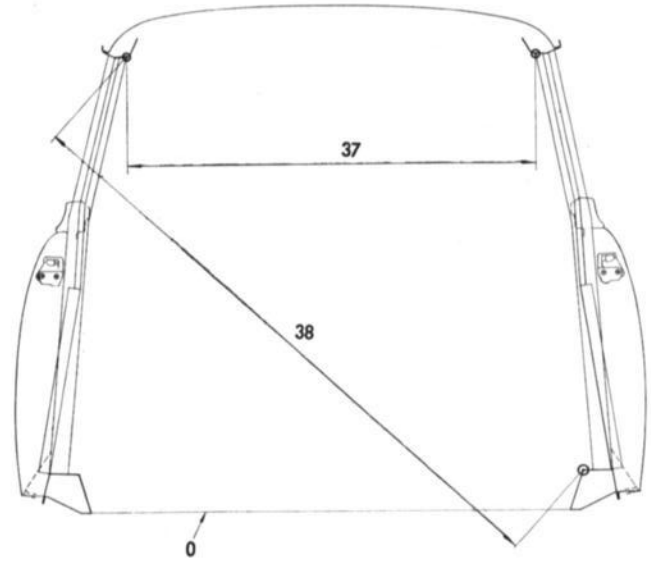
VY C-C S 810



VY D-D S 812



VY E-E



VY F-F S 811

Body measurements, Saab 95 The same table with English measures on page 810-22

Item	mm.	Remarks	Item	mm.	Remarks
0	—	Underside of sill	22	1050 ± 3	To leading edge of pillar reinforcement tube
1	**2138 ± 2**		23	1210 ± 4	
2	**347 ± 1**		24	1023 ± 4	
3	38 ± 0,5		25	90°	
4	**84,5 ± 1,5**		26	1377 ± 5	Tongue of dash panel, elev. A and plan C-C
5	**210 ± 1**				
6	**99 ± 0,5**		**27**	**1256 ± 3**	Measured parallel to wheelhouse — see C-C
7	**249,5 ± 1,5**				
8	**100 ± 0,5**		**28**	**420 ± 2**	
9	**485 ± 1,5**		**29**	**25 ± 2**	
10	**2294 ± 3**		**30**	**1084 ± 2**	See elev. A and plan C-C and plan G-G
11	784 ± 3				
12	730 ± 2		**31**	**730 ± 2**	See plan C-C and H-H
13	327 ± 3	To leading edge of pillar reinforcement tube	**32**	**348 ± 2**	See plan C-C
			33	271 ± 3	
14	365 ± 3		34	760 ± 2	
15	139 ± 3		35	643 ± 3	
16	**237 ± 1**	To middle of center brg.	36	663 ± 2	
17	**53 ± 3**	— ,, —	37	1006 ± 3	To upper edge of pillar
18	30 ± 0,5		38	1504 ± 4	
19	1345 ± 4		**39**	**609,5 ± 2**	Holes for engine suspension pads
20	161 ± 4				
21	706 ± 3		40	120 ± 1	

N.B. The most important measurements are indicated in bold type.

Body measurements, Saab 96

The same table with metrical measures on page 810—19

Item	ft	in.	Remarks	Item	ft	in.	Remarks
0		—	Underside of sill	22	3	5,34 ±0.12	To leading edge of pillar reinforcement tube
1	**7**	**0,17 ±0.08**					
2	**1**	**1,66 ±0.04**		23	3	11,52 ±0.16	
3		1,50 ±0.02		24	3	4,28 ±0.16	
4		**3,33 ±0.06**		25		90°	
5		**8,27 ±0.04**		26	4	6,21 ±0.20	Tongue of dash panel, elev. A and plan C-C
6		**3,90 ±0.02**					
7		**9,82 ±0.06**		**27**	**4**	**1,45 ±0.12**	Measured parallel to wheelhouse — see C-C
8		**3,94 ±0.02**					
9	**1**	**7,09 ±0.06**		**28**	**1**	**4,54 ±0.08**	
10	**7**	**6,31 ±0.12**		29		0,98 ±0.08	From underside of floor to underside of sill
11	2	6,87 ±0.12					
12	2	4,74 ±0.08		**30**	**3**	**6,60 ±0.08**	See view A, view C-C and G-G
13	1	0,87 ±0.12	To leading edge of pillar reinforcement tube	**31**	**2**	**4,74 ±0.08**	See view C-C and view H-H
14	1	2,37 ±0.12					
15		5,47 ±0.12		**32**	**1**	**1,70 ±0.08**	See view C-C
16		**9,33 ±0.04**	To middle of center brg.	33		10,67 ±0.12	
17		**2,09 ±0.12**	— ,, —	34	2	5,92 ±0.08	
18		1,18 ±0.02		35	2	1,31 ±0.12	
19	3	9,71 ±0.16		36	2	2,10 ±0.08	
20		7,99 ±0.16		37	3	3,61 ±0.12	To upper edge of pillar
21	2	3,80 ±0.12		38	4	11,21 ±0.16	
				39	2	±0.08	Holes for engine suspension pads
				40		4,72 ±0.04	

N.B. The most important measurements are indicated in bold type.

Body measurements, Saab 95

The same table with metrical measures on page 810—21

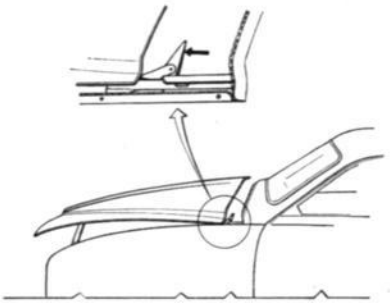
Item	ft	in.	Remarks	Item	ft	in.	Remarks
0		—	Underside of sill	22	3	5,34 ±0.12	To leading edge of pillar reinforcement tube
1	**7**	**0,17 ±0.08**					
2	**1**	**1,66 ±0.04**		23	3	11,64 ±0.16	
3		1,50 ±0.02		24	3	4,28 ±0.16	
4		**3,33 ±0.06**		25		90°	
5		**8,27 ±0.04**		26	4	6,21 ±0.20	Tongue of dash panel, elev. A and plan C-C
6		**3,90 ±0.02**					
7		**9,82 ±0.06**		**27**	**4**	**1,45 ±0.12**	Measured parallel to wheelhouse — see C-C
8		**3,94 ±0.02**					
9	**1**	**7,09 ±0.06**		**28**	**1**	**4,54 ±0.08**	
10	**7**	**6,31 ±0.12**		29		0,98 ±0.08	From underside of floor to underside of scuff
11	2	6,87 ±0.12		**30**	**3**	**6,60 ±0.08**	
12	2	4,74 ±0.08		**31**	**2**	**4,74 ±0.08**	
13	1	0,87 ±0.12	To leading edge of pillar reinforcement tube	**32**	**1**	**1,70 ±0.08**	See elev. plan C-C
				33		10,67 ±0.12	
14	1	2,37 ±0.12		34	2	5,92 ±0.08	
15		5,47 ±0.12		35	2	1,31 ±0.12	
16		**9,33 ±0.04**	To middle of center brg.	36	2	2,10 ±0.08	To upper edge of pillar
17		**2,09 ±0.12**	— ,, —	37	3	3,61 ±0.12	
18		1,18 ±0.02		38	4	11,21 ±0.16	
19	4	5,00 ±0.16		39	2	±0.08	Holes for engine suspension pads
20		6,34 ±0.16					
21	2	3,80 ±0.12		40		4,72 ±0.04	

N.B. The most important measurements are indicated in bold type.

HOOD

Removal of hood

1. Open the hood with the control mechanism under the instrument panel. The hood then opens half-way. To open the hood wide, move the latch at its rear edge forwards and lift the hood forwards. See fig.
2. Grip the hinge stay on one side, bending it slightly inwards to free the pin. The assistant holding the hood on the other side at the same helps to lift it off. Note that the hood must be wide open to permit removal of the bearing pins from the bearings.



HOOD CATCH

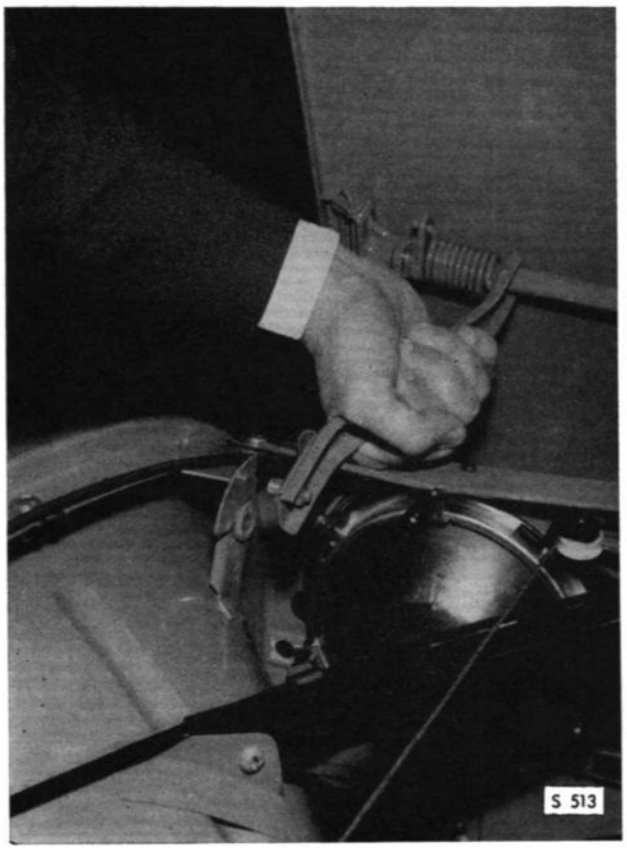
Installation of hood

1. Place the hood in the open position by the front panel.
2. Press the hinge stays inwards and slide the pins into the bearings.
3. Close the hood.

Hood lock

The hood is fitted with a locking pin, longitudinally adjustable by means of two nuts. This adjustment can be used to obtain the wanted amount of tension on the hood in the locked position. The lock can be centered in relation to the pin in the hood by slackening the two retaining screws in the front panel.
If the hood control should be damaged so that the hood cannot be opened from inside the car, proceed as follows. Pass a screwdriver through the grille immediately under the lock and press the control arm to the right. The hood can now be opened.

HOOD WITH ASSEMBLY COMPONENTS



REMOVAL OF HOOD

Front panel

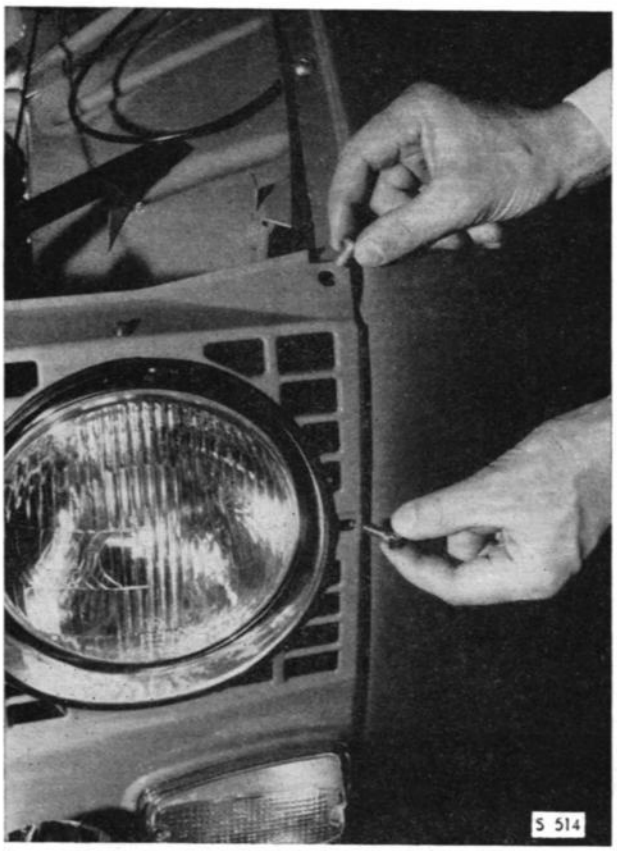
To remove the front panel, back off and remove the two screws on either side and the screws for the radiator supports and wheel-house brackets.
Disconnect the hood control and the cable connections for the headlamps and flashers — and for the parking lights.

Headlamps shells

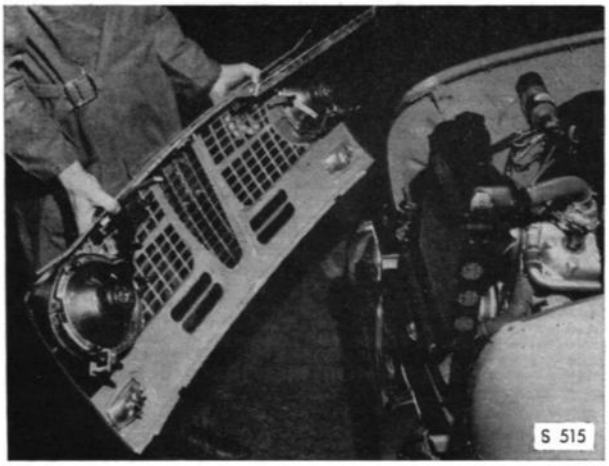
The headlamp shells are incorporated in the front panel which is pressed in a special fashion in order to accommodate them. When replacing the front panel or shells, the parts must be drilled and riveted to each other.

Grille

The grille is attached to the front panel by means of six bolts which are screwed directly into the grille panel and are accessible from inside the front panel.



REMOVAL OF SCREWS, FRONT PANEL



REMOVAL OF FRONT PANEL

FENDERS

After considerable mileage, especially on gravel roads, the underseal composition may be worn away at exposed points, and should therefore be examined at regular intervals and touched up as required. The rear fenders are particularly exposed to the effects of flying gravel and stones.

Removal

When removing the rear left fender, plug the fuel filler pipe with a piece of clean linen rag to prevent dirt from entering the fuel tank during the course of the work, when the cap is removed.

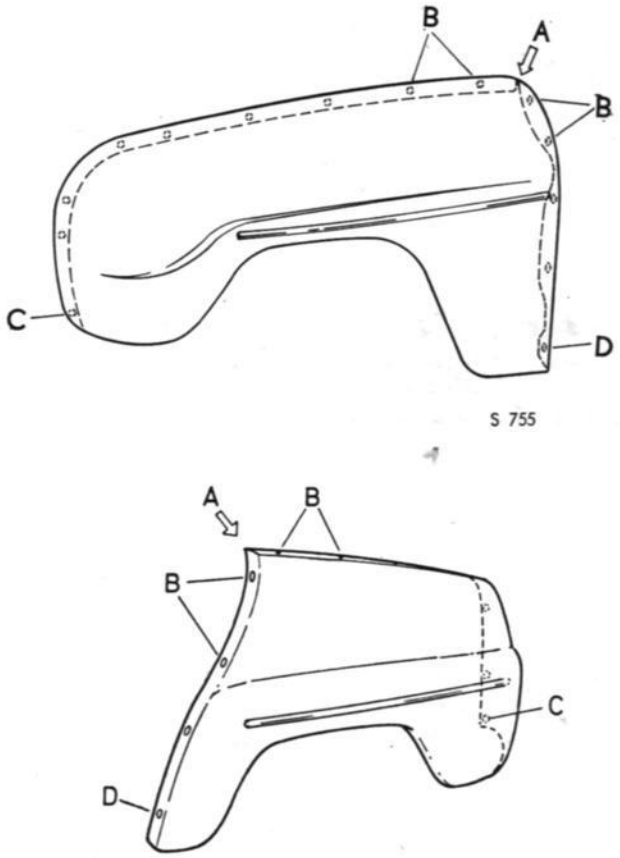
1. Take off the wheel.
2. Back off and remove the fender retaining screws, starting at C and D. See fig.
3. Disconnect the electrical cables as necessary, and then back off and remove the screws at B.
4. Release and remove the fender, collecting the tadpole sealing bead.

Installation

After having treated the fender with underseal composition and refitted the moldings, lights and possible rubber grommet (left rear fender), reinstall as follows:

1. Locate the fender and tandpole sealing bead in position and insert screws B and C.
2. Align corner A and tighten screws B and C enough to retain the fender firmly while permitting further alignment if necessary.
3. Insert the remaining screws.
4. Check the fender alignment and tighten all the screws finally, but not so hard as to buckle the fender panel at the tadpole sealing bead.
5. Reconnect cables, as applicable, and refit the cable sleeves. Pass the filler pipe through the rubber grommet and screw on the filler cap after removing the linen rag or similar plugging material. Tighten the clamps, if previously slackened.
6. Cut off surplus tadpole sealing bead below the fender and refit the wheel.

The clearance between the front fender and the door can be adjusted by removing the fender and hammering the vertical panel to which the fender is attached forwards or rearwards as necessary.



DISASSEMBLY AND REASSEMBLY OF FENDERS, SAAB 96

DOORS

Removal of door

1. Remove the interior door trim.
2. Release the door stop by driving out the pin at the upper hinge.
3. Let the door rest on a suitable support or suspend it in a suitable way in order to relieve the hinges of its weight.
4. Bend back the locking tabs for the externally sited nuts.
5. Back off the two nuts, accessible from inside the door, and remove the door.

> NOTE
>
> Be careful not to damage the outside of the door with the tools used to release the nuts.

6. Remove the hinges from the body.

Installation and adjustment of door

1. Refit the hinges to the body, if previously removed. Also fit the inner locking nuts on the hinge pivot pins.
2. Block up or suspend the door in the correct position and pass it onto the hinge pivot pins.
3. Refit the washers and hinge nuts inside the door.
4. Check carefully to see if the door fits properly into the opening.

> NOTE
>
> Be careful not to damage the front fender when opening the door without the door stop being fitted.

5. Adjust the door in the longitudinal direction of the car by advancing or backing off the nuts a little at a time. To adjust the vertical position of the door, move it up or down in the elongated holes after loosening the nuts slightly.
6. When the door is correctly positioned and fits snugly against the weather strips, tighten the nuts and secure with the locking tabs.
7. Refit the door-stop pin and the interior trim.

INSTALLING A DOOR

Removal and installation of window regulator

1. Removel the inside door handle, window regulator crank and door trim.
2. Back off the four screws accessible through the holes in the toothed segment of the window regulator, holding the window pane in position meanwhile.
3. Release the control-arm pin from the retainer groove and remove the window regulator.

To reinstall the window regulator, proceed in the reverse order to that given above.

Replacement of door lock

1. Close the door window.
2. Remove the interior door trim.
3. Unscrew the inside lock retainer.
4. Back off and remove the seven door-lock retaining screws, four on the back of the door and three on the inside, and unscrew the button used to lock the door.
5. Release and remove the lock.
6. If necessary, the outside door handle can be removed by backing off and removing the two retaining screws, one inside and one on the back of the door.

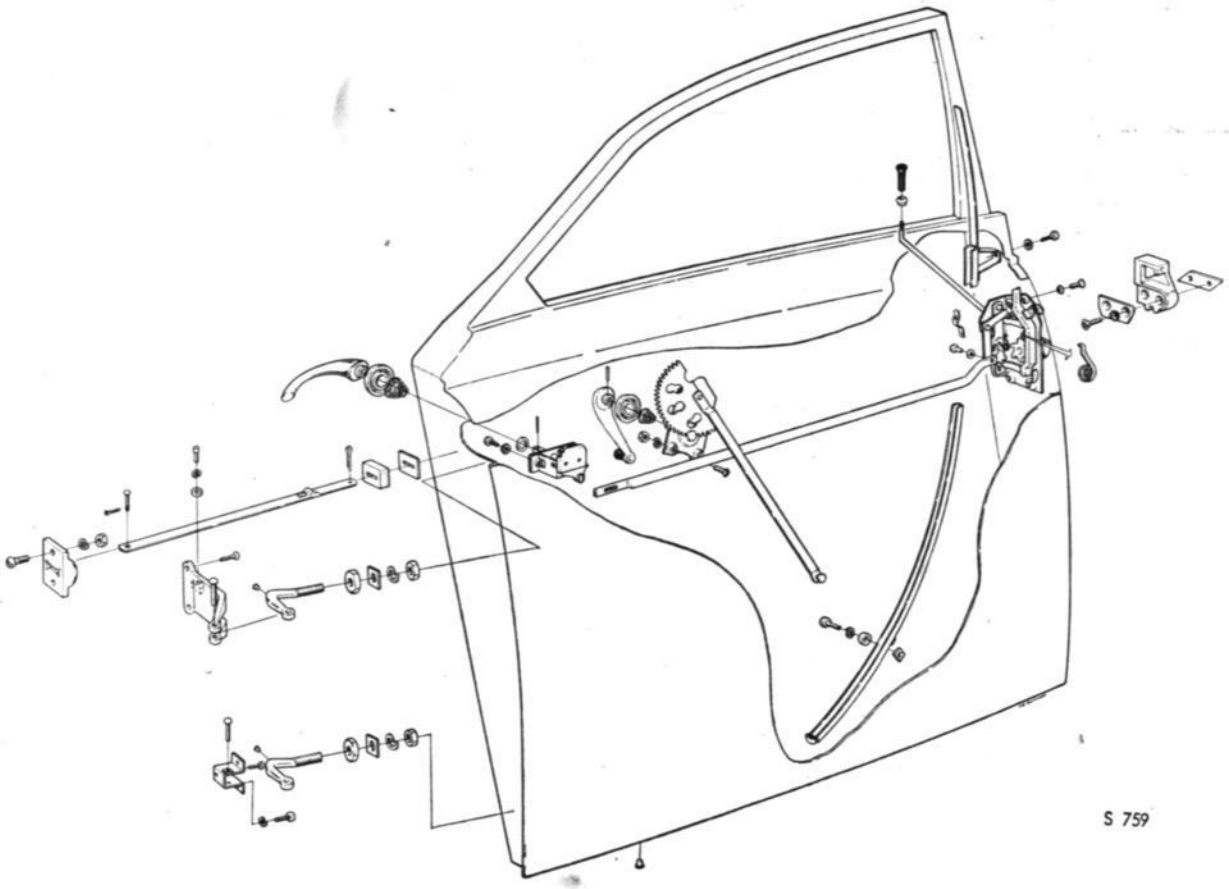
To reinstall the door handle and door lock, proceed in the reverse order to that given above. Before refitting, check that the moving parts of the lock, and the lock springs, are well lubricated with SAAB Special Chassis Grease.

Check that a clearance of 0.004—0.02 in. (0.1—0.5 mm) is maintained when the button in the outside door handle is depressed. To adjust this clearance, lightly file the arm on the handle button.

After refitting the door, adjust the striker plate so that the door opens and closes easily. Check also that the teeth mesh satisfactorily in all positions.

Adjustment of door striker plate

The striker plate is adjustable and can be moved if the screws are slackened. Adjust the striker plate so that the door opens and closes easily without being forced up or down by the location of the plate. Make sure that the teeth mesh satisfactorily in all positions. Tighten the striker-plate screws firmly to prevent them from working loose.



DOOR WITH LOCK, HINGES AND WINDOW REGULATOR

Replacement of door lock cylinder

After removing the interior door trim, take off the outside door handle by removing the two retaining screws, one inside and one on the front of the door. Then disassemble and reassemble the door handle as described in the following.

Disassembly

1. Depress the pushbutton 7 and drive out the pin 2 with a driver (max. 0.12 in. or 3 mm). Remove the arm and the washers 3 and 4.
2. Remove the pushbutton and the spring 5.
3. Press the pushbutton out of the sleeve 6.
4. Insert the key and turn it 35° to the right.
5. Press the catch pin 8 in with a driver (max. 0.12 in. or 3 mm).
6. Pull the lock cylinder 9 out of the pushbutton.
   If the key has been lost, the catch pin can be driven into the lock cylinder by force, using a driver or pin (with a diameter of max. 0.12 in. or 3 mm), thus enabling the cylinder to be removed from the push-button. This treatment ruins the lock cylinder and a new one must therefore be fitted.

Reassembly

1. Drive in the catch pin and press the lock cylinder into the pushbutton.
2. Ease the sleeve onto the pushbutton and then fit the pushbutton, together with the spring, in the handle.
3. Insert the arm and the washers and drive in the pin. Note that the two washers have different sizes of holes.

Keys

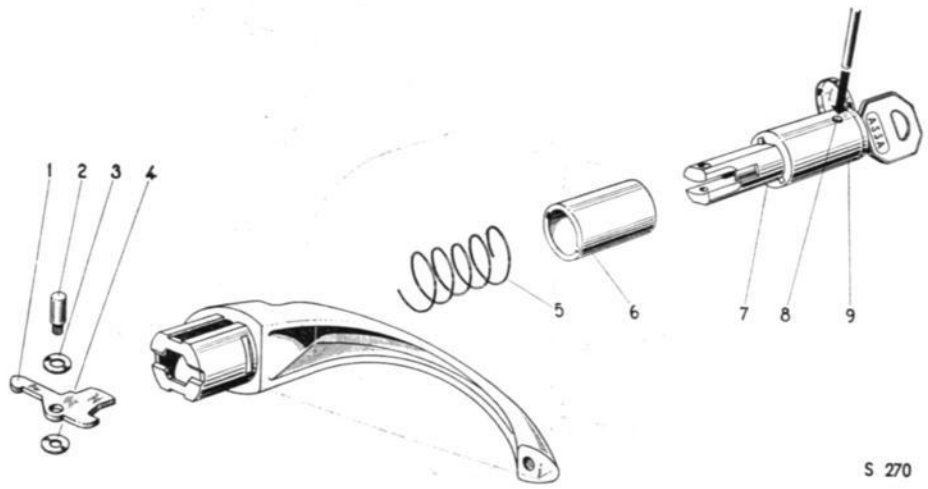
Two different keys are provided with the car. One of these is a master key (code-marked 2) that fits all the locks on the car, while the other is a secondary key (code-marked 8) and can be used only for the door lock and ignition lock.

Spare parts

If a lock cylinder for a door, luggage-compartment or ignition lock is damaged, a new lock cylinder can be ordered, in which case the key number and spare-part number must be quoted (see Spare Parts List). The system whereby only one key is used for all the car locks can thus be retained without any necessity of replacing a complete lock kit.

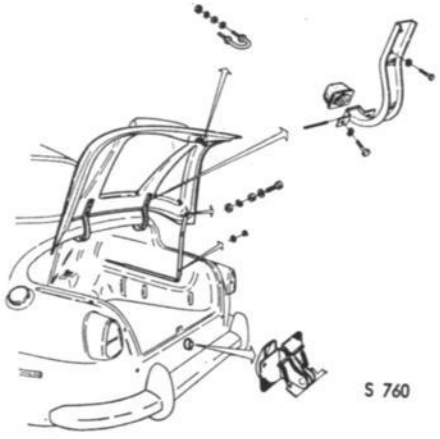
Lubrication

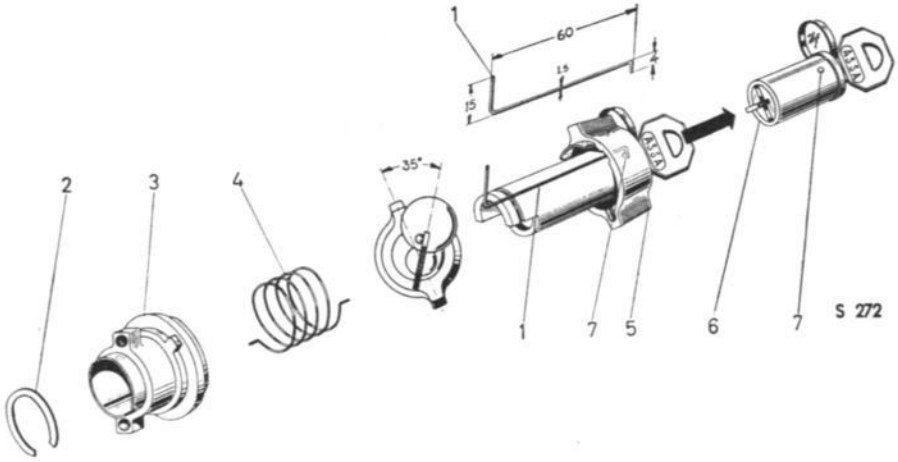
If the lock cylinder is lubricated with oil or grease, the lock pins may get caught in the cylinder. The reason for this is that dirt adheres to the key and thus gets into the lock cylinder. Because of this, the lock cylinder itself should never be lubricated.
If the key moves stiffly in the lock, so that lubrication is called for, a little glycerine may be applied to the back of the key. NOTE! Never lubricate the indented side of the key. After lubricating in this way, turn the key back and forth a few times.



DOOR HANDLE

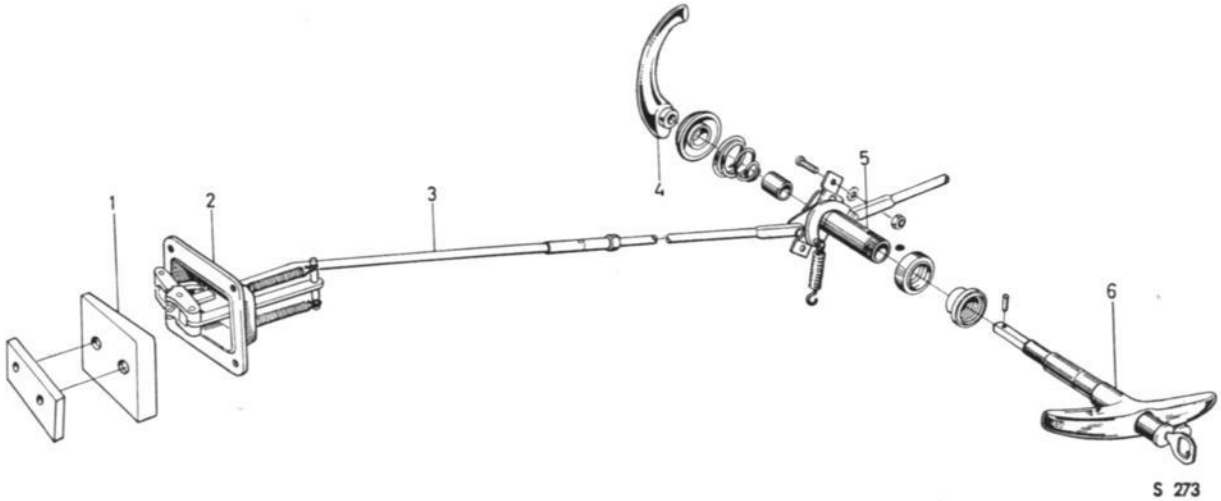
1. Arm
2. Pin
3. Washer
4. Washer
5. Spring
6. Sleeve
7. Pushbutton
8. Catch pin
9. Lock cylinder





REAR COMPARTMENT LID WITH ASSEMBLY DETAILS AND LOCK

1. Wire picklock
2. Retaining ring
3. Housing
4. Spring
5. Sleeve
6. Lock cylinder
7. Catch pin



LOCKING DEVICE, REAR DOOR, SAAB 95

1. Locking plate
2. Door lock
3. Switch rod, adjustable
4. Inner handle
5. Latch
6. Outside handle

LUGGAGE COMPARTMENT AND REAR DOOR

Replacement of luggage-compartment lock Saab 96 and Sport

Disassembly

1. Remove the lock from the car.
2. Make a wire picklock 1 to the dimensions shown in the fig.
3. Remove the retaining ring 2.
4. Remove the housing 3 and the torsion spring 4.
5. Turn the key 35° to the right.
6. Pass the picklock in towards the locking pin 7, turning to force the latter in towards the cylinder.
7. Withdraw the cylinder 6 from the lock.

Reassembly

1. Press the locking pin 7 into the lock cylinder 6 and insert the cylinder in the sleeve 5. Note: this can be done only when the key has been turned 35° to the right.
2. Refit the torsion spring 4 and the housing 3, making sure that the spring is inserted in the smallest of the notches in the sleeve and in the hole in the housing.
3. Refit the retaining ring 2.
4. Refit the lock on the car.

Rear-door lock Saab 95

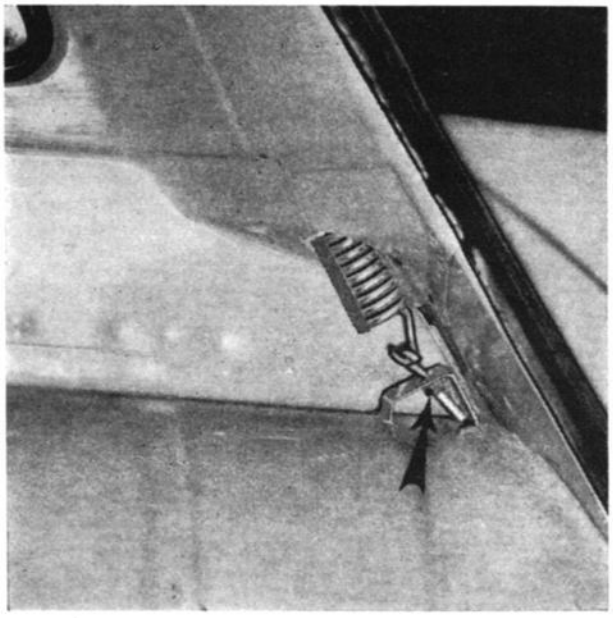
Removal of the door trim provides access to the lock mechanism and to the outside handle with lock cylinder for removal. The striker plate should be adjusted in the same way as those for the front doors.
Note that the rear door must always be closed carefully without "banging", with the handle in the closing position, i.e. twisted slightly to the right. When the lock levers have engaged with the lock plates and pressed the door in against the weather strips, turn the handle back to the horizontal position.

Removal and replacement of luggage-compartment lid Saab 96 and Sport

1. Raise the luggage-compartment lid and detach the stay.
2. Disconned the wires to the number plate lights and trunk lamp.
3. Back off and remove the hinge retaining screws on the lid and lift off the lid.

> NOTE
>
> Take care to avoid damaging the body paintwork when removing and replacing the luggage-compartment lid.

4. Replace the lid, proceeding in the reverse order.



ADJUSTMENT NUT FOR TENSION OF TAILGATE BALANCE SPRINGS, SAAB 95

Rear door, Saab 95

Adjustment of balance spring tension

The rear door on the Saab 95 is fitted with two balance springs, the tension of which can be adjusted with a nut — see fig. The spring, which is accessible after removal of the trim between the rear door and the quarter window, should be tightened hard enough for the door to stop in any position after opening.

Removal and installation of tailgate Saab 95

1. Open the tailgate.
2. Remove the sealing strip between tailgate and body by loosening and removing the self- tapping screws in the upper edge of the tailgate.
3. Remove the retaining screw in each hinge which are accesible when the tailgate is open.
4. Remove the lever of the door lift from the gate by removing the nuts. Be careful when removing the lever as is spring loaded.
5. Close the tailgate.
6. Remove the attachment screws of the remaining hinges.
7. Remove the tailgate.
8. Installation is made in the opposite way.

GLASS

Window-glass, general

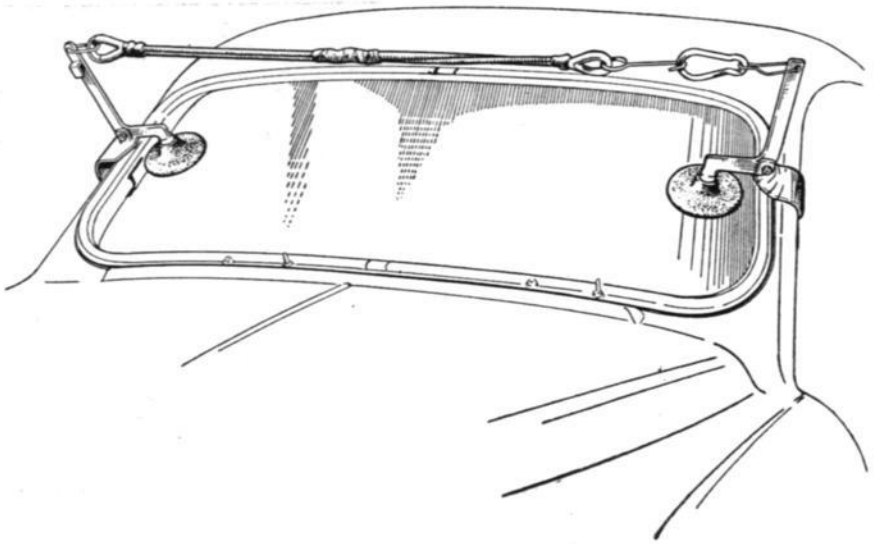
All windows are made of toughened glass, a safety zone being provided in front of the driver, thus enabling him to see clearly in the driving direction even if the windshield is shattered. Cars intended for export to some countries, however, have windshields of laminated glass. When installing new windshields and windows, always use safety glass, i.e. toughened or laminated glass.

Replacement of windshield

1. Remove the windshield-wiper arms.
2. Press the windshield outwards with the hand from inside the car, after having removed the rubber weather strip from the bodywork.
3. Clean the contact surface of the weather strip on the body, and remove all traces of old sealing compound.
4. Fit a new weather strip to the windshield. Be sure to locate the weather-strip joint (possibly marked with a yellow dot) in the middle of the lower edge of the windshield.
5. Press the trim molding deep into its groove, using the thumb, and fit the two joint clips.
6. Insert a leather thong in the slit in the rubber weather strip, so that its ends are at the center of the lower edge of the windshield.
7. Coat the body opening and the weather strip with soapy water and put the windshield in position, holding it there by means of the arrangement shown in the fig., or with the aid of an assistant.
8. From inside the car, pull the leather thong so that the edge of the weather strip is drawn over the edge of the panelling. Pull left and right sides alternately, while an assistant presses the glass from outside and succesively, with great care, pounds the rubber weather strip with a rubber mallet.
9. Check that the inside flange of the weather strip is inside the edge of the bodywork all round the windshield. Strike the molding gently with a rubber mallet so that its flange homes properly. Slide the joint clips into place.
10. Inject sealing compound both between the weather strip and the body and between the weather strip and the glass. See fig.
11. Remove excess sealing compound from the body and glass, using kerosene or a similar solvent, and rinse thoroughly with water afterwards.

REMOVAL OF WINDSHIELD

FITTING WINDSHIELD STRIP WITH LEATHER THONG



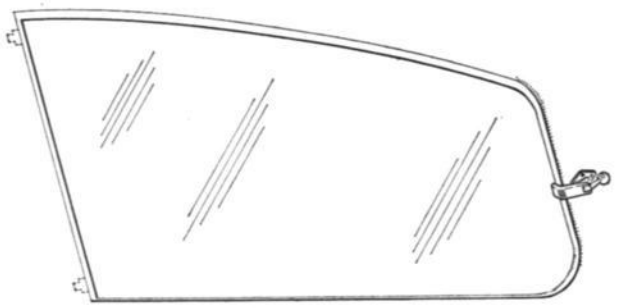
ARRANGEMENT FOR LOCATING WINDSHIELD DURING FITTING

Replacement of rear window

The rear window is replaced in the same manner as the windshield, although the shelf over the luggage compartment must be removed first.

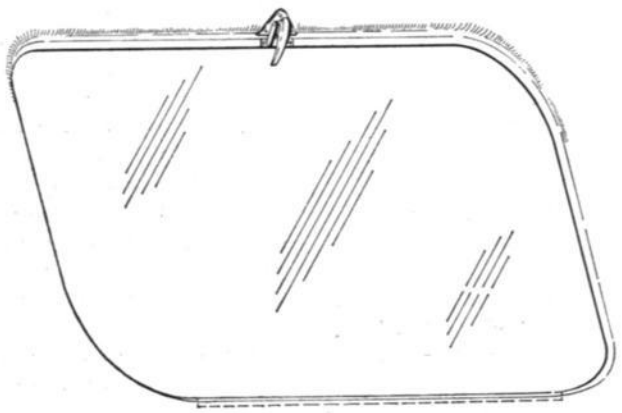
Opening side windows (quarter windows)

Opening side windows are fitted on some types. The only spare part available is the window glass complete with frame.



S 761

OPENING SIDE WINDOW, SAAB SPORT



S 762

OPENING SIDE WINDOW, SAAB 95

Replacement of door window

The bottom of the door window glass is pressed into a retainer channel with a slot for the window-regulator winder arm. A hinge is fitted to the front end of the retainer channel and secured to the door frame by means of two screws. A run channel guides the rear edge of the window glass.

Removal

1. Wind down the window until its rear edge is just below the weather seal.
2. Back off the two screws at the hinge.
3. Twist the glass to bring its rear edge upwards and in towards the car.
4. Pull up the glass as shown in the fig.
5. Release the glass from the retainer channel, if necessary.

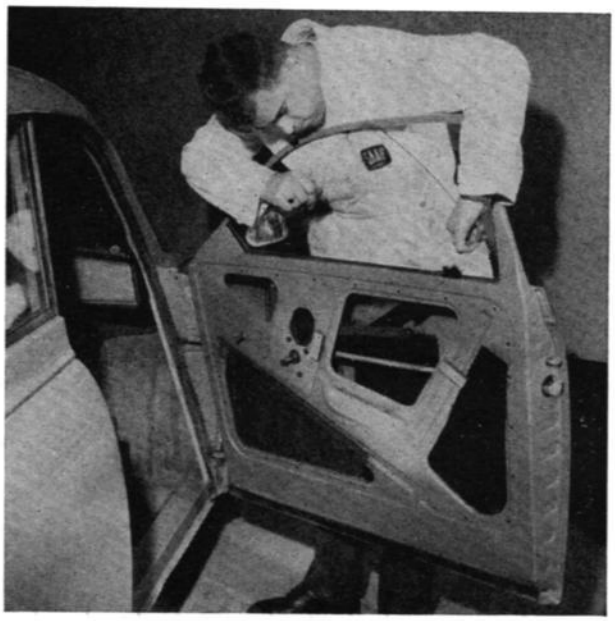
Installation

Installation, as well as removal, can be done without removing the interior door trim, but is nevertheless facilitated if the trim is taken off.

1. Fit the rubber inserts in the glass retainer channel and press the glass firmly into the channel. Make sure that the retainer holds the glass firmly.
2. Lower the glass at an angle from inside the door and with the hinge at the bottom. At the same time, guide the window-regulator pin into the slot.
3. Now twist the glass to bring the hinge up into position, moving the glass rearwards at the same time so that it enters the run channel.
4. Insert the two hinge screws and wind up the window.
5. Adjust the window at the hinge so that it fits snugly in the run channel without smooth operation being impeded. Having done this, tighten the two hinge screws up finally.

Replacement of quarter windows

1. Press the glass outwards from the inside, meanwhile turning up the inside flange of the rubber weather strip. Begin at the rear edge of the window.
2. Fit a new pane of glass of the prescribed quality in the weather strip. Insert a leather thong in the slit in the weather strip, with the ends at the rear part.
3. Pull the glass and weather strip into position with the aid of the leather thong in the same way as described for the windshield. Start at the rear edge of the glass.



REMOVAL AND INSTALLATION OF DOOR GLASS

TRIMS AND INTERIOR FITMENTS

Door and side trims

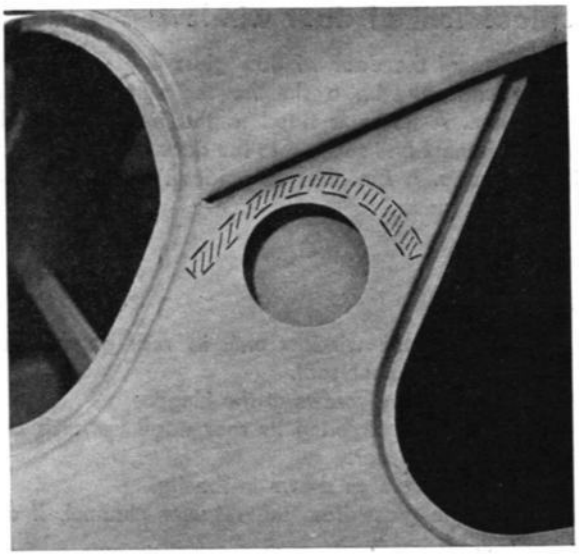
The door trims and side trims are stretched over sheets of porous wallboard. They are attached to the doors and body, as applicable, by means of spring clips of conventional type. These trims are readily removable for replacement or for such purposes as inspection of the inside of the door.

Cowl plate trim

The cardboard cowl plate trim is secured to the cowl plate with sheet-metal screws and spring clips. Insulation against sound and heat is afforded by a thick quilt of glass fiber between the cowl plate and the trim.

Mats

The rubber mats at the front sides are glued to the wheel houses, while the front and rear mats are loose. Insulating sheets of wallboard covered with waffle-pattern cardboard are fitted under the floor mats.



RUBBER MOLDING INSIDE AIR EXTRACT COVER PANEL, SAAB 96 (COVER PANEL REMOVED)

HEADLINING, SAAB 96

Removal and installation

The headlining is held in position by a wire spiral running all the way around it. See fig.

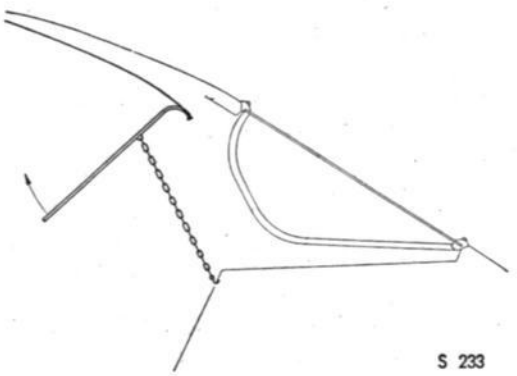
When the headlining is installed, it must be attached to the three front hooks in the windshield frame. The crosswise bows are then fitted rearwards, with the bows lying down.

Using tool No. 784096, stretch the headlining over the holders welded to the roof frame between the side and rear windows. Insert the tool hook in the openings provided in the headlining.

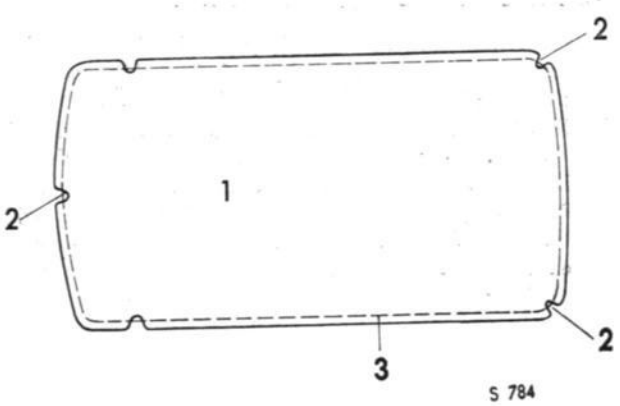
Finally stretch the headlining by folding up the bows. If the headlining is not perfectly smooth after installation, heat gently with a heating torch (of the type used to touch-up paintwork) in order to stretch it.

NOTE: If the lining is heated excessively, the plastic will melt and become glossy.

To remove the headlining, proceed in the reverse order, but take great care to avoid tearing the headlining.



FASTENING OF HEADLINING WITH TOOL 784096

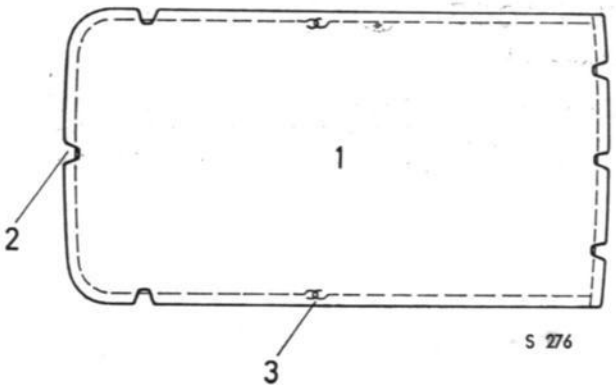


HEADLINING, SAAB 96

1. Headlining
2. Retainer
3. Spiral

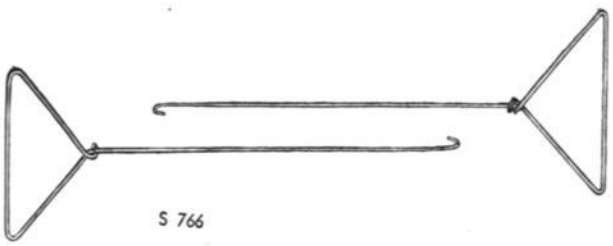
HEADLINING, SAAB 95
Removal and installation

To install, first attach the headlining to the three hooks in the upper part of the windshield frame. Then stretch the lining rearwards while putting on the bows. Using tool No. 784096, fit the rear edge of the headlining over the three hooks. Finally, stretch the longitudinal wire spirals. These are divided in the middle and fitted with hooks. Using two double-folded steel wires, get hold of these hooks and hook them into one another. See fig. Disassemble in the reverse order.

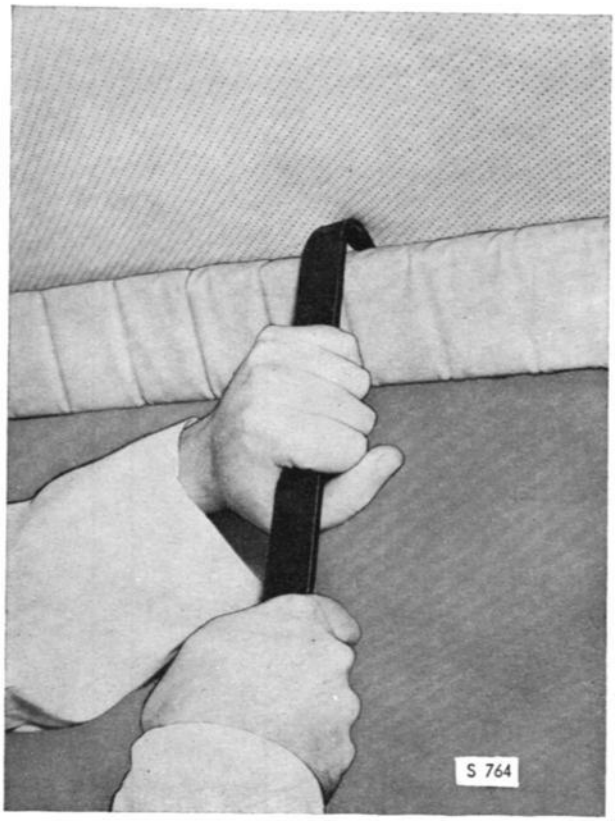


HEADLINING, SAAB 95

1. Headlining
2. Retainer
3. Wire spiral with hooks



ASSEMBLY HOOKS FOR STRETCHING OF SPIRALS



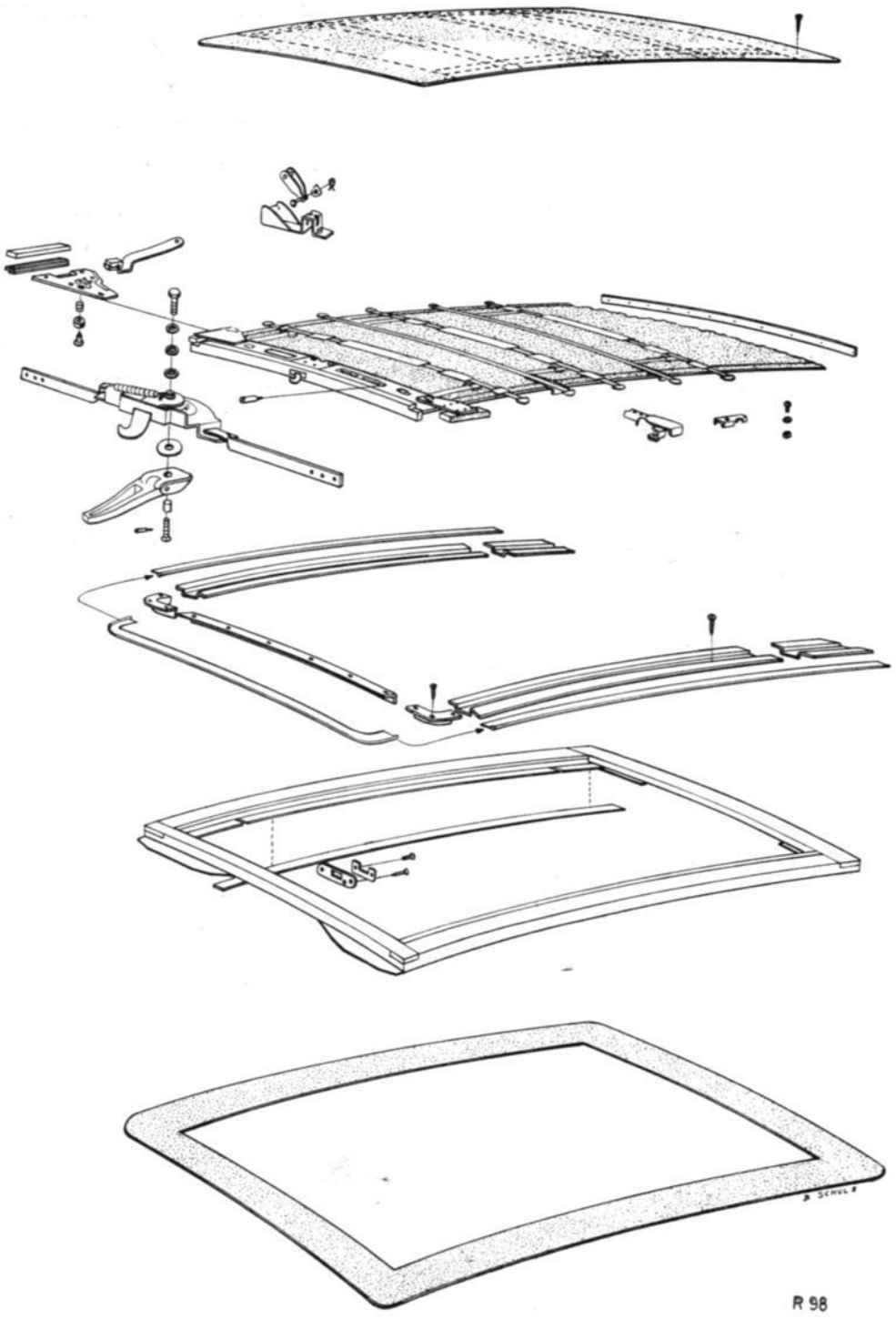
INSTALLATION OF HEADLINING, SAAB 95

STRETCHING THE WIRE SPIRALS, SAAB 95

SUN ROOF

General

The sun roof comprises outer and inner fabrics, retained by ribs and a tensioning device. The retaining ribs run in rails screwed to a wooden frame attached to the roof panel.

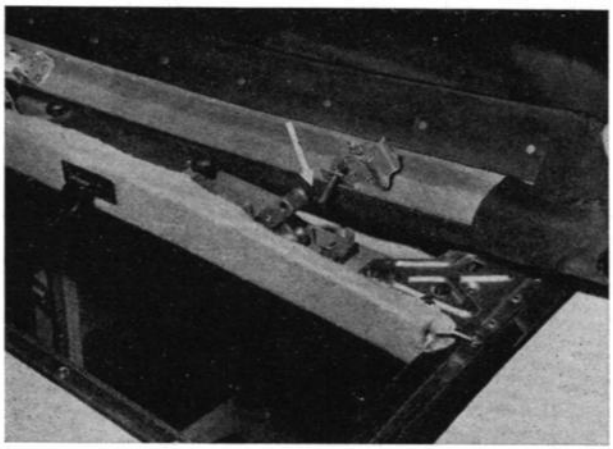


R 98

SUN ROOF

Removal and installation of outer fabric

1. Open the sun roof halfway, pass one hand under the fabric and remove the two front retaining bolts with the aid of a screwdriver. See fig.
2. Fold the fabric back successively as it is released from the ribs, to which it is attached by means of clips.
3. Pull the cover strip away from the rear attachment and remove the screws and rail holding the outer sun roof to the body.
4. Install in the reverse order.

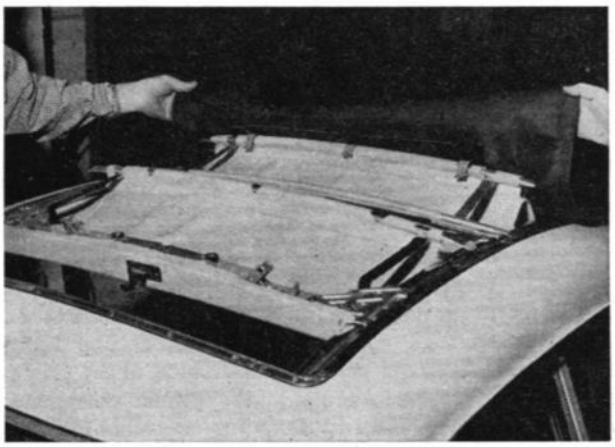


RETAINING BOLTS FOR OUTER FABRIC

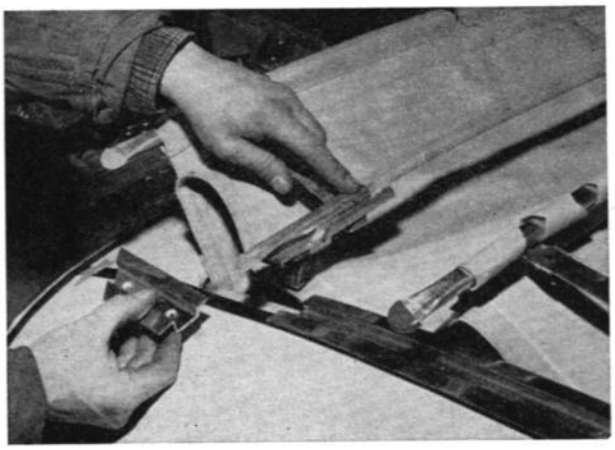
Removal and installation of inner fabric with ribs and locking device

1. After removing the outer fabric, take away the two short side rails at the rear. See fig.
2. Release the fabric at the rear edge, where it is nailed to the wooden frame.
3. Pass the inner fabric, together with the ribs and locking device, rearwards and remove it from the car.
4. If a new fabric is to be fitted, release the old fabric from the ribs and from the locking device to which it is glued.
5. Install in the reverse order.

The roof fabric is stretched by means of wire spirals at the outer edges, in the same way as the headlining in standard models. The fabric is glued and nailed to the wooden frame.



REMOVAL OF OUTER FABRIC



REMOVAL OF RAILS TO ALLOW REMOVAL OF LOCKING DEVICE AND INNER FABRIC

Adjustments

Stretching the outer fabric

If the outer fabric needs stretching, it must be removed altogether. Then detach the fabric from the rear rail, move it the requisite amount and reglue it to the rail before screwing it on again.

Adjustment of locking device

The locking device can be adjusted laterally to ensure proper travel in the side rails. Three adjustment screws are provided on each side. See fig.

Adjustment of ribs

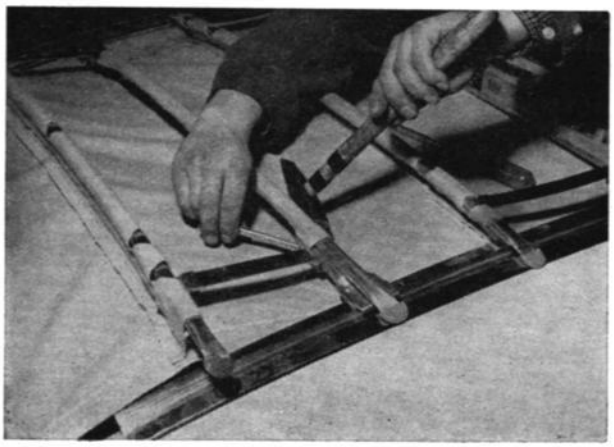
Two of the ribs are laterally adjustable. The adjustment screws are located under the rib as shown in the fig.

Maintenance of outer fabric

The outer fabric is a plastic-impregnated, woven material (Covertex), which requires no other maintenance than regular washing. Special detergents intended for the Saab sun roof are available on the market under the names of "Happich-Frischdienst" and "Synclean".
The outer fabric must not on any account be washed with solvents such as trichloroethylene, carbon tetrachloride, etc. Such solvents ruin the surface of the fabric, allowing dirt to penetrate into the plastic compound. After such treatment, the roof will be impossible to clean properly and will also become rigid and hard.

ATTACHMENT OF OUTER FABRIC AT REAR EDGE

ADJUSTMENT SCREWS FOR LOCKING DEVICE



ADJUSTMENT OF RIBS

SEATS

Front seats

The front seats are made of resilient steel tubing with foam-rubber cushions and covers fitted on transverse coil springs. The front seats are adjustable for legroom, and are secured in the desired position by means of a readily accessible, spring-loaded latch. The slope of the seat back can be altered with a lever located between the seat and the door. Wedge-shaped wooden blocks are fitted under the seats, thus affording a higher sitting position for the driver. To prevent the back of the right-hand seat from being jack-knifed in response to sudden application of the brakes, a special safety catch is fitted at the rear left side of this seat. The Saab Sport is fitted with more comfortable seats, the backs of which may be dropped fully to the rear. The passenger seat is also equipped with a headrest.

Removal of front seats

1. Lift up or take out the rear-seat cushion.
2. Depress the seat-adjustment catch and slide the seat back until the seat rails are clear of the floor rails, after which the seat can be removed.

The seat floor rails should be inspected at regular intervals, to make sure that the retaining bolts are tight and that the rails are not laterally displaced. If the seats move stiffly, grease the upper rails.

Rear seat

In the Saab 96, the rear-seat cushion and back consist of a spring-filled frame with padding and upholstery. Both cushions have a sheet of plywood as the base. The seat cushion is loose, being held in position by the transverse floor member at its front edge. The base of the back cushion rests on two brackets secured to the inclined rear panel. This cushion is also secured at the top, to prevent objects in the luggage compartment from rushing forwards when the brakes are applied hastily. A device for adjusting the height of the rear seat is provided under the rear-seat cushion. See fig.
In the Saab 95, the two rear seats are made of foam rubber on a base which serves as a luggage deck when the seats are collapsed.
In the Saab Sport, the rear seat is designed as an occasional seat with loose cushions, space for baggage being provided under these cushions.

Cleaning upholstery

When attempting to remove stains from fabrics of any kind it is recommended that the area adjacent to the stain first be moistened with the solvent before working on the stain itself. Otherwise, a soil ring may be left around the cleaned spot.

Specific stains

Grease, oil and lipstick can be removed with carbon tetrachloride. Large stains are best dealt with by moistening in the normal manner and then pouring solvent over the entire stain and soaking it up with blotting paper.
Chocolate, ice-cream, fruit and vomit stains should be treated initially with lukewarm water, possibly with the addition of a little soap solution. After drying, any residual stains may be removed with carbon tetrachloride.
Battery acid should be treated instantly with large quantities of cold water, as otherwise the acid may burn holes in the upholstery. If possible, add a few drops of ammonia to the first water.
Blood stains should never be allowed to dry, but should be removed immediately with cold water.

Unidentified stains

Try the following solvents in the order named:

Cold or lukewarm water
Lukewarm soap solution

Before making further attempts, remove the soap solution with lukewarm water and allow the material to dry, since the following solvents are not miscible with water.

Continue with

Carbon tetrachloride
Trichloroethylene
Pure gasoline

Rub the spot while the solvent evaporates, first hard and gradually more gently as evaporation continues.
Do not forget the initial moistening round the stain. The bigger the stain, the bigger the area to be moistened. Lighter fluid can be used instead of carbon tetrachloride.

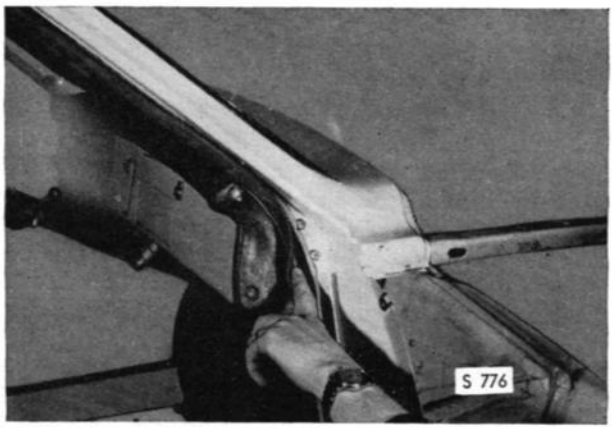
Cleaning plasticized fabrics

Plasticized fabrics are impermeable to dirt, being completely dust-tight and proof against oil and gasoline. A dirty plastic surface can easily be cleaned by washing with water and a synthetic detergent. Large oil stains, etc., can be treated with white spirit, trichloroethylene and similar solvents. Such organic solvents, however, should not be used too frequently, as they tend to cause stiffness in the plastic.

INSTRUMENT PANEL

Removal and installation

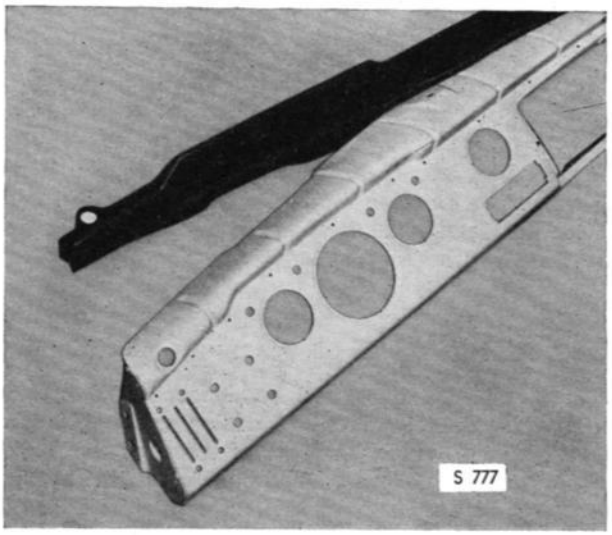
1. Remove the end fairings by backing-off the sheet-metal screws and releasing the clips.
2. Release from the point of attachment to the body the brace located in the center of the instrument panel.
3. Back off and remove the two screws on either side, collect the rubber spacers and washers, and pull out the instrument panel. See fig.
4. Disconnect cable terminals, speedometer wire and hoses for the defroster and windshield washer.
5. Reinstall in the reverse order.



RETAINING SCREWS FOR INSTRUMENT PANEL

Replacement of instrument panel overlay

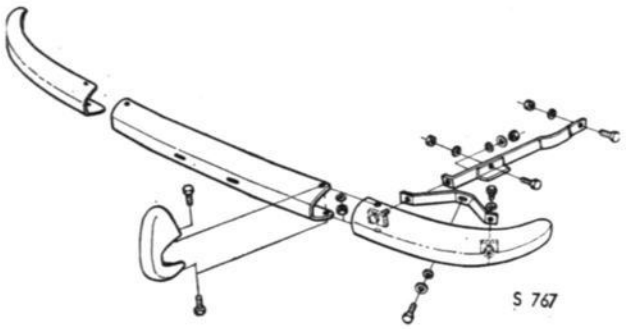
1. Remove the instrument panel and take off the instruments and glove compartment.
2. Release the lower molding by removing the clips at the rear.
3. Release the clips at the upper edge, which possibly also retain the defroster duct, and remove the overlay from the panel.
4. When refitting, apply glue only to the projecting part of the instrument panel and the corresponding part of the overlay. Then press the overlay in position. See fig.
5. Refit the molding and clips, cutting off the part of the overlay that projects beyond the molding. Do not, however, cut away the part over the opening for the instrument cluster.
6. Refit the instruments and glove compartment.



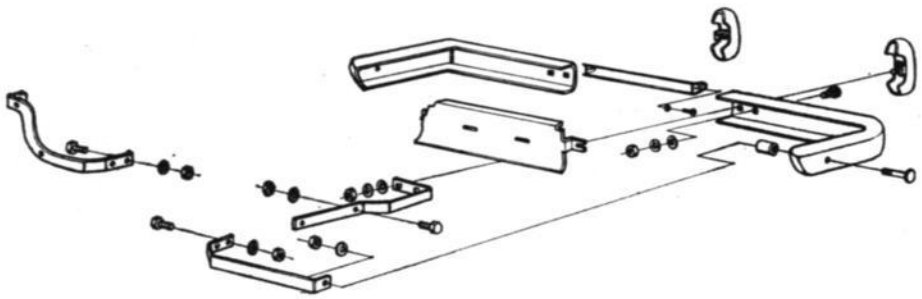
GLUEING ON THE OVERLAY

BUMPERS

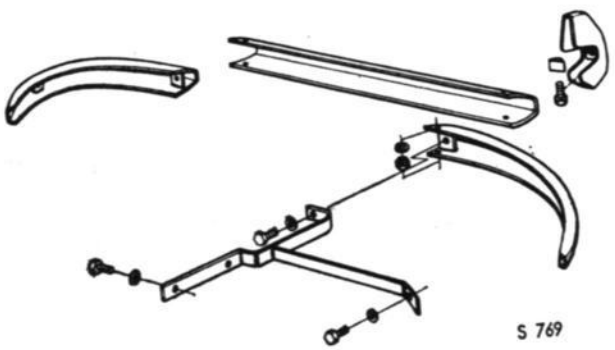
Each bumper comprises a middle bar and two outer bars, two overriders and two brackets. In addition, there are two braces for the front bumper and two cork pads to prevent flying stones from attacking the body through the rear overriders.
The component parts of the bumpers are bolted together at the overlap joints between the middle and the outer bars.



BUMPER, FRONT, SAAB 95, 96 AND SPORT



BUMPER, REAR, SAAB 95



BUMPER, REAR, SAAB 95, 96 AND SPORT

BODY FINISHING

General

Enamel

Saab cars are painted with a synthetic stoving enamel, a combination of alkyd resin, melamine resin, pigment and solvent. In addition to these two types of resins, there is also an epoxy-base binder. The pigment serves to give the paint its color, body, tenacity and hiding power. The colors of an enamel are generally produced by mixing several pigments of different shades. In addition, the pigment must protect the binder against the action of ultra-violet light. The solvents consist largely of aromatic hydrocarbons (e.g. xylene), aliphatic hydrocarbons (e.g. gasoline) and alcohol. The melamines are generally dissolved in an alcohol (e.g. butanol). The solvents contribute effectively to the obtention of desirable paint properties such as sprayability, drying time and flow characteristics.

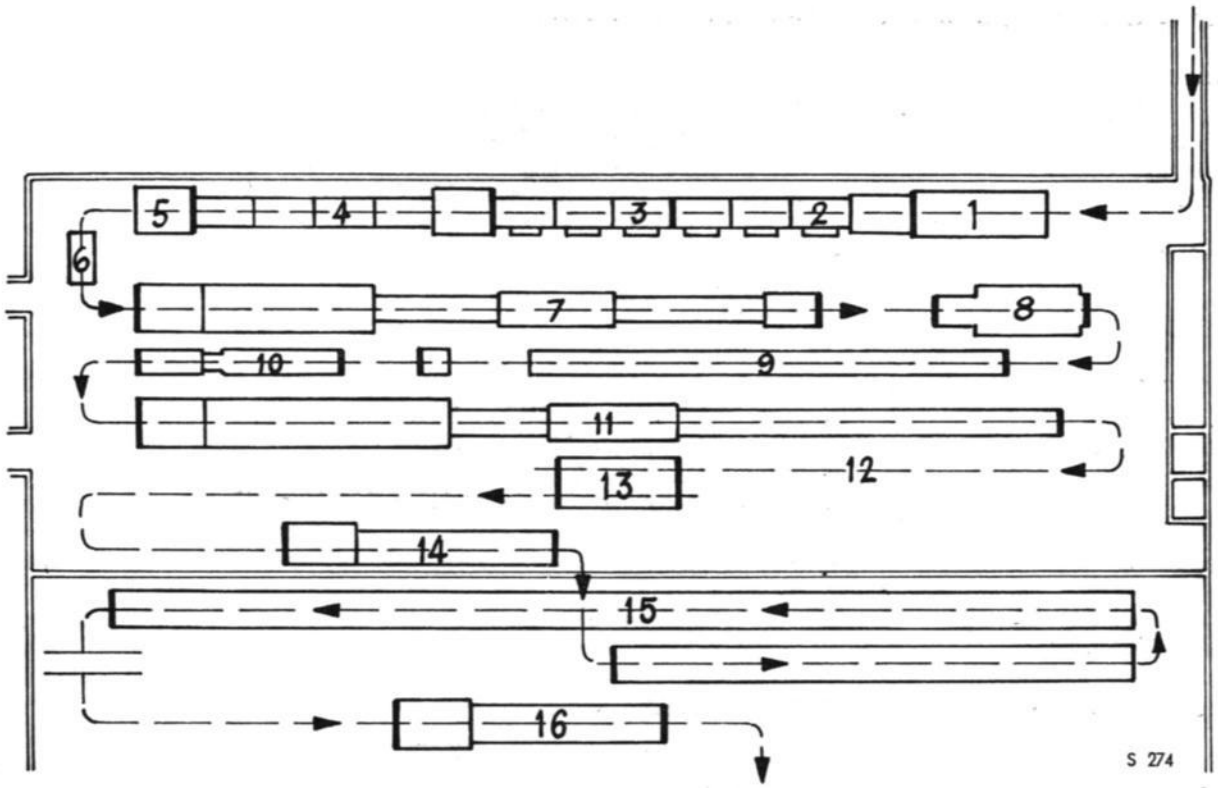
Underseal composition

The underbody of Saab cars is sealed at the factory, immediately after stoving of the primer. The underseal composition is applied with a hot-sprayer at a temperature of 140°F (60°C). It contains about 50% synthetic rubber varnish (bitumen-based), 25% filler (asbestos fiber) and 25% solvent (aromatic hydrocarbons).
The minimum skin in the wet state is 0.054 in. (1.5 mm). On particularly exposed areas, e.g. under the fenders, at least 0.078 in. (2 mm) should be applied. In the dry state, the skin thickness decreases by about 25%.

The Saab body-finishing plant

The body assembly passes through several finishing stages. On leaving the assembly line, it is carried by an overhead conveyor to a manual cleaning station, where major accumulations of grease are removed.

Any body rust is treated with a product consisting largely of phosphoric acid and emulsifiers, mixed with a filler to a jelly-like consistency. This is followed by surface treatment in an automatic plant with six zones and intermittent operation. Degreasing takes place in zone 1 and is followed by washing in zones 2 and 3. In zone 4, the body is phosphatized by the zinc-phosphate method, rinsing and passivating being carried out in zones 5 and 6. Passivating is done in water with an addition of phosphoric and chromic acids.
After treating tin joints with zinc-chromate primer, the body passes through a 65-ft (20-m) drying oven at a temperature of 347°F (175°C). Next, all body joints are closed with a body sealing composition consisting of rubber varnish, asbestos fiber, alkyd resin and aromatic hydrocarbons. Solventless compositions (plastisols) are also used. After spirit-washing and tack-ragging, the body is ready for priming. Tack-ragging involves wiping the body metal with a piece of gauze drenched in slow-drying varnish. The primer coat, a synthetic, epoxy-base primer, is stoved in a 75-ft (23-m) oven, where the body passes both an infra-red zone and a convection zone. After cooling in a cold zone, the underbody composition is sprayed on at 140°F (60°C). Inside the fenders, and at other points which are difficult of access, the underseal composition is applied with a brush. The body is now washed and flatted prior to application of the finish coats. Body surfaces on which the primer coat has been rubbed away in course of the flatting process are sprayed with vinyl phosphate. The body now passes through a drying oven and is once more spirit-washed and tack-ragged prior to application of the finish coats. The finish enamel is stoved in a 135-ft (41-m) oven, where it passes one infra-red zone and two convection zones. After cooling, the top coat is inspected and the body transferred to the final assembly line or, if the paintwork is imperfect, to the touch-up line. After final assembly, the finish is inspected again and cars on which faults are noted are sent to a touch-up bay for finished cars.



THE SAAB BODY-FINISHING PLANT

1. Reception
2. Degreasing and rinsing
3. Phosphating and rinsing
4. Drying
5. Filling
6. Body sealing
7. Primer and stoving
8. Undersealing
9. Flatting
10. Drying
11. Finish coats and stoving
12. Inspection of top coat
13. Transfer
14. Touch-up, body
15. Final assembly
16. Touch-up, finished cars

TECHNICAL INFORMATION, FACTORY FINISHES

Primer

Spraying viscosity	40—50 sec. (SIS beaker at 68°F or 20°C)
Mode of application	Hot-spraying at approx. 158°F (70°C).
Rate of application	0.1 U.S. gal./min. (500 ml/min.)
Max. temperature	347°F (175°C). (Stoving: 30 min. at 302°F (150°C) or 60 min. at 248°F (120°C).
Manufacturer	AB Arvid Lindgren Glassurit-Werke
Skin thickness after stoving	0.04 mm (40 μ)

FINISH COAT

Spraying viscosity	35—40 sec. (SIS beaker at 68°F or 20°C)
Mode of application	Hot spraying at approx. 158°F (70°C).
Rate of application	0.1 U.S. gal./min. (500 ml/min.)
Max. temperature	320°F (160°C). (Stoving: 30 min. at 302°F (150°C) or 60 min. at 248°F (120°C)
Manufacturer	AB Arvid Lindgren Glassurit-Werke
Skin thickness after stoving (primer+finish coat)	0.07—0.1 mm (70—100 μ)

TOUCH-UP ENAMEL (FACTORY FINISH WITH ADDED HARDENER)

Spraying viscosity	18—22 sec. (SIS beaker at 68°F or 20°C).
Mode of application	Cold-spraying
Rate of application	Depends on nature of touch-up job
Max. temperature	194°F (90°C). (Stoving: 60 min. at 194°F (90°C)
Manufacturer	AB Arvid Lindgren Glassurit-Werke

TOUCH-UP AND REFINISH INSTRUCTIONS

General

For all touch-up or refinish jobs, use synthetic stoving or air-drying enamel of the same make as that used for the original paintwork. The use of cellulose or combination enamels should be avoided, since these have inferior characteristics in respect of durability, glass and color retention, largely due to differences in the binders incorporated.

For perfect results, it is essential that the paintshop be kept absolutely free of dust. It should also be free of drafts and must naturally not be used as a means of access to other departments. Keep the floor thoroughly damp while spraying. A paint job ruined by dust cannot be restored by polishing — wet flatting with 400 abrasive paper and respraying will be necessary. This respray

coat, however, must be very thin. Before any partial refinishing is undertaken, spray a test area to check that the shade used is identical with the color of the parts that are not to be resprayed. Any deviations must be corrected by the addition of a little toning shade to the paint.

Touch-up and refinish jobs involve the following operations:

Removal of rust and old paint.
Rubbing down.
Solvent-cleaning.
Priming, for instance with wash primer.
Filling — if necessary.
Flatting.
Finishing.
Air-drying, stoving with infra-red radiant heat or in a drying oven, depending on the type of enamel used.

Cleaning

If the old finish shows defects such as cracking, pitting due to the impact of flying stones, etc., apply a paint remover or flatten down to the bare metal. After removal of the old finish by one or the other of these methods, degrease the metal with spirit, thinner or some other suitable solvent. In principle, the same cleaning procedure should be used even if the old finish has merely been rubbed down instead of being removed. Realign any distorted panels and grind with a disc grinder, if necessary, before flattening with 220—240 abrasive paper. Finally, reclean all the parts with spirit or cellulose thinner. Thoroughness in this respect is vital to good adhesion.

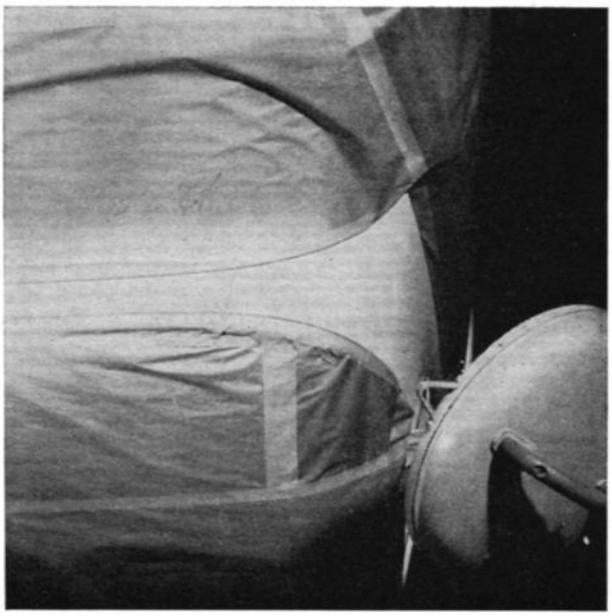
Priming

Coat all cleaned metal surfaces with primer. The normal drying time is about 45 minutes at 158°F (70°C) or five to six hours in the case of air-drying. An infra-red radiation lamp may also be used, but care must be taken to keep it at a distance of not less than 16 in. (40 cm) from the metal. After drying, fill as necessary, applying the putty in thin layers, allowing the stipulated drying time between each application.

Rubbing down

Rub down the primed and filled surface with 320-mesh wet abrasive paper, and then with 400-mesh paper. After removing all water, wash the surfaces again with spirit or cellulose thinner and tack-rag them. Tack-ragging involves wiping the surfaces with a piece of gauze drenched in slow-drying varnish.

MEASURING VISCOSITY WITH AN SIS BEAKER



USE OF RADIATION LAMP TO DRY REFINISHED PART

Equipment and procedure for refinishing

A. Stoving touch-up enamel

Oven: Convection oven with an air temperature of 194—212°F (90—100°C), giving a metal temperature of about 176°F (80°C). It is also possible to use a radiation oven, in which case the metal temperature should be about 176°F (80°C). It is important for the air temperature to be even throughout the oven, and the air temperature must therefore be continuously checked. For this purpose, it is appropriate to use a calibrated max. and min. thermometer or a thermo-element with a compensator. The plate temperature can be checked only with this latter device.

Enamels: 20—25% hardener must be added to the stoving touch-up enamels manufactured by AB Beckers. The stoving touch-up enamels supplied by A/G Glassurit-Werke already incorporate the necessary hardener.
The enamel can be sprayed either hot or cold, and the viscosity should be adjusted accordingly with a synthetic thinner to the following:

Hot-spraying — viscosity approx. 35 sec.
Cold-spraying — viscosity approx. 21 sec.
Measure the viscosity with a beaker according to the method described in the Swedish standard SIS 16 00 11 at a temperature of approx. 68°F (20°C).

Procedure: First clean the body and chassis of the car thoroughly, thus ensuring that dust will not spread in the spraying booth or drying oven. Disconnect the battery negative cable and empty the fuel tank. Remove the fuel filler cap and the stop-light lenses. Cover all glass windows with paper to prevent the temperature inside the car from becoming too high. When the car is pretreated and painted, see below, it should have cooled to room temperature.

The car should be placed in the oven when the latter has reached the prescribed temperature of 194—212°F (90—100°C). Leave the car there for one hour. It is important that the air temperature inside the car does not exceed 167°F (75°C), and because of this all doors, windows and lids must be kept closed. If the luggage-compartment lid or the hood has to remain open for any reason, mask the space inside.

B. Air-drying touch-up enamel (68–176°F or 20–80°C)

When air-drying enamel is used, no special arrangements are necessary other than a well-heated, dustless booth. The drying time, however, can be speeded up considerably by stoving the enamel with an infra-red radiation lamp or in an oven with an air temperature of not more than 176°F (80°C).
The enamel can be sprayed either hot or cold, and the viscosity should be adjusted accordingly with a synthetic thinner to the following.

Hot-spraying — viscosity approx. 35 sec.
Cold-spraying — viscosity approx. 21 sec.
Measure the viscosity with a beaker according to the method described in the Swedish standard SIS 16 00 11 at a temperature of approx. 68°F (20°C).

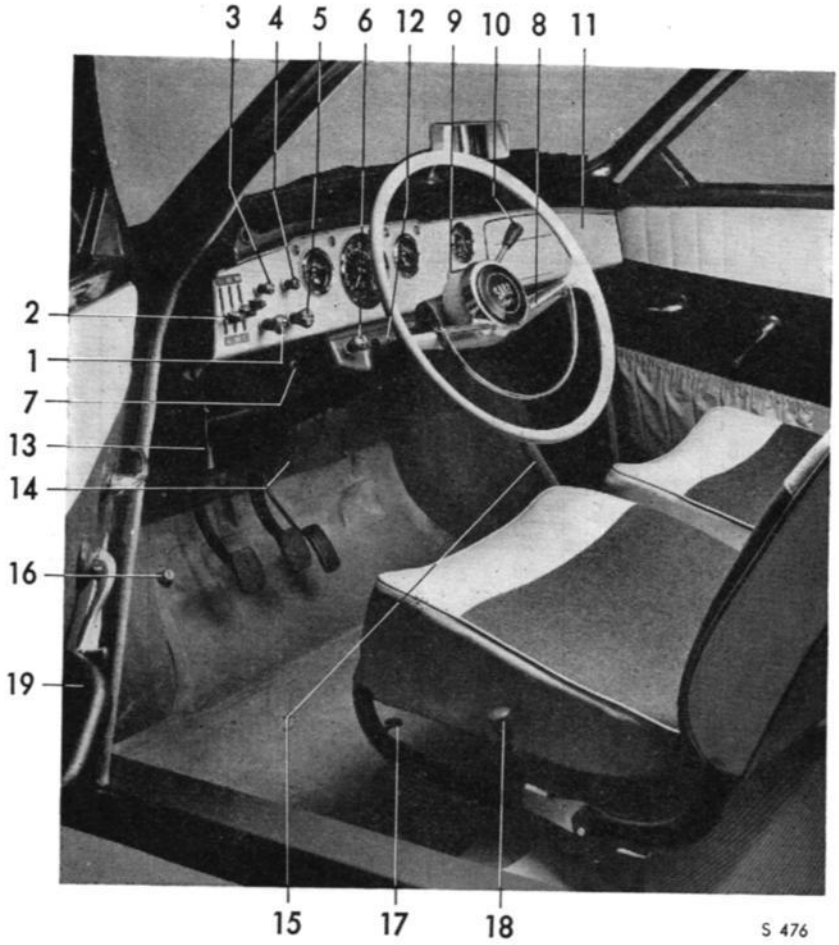
The metal must have adopted room temperature prior to pretreatment and painting.

> NOTE
>
> Enamel conforming to the same color specification may be supplied by several different manufacturers. It is therefore essential to quote the car chassis number and the original color when placing orders for touch-up enamel.

General maintenance

Proper care and attention is necessary to retain the gloss, durability and protective properties of the enamel finish. Recommendations in respect of general maintenance are given in Chapter I.

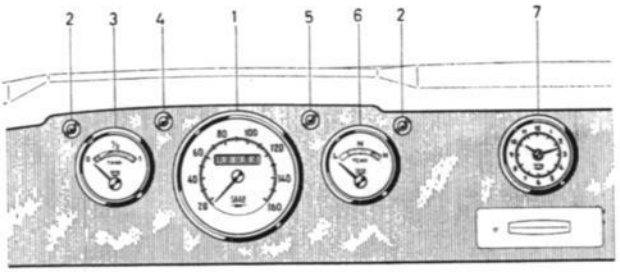
CONTENTS



INSTRUMENTS, SAAB 95 AND 96

Controls

1. Cold-start control.
2. Heater controls.
3. Heater fan switch.
4. Switch for extra equipment.
5. Combination switch for windshield wipers and windshield-washer pump: turn to start wipers, pull and release to operate washer (manually).
6. Switch for lights and instrument-panel illumination. Pull out to first position to light parking and number-plate lamps. Pull full out to light headlamps also. Twist knob to adjust intensity of instrument-panel lighting.
7. Hood lock.
   Open the hood forwards towards the front of the car as follows:
   a) Pull the control at the steering-column stand under the instrument panel, whereupon the hood opens half way.
   b) Push aside the catch located under the rear left-hand corner of the hood.
   c) Open the hood wide.
8. Horn switch.
9. Ashtray. A second ashtray is provided in the rear passenger compartment.
10. Gear-shift lever.
11. Glove compartment with lockable door. A removable panel in the door provides for radio installation, if desired.
12. Flasher switch.
13. Radiator blind control.
14. Freewheel control. Pull out fully to lock freewheel action.
15. Handbrake.
16. Dip switch.
17. Seat adjusting mechanism. Press the catch to release the seat for leg-room adjustment.
18. Back-rest adjuster (for setting back-rest at desired angle).
19. Arm-rest. This can be adjusted to three different positions by moving the retaining screws.



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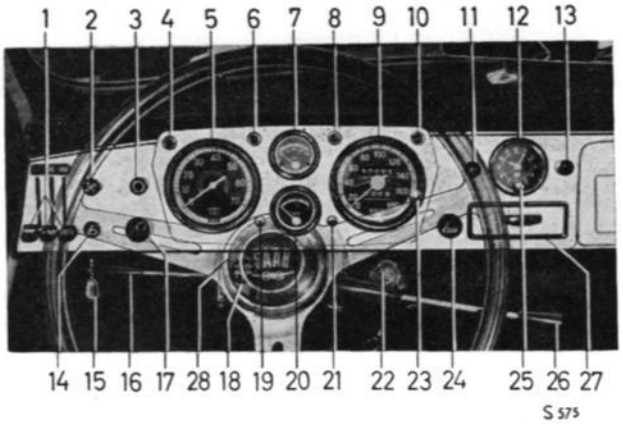
INSTRUMENTS, SAAB 95 AND 96

The instrument cluster is placed directly in front of the driver, who has a good view of all dials thanks to the two-spoke design of the steering wheel.

1. Speedometer and mileage recorder. The speedometer is graduated from 0—100 m.p.h. or 0—160 km/h. The mileage recorder indicates the distance covered in miles (or kilometers).
2. Flasher warning lamp — flashes green in time with the direction-indicating flashers.
3. Fuel gage. The amount of fuel left in the tank is indicated when the ignition is switched on. A warning lamp glows red when there is less than about 1.8 U.S. gal. (7 liters) left.
4. High beam indicator light — shows a red light when the headlamps are on high beam.
5. Charge indicator lamp. Shows an orange light when the generator is not charging — normal when the engine is idling.
6. Coolant thermometer. The green zone indicates normal operating temperature.
7. Electric clock with setting screw. A regulating screw is provided on the back of the clock.



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INSTRUMENTS AND CONTROLS, SAAB SPORT

1. Air heater controls
2. Ventilator fan switch with two speeds
3. Switch for extra equipment
4. Turn indicator control light, left
5. Tachometer
6. Oil-pressure indicator light
7. Thermometer
8. Charging indicator light
9. Speedometer and mileage recorder with trip meter
10. Turn indicator control light, right
11. Fog light switch
12. Electric clock
13. Spotlight switch
14. Windshield wiper/washer switch
15. Radiator blind control
16. Turn indicator lever
17. Cold start control
18. Headlight and parking light switch and rheostat for the intensity of instrument lighting
19. Fuel indicator light
20. Fuel gage
21. High beam control light
22. Gear lever and ignition lock
23. Zero button for trip meter
24. Cigaret lighter
25. Set screw for clock
26. Gear lever
27. Ash tray
28. Horn button

INSTRUMENTS

Speedometer and mileage recorder Removal and installation

Since the speedometer and mileage recorder form an independent unit, removal and installation can be carried out without interfering with any of the other instruments in the cluster.

1. Disconnect the cables to the earth terminal, withdraw the lampholders together with their connection wires, and disconnect the speedometer drive cable.
2. Saab 96 and Saab Sport: Back off the knurled center nut retaining the bezel. Saab 95: Back off the two knurled nuts retaining the bezel.
3. Remove the instrument from the panel.
4. Install in the reverse order, making sure that the stamped mark or line on the periphery of the housing coincides with the notch in the hole for the instrument in the panel.

> Repairs and adjustments of the speedometer and mileage recorder should always be entrusted to a specialist firm.

Speedometer drive cable

When handling the speedometer drive cable, never coil it in rings with a diameter of less than about 12 inches (300 mm). Otherwise, there is a risk of damaging the flexible inner wire, which might lead to unwanted noise after installing.

When fitting the speedometer drive cable, note the following points:

1. Release the dash-panel trim at the hole where the cable enters through the dash panel.
2. Secure the upper nut to the speedometer drive cable with adhesive tape and then pass the cable up from the engine compartment and through the hole in the dash panel.
3. When fitting the cable, take care to arrange it smoothly, without any sharp bends.

Ammeter, fuel and temperature gages, clock

General

These instruments are independent units and can be removed separately from the instrument panel by disconnecting the wires and removing the retaining clips.

> Repairs and adjustments of any of these instruments should always be entrusted to a specialist firm.

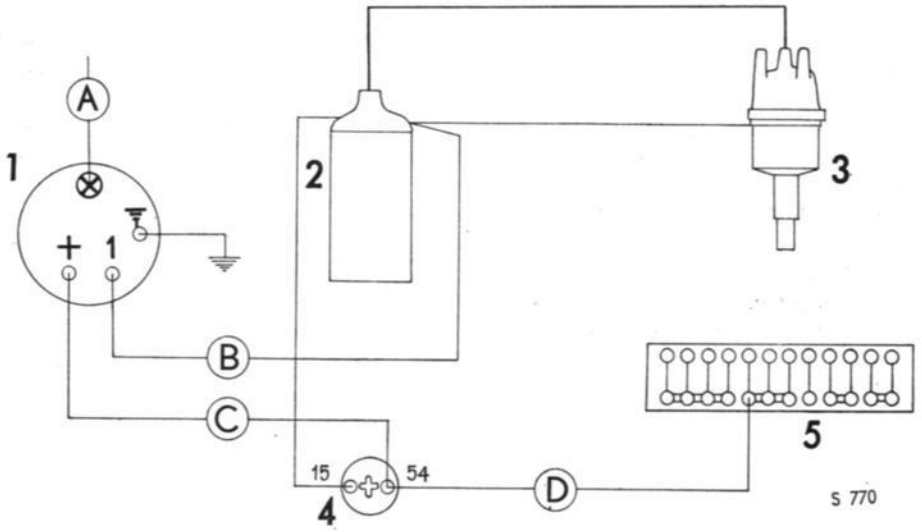
Revolution counter

General

The Saab Sport is equipped with an electric revolution counter, connected to the ignition primary circuit. See the wiring diagram in Section 3, group 37. When installing a revolution counter in, for instance, a Saab 96, follow the wiring diagram below.

CAUTION

Do not confuse plus and minus leads, or the instrument may get ruined.



WIRING DIAGRAM FOR FITTING AN ELECTRIC REVOLUTION COUNTER IN SAAB 95 AND 96 CARS

1. Rev. counter
2. Ignition coil
3. Distributor
4. Ignition switch
5. Fuse block

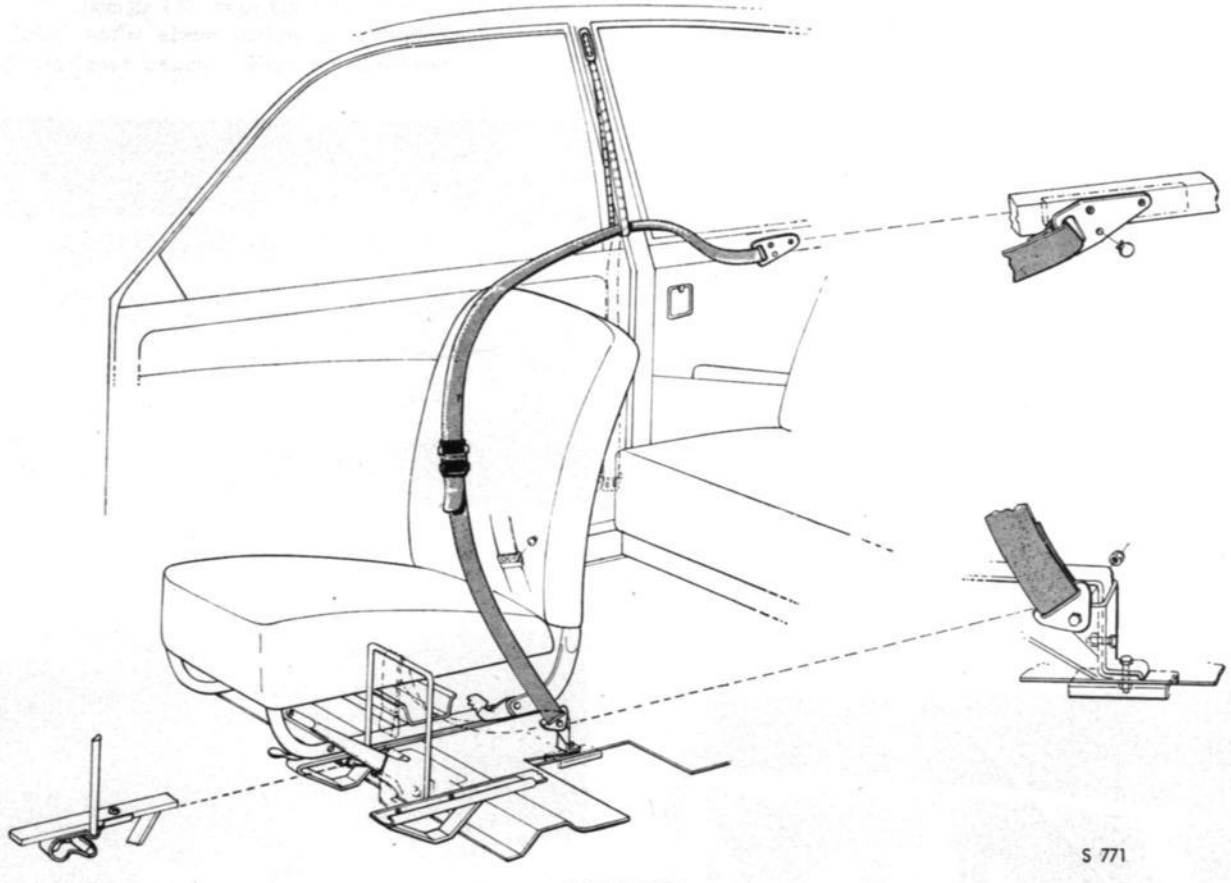
A. Instrument-lighting lead.
B. Lead between ig. coil and terminal 1 on counter.
C. Lead between terminal 54 on ig. switch and plus lead on rev. counter.
D. Outgoing lead from ig. switch to fuse block.

MECHANICAL ACCESSORIES

Seat belts

Use

Saab cars are fitted with seat belts of diagonal type. Pass the belt over one shoulder and diagonally across the chest. Do not tighten the belt so much that it causes irritation, but on the other hand do not let it sit too loosely. When not in use, place the inner strap over the holder between the front seats, so that it is readily available and will not be soiled. See fig. The outer strap is retained in a convenient fitting position by the extended strop, which also keeps the belt out of the way of the rear-seat passengers and prevents it from getting caught in the door and from being soiled.



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SEAT BELT

ELECTRICAL ACCESSORIES

Radio installation

Installation

The most convenient site in which to install the radio receiver is in the space provided in the glove compartment.

L.H.-DRIVE CAR

Remove the panel in the glove compartment door and place the receiver in the glove compartment on the lefthand side. It may be necessary to cut out a hole in the bottom, corresponding to the width of the receiver. See fig.

R.H.-DRIVE CAR

The receiver is placed on the lefthand side in the glove compartment and the upper part of the front panel of the receiver must be cut off. See fig. A hole is cut out in the bottom of the glove compartment, corresponding to the width of the receiver.

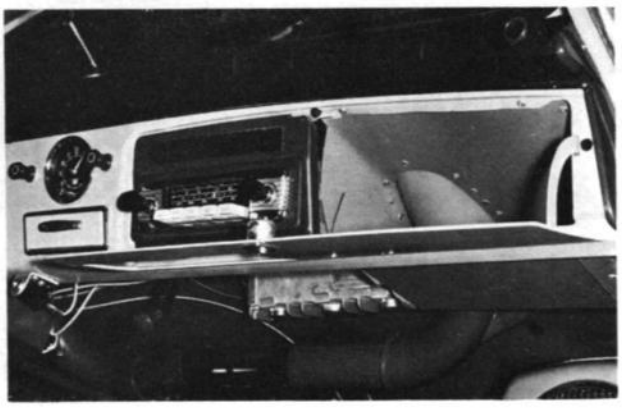
A rectangular hole is made in the door of the glove compartment for the dial and controls of the receiver. See fig.

Location of antenna

It is appropriate to locate the antenna on the left fender in order to come as far away as possible from the ignition coil, or on the rear part of the car.

When fitting a radio and antenna, the supplier's instructions should be followed.

Instructions concerning suppression measures are given in chapter 3.



RADIO INSTALLATION L.H.D. CAR

Electrical accessories

General

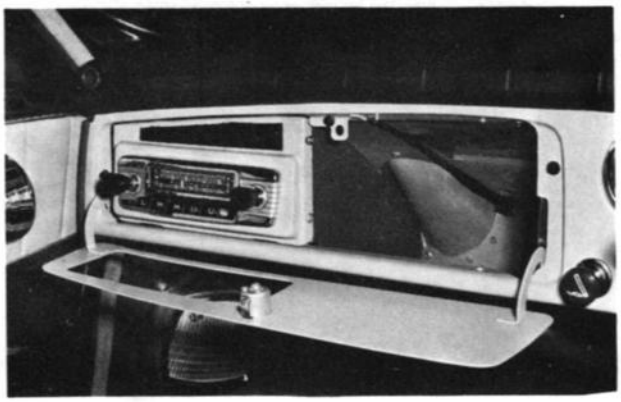
The radio and any other electrical accessories, such as extra lights, etc., must be properly fused off and should therefore be connected to the ignition switch or to the fuse block on the dash panel, which is provided with spare fuses for this purpose.

The wiring for electrical accessories should be so dimensioned as to ensure the least possible voltage drop. As a general rule, the following applies:

Current consumption less than 8 A (96 W): use a wire with a sectional area of 0.002 sq.in. (1.5 sq.mm).

Current consumption more than 8 A (96 W): use a wire with a sectional area of 0.003 sq.in. (2.5 sq.mm).

For all connections and splices made when installing electrical accessories, use AMP crimped terminals. See further details in Chapter 3.



RADIO INSTALLATION R.H.D. CAR

LOCATION OF ANTENNA

FRESH-AIR HEATER

General

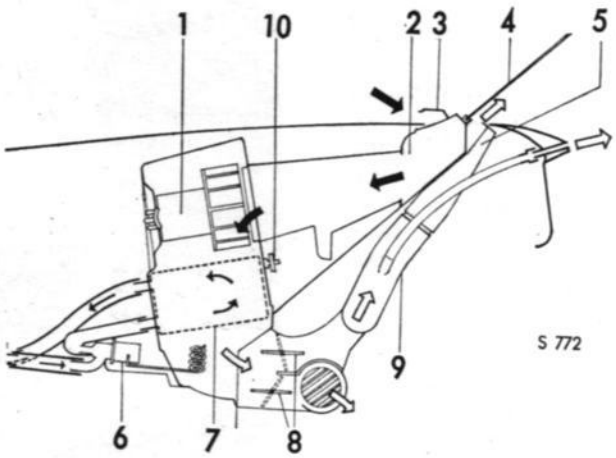
The fresh-air heater comprises a separate system, but is connected to the cooling system.

Through the air intake 3 in front of the windshield, air enters a "collection box" 2 formed by the body panels. Located in front of this chamber, in a metal casing in the engine compartment, is the heater core 7. The air passing the core, which is heated by the cooling water and the water temperature of which can be varied with the thermostat-controlled stopcock 6, is warmed up. The thermostat bulb is located in the current of air injected into the passenger compartment. Having passed the heater core, the warm air flows into the car through the fan housing which encloses the fan and is fitted with two dampers 8. the first damper regulates the flow of air towards the floor and sides of the passenger compartment, while the second regulates the amount of air admitted to the defroster. In the latter case, the air flows through a number of slots up to, and across the entire width of, the windshield and through a hole on either side of the instrument panel towards the door windows.

When the road speed exceeds 30 m.p.h. (50 km/h), the speed wind is generally sufficient to ensure satisfactory function of the fresh-air heater. Consequently, it is only necessary to use the fan when the car is being driven at a relatively low speed.

When driving slowly on hot summer days, driving comfort may be improved by using the fan to draw fresh air into the car. Needless to say, the control lever should then be set at cold. The figures below show the settings of the heater controls.

The heater coil is fitted with a bleed nipple, with which the coil is to be bled whenever the cooling system is refilled.

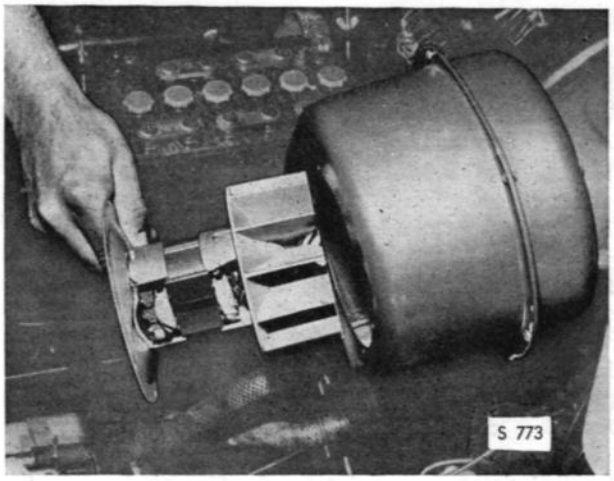


HEATING SYSTEM, PRINCIPLE

1. Fan and moter
2. Collection box
3. Fresh-air intake
4. Windshield
5. Defroster jet
6. Thermostat valve
7. Heater core
8. Dampers
9. Defroster hose
10. Bleeder screw

Removal and installation of fan motor

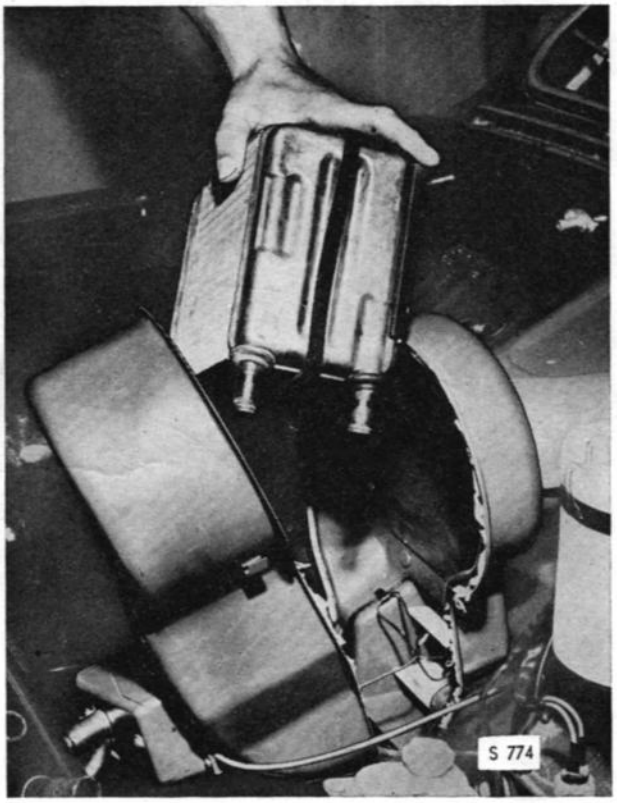
1. Disconnect the three cables from the fan motor, noting their respective locations.
2. Back off and remove the six screws retaining the front cover of the fan housing.
3. Pull out the cover, together with the fan motor.
4. Remove the nuts holding the motor to the front cover. The fan motor and impeller are balanced together in order to ensure vibrationfree running. An exchange system is operative in respect of the complete fan unit. Reinstall in the reverse order.



REMOVAL OF FAN MOTOR

Removal and installation of fresh-air heater core

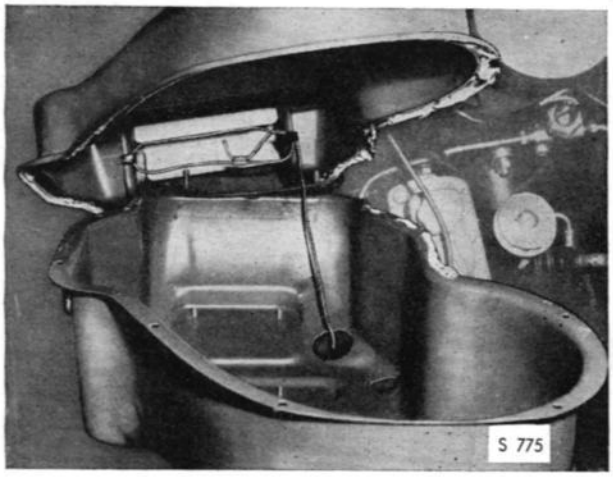
1. Drain off the cooling water and disconnect the two hoses from the heater core.
2. Disconnect the three cables from the fan motor, noting their respective locations.
   Back off and remove the six screws retaining the front cover of the fan housing. Lift out the fan motor.
3. Back off the screws holding together the fan-housing casings. Eight screws are accessible from the engine compartment and two nuts from inside the car. To provide access to these two nuts, fold back the rubber mat, unscrew the freewheel control handle and remove the two trim clips, whereupon the insulation can be turned back from the cowl plate and the nuts removed.
4. Pull the front part of the fan-housing casing out so far as to allow removal of the heater core. See fig. Note: Proceed with care, to avoid damaging the thermostat coil. Before refitting the heater core, check that the sealing rings on the water pipe are in place. Install the heater core in the reverse order. Then refill the cooling system with water and check the hose connections for leaks.



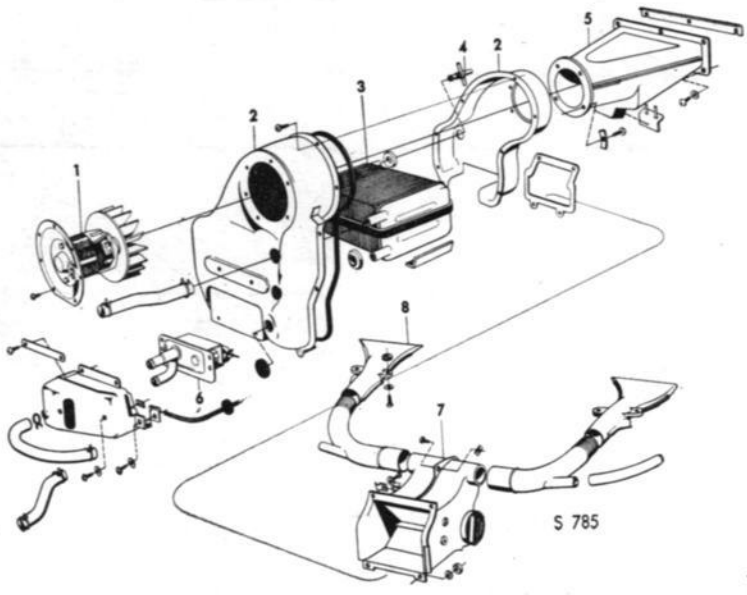
REMOVAL OF HEATER CORE

Removal and installation of fresh-air heater thermostat valve

1. Drain off the cooling water and disconnect the hoses from the heater core and thermostat valve.
2. Divide the throttle linkage at the rubber joint and pull the shaft out of the thermostat-valve casing.
3. Remove the four screws holding the thermostat-valve casing to the fan-housing casing.
4. Remove the three cables from the fan motor, noting their respective locations.
   Back off and remove the six screws retaining the front cover of the fan housing. Lift out the fan motor — see fig.
5. Back off and remove the screws holding together the fan-housing casings. Eight screws are accessible from the engine compartment and two nuts from inside the car. To provide access to these two nuts, turn back the rubber mat, unscrew the freewheel control handle and remove the two trim clips, whereupon the insulation can be turned back from the cowl plate and the nuts removed.
6. Pull out the front part of the fan-housing casing and lift out the heater core. Disconnect the thermostat coil by bending up the sheet-metal tabs on the inside of the fresh-air heater casing. See fig.
   Remove the control and protective casing (2 screws) from the stop cock. The thermostat valve can now be extracted.
   Reinstall the thermostat valve in the reverse order. Then refill the cooling system with water and check the hose connections for leaks.



SEPARATING THE FRESH-AIR HEATER CASING



FRESH-AIR HEATER

1. Fan and motor
2. Casings
3. Heat exchanger
4. Bleeder screw
5. Fresh-air duct
6. Thermostat valve
7. Damper housing
8. Defroster jet

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