

**SAAB**

**9000**

**SERVICE  
MANUAL**

**6** **Front assembly and steering**

**M 1985-88-**





## **SERVICE MANUAL**

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### **6 Front assembly and steering** M 1985-88-

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## Units

The basic and derived units used throughout the Service Manual are in accordance with the SI system.

For users not familiar with the SI units, some non-Continental units are given in brackets after the respective SI unit.

The following symbols and abbreviations are used:

SI unit	Equivalent unit and symbol
mm	inch (in)
kg	pound (lb)
N	pound-force (lbf)
Nm	pound-force foot (lbf ft)
bar	pound-force per square inch (lbf/in <sup>2</sup> ) (Also abbreviated: psi)
l (litre)	US liquid quart (liq qt) (Also abbreviated: qts)
	US gallon (USgal)
°C	°F

## Conversion factors

1 in = 25.4 mm	1 mm = 0.039 in
1 lbf = 4.45 N	1 N = 0.23 lbf
1 lbf ft = 1.36 Nm	1 Nm = 0.74 lbf ft
1 psi = 0.07 bar	1 bar = 14.5 lbf/in <sup>2</sup>
1 liq qt = 0.95 l	1 l = 1.05 liq qt
1 US liq qt = 0.83 UKqt	1 USgal = 0.83 UKgal

## Market codes

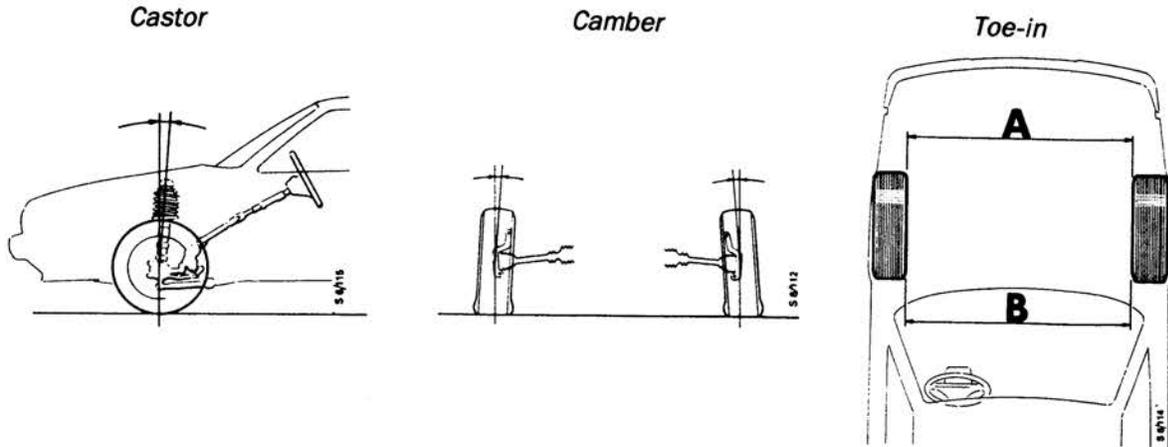
The codes refer to market specifications

AT	Austria	FR	France
AU	Australia	GB	Great Britain
BE	Belgium	GR	Greece
CA	Canada	IS	Iceland
CH	Switzerland	IT	Italy
DE	Germany	JP	Japan
DK	Denmark	ME	Middle East
ES	Spain	NL	Netherlands
EU	Europe	NO	Norway
FE	Far East	SE	Sweden
FI	Finland	US	USA

# Technical data

All tightening torques apply to unlubricated nuts and bolts, unless otherwise stated.

## Front-wheel alignment (unladen car)



Castor	Degrees (°)	$1.65 \pm 0.50$
Camber	Degrees (°)	$-0.65 \pm 0.50$
Toe-in, measured between rims (B - A)	mm (in)	$1.5 \pm 0.5$ ( $0.06 \pm 0.02$ )
Swivel pin (king pin) inclination	Degrees (°)	$11.3 \pm 0.5$
Steering angle		
Outer wheel	Degrees (°)	20
Inner wheel	Degrees (°)	$21.0 \pm 0.5$

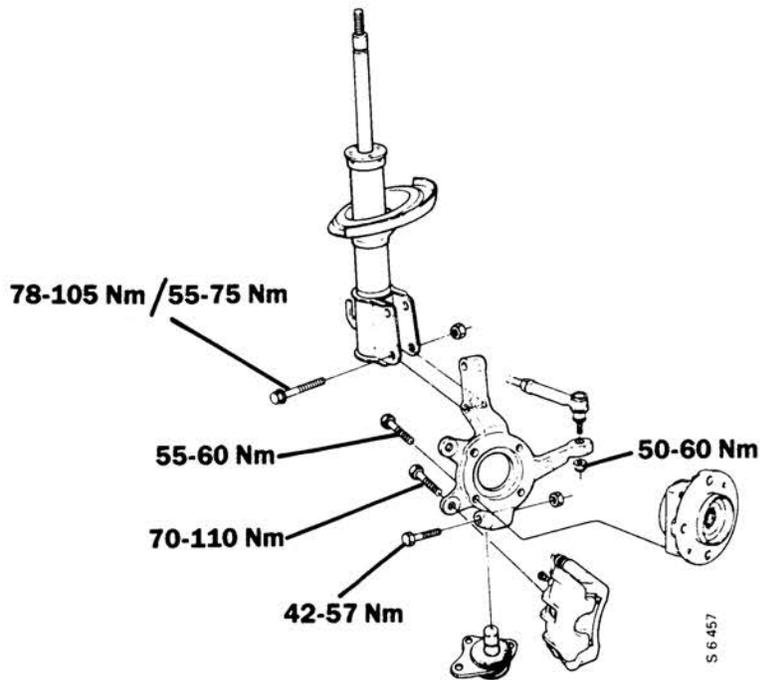
## Rear-wheel alignment

Toe-in	mm (in)	$2.5 \pm 1.5$ ( $0.1 \pm 0.06$ )
Camber	Degrees (°)	$-0.25 \pm 0.25$

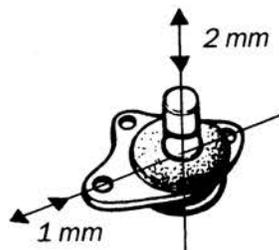
<b>Wheelbase</b>	mm (in)	2672 (105)
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**Steering swivel member**

**Tightening torques**



Tightening torque:			
To strut	Nm (lbf ft)	78 - 105 (57.5 - 77.4)	
(with Vaseline on thread)	Nm (lbf ft)	55 - 75 (40.6 - 55.3)	
To ball joint	Nm (lbf ft)	42 - 57 (31.0 - 42.0)	
To track-rod end	Nm (lbf ft)	50 - 60 (36.9 - 44.2)	
To hub	Nm (lbf ft)	55 - 60 (40.6 - 44.2)	
To brake caliper	Nm (lbf ft)	70 - 110 (51.6 - 81.1)	
Ball-joint wear limits:			
Axial play	mm (in)	2 (0.08)	
Radial play	mm (in)	1 (0.04)	
Ball-joint lubricant		Molycote Longterm 2E	

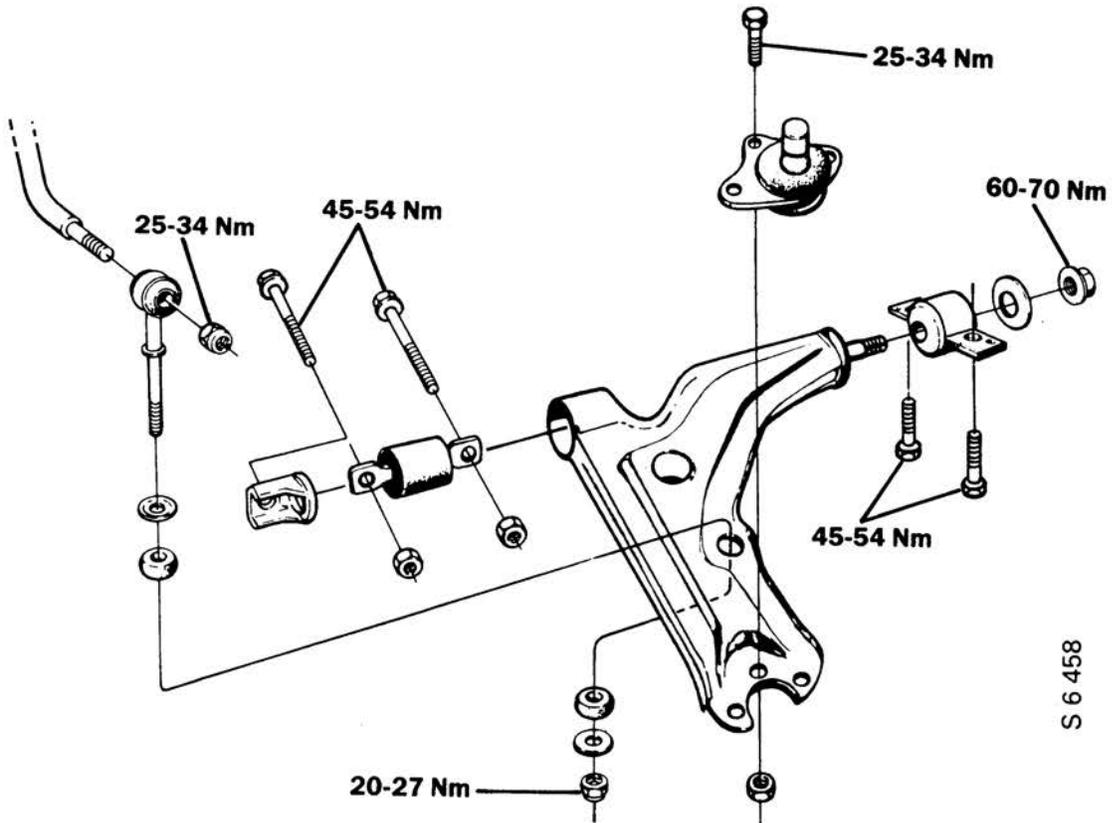


*Ball-joint wear limits*

**Suspension arms**

Tightening torque:		
To ball joint	Nm (lbf ft)	25 - 34 (18.4 - 25.1)
To anti-roll bar link	Nm (lbf ft)	20 - 27 (14.8 - 19.9)
Anti-roll bar link to anti-roll bar	Nm (lbf ft)	25 - 34 (18.4 - 25.1)
Front mounting	Nm (lbf ft)	45 - 54 (33.2 - 39.8)
Rear mounting	Nm (lbf ft)	60 - 70 (44.3 - 51.6)
Rear mounting to subframe	Nm (lbf ft)	45 - 54 (33.2 - 39.8)

**Suspension arm tightening torques**



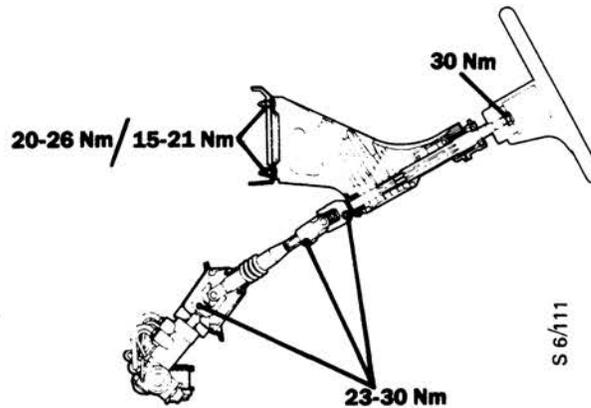
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## 026-4 Technical data

### Steering column assembly

Tightening torque:		
UJ pinch-bolt	Nm (lbf ft)	23 - 30 (17.0 - 22.1)
UJ intermediate shaft	Nm (lbf ft)	23 - 30 (17.0 - 22.1)
Steering wheel centre-nut	Nm (lbf ft)	30 (22.1)
Fixing bolts	Nm (lbf ft)	20 - 26 (14.8 - 19.2)
(waxed - green chromated)	Nm (lbf ft)	15 - 21 (11.1 - 15.5)

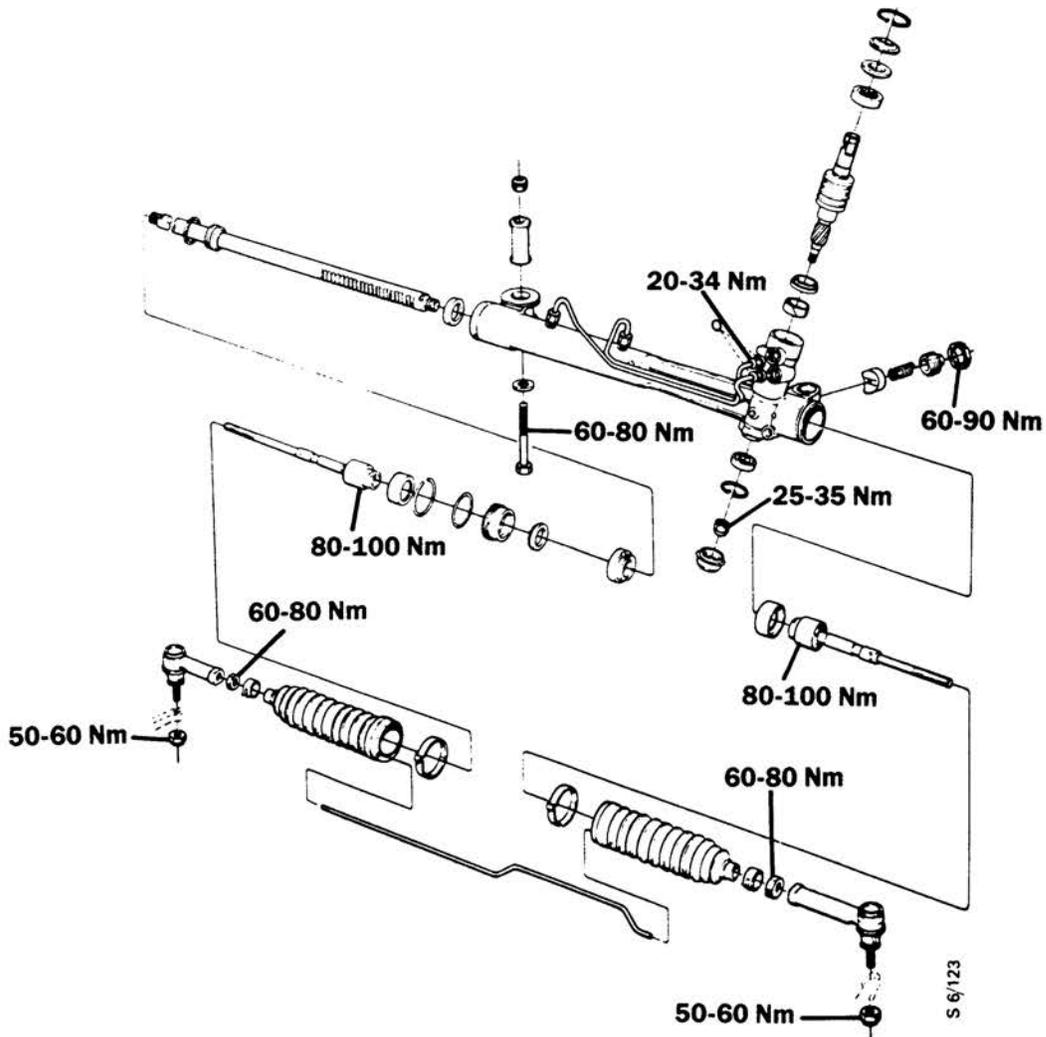
### Steering column assembly tightening torques



### Power-assisted steering

Steering wheel turns, lock-to-lock		3.21
Damping yoke		The rack must be centred. Tighten the adjusting screw to a torque of 8 - 15 Nm (5.9 - 11.1 lbf ft) then back off through 40° - 60°. Ensure that the rack does not bind at any point.
Servo fluid	cl (liq qt)	Texaco 4634 Power Steering Fluid 75 (0.8)
Lubricant for damper yoke, rack and pinion		Lithium grease - Shell EPB2 Code 71303, Shell Retinax A or equivalent
Rack-and-pinion gear torque, wheels off ground	Nm (lbf ft)	0.8 - 2.5 (0.59 - 1.85)
Tightening torques:		
Fixing bolts	Nm (lbf ft)	60 - 80 (44.3 - 59.0)
Hydraulic hose fittings	Nm (lbf ft)	20 - 34 (14.8 - 25.1)
Pinion locknut	Nm (lbf ft)	25 - 35 (18.4 - 25.8)
Damper yoke locknut	Nm (lbf ft)	60 - 90 (44.4 - 66.4)
Inner ball joint	Nm (lbf ft)	80 - 100 (59.0 - 73.8)
Track-rod end: locknut	Nm (lbf ft)	60 - 80 (44.3 - 59.0)
to steering swivel member	Nm (lbf ft)	50 - 60 (36.9 - 44.3)

**Power-assisted steering tightening torques**

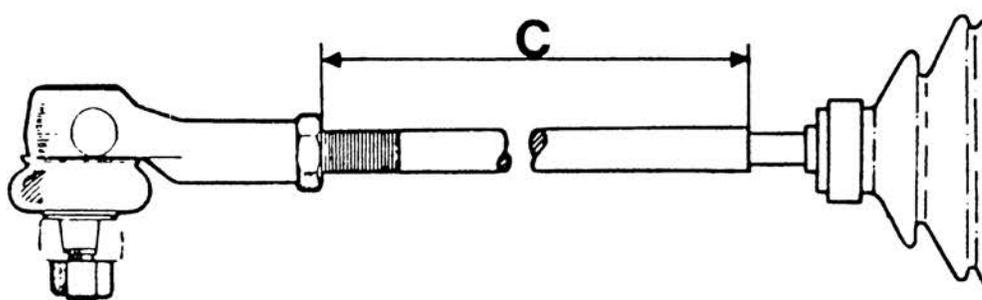


**Hydraulic (servo) pump**

Belt tension:		
New belt	N (lbf)	800 ± 45 (184 ± 10)
After adjustment	N (lbf)	535 ± 45 (123 ± 10)
Minimum	N (lbf)	355 (82)
Control valve:		
Opening pressure	bar (psi)	68.9 - 75.8 (1000 - 1100)
Flow	litre/min (g/min)	6.4 - 7.9 (1.7 - 2.1)

**Ball joints**

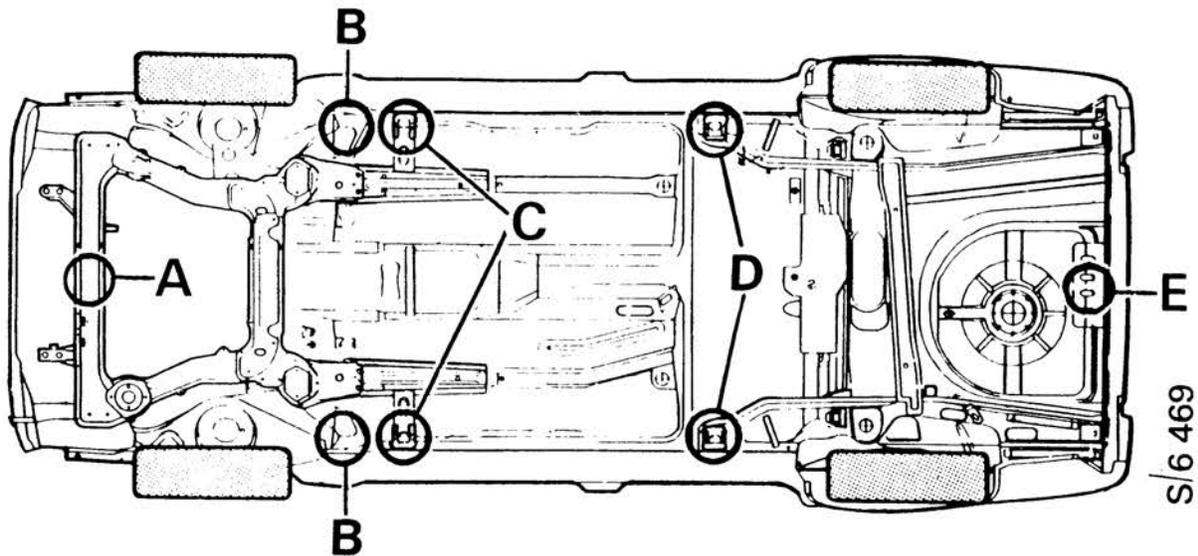
Wear check: Inner ball joint		Ball joint must move freely, without binding, to limit of travel in all directions. With the rack horizontal, the track rod complete with ball joint should remain in any position and not be able to fall under its own weight. If the track rod falls under its own weight, there is excessive play in the ball joint and the track rod assembly should be replaced.
Wear check: Track-rod ends		Nonadjustable - must be replaced before maximum permissible play present.
Maximum play in inner ball joint:		
Axial play	mm (in)	2 (0.08)
Radial play	mm (in)	1 (0.04)
Maximum play in track-rod ends:		
Axial play	mm (in)	2 (0.08)
Radial play	mm (in)	1 (0.04)
Inner ball joint lubrication		Permanently lubricated
Track-rod end lubrication		Molycote Longterm 2E
Maximum value of 'C' after adjustment of toe-in:	mm (in)	140 (5.51)
Maximum difference in value of 'C' between LH and RH track rods	mm (in)	2 (0.079)



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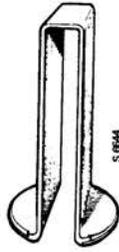
C = 140 mm (5.51 in) maximum

**Jacking points**

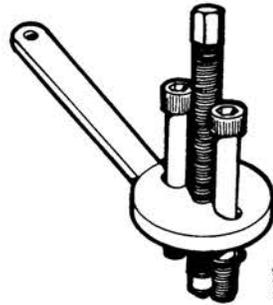


- A Front jacking point - trolley jack
- B Front jacking points - car lift and axle stands
- C Front jacking points - standard jack
- D Rear jacking points - car lift, axle stands and standard jack
- E Rear jacking point - trolley jack

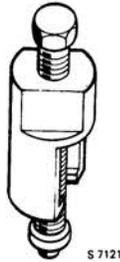
# Special tools



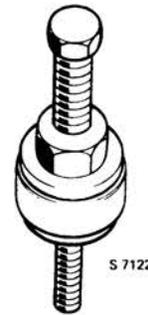
89 96 399 Tool for removing inner hydraulic seal from rack-and-pinion gear



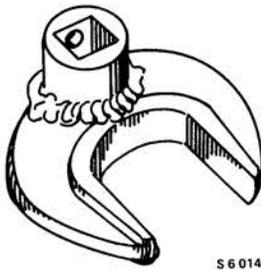
89 96 258 Steering-wheel puller



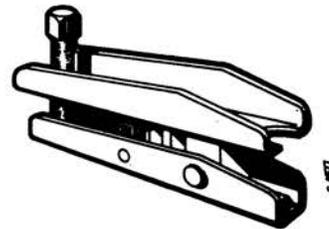
89 96 423 Puller for servo pump pulley



89 96 415 Tool for fitting servo pump pulley



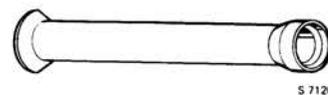
89 96 480 Tool for removal/refitting inner ball joint on rack



89 95 409 Ball-joint separator for inner ball joints and track-rod ends

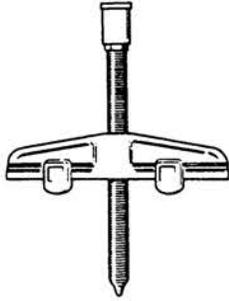


78 41 067 Sleeve for fitting control valve and end cap over pinion locknut

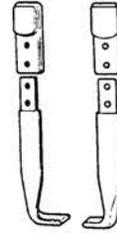


89 96 407 Press sleeve for fitting of sealing ring between control valve and pinion

## 106-2 Special tools



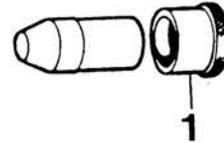
87 91 287 Puller jackscrew



87 91 303 Puller arms



83 91 849 Dolly for removal of control valve

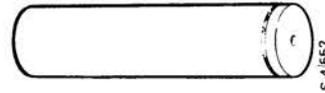


89 95 938 Seal-fitting tool (complete)

89 95 946 Seal protector (1)



83 90 148 Press adaptor sleeve for rack



87 91 204 Tool for pressing out of suspension-arm bearing



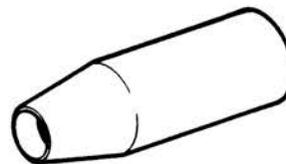
83 93 985 Belt-tension meter



88 19 013 Tracking gauge



87 90 644 Dolly for removal of control valve



84 71 138 Centring mandrel

# Technical description

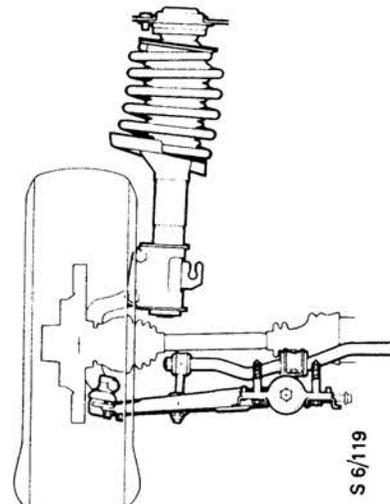
Front suspension . . . . .	600-1	Track-rod ends . . . . .	600- 3
MacPherson struts . . . . .	600-1	Power-assisted steering	
Suspension arms . . . . .	600-2	system . . . . .	600- 4
Steering swivel members . . . . .	600-2	Servo pump . . . . .	600- 7
Steering column assembly . . . . .	600-3	Wheel geometry . . . . .	600-11

## Front suspension

The car has independent front suspension incorporating MacPherson struts, which are fitted between the steering swivel members and the body and are therefore direct-acting on the wheels.

Besides being of compact, robust and reliable design, MacPherson-strut suspension also provides good isolation from road noise.

The long stroke (185 mm) of the strut makes for excellent roadholding and a comfortable ride. The spring and damper act in the ratio of 1:1 relative to the wheel.

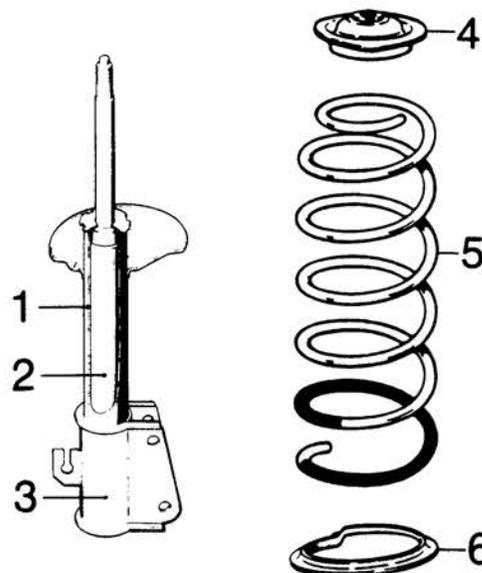


## MacPherson struts

The strut comprises an interior damper, a coil spring and a 52-mm dia tube with welded-on mountings

The upper end of the damper piston inside the strut is mounted in a ball bearing impacted in a rubber bearing. The damper piston performs two functions: it absorbs the energy stored in the spring and also the forces generated during acceleration, braking and cornering.

The damper piston is 22 mm in diameter and manufactured to close tolerances to minimize any play.

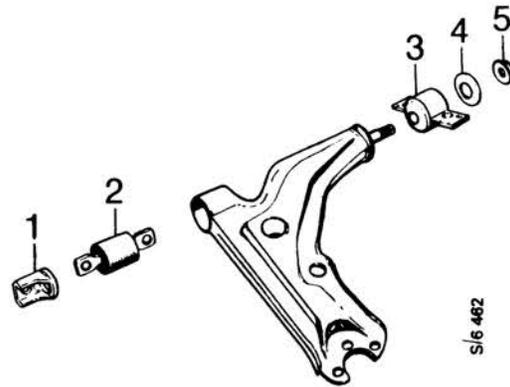


- 1 Tubular strut
- 2 Damper
- 3 Mounting
- 4 Top spring cup
- 5 Coil spring
- 6 Bottom spring cup

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## Suspension arms

Each suspension arm is attached to the front subframe via two rubber bushes, and to the steering swivel member by means of a ball joint.



- 1 Bearing bracket
- 2 Rubber bush
- 3 Rear bearing
- 4 Washer
- 5 Nut

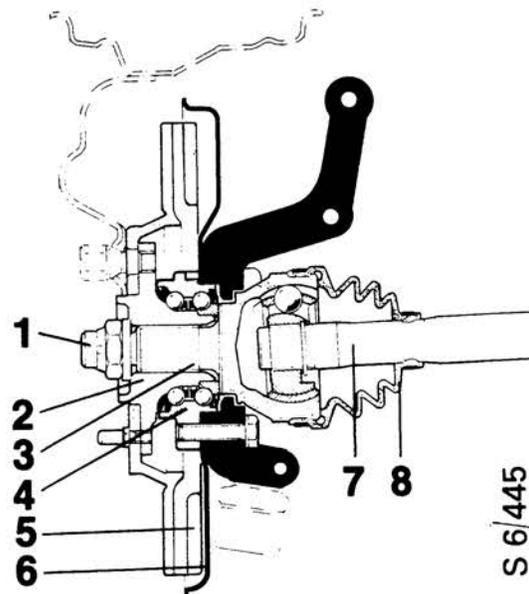
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## Steering swivel members

The steering swivel member is the main component in the wheel bearing assembly and consists of a bearing housing with inswept arms incorporating mountings for the MacPherson strut, the ball joint and the track-rod end.

The wheel bearing is a double-row, angular contact bearing, which is bolted to the steering swivel member. On the outboard side of the bearing is the brake disc, with the disc backplate clamped between the wheel bearing and steering swivel member.

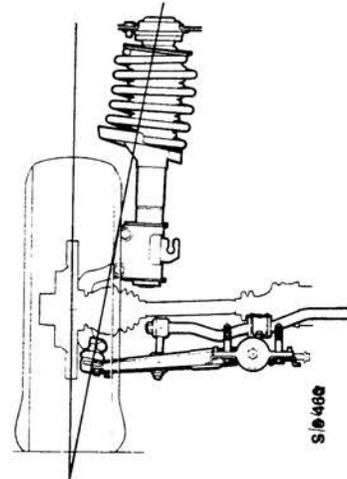
The outboard and inboard drive shafts are coupled through the outboard universal joint (CV joint). A rubber gaiter is fitted over the joint to prevent the ingress of dirt or moisture.



- 1 Hub centre-nut
- 2 Hub
- 3 Outboard drive shaft
- 4 Bearing with seals
- 5 Brake disc
- 6 Disc backplate
- 7 Inboard drive shaft and CV-joint assembly
- 8 Rubber gaiter

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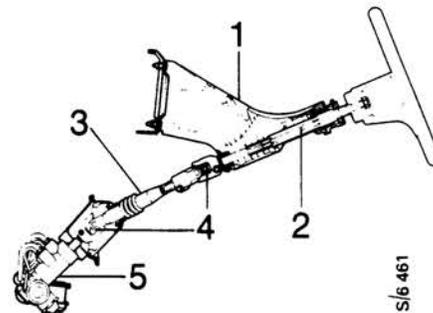
When the steering wheel is turned, the steering swivel member, hub and wheel swivel round the swivel axis - an imaginary line running through the centre of the top spring cup and the ball joint. Because the imaginary swivel-axis line intercepts the centre line of the wheel below the ground, the car is said to have positive offset or a positive scrub ratio.



## Steering column assembly

The steering column is bolted to the bulkhead and the steering-column shaft is mounted in two needle bearings suspended in rubber mountings in the steering column. An intermediate shaft, with a universal joint at either end, links the steering-column shaft to the rack-and-pinion gear.

The steering column incorporates a number of safety features, including a collapsible steel cage, a telescopic steering-column shaft and a deformation zone in the intermediate shaft designed to crumple progressively in the event of a head-on collision. In addition, the universal joints are configured in such a way that the shaft will be directed away from the driver in a collision.



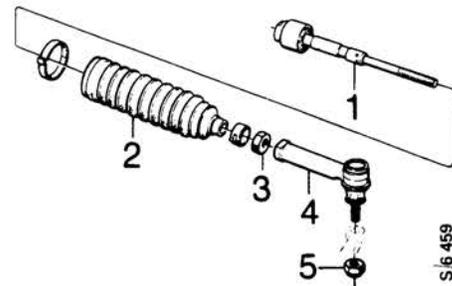
- 1 Steering column
- 2 Steering-column shaft
- 3 Intermediate shaft
- 4 Universal joints
- 5 Power-assisted rack-and-pinion gear

## Track-rod ends

The ball joints on the track-rod ends are screwed onto the track rods and secured by locknuts. To adjust the toe-in setting, the length of the track rods can be adjusted by slackening the locknuts and screwing the track-rod ends in or out as appropriate.

The ball joint on the track-rod end is secured to the steering swivel member by means of a self-locking nut.

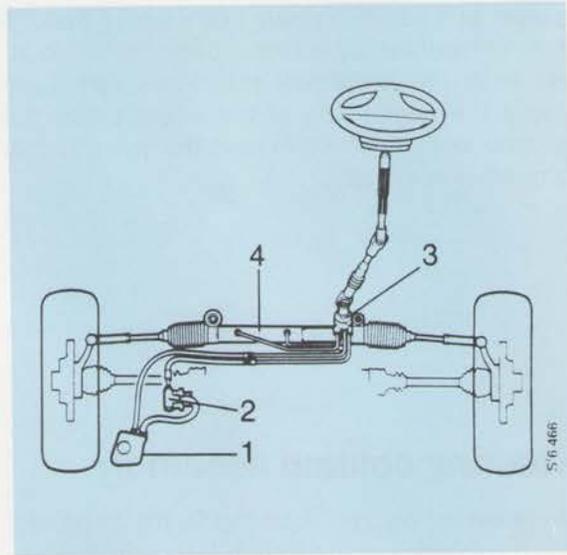
The track-rod ends cannot be dismantled but are self-adjusting and able to take up a moderate amount of wear.



- 1 Track rod with inner ball joint
- 2 Rubber gaiter
- 3 Locknut
- 4 Track-rod end
- 5 Self-locking nut

## Power-assisted steering system

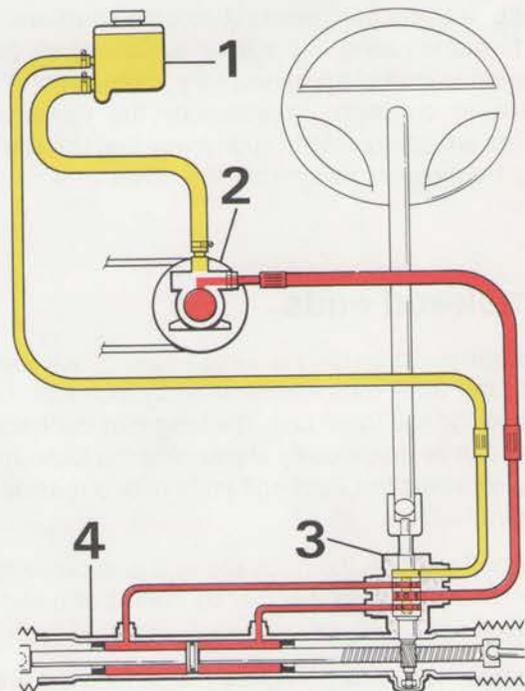
The power-assisted steering system is of the rack-and-pinion type, the main components of which are a control valve, servo cylinder and hydraulic servo pump.



*Power-assisted steering gear*

- 1 Power steering fluid reservoir
- 2 Servo pump
- 3 Control valve
- 4 Servo cylinder

The pump supplies fluid under pressure to the control valve which, according to which way the steering wheel is turned, directs the flow to the right or left side of the servo cylinder. The fluid inside the cylinder acts on the rack, thus providing power assistance to the rack-and-pinion gear. The mechanical components of the rack-and-pinion gear are lubricated by a high-viscosity grease and sealed from the hydraulic circuit and other parts of the system by means of seals and rubber gaiters.



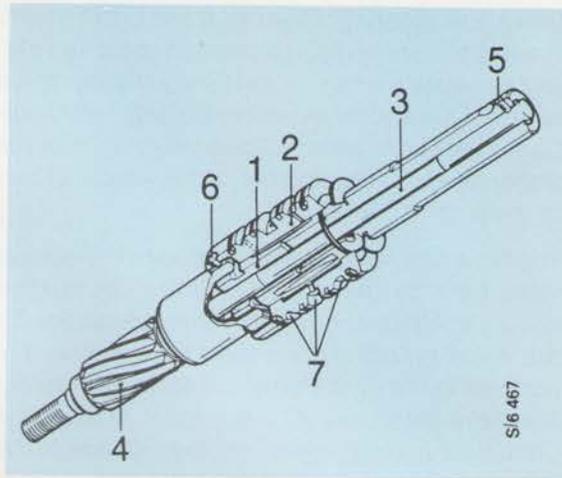
*Power-assisted steering system*

- 1 Power steering fluid reservoir
- 2 Servo pump
- 3 Control valve
- 4 Servo cylinder

**Control valve**

The control valve consists of a valve (1), a spool (2), a torsion rod (3) and the pinion (4). The intermediate shaft is splined to the valve and one end of the torsion rod is secured to the splined joint by means of a pin (5).

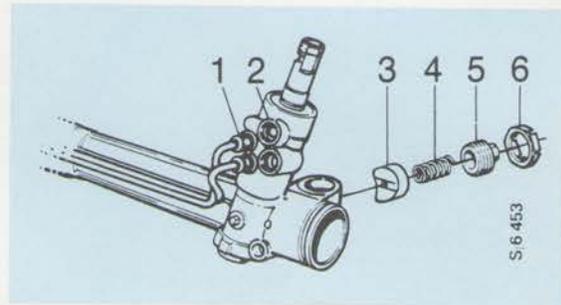
The other end of the torsion rod is press-fitted in the pinion, to which the spool is secured by means of a pin (6), with the result that the spool follows the rotation of the pinion exactly. A splined joint between the valve and the pinion constitutes an additional fail-safe measure. The top of the pinion is supported in a needle bearing and the bottom in a ball bearing.



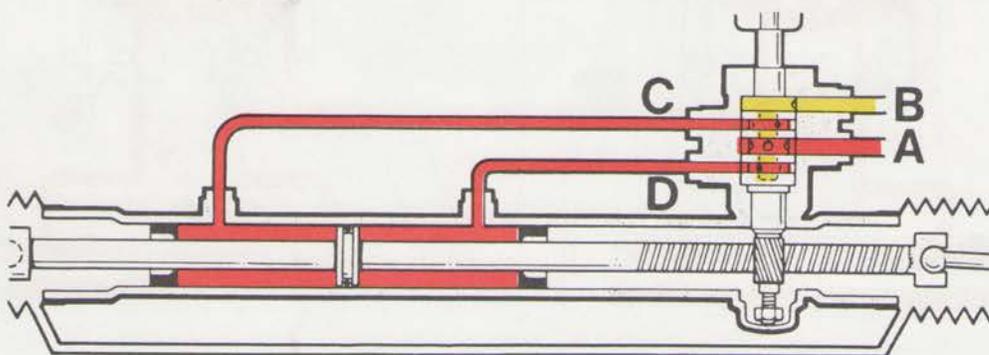
- 1 Valve
- 2 Spool
- 3 Torsion rod
- 4 Pinion
- 5 Pin
- 6 Pin
- 7 Radial grooves

A spring-loaded damper yoke presses the rack into mesh with the pinion and is adjustable to take up any backlash due to wear.

The valve housing, which is part of the rack housing, incorporates four hydraulic connections: two for pump flow and return and two for servo cylinder flow and return. The spool has three radial grooves, the fluid being pumped to the middle one. When the steering wheel is in the straight-ahead position, the control valve is open and the fluid flows up through the valve and back to the pump via the chamber at the top of the spool.



- 1 Flow/return of fluid from/to the servo cylinder
- 2 Flow/return of fluid to/from the pump
- 3 Damper yoke
- 4 Spring
- 5 Adjusting screw
- 6 Locknut



*Control valve and servo cylinder*

- A Delivery pressure from pump
- B Return to reservoir
- C To servo cylinder for turning right or from servo cylinder for turning left

- D To servo cylinder for turning left or from servo cylinder for turning right

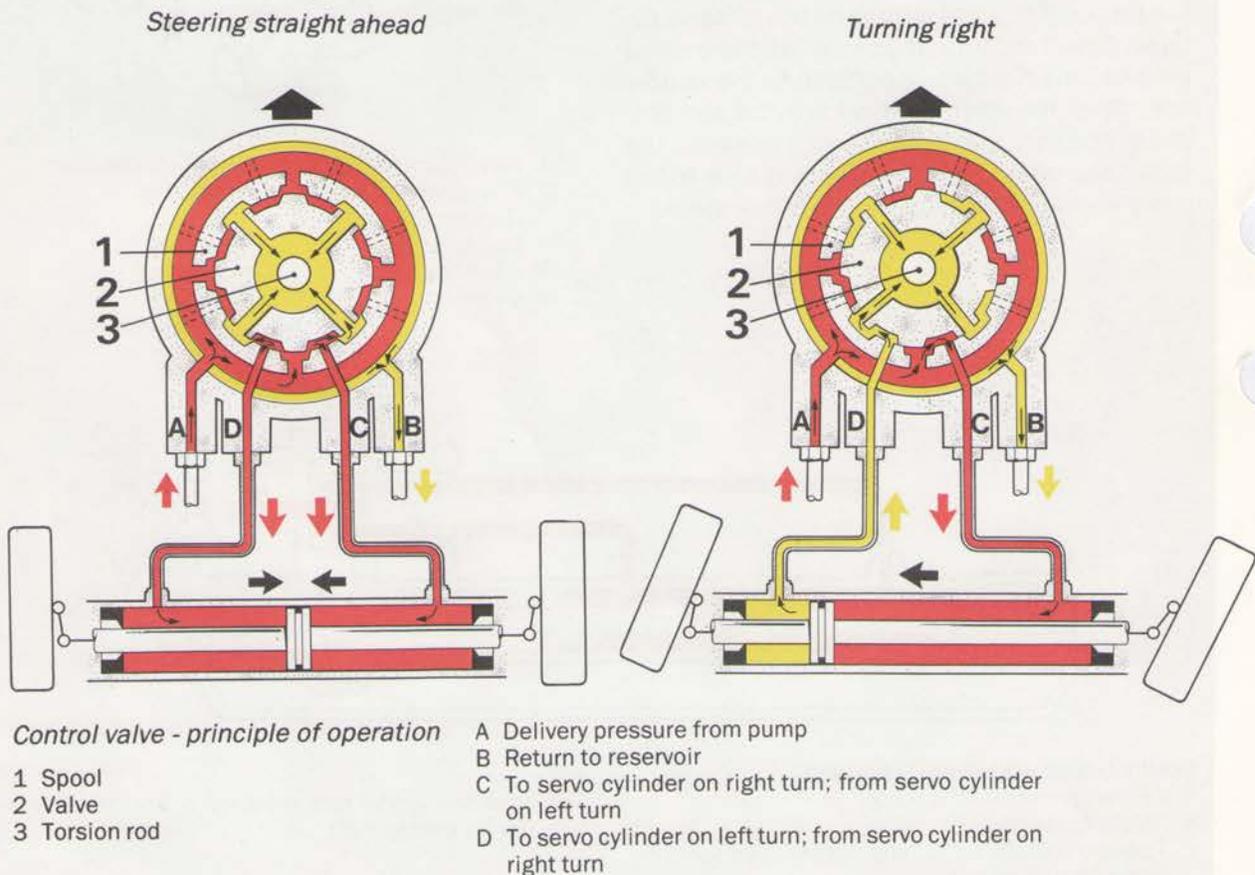
## 600-6 Technical description

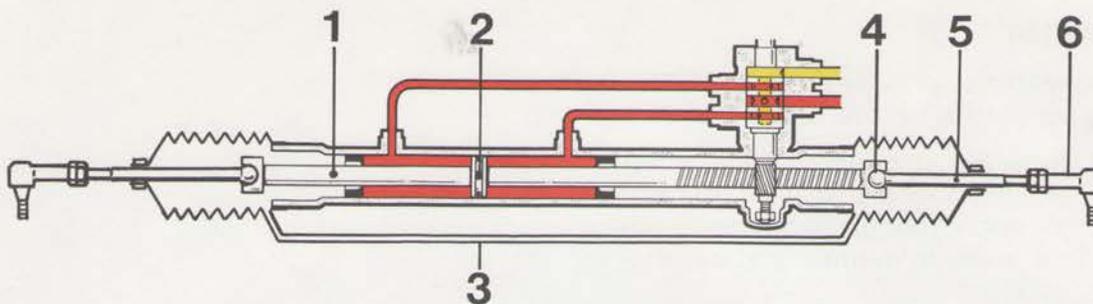
When the steering wheel is turned, the movement is transferred via the torsion rod to the pinion. Because the torsion rod twists slightly, there will be a difference between the degree of rotation of the valve (which follows the rotation of the intermediate shaft) and the spool, which is fixed to the pinion.

The fluid can no longer flow through the control valve back to the reservoir direct but instead flows through the flow and return passages for the servo cylinder. For a right turn, the fluid is pumped to the right side of the servo cylinder via the top radial groove (C) in the spool. At the same time, fluid is discharged from the left side of the servo cylinder via the bottom radial groove (D) in the spool. The fluid flows up through the valve into the chamber above the spool and is returned to the reservoir (B). For turning left, the opposite circuit is opened.

As long as the torsion rod is twisted, hydraulic pressure will act on the rack to provide power assistance. The amount of twist in the torsion rod will be reduced when the hydraulic fluid acts on the rack, reinforcing the action of the pinion. The moment the torsion rod is no longer under torsion, the return passage through the valve is opened again, allowing fluid to flow back to the reservoir direct.

There is always some flow of fluid through the valve, apart from when the steering wheel is at full lock. This is necessary for the control valve in the pump to operate and also helps to cool the fluid.





*Servo cylinder - principle of operation*

- 1 Rack
- 2 Piston
- 3 Pressure-equalizing capillary tube
- 4 Inner ball joint
- 5 Track rod
- 6 Track-rod end

### Servo cylinder

The cylinder is part of the rack housing. The rack (1) is equipped with a piston (2) complete with seals. For flow between the cylinder and the control valve there are two pipes, connected one on either side of the piston. For turning right, fluid is pumped to the right side of the servo cylinder, forcing the piston and rack towards the left, whereupon the fluid is discharged from the left section of the servo cylinder. Simultaneously, the gaiter on the LH side is distended and that on

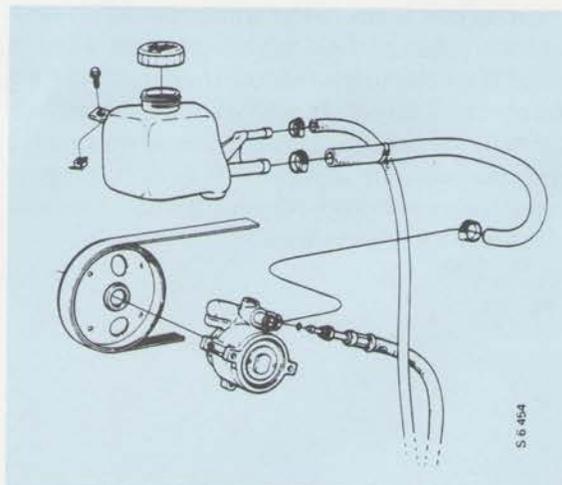
the right compressed, causing air to flow through a capillary tube (3) between the gaiters, thus keeping the air pressure constant. Movement of the rack is transferred via the inner ball joints (4), track rod (5) and track-rod ends (6) to the track arms on the steering swivel members.

Both the inner ball joints and the track-rod ends are lubricated for life and self-adjusting, with no further lubrication or adjustment required.

### Hydraulic servo pump

The hydraulic servo pump is driven by a vee belt from the crankshaft pulley and incorporates a control valve for regulation of the pressure and flow.

The reservoir is transparent, enabling the fluid level to be read off against marks on the outside of the reservoir.



*Servo pump and fluid reservoir*

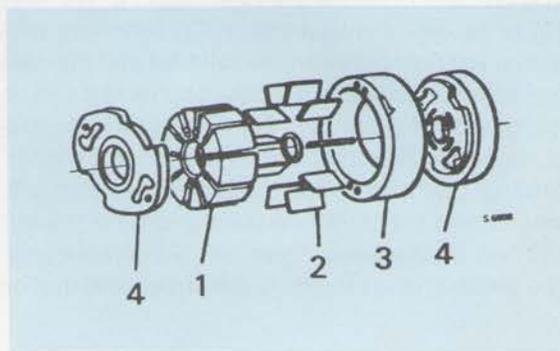
### Caution

To avoid damage to the pump, the following points must be observed:

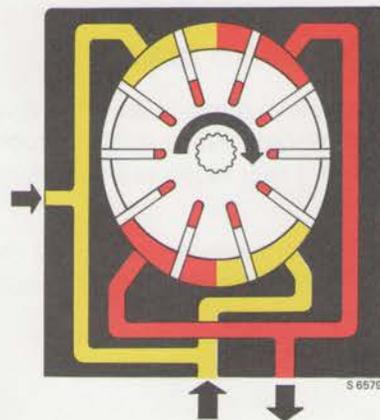
- 1 Never forcibly hold the steering wheel at full lock for any length of time with the engine running, as this may cause the pump to overheat and be damaged.
- 2 Take care never to allow any particles of dirt to get into the hydraulic system, e.g. when checking or topping up the fluid level.
- 3 Never allow the pump to run dry, with no fluid in the system.

### Principle of operation

The pump comprises a slotted or aperture rotor (1), a vane (2) for each slot in the rotor, a pump casing (3) and two end plates (4) with inlet and outlet ports.



Because of the oval shape of the pump casing, the volume between the vanes increases and decreases twice during each revolution of the rotor. The inlet port leads to the areas in which the volume increases and the outlet ports from those in which the volume decreases, thereby producing the pumping effect. As well as being forced outwards by the centrifugal force, the vanes are also pressed outwards against the pump casing by the pressure of the fluid flowing through the slots at the bottom of the vanes.



### Control of pressure and flow

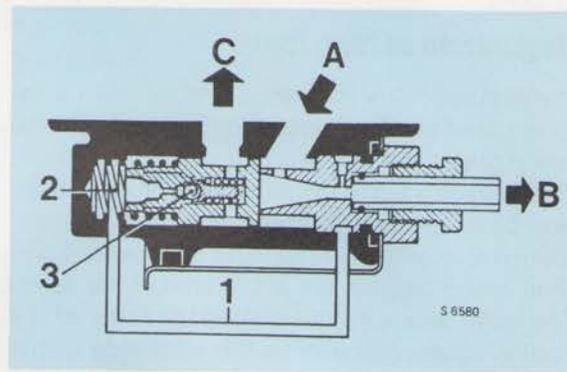
The function of the control valve in the pump is to regulate the pressure and flow to the level required by the rack-and-pinion gear.

One side of the control valve is in direct communication with the delivery pressure (A) from the pump. The pump outlet (B) incorporates a restriction which is connected by a passage (1) to the other, spring-loaded side of the valve (2). In the rest position, the valve is pressed towards the discharge side.

Inside the control valve is a relief valve (3) which, once the pressure exceeds a certain limit, is actuated by the pressure on the spring-loaded side of the control valve.

For the valve to operate, some fluid must circulate continuously through the valve, apart from when the steering wheel is at full lock.

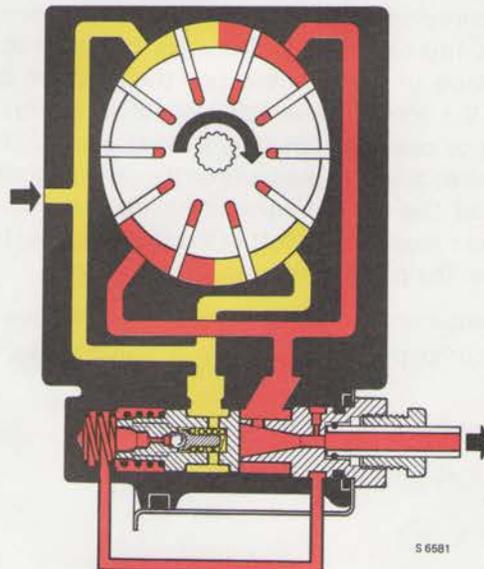
The pump delivers a maximum pressure of approx. 75 bar (1088 psi) and a maximum flow of 8.5 litres (9 liq qt) a minute.



- 1 Connecting passage
- 2 Spring
- 3 Relief valve
- A = From delivery side of pump
- B = To rack-and-pinion gear
- C = To intake side of the pump

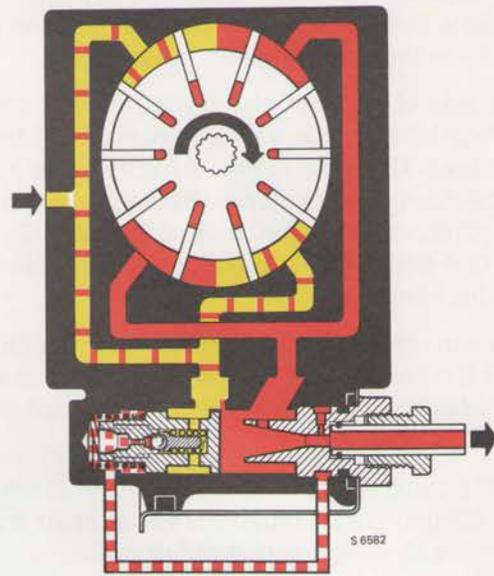
### Regulation at low rpm

The pressure raised by the pump (shown in red) is reduced slightly by the restriction in the pump outlet. This drop in pressure is also communicated to the spring-loaded side of the control valve, creating a small pressure difference across the valve. Because of the low speed of the pump, the pressure is insufficient to overcome the force of the spring and actuate the valve.



### Regulation at high rpm

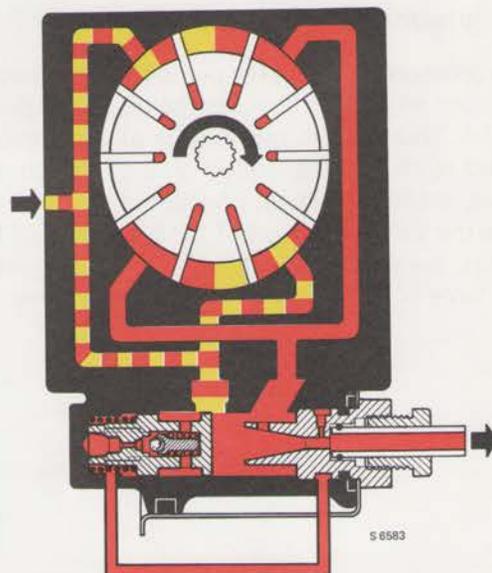
The hydraulic flow increases with increasing engine speed and because of the restriction in the pump outlet the flow velocity is also increased. This causes a fall in pressure in the communication passage, and the pressure on the spring-loaded side of the control valve will now be lower than that acting on the outlet side of the valve. The valve therefore overcomes the force of the spring, opening a port to the inlet side of the pump and allowing internal recirculation of the fluid. Because of the recirculation of the fluid inside the pump and the higher pressure created on the inlet side of the pump, a supercharging effect is obtained, making it possible for a fairly heavy flow at high pressure to be generated when required.



### High torque applied to steering wheel or wheel turned to full lock

When a load is applied to the rack-and-pinion gear and the delivery pressure from the pump increases, there is a corresponding increase in pressure on the spring-loaded side of the control valve. This causes the relief valve inside the control valve to open, whereupon the pressure behind the control valve falls, enabling the relief valve to operate, opening a relief circuit. This produces a drop in pressure on the spring-loaded side of the control valve, causing the control valve to move to the left in the picture, opening further the port for internal recirculation.

The supercharging effect that this produces in the pump provides the required pressure and flow.



## Wheel geometry

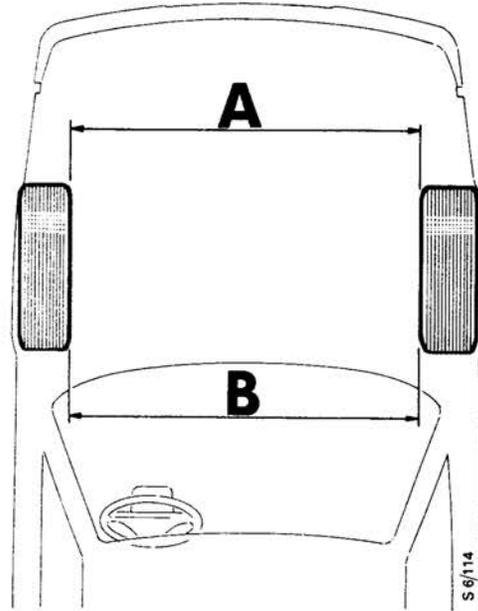
### Toe-in

Toe-in is the difference between A and B.

If the wheels are exactly parallel, with the two dimensions equal, the toe-in will be zero.

The toe-in value must always be positive, i.e. dimension B must be greater than dimension A.

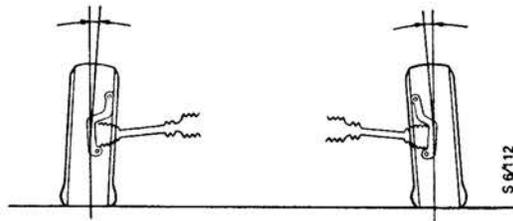
$B - A = \text{Positive value}$



Toe-in

### Camber

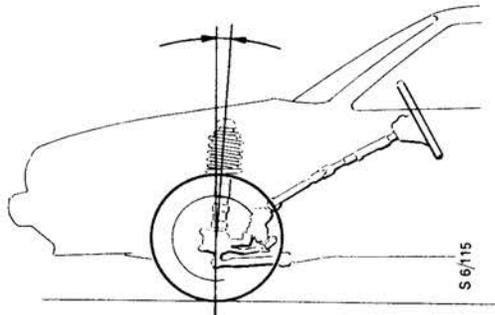
Camber refers to the angle formed between the wheel and the vertical. If the wheel tilts outwards, the camber angle is said to be positive; if it tilts inwards, the angle is said to be negative. The camber on the Saab 9000 is negative.



Camber

### Castor

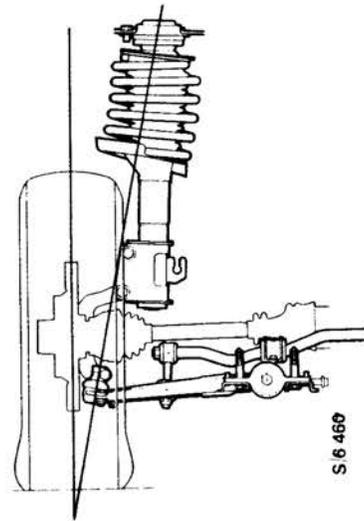
Castor is the angle at which the swivel pin (king pin) deviates from the vertical when viewed from the side. When the swivel axis is inclined backwards as shown, the castor is said to be positive; when inclined forwards, the castor is said to be negative. The Saab 9000 has positive castor.



Castor

### Swivel-pin inclination

Swivel-pin inclination (KPI) is the angle between the swivel axis (the imaginary line running through the centre of the ball bearing at the top of the strut and the centre of the ball joint on the suspension arm) and the vertical.

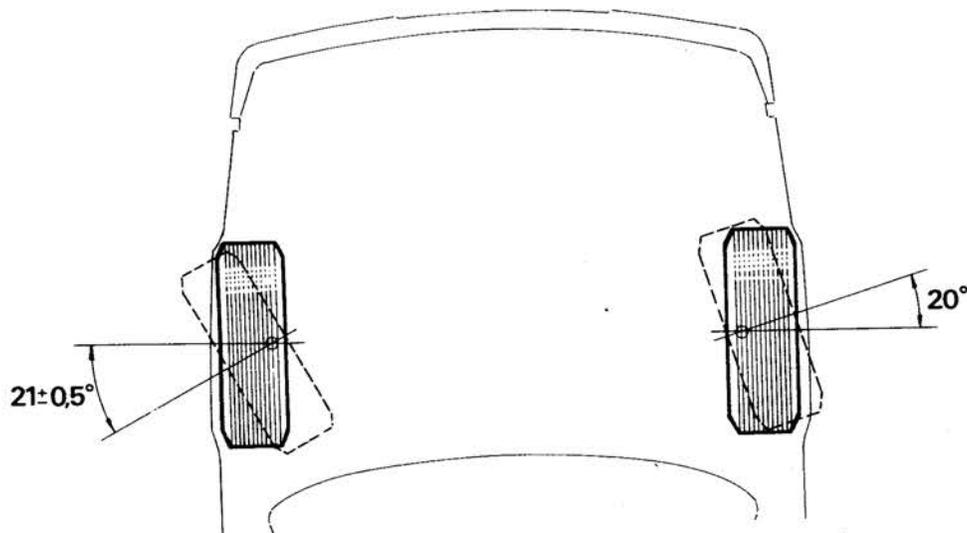
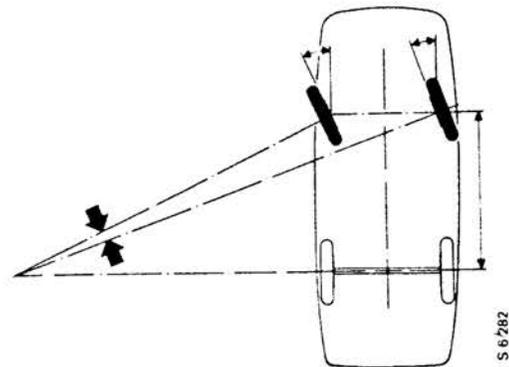


Swivel-pin inclination

### Steering angles

The ideal steering angle for perfect rolling of the wheels on cornering varies with the speed of the car and the tightness of the turn, owing to suspension movement and deflection of the tyres on cornering.

Because the track arms are turned slightly inwards in relation to the path taken by the car, the angle of the inner wheel on cornering will be slightly greater than that of the outer wheel.



Steering angle

# Wheel alignment

Checking and adjusting . . . . .	601-1	Castor . . . . .	601-5
Toe-in . . . . .	601-2	Swivel-pin inclination . . . . .	601-5
Checking the track-rod length . . . . .	601-4	Checking the steering angles . . . . .	601-6
Camber . . . . .	601-5		

## Checking and adjusting

If there is reason to believe that the front-wheel alignment is incorrect (e.g. because of abnormal tyre wear, impaired steering or roadholding properties, etc.) the following procedure should be followed:

- 1 Check the tyre pressures.
- 2 Check the front-wheel bearings, suspension-arm mountings and ball joints, the track-rod ends and inner ball joints. Adjust or replace any defective parts as necessary, to eliminate any symptoms caused by such defects.
- 3 Inspect the dampers and replace any that are defective, together with any worn rubber bushes.
- 4 If the car has been involved in a collision, has run off the road or the like, repair any damage before starting wheel-alignment checks.
- 5 To prevent spurious readings being obtained, rock the car firmly a few times to allow the suspension to settle before starting any checks.

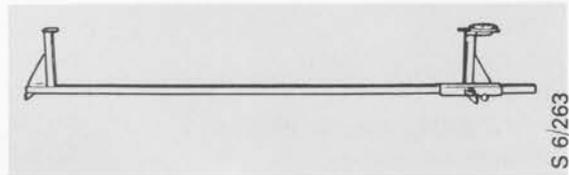
For checking of wheel alignment and steering angles, the car must be unladen, with nobody inside it, but with a full tank of fuel and on a perfectly level surface.

A variety of wheel-alignment equipment, for mounting on the wheel rim or the stub axle, is available. For the correct use of such equipment, refer to the manufacturer's instructions.

### Toe-in

#### Adjusting using a tracking gauge

- 1 With the car on a perfectly level surface, roll it straight ahead and allow it to come to a stop by itself.

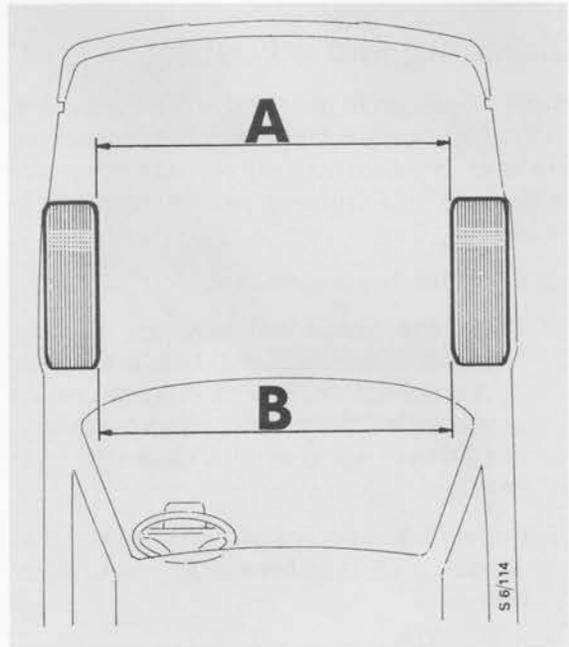


Tracking gauge

- 2 Using the tracking gauge, measure dimension A between the rims, at axle height.

Mark the measuring points with chalk. Roll the car forward until the chalk marks are at axle height again and then measure dimension B.

In this method, the tracking gauge remains in the same position on the floor for both measurements, thereby preventing any unevenness in the surface of the floor from influencing the measurements.



- 3 If adjustment is necessary, do this by adjusting the length of the track rod. Slacken the locknut at the track-rod end and the outer clip securing the gaiter on the steering rack.
- 4 Gripping the track rod with a suitable tool, turn it clockwise or anticlockwise the number of turns shown in the table on page 601-3 until the correct toe-in is obtained. Make sure that the gaiter does not turn with the track rod.



Adjusting the length of the track-rod

**Toe-in adjustment table**

Use the table as shown in the following example:

- 1 Assume that the tracking gauge gives a value of 0.5 toe-out.
- 2 Find this value in the 'Toe-out' section of the first column and follow the line across to the second column, which gives the number of required turns: '0.4 out'. This means that together the two track rods must be turned through 0.4 turns, i.e. each track rod should be rotated 0.2 turns outwards or anticlockwise.

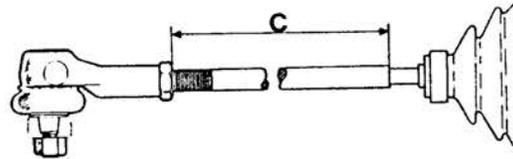
Measured toe setting		Number of track-rod turns required; in = clockwise, out = anticlockwise.
Toe-out mm	6	1.5 out
	5.5	1.4 out
	5	1.3 out
	4.5	1.2 out
	4	1.1 out
	3.5	1.0 out
	3	0.9 out
	2.5	0.8 out
	2	0.7 out
	1.5	0.6 out
	1	0.5 out
	0.5	0.4 out
	0	0.3 out
	0.5	0.2 out
	1	0.1 out
1.5	Correct value	
2	0.1 in	
Toe-in, mm	2.5	0.2 in
	3	0.3 in
	3.5	0.4 in
	4	0.5 in
	4.5	0.6 in
	5	0.7 in
	5.5	0.8 in
	6	0.9 in
	6.5	1.0 in
	7	1.1 in
	7.5	1.2 in
	8	1.3 in
	8.5	1.4 in
	9	1.5 in
	9.5	1.6 in
10	1.7 in	

**Locknut tightening torque:  
60 - 80 Nm (44.4 - 59.2 lbf ft)**

### Checking the track-rod length

- 1 Adjust the toe-in.
- 2 Slacken the clip for the rack gaiter.
- 3 Slide the rubber gaiter towards the rack-and-pinion housing to expose the groove in which it seals.
- 4 Measure dimension C.

Dimension C, the distance between the locknut and the edge of the groove for the gaiter, must never be allowed to exceed 140 mm (5.51 in).



S 6/166

$C = 140 \text{ mm (5.51 in) maximum}$

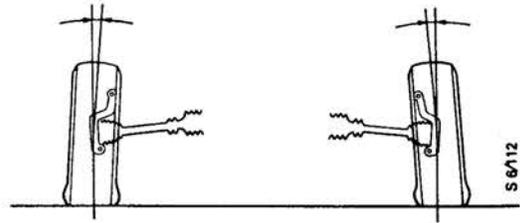
- 5 Repeat steps 2 - 4 on the other side of the car.
- 6 Compare the two values of dimension C. The difference between the two sides of the car must not exceed 2 mm (0.079 in).

The two main reasons that dimension C on either side of the car must not vary by more than 2 mm are:

- To avoid undesirable oversteer on cornering;
  - To avoid exceeding the maximum permissible working angle of the CV joints.
- 7 If the track-rod length has been adjusted, re-check the toe-in.
  - 8 Slide the gaiter back into the groove.
  - 9 Refit the clip.
  - 10 Repeat steps 8 & 9 on the other side of the car.
  - 11 Check the position of the steering wheel.

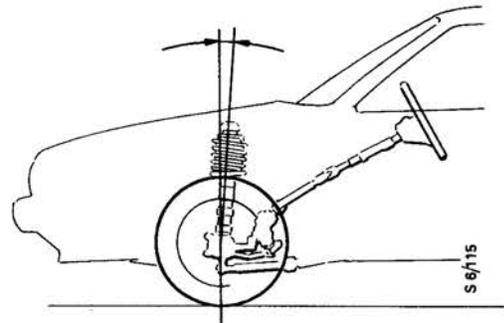
## Camber

The camber cannot be adjusted and, if it is found to be outside the specified limits, must be recified by replacing the defective components.



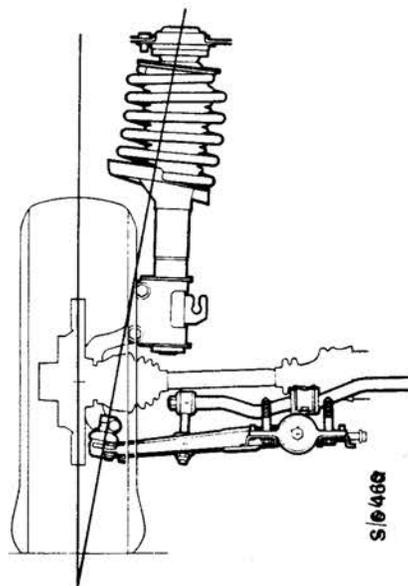
## Castor

The castor cannot be adjusted and, if it is found to be outside the specified limits, must be recified by replacing the defective components.



## Swivel-pin inclination (KPI)

The swivel-pin inclination cannot be adjusted as it is determined by the steering swivel member. If it is found to be outside the specified limits despite the camber being correct, the steering swivel member must have become distorted and should therefore be replaced.

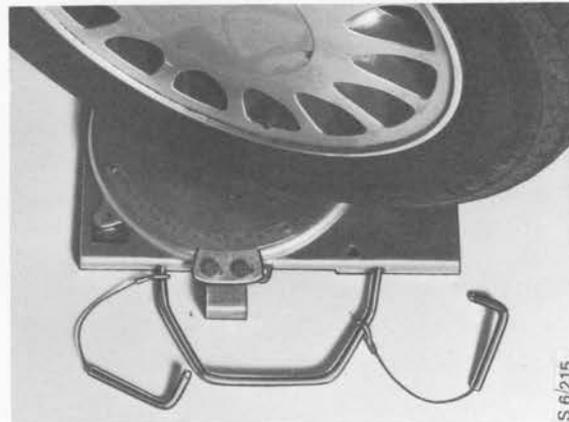
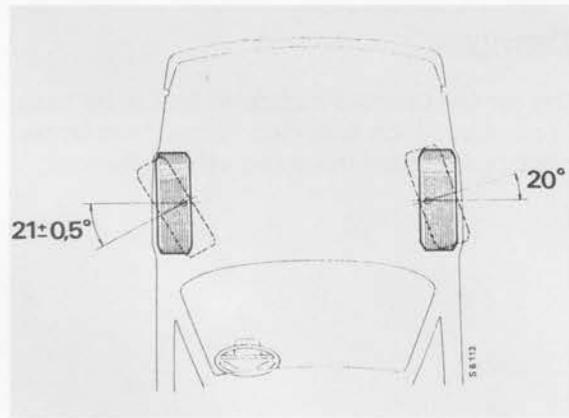


### Checking the steering angles

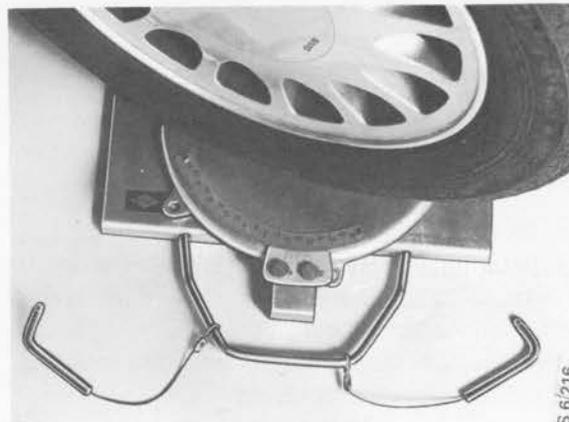
Before the steering angles on the wheel can be adjusted, the toe-in setting must be correctly adjusted.

Measuring of the steering angles is done using two standard, graduated turntables combined with optical measuring equipment. Each turntable must be centred underneath the respective wheel.

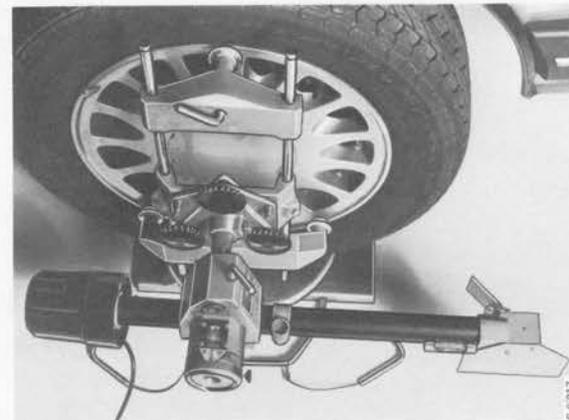
Example: Turn the steering wheel to the left until the right-hand (outer) wheel is at an angle of  $20^\circ$ . If the steering angle is correct, the other (inner) wheel should be at an angle of  $21^\circ \pm 0.5^\circ$ . If the measurements show the angle to be incorrect, one or both of the steering swivel members is distorted and must be replaced.



Outer wheel:  $20^\circ$



Inner wheel:  $21^\circ \pm 0.5^\circ$



Optical measuring equipment

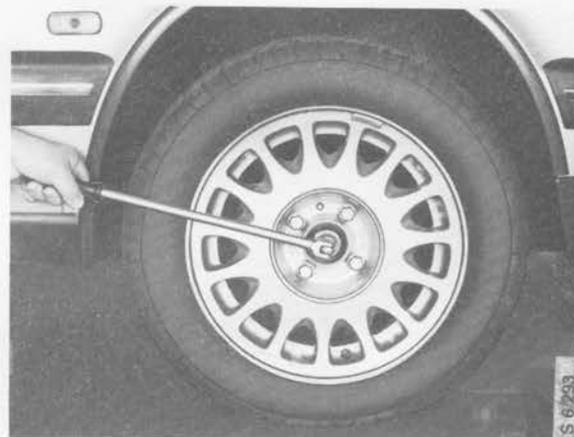
# Steering swivel members

To remove . . . . . 631-1  
To fit . . . . . 631-4

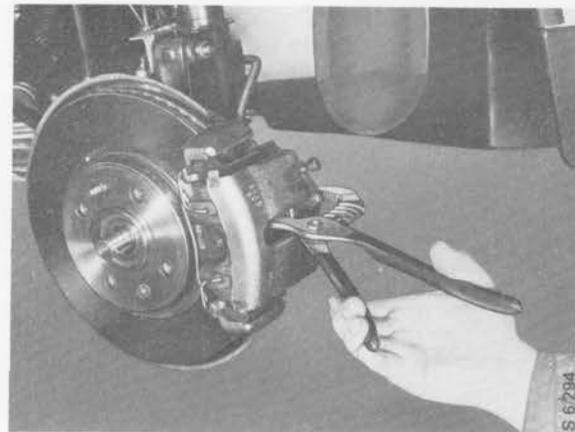
Ball joints . . . . . 631-7

## To remove

- 1 Remove the hub cap.
- 2 Remove the centre-nut.



- 3 Raise the front of the car. If using a jack, support the car on axle stands.
- 4 Remove the road wheel.
- 5 Remove the brake caliper as follows:
  - Using a pair of water pump pliers, ease the brake pads away from the disc.

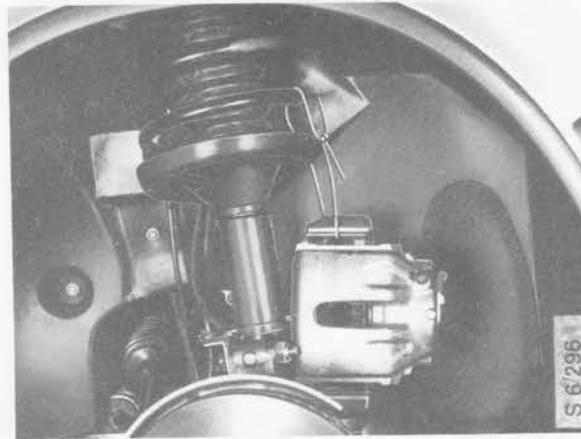


- Undo the two bolts securing the carrier to the steering swivel member.

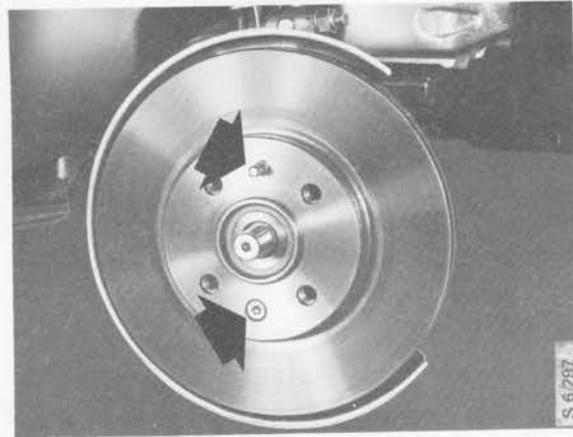


## 631-2 Steering swivel members

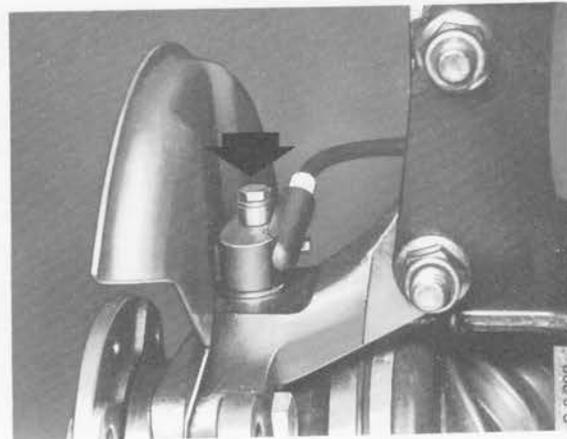
- Tie the caliper to the spring using a piece of welding wire.



- 6 Remove the locating stud and screw and lift off the brake disc.



- 7 Cars with ABS brakes: Undo the securing bolt for the ABS wheel sensor and lift the sensor clear.



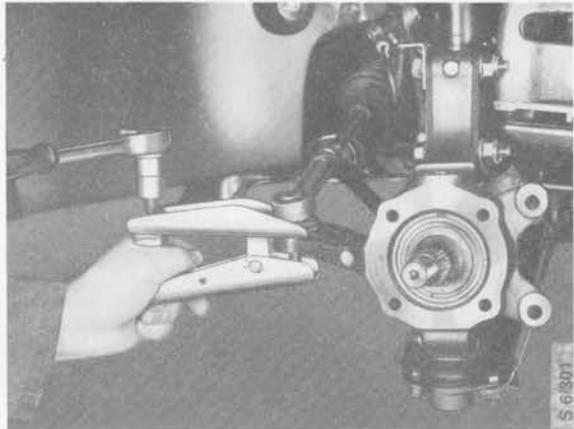
- 8 Remove the four bolts securing the hub to the steering swivel member.



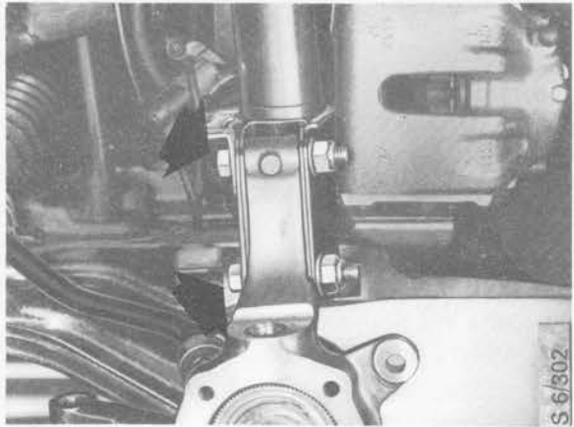
- 9 Pull the hub off the drive shaft using puller 87 91 287 and puller arms 87 91 303. Remove the disc backplate.



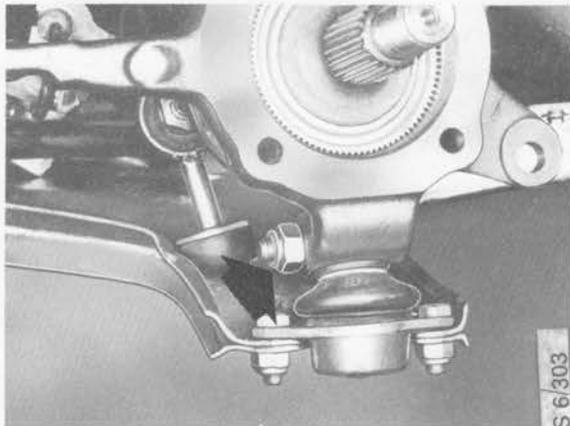
- 10 Undo the nut securing the track-rod end to the steering swivel member and remove the track-rod end using ball-joint separator 89 95 409. If necessary, fit a spacer under the bolt.



- 11 Undo the two bolts securing the MacPherson strut to the steering swivel member.  
Cars with ABS: Swivel the retaining bracket for the sensor lead out of the way.



- 12 Undo the bolt securing the ball joint to the steering swivel member.



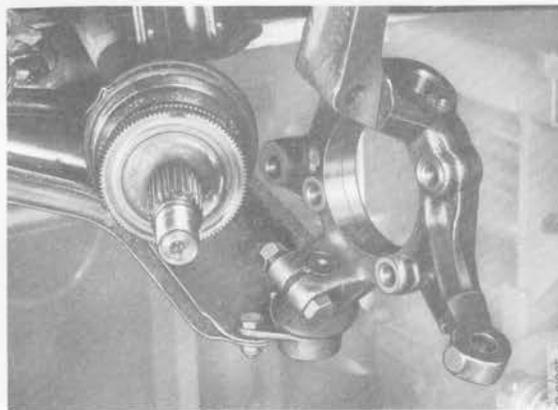
## 631-4 Steering swivel members

- 13 Move the steering swivel member out of the way and support the CV joint on the suspension arm.
- 14 Lift off the steering swivel member.



### To refit

- 1 Lift the steering swivel member into position, insert the bolt securing it to the ball joint and loosely fit the nut. Make sure that the bolt locates in the recess in the ball joint.
- 2 Swivel out the steering swivel member and insert the CV joint.



- 3 Fit the steering swivel member to the MacPherson strut.  
Cars with ABS brakes: Put back the ABS sensor lead retaining bracket.

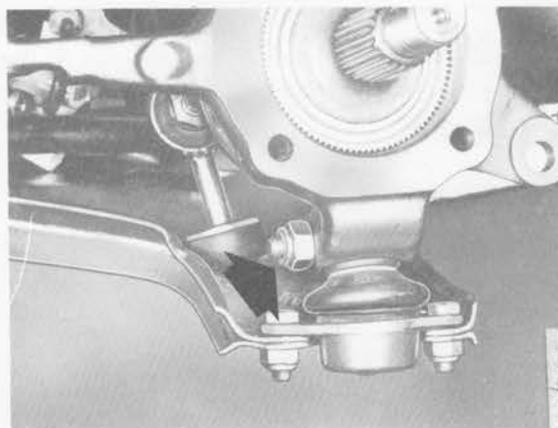
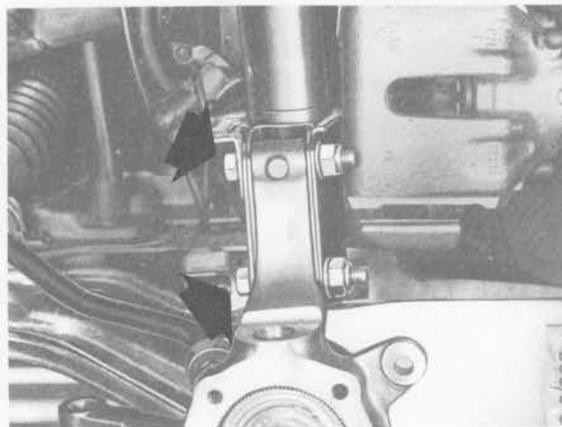
Tighten the two securing bolts for the steering swivel member and MacPherson strut.

**Tightening torque:**  
**78 - 105 Nm (57.5 - 77.4 lbf ft)**

**With Vaseline on threads:**  
**55 - 75 Nm (40.6 - 55.3 lbf ft)**

- 4 Tighten the bolts securing the steering swivel member to the ball joint.

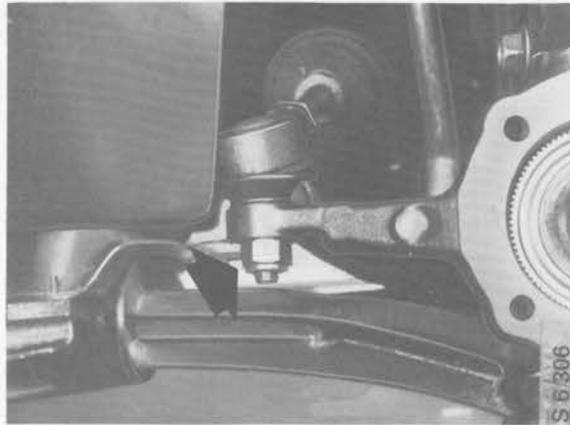
**Tightening torque:**  
**42 - 57 Nm (31.0 - 42.0 lbf ft)**



- 5 Tighten the nut securing the track-rod end to the steering swivel member.

**Tightening torque:**

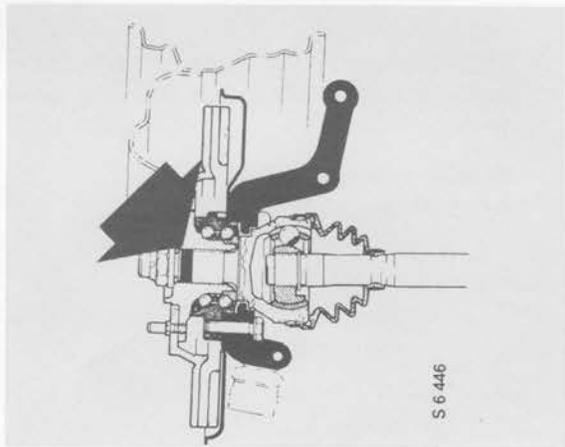
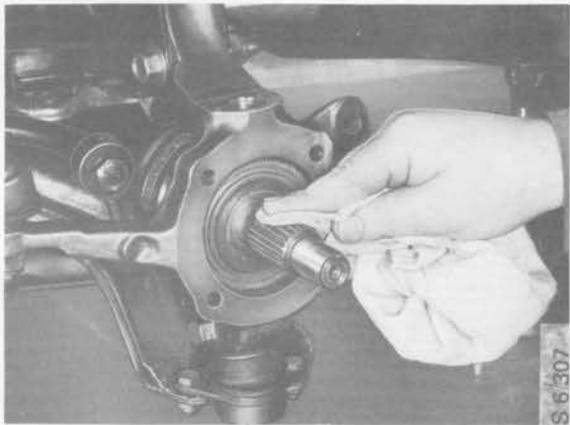
**50 - 60 Nm (36.9 - 44.2 lbf ft)**



- 6 Clean and remove all grease from the drive shaft and, on refitting, the hub. Thereafter, apply Loctite 641 all the way round the shaft as shown.

**N.B.**

Do not drive the car for at least an hour, to give the Loctite time to harden.



*Application of Loctite 641 to drive shaft*

- 7 Refit the disc backplate and press on the hub.



## 631-6 Steering swivel members

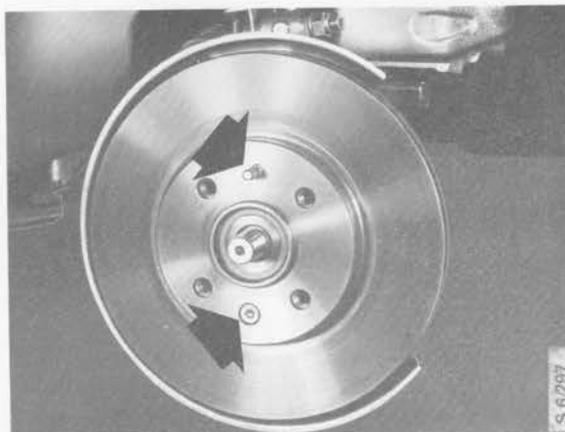
- 8 Tighten the four bolts securing the hub to the steering swivel member.

**Tightening torque:**

**55 - 60 Nm (40.6 - 44.2 lbf ft)**



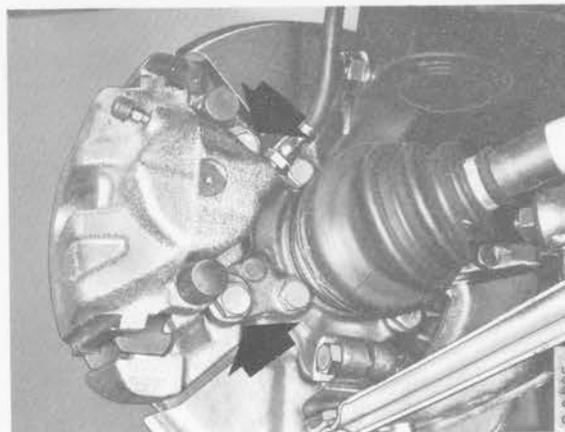
- 9 Fit the brake disc and locating stud and tighten the retaining screw.



- 10 Fit the brake caliper, tightening the two bolts securing the carrier to the steering swivel member.

**Tightening torque:**

**70 - 110 Nm (51.6 - 81.1 lbf ft)**



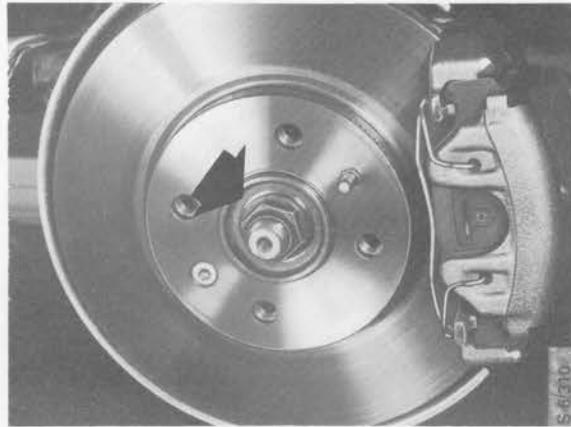
- 11 Cars with ABS brakes:

- Glue a new spacer onto the end of the sensor.  
Spacer thickness: 0.65 mm.



- Position the sensor correctly and tighten the securing screw.

12 Coat the thread of the drive shaft with Loctite 242 and screw on a new hub centre-nut.



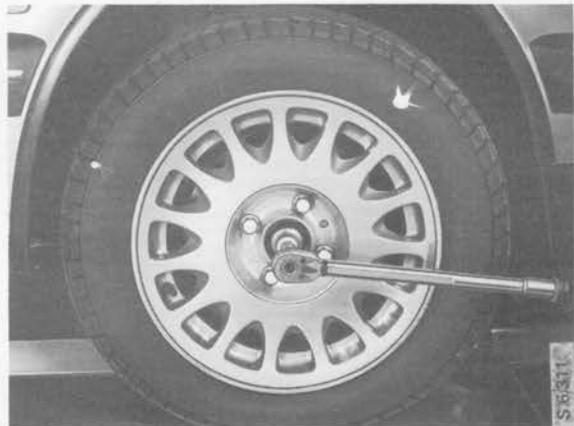
13 Fit the road wheel and lower the car.

**Tightening torque:**  
**105 - 125 Nm (77.4 - 92.2 lbf ft)**

14 Tighten the hub centre-nut.

**Tightening torque:**  
**270 - 290 Nm (199.1 - 213.9 lbf ft)**

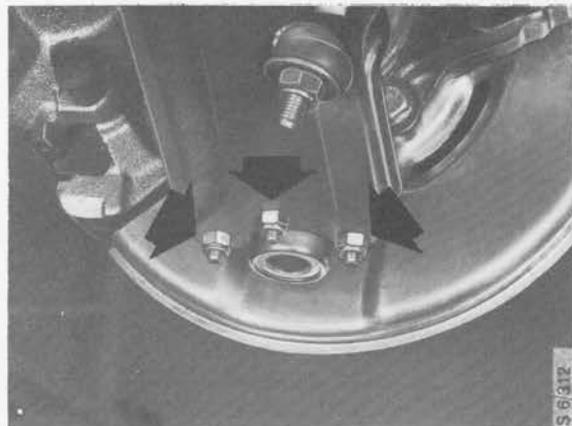
15 Pump the brake pedal to bring the pads up to the disc.



## Ball joints

### To remove

- 1 Raise the front of the car. If using a jack, support the car on axle stands.
- 2 Remove the road wheel.
- 3 Remove the three bolts securing the ball joint to the suspension arm.

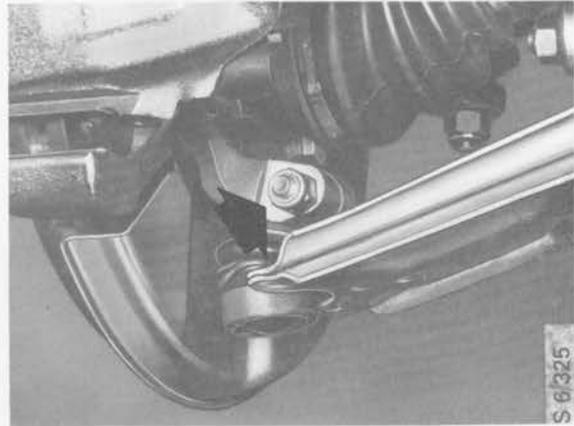


## 631-8 Steering swivel members

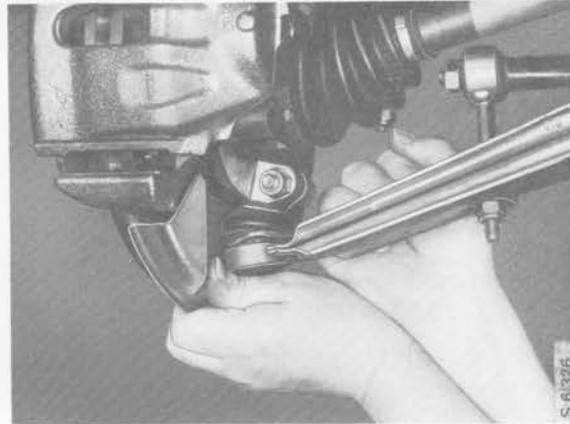
- 4 Remove the bolt securing the ball joint to the steering swivel member and remove the ball joint.

### To fit

- 1 Fit the ball joint to the steering swivel member. Insert the bolt and screw on the nut. Ensure that the bolt locates in the slot in the ball joint.

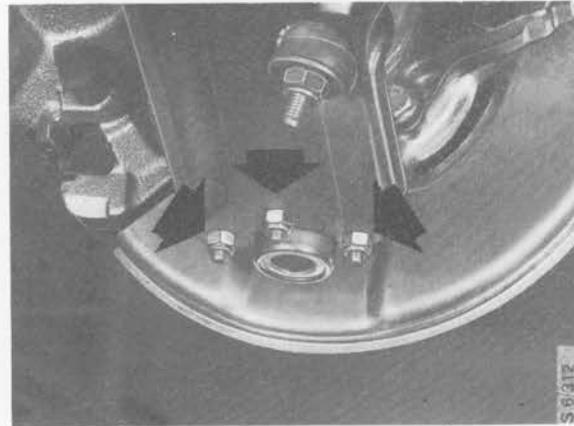


- 2 Locate the ball joint in the suspension arm.



- 3 Tighten the three bolts securing the ball joint to the suspension arm.

**Tightening torque:**  
**25 - 34 Nm (18.4 - 25.1 lbf ft)**

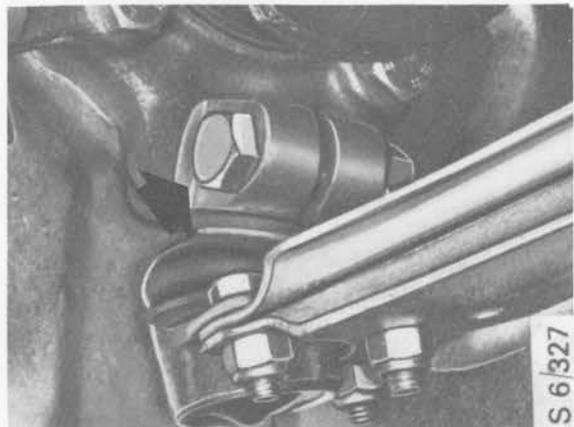


- 4 Tighten the bolt securing the ball joint to the steering swivel member.

**Tightening torque:**  
**42 - 57 Nm (31.0 - 42.0 lbf ft)**

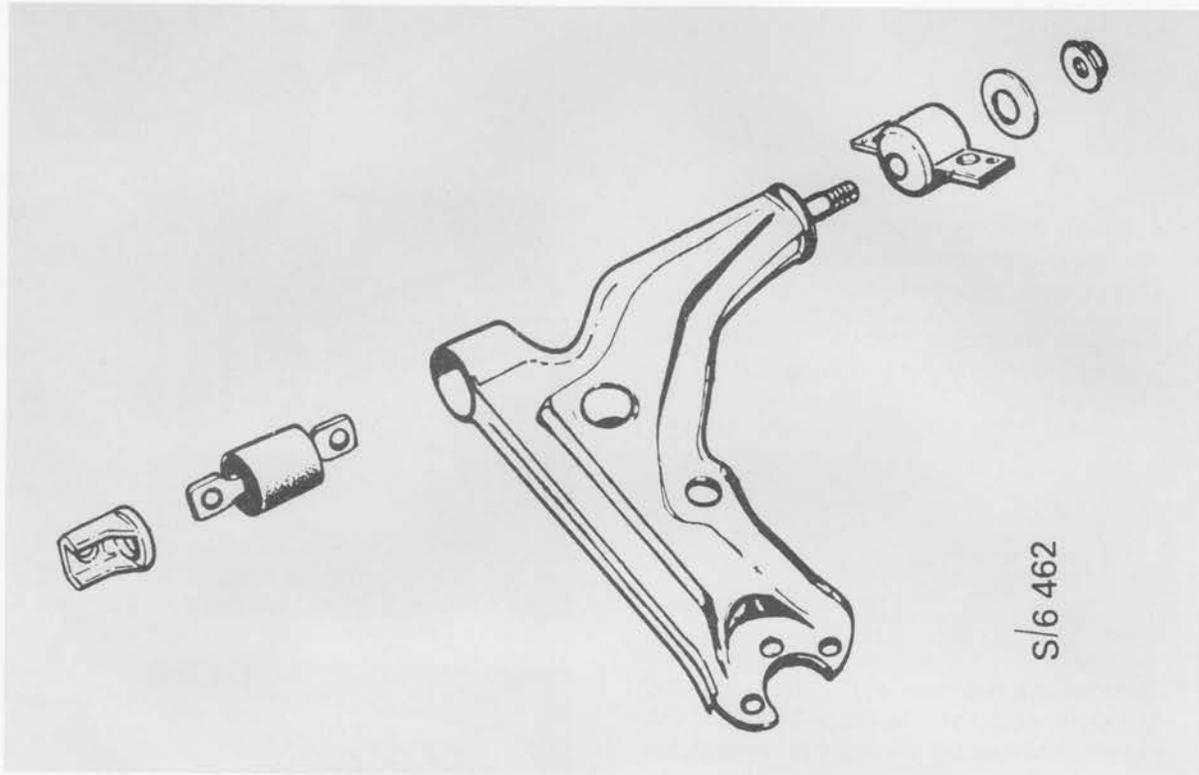
- 5 Fit the wheel and lower the car.

**Tightening torque:**  
**105 - 125 Nm (77.4 - 92.2 lbf ft)**



## Suspension arms

Removal . . . . .	632-1	Replacing the rear bearing	
Refitting . . . . .	632-3	(suspension arm in situ) . . . . .	632-9
Replacing the bearings . . . . .	632-5		
Replacing the front bearing brackets			
(suspension arm in situ) . . . . .	632-6		



### To remove

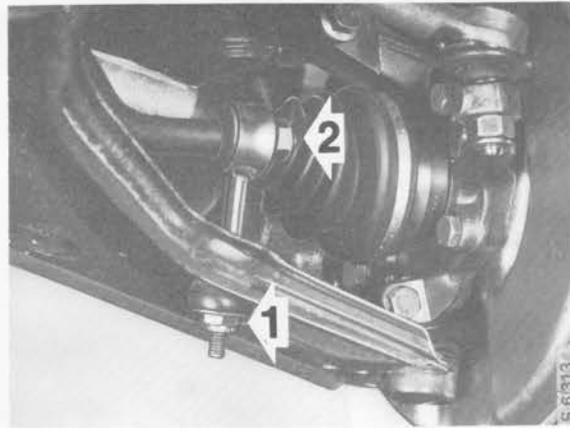
- 1 Raise the front of the car. If using a jack, support the car on axle stands.
- 2 Remove the road wheel.
- 3 Remove the three bolts securing the ball joint to the suspension arm.



## 632-2 Suspension arms

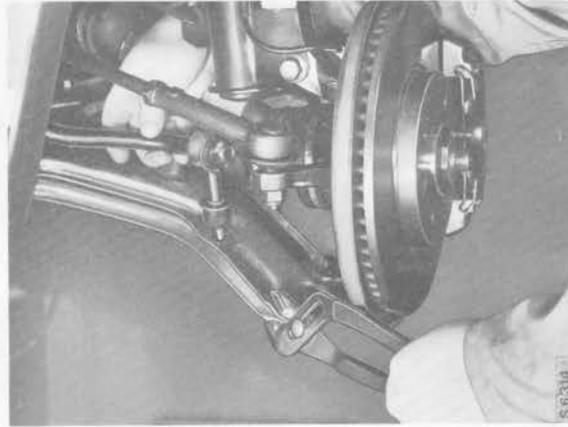
- 4 Remove the nut securing the anti-roll bar link (1) to the suspension arm.

Slacken, but do not remove, the nut securing the anti-roll bar link to the anti-roll bar (2).

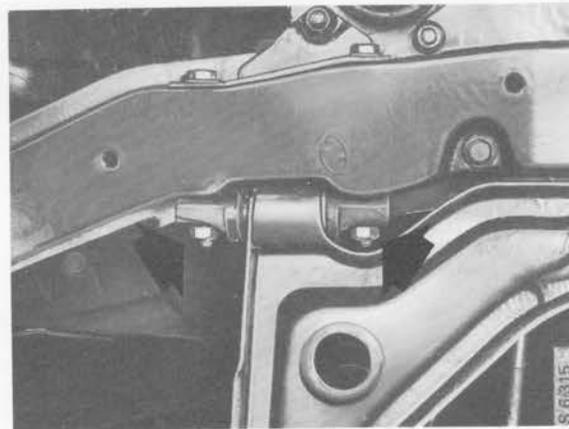


- 5 Push the steering swivel member out of the way. Push down on the suspension arm and withdraw the anti-roll bar link.

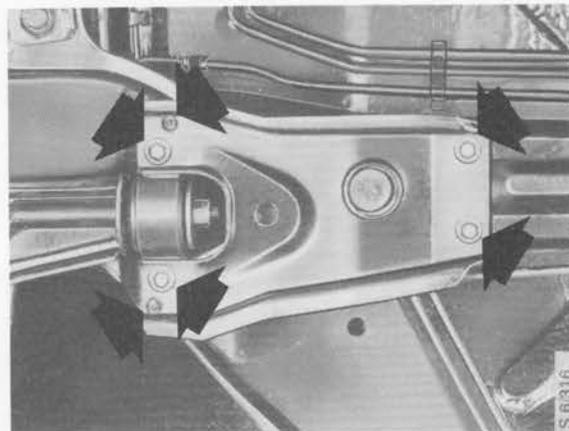
- 6 Take the weight off the suspension arm by resting the arm on the ball joint.



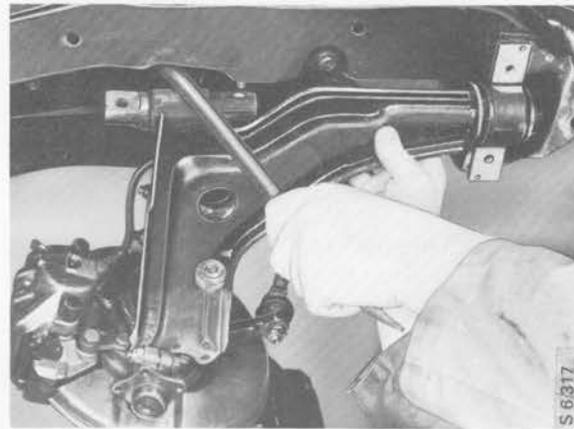
- 7 Remove the two nuts at the front securing the suspension arm to the subframe. Push out the bolts as far as possible towards the engine.



- 8 Undo the six securing bolts and remove the reinforcement plate.



- 9 Lever the suspension arm towards the steering swivel member and lift it down and off.



## To refit

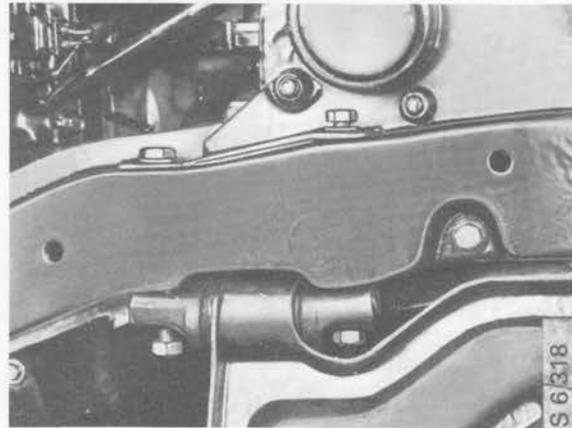
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### N.B.

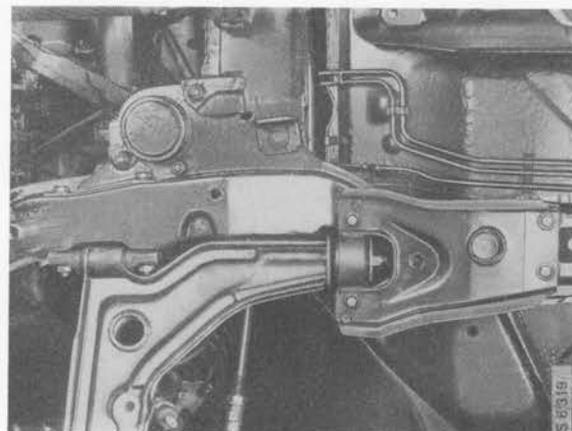
The nut for the suspension arm rear mounting must not be tightened before all four road wheels are back on the ground. Tightening the nut before the suspension arm has assumed its natural position can result in damage to the rubber on maximum deflection of the arm.

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- 1 Lift the suspension arm into position and take the weight off it by resting the arm on the ball joint. Insert the two bolts securing the suspension arm front mounting to the subframe and screw on the nuts.



- 2 Tighten the six securing bolts for the reinforcement plate and the two bolts securing the suspension arm front mounting to the subframe.



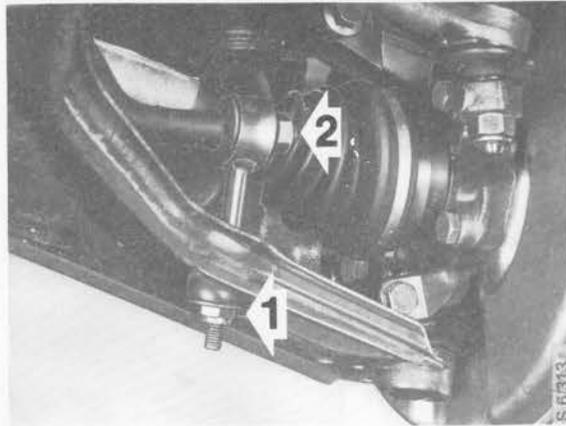
## 632-4 Suspension arms

- 3 Push the steering swivel member clear and insert the anti-roll bar link through the hole in the suspension arm. Fit the rubber bush and washer and tighten the nut (1).

**Tightening torque:**

**20 - 27 Nm (14.8 - 19.9 lbf ft)**

- 4 Tighten the nut securing the anti-roll bar link to the anti-roll bar (2).



- 5 Tighten the three bolts securing the ball joint to the suspension arm.

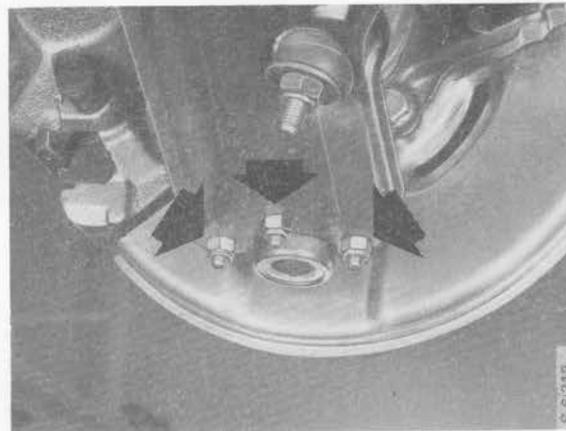
**Tightening torque:**

**25 - 34 Nm (18.4 - 25.1 lbf ft)**

- 6 Fit the road wheel and lower the car.

**Tightening torque:**

**105 - 125 Nm (77.4 - 92.2 lbf ft)**



- 7 With all four wheels back on the ground, tighten the nut on the suspension arm rear mounting (if previously slackened).

**Tightening torque:**

**60 - 70 Nm (44.3 - 51.6 lbf ft)**

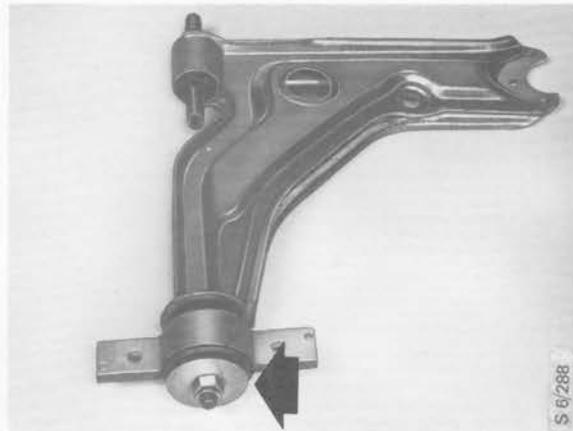
- 8 Check, and if necessary, adjust the toe-in.



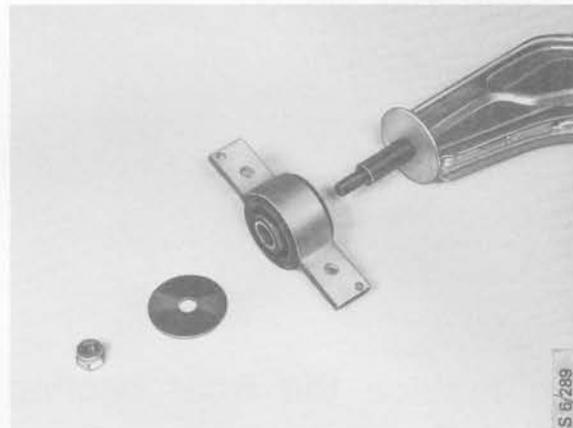
## Replacing the bearings

### Rear mounting

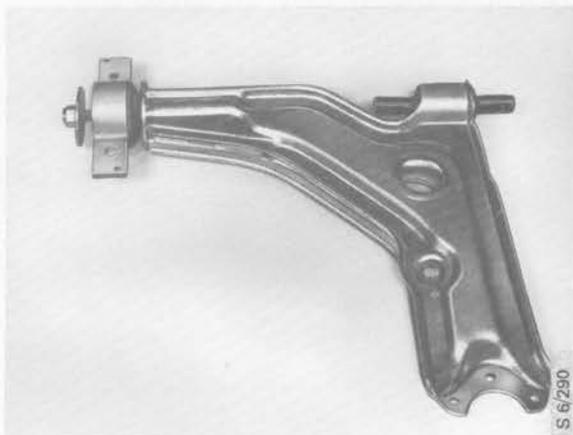
1 Remove the nut, washer and bearing.



2 Fit the new bearing with the side with the groove in it facing out.



3 Refit the washer and screw on the nut.




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#### **N.B.**

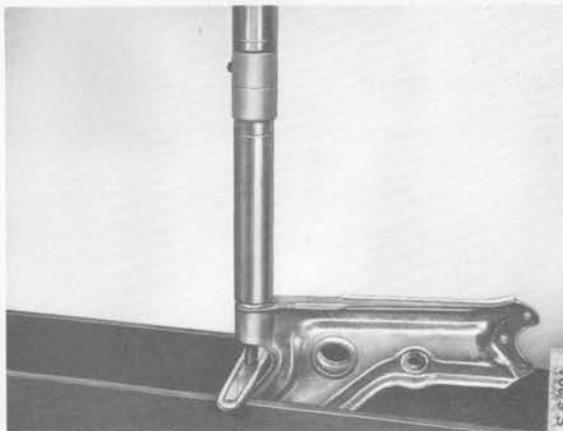
The nut for the suspension arm rear mounting must not be tightened before all four road wheels are back on the ground. Tightening the nut before the suspension arm has assumed its natural position can result in damage to the rubber on maximum deflection of the arm.

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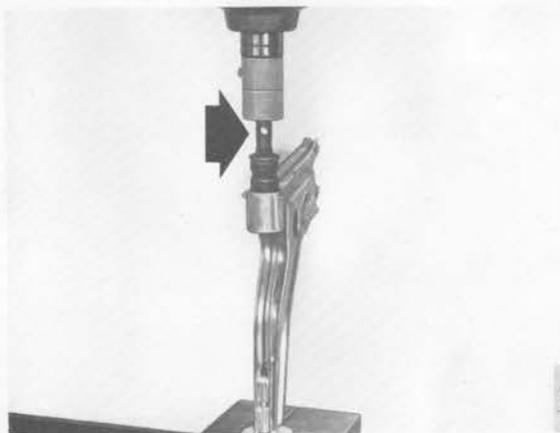
## 632-6 Suspension arms

### Front mounting

- 1 Press out the bearing using sleeve 87 91 204 (special tool for gearbox). Use a strong flat steel bar to hold the workpiece steady.

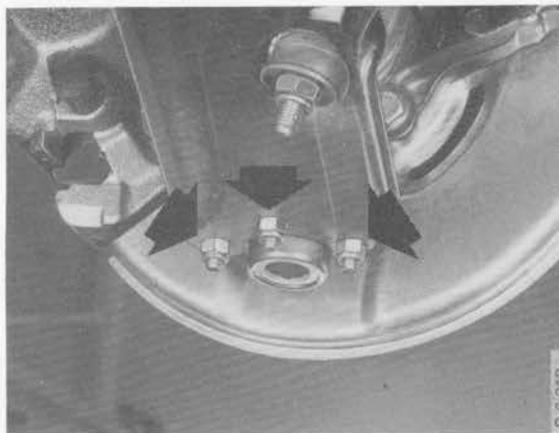


- 2 Coat the new bearing with Vaseline and press it into the arm. Ensure that the hole is correctly orientated, as shown.



### To replace the front bearing brackets (suspension arm in situ)

- 1 Raise the front of the car. If using a jack, support the car on axle stands.
- 2 Remove the road wheel.
- 3 Remove the three bolts securing the ball joint to the suspension arm.

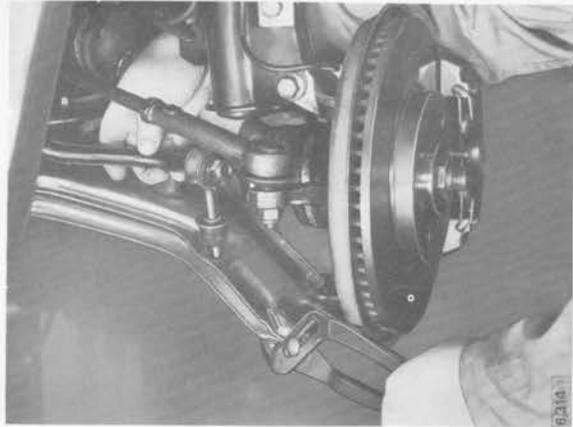


- 4 Remove the nut securing the anti-roll bar link (1) to the suspension arm. Save the washers and bushes.

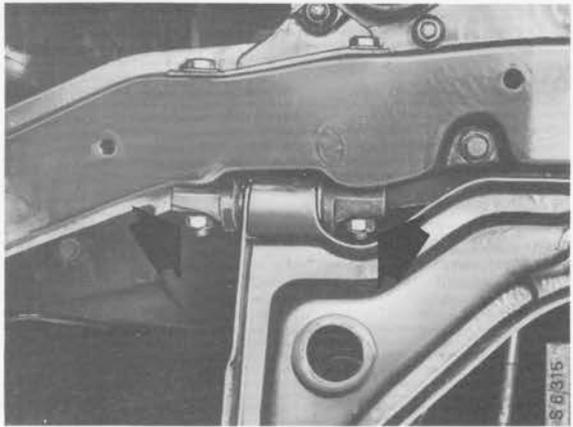
Slacken, but do not remove, the nut securing the anti-roll bar link to the anti-roll bar (2).



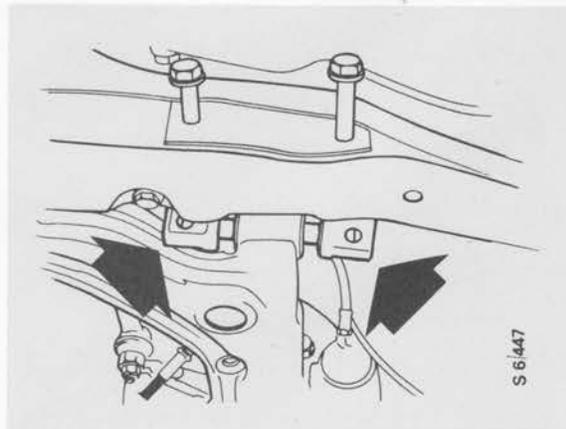
- 5 Detach the anti-roll bar link from the suspension arm. Take the weight off the suspension arm by resting the arm on the ball joint.



- 6 Remove the two nuts at the front securing the suspension arm to the subframe. Push out the bolts as far as possible towards the engine.



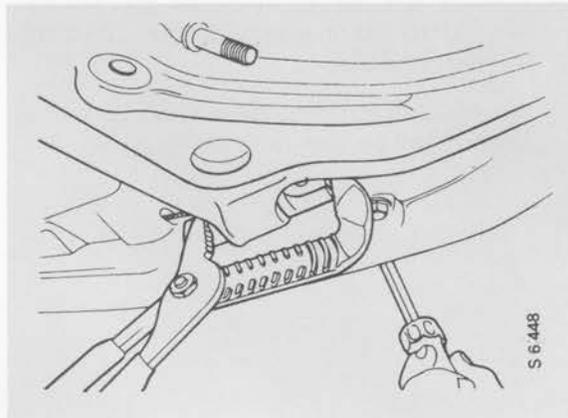
- 7 Replace the bearing brackets.



## 632-8 Suspension arms

- 8 Holding the bearing brackets by means of a large pair of water pump pliers, use a screwdriver to push in the bolts.

Tighten the nuts.

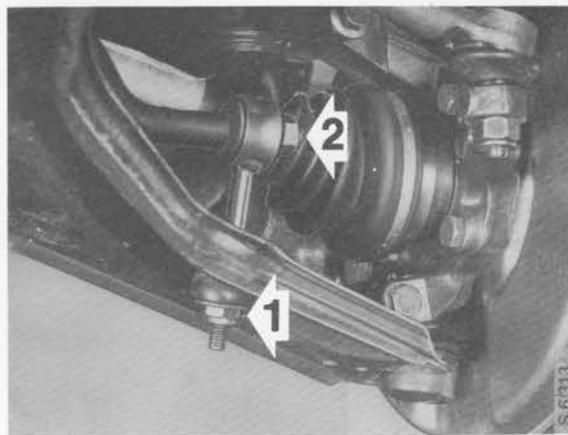


- 9 Insert the anti-roll bar link through the hole in the suspension arm. Fit the rubber bush and washer and tighten the nut (1).

**Tightening torque:**

**20 - 27 Nm (14.8 - 19.9 lbf ft)**

- 10 Tighten the nut securing the anti-roll bar link to the anti-roll bar (2).



- 11 Tighten the three bolts securing the ball joint to the suspension arm.

**Tightening torque:**

**25 - 34 Nm (18.4 - 25.1 lbf ft)**

- 12 Fit the road wheel and lower the car.

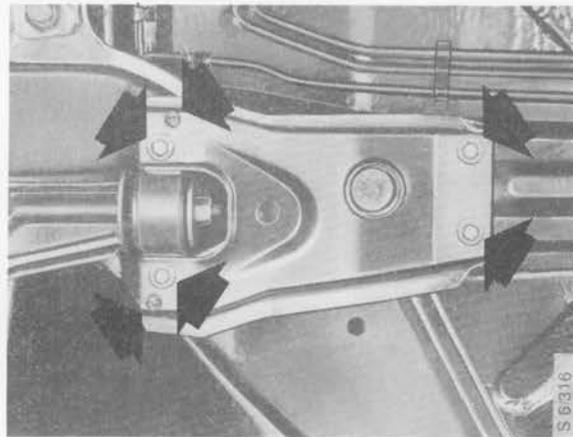
**Tightening torque:**

**105 - 125 Nm (77.4 - 92.2 lbf ft)**

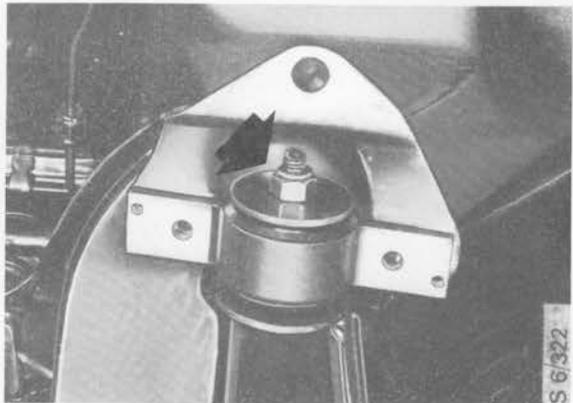


## To replace the rear bearing (suspension arm in situ)

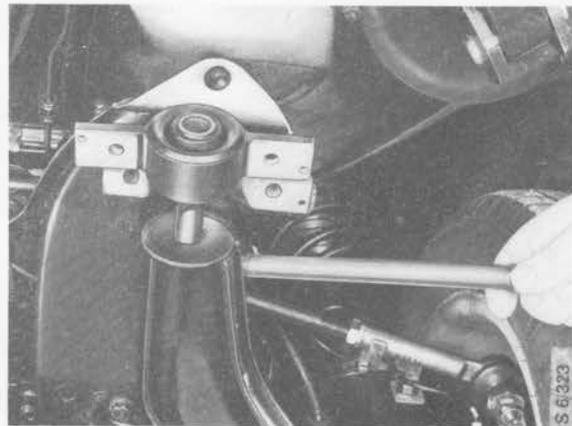
- 1 Raise the front of the car. If using a jack, support the car on axle stands.
- 2 Undo the six securing bolts and remove the reinforcement plate.



- 3 Remove the securing nut and washer from the rear pivot mounting.



- 4 Press down the suspension arm and remove the bearing.
- 5 Fit a new bearing with the side with the groove in it facing towards the rear of the car.

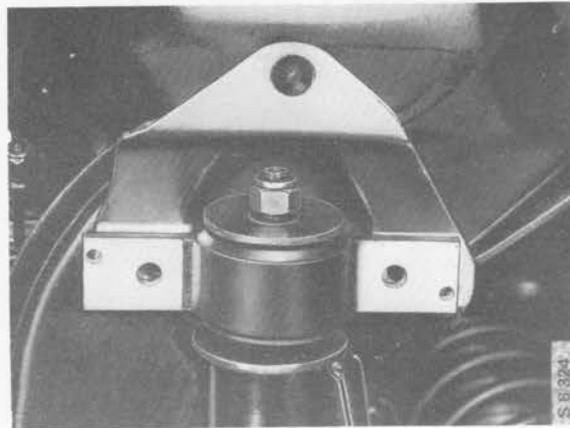


## 632-10 Suspension arms

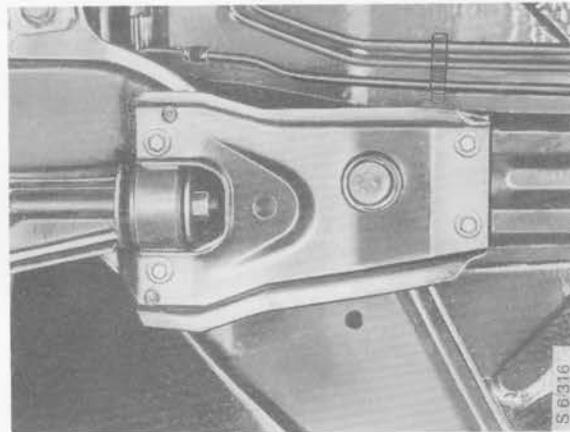
- 6 Fit the washer, and screw on the nut.

### **N.B.**

The nut for the suspension arm rear mounting must not be tightened before all four road wheels are back on the ground. Tightening the nut before the suspension arm has assumed its natural position can result in damage to the rubber on maximum deflection of the arm.



- 7 Fit the reinforcement plate and tighten the six bolts.



- 8 Lower the car.  
9 Tighten the nut in the rear mounting.

**Tightening torque:**  
**60 - 70 Nm (44.3 - 51.6 lbf ft)**



# Steering column assembly

Steering wheel . . . . .	641- 2	Replacing the lower bearing . . . . .	641-20
Removal . . . . .	641- 4	Steering lock . . . . .	641-20
Refitting . . . . .	641-12		

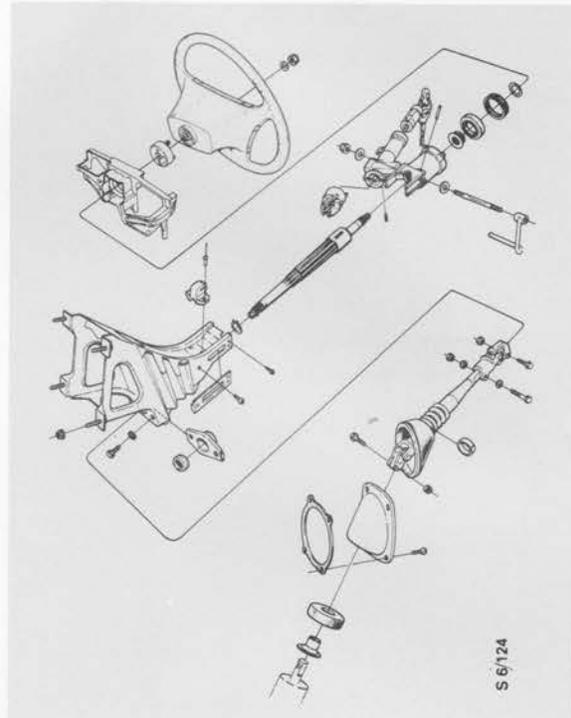
## Caution

The collapsible steering column must be handled with care. If it is knocked or treated roughly the preset length of the telescopic section can be altered and the energy-absorbing properties of the column impaired. Under no circumstances must the splined joints in the steering column shaft be separated.

When fitting the steering column, make doubly certain that the splined joint is slid fully home on the pinion shaft, so that the groove in the shaft lines up with the pinch bolt. The joint should slide easily onto the shaft; should the splines bind, never tap or hammer the top of the column.

The same applies when removing or fitting the steering wheel: never try to tap the steering wheel on or off.

When the front wheels are off the ground, never forcibly swivel a front wheel, causing the steering to spin to full lock. This can very easily result in serious damage to the steering system. Operating the rack-and-pinion gear by swivelling a road wheel will cause the steering wheel to spin at high torque, exerting a powerful torsional stress on the steering column when the rotation is arrested by the stop in the rack-and-pinion gear.



## Steering wheel

### To remove

- 1 Three-spoke wheels:  
Unhook the rubber flanges on the padding from the spokes.



- Four-spoke wheels:  
Remove the badge.



- 2 Remove the centre-nut and washer. Pull the steering wheel off the shaft using puller 89 96 258, which screws into the two holes in the steering-wheel hub.



- Using two screwdrivers, prise off the actuator for the cancelling mechanism for the direction indicators.



S 6/089

## To fit

- Refit the actuator for the cancelling mechanism for the direction indicators.



S 6/090

- Fit the steering wheel onto the shaft. The road wheels must be pointing straight ahead and the steering wheel must be fitted with the spokes symmetrical. Fine-tuning of the position of the steering wheel should be done on the road. If the steering wheel cannot be fitted with the spokes level (e.g. top spoke lined up with instrument panel), adjustment can be made by screwing the track rods in or out by the same amount on both sides (see subsection 601). Tighten the centre-nut to the correct torque.



S 6/436

**Tightening torque: 30 Nm (22.1 lbf ft)**

- Three-spoke wheels:  
Hook the rubber flanges of the padding onto the spokes.

Four-spoke wheels:  
Fit the badge.

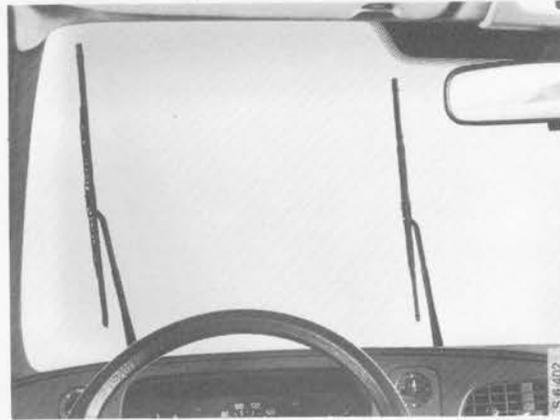


S 6/087

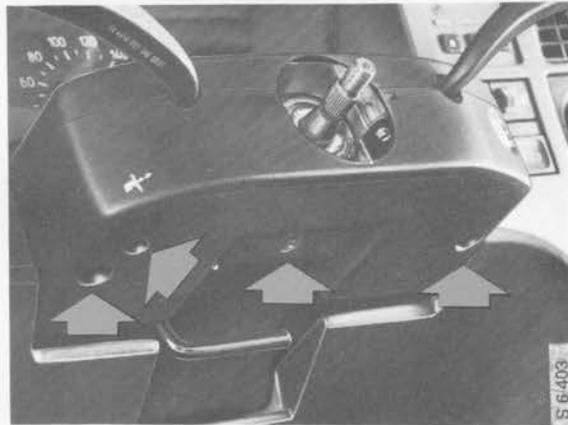
## 641-4 Steering column assembly

### To remove

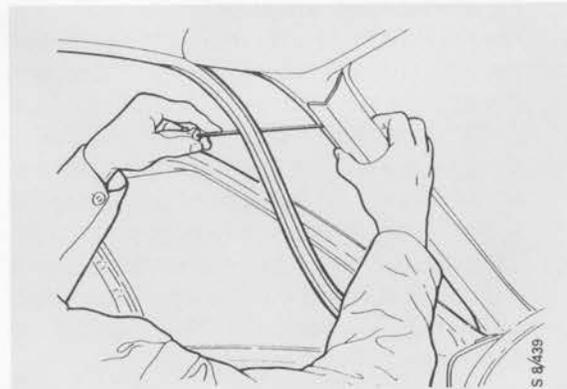
- 1 Park the windscreen wipers in the vertical position.
- 2 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.
- 3 Remove the steering wheel (see subsection 641-1).



- 4 Remove the two steering-column cowls.



- 5 Ease the trim away from the A pillars.



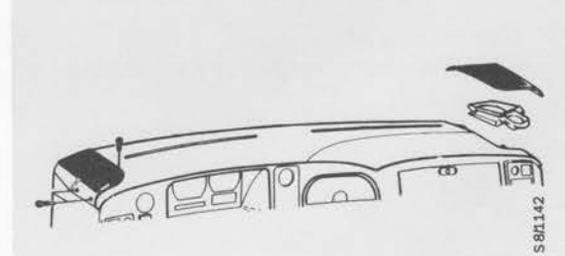
- 6 Remove the speaker grilles and collars.

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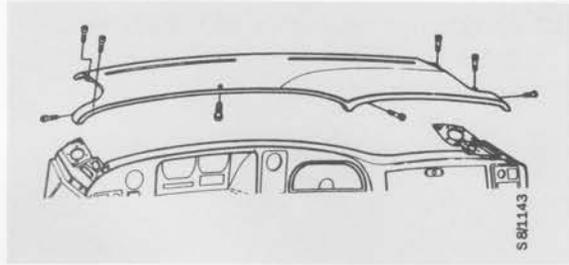
#### **N.B.**

On cars with ACC, take care not to damage the leads to the sun sensor when removing the RH speaker grille.

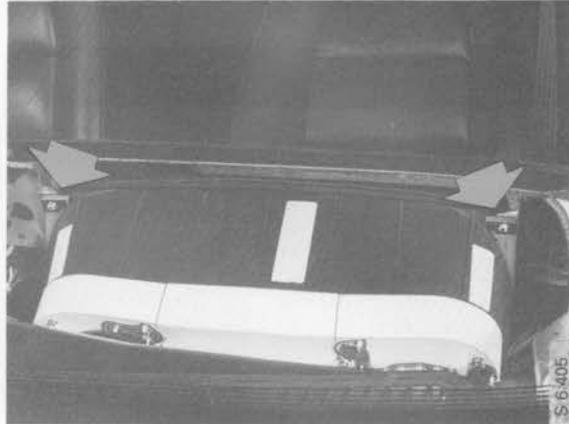
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- 7 Remove the fascia top: one of the fixing screws is accessible behind a rubber plug inside the glove compartment.



- 8 Remove the two retaining screws for the main instrument display panel.



- 9 Lift up the instrument display panel so that the rear of the panel is facing the cabin. Take care not to lose the two rubber feet.



- 10 Label and unplug the electrical connectors.

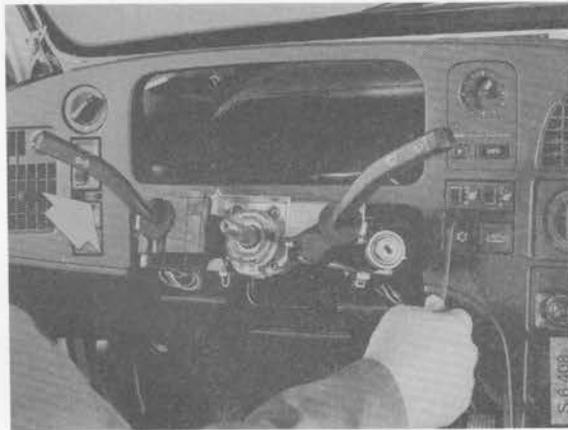
Turbo cars: Disconnect the vacuum hose.

- 11 Lift out of the instrument display panel.



## 641-6 Steering column assembly

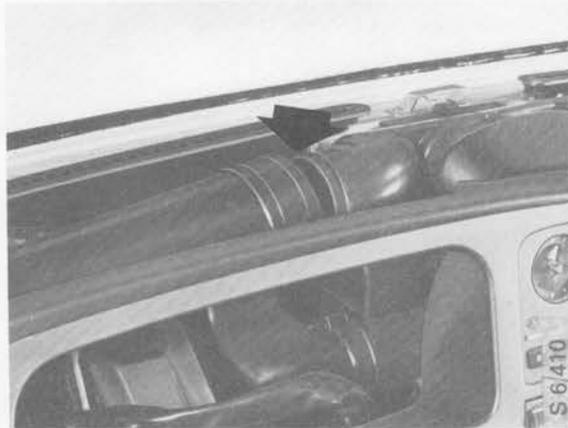
- 12 Remove the two blanks and undo the screws in the switch panels.



- 13 Bend out the LH side of the instrument surround and disconnect the duct from the fresh air vent.



- 14 Disconnect the duct from the fan casing and lift the duct away.



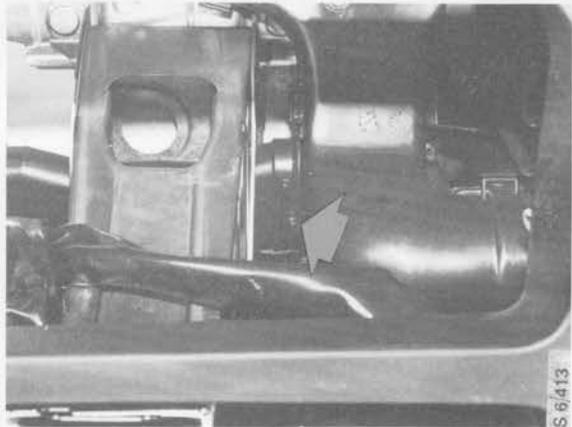
- 15 Undo the screw securing the side defroster end piece to the dash panel.



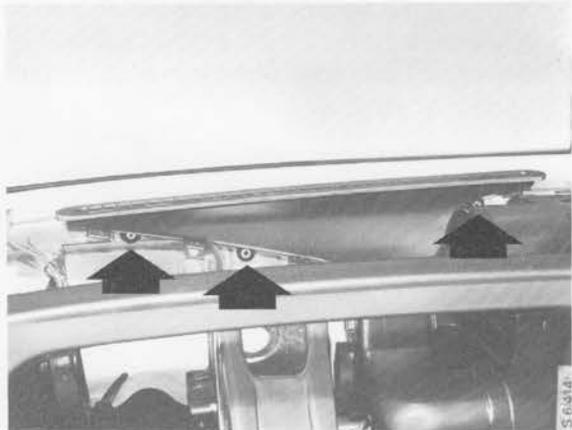
- 16 Disconnect the duct from the side defroster end piece.



- 17 Undo the screw securing the side defroster duct to the top vent and lift out the duct.



- 18 Remove the defroster top vent.



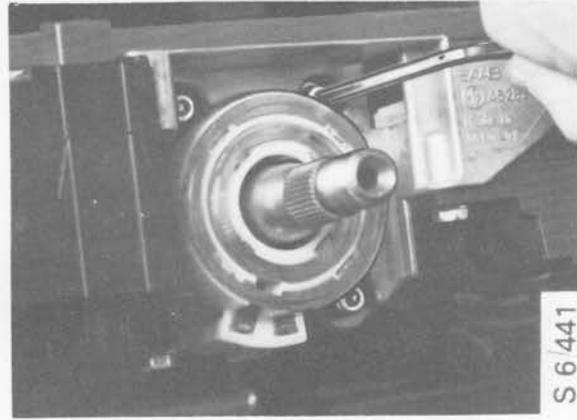
- 19 Snip off the cable tie securing the wiring loom to the steering column.

- 20 Unplug the connectors from the stalk switch unit and the leads from the horn contacts and ignition switch. Label the leads to ensure that they are reconnected correctly.

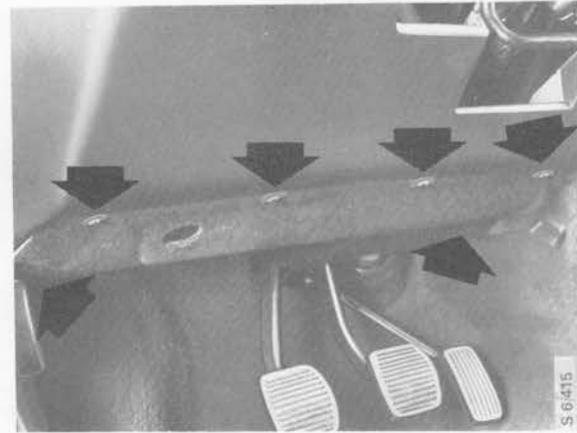


## 641-8 Steering column assembly

- 21 Undo the three securing screws and remove the stalk switch unit from the steering column.



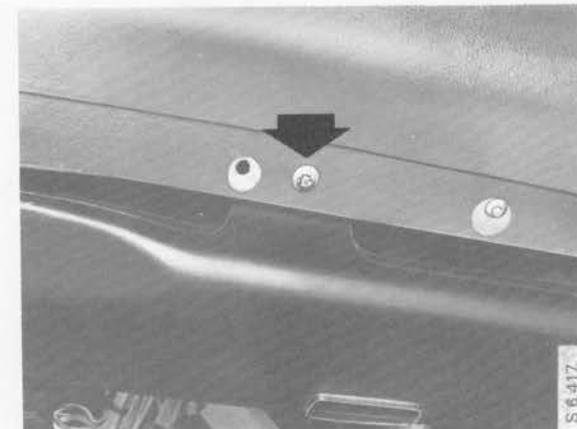
- 22 Remove the acoustic insulation from under the dash panel.



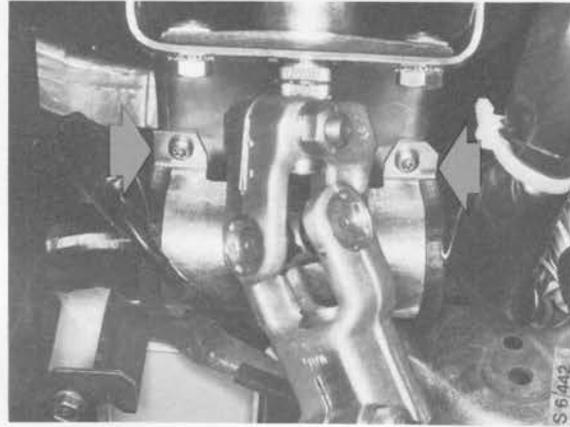
- 23 Release the fasteners for the carpet trim at the centre console on the driver's side. Release the lower edge of the trim and then pull it down to remove.



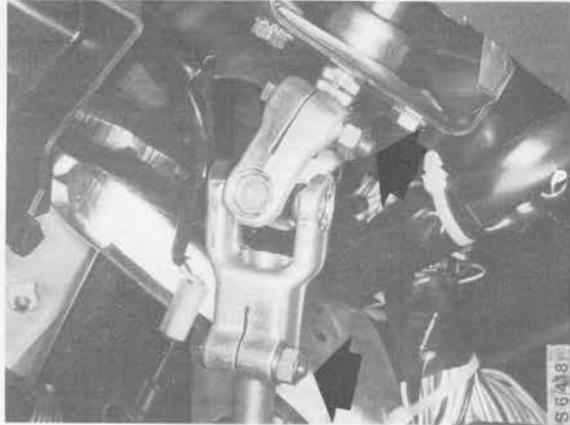
- 24 Remove the floor duct.



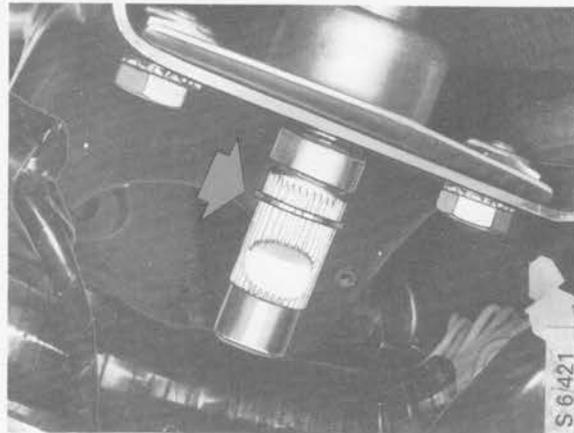
25 Remove the wiring-loom guide.



26 Remove the two pinch-bolts in the UJ between the steering-column shaft and the intermediate shaft and pull the joint off the splines on the shaft.



27 Remove the circlip from the bottom of the steering-column shaft.



28 Remove the steering-wheel adjustment assembly as follows:

- Tap out of the tubular dowel.

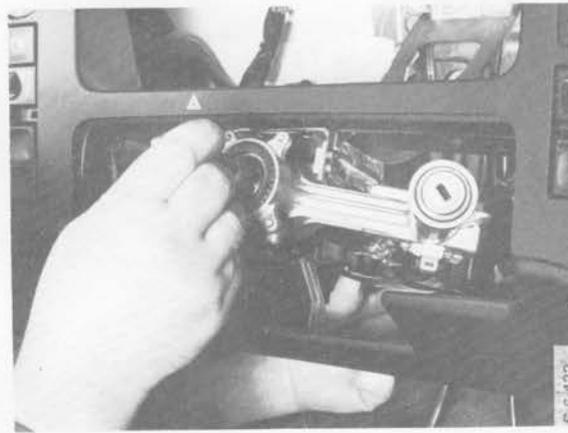


## 641-10 Steering column assembly

- Using a hexagon socket bit adaptor to stop the assembly turning, undo the nut and remove the washer.
- Withdraw the spindle.



- Push the steering-column shaft up and out of the lower bearing and withdraw it complete with the ignition switch and steering lock assembly.



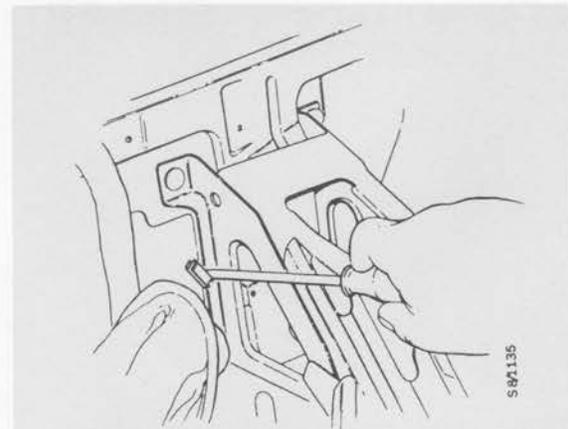
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### **N.B.**

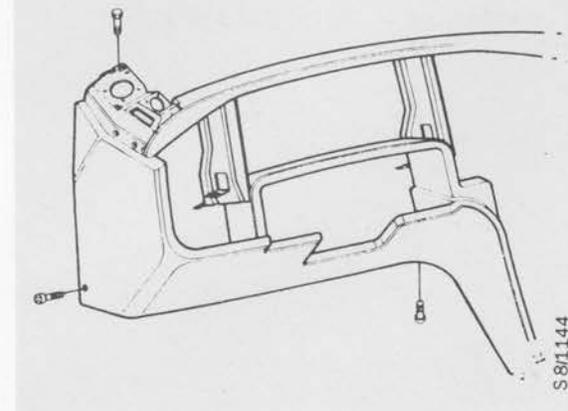
Under no circumstances must the splined joint in the steering-column shaft be separated.

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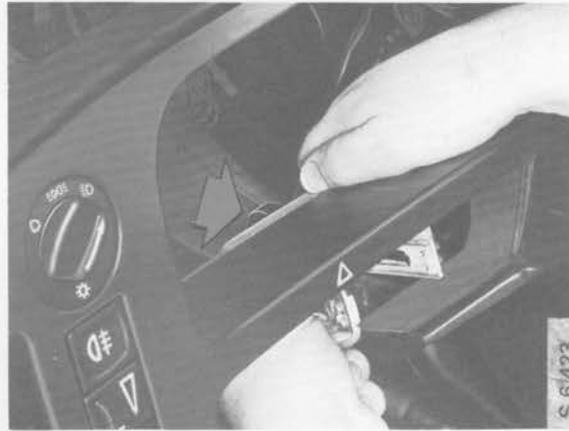
- 29 Remove the two metal fasteners located between the steering-column bracket and the dash panel. These fasteners need not be re-fitted.



- 30 Remove the three securing screws for the LH side of the dash panel.



- 31 Pull away the panel to release it from the clip on the steering column.



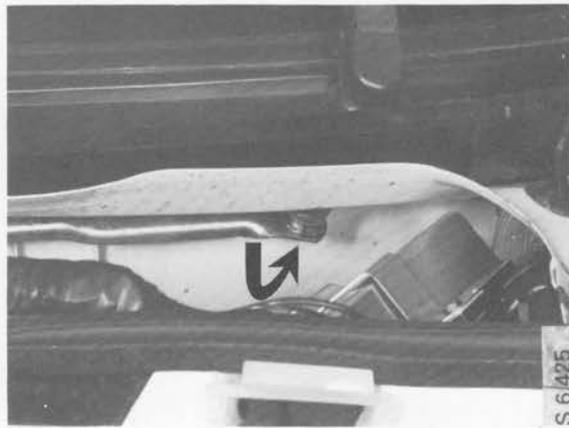
From the engine bay:

- 32 Remove the cover from the LH end of the false bulkhead panel.



- 33 Cars with ABS:  
Remove the ABS ECU complete with bracket.

- 34 Remove the C clip securing the link rod to the wiper spindle.



- 35 Disconnect the link rod from the wiper spindle.



## 641-12 Steering column assembly

- 36 Move aside the wiring loom and remove the nuts securing the steering-column bracket.

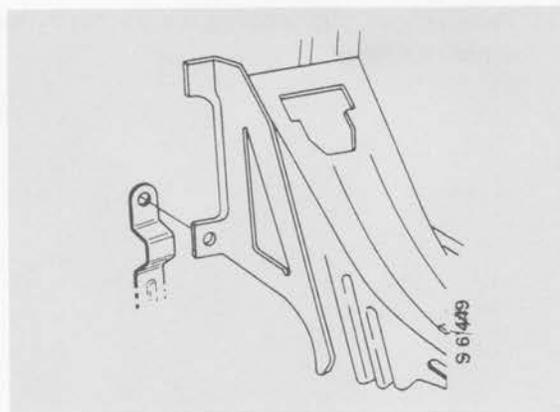


- 37 Pull the steering-column bracket away from the bulkhead and save the washers. Rotate and lift out the bracket, taking care not to scratch the windscreen.



### To refit

- 1 Fit the washers onto the securing bolts for the steering-column bracket. Lift the bracket into position on the bulkhead. Remember that the bracket for the relay holder is also secured by the lower bolt.



- 2 Press the dash panel home to engage the clip.



- 3 Fit and tighten the nuts on the steering-column bracket.

**Tightening torque:**

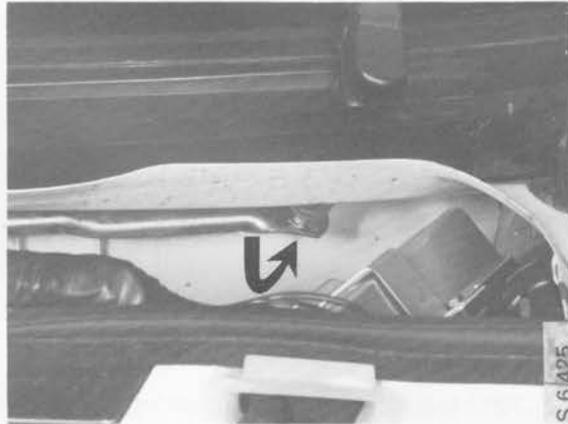
**20 - 26 Nm (14.8 - 19.2 lbf ft)**

**Prelubricated nuts (green chromated):**

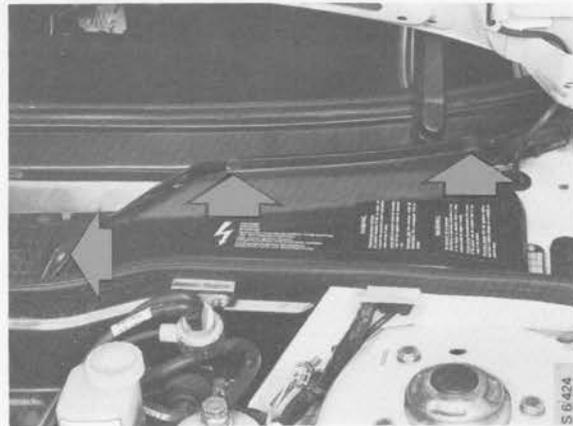
**15 - 21 Nm (11.1 - 15.5 lbf ft)**



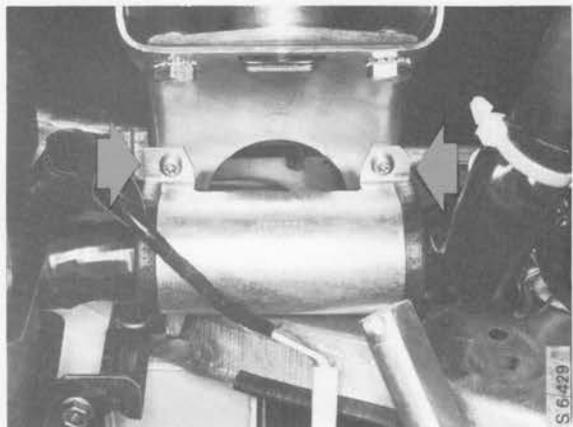
- 4 Reconnect the link rod to the wiper spindle and fit the C clip.
- 5 Cars with ABS brakes:  
Refit the ABS ECU and bracket.



- 6 Refit the cover on the false bulkhead panel.

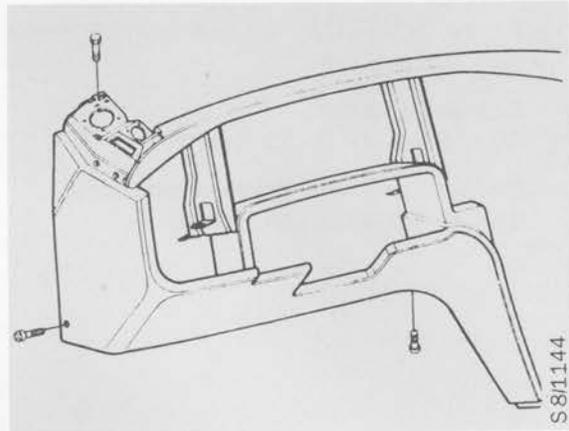


- 7 Fit the wiring-loom guide onto the steering-column bracket and fit the two screws.

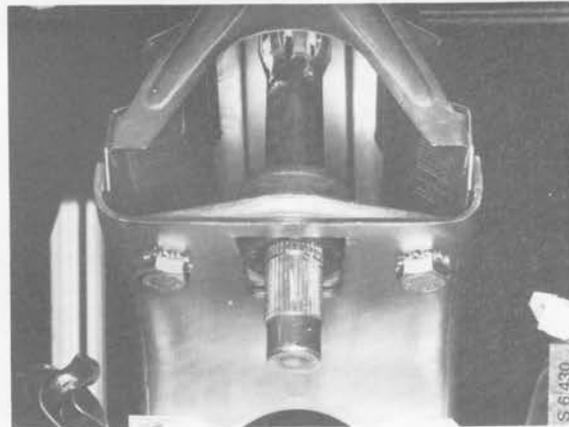


## 641-14 Steering column assembly

- 8 Press the dash panel into position and tighten the three retaining screws.

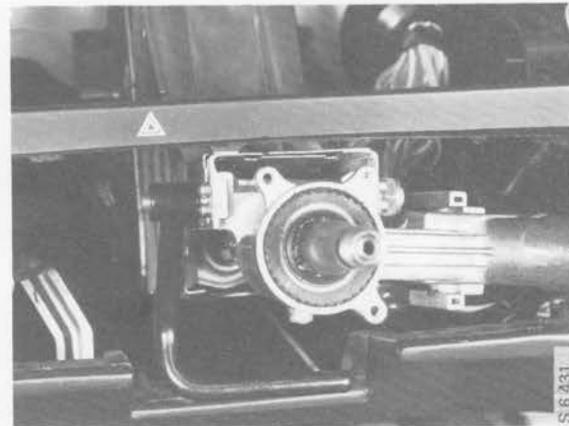


- 9 Lift the steering column and steering-lock assembly into position, ensuring that the column engages in the lower bearing in the bracket.



- 10 Refit the steering-wheel adjustment assembly as follows:

- Fit the flat washer onto the spindle and insert the spindle in the bore.
- Fit the washer, and screw on the nut on the RH end of the spindle.



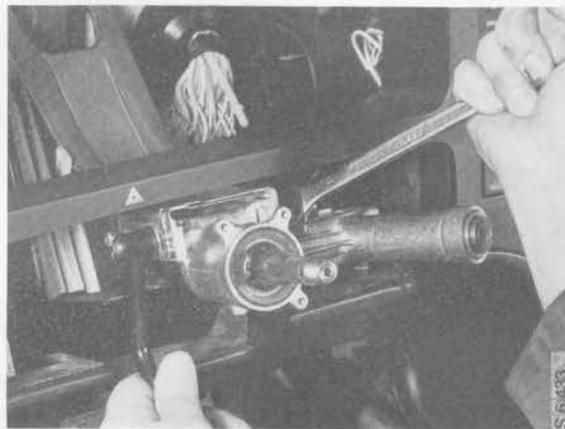
- Make sure that the hole for the tubular dowel is slightly to the right of the imaginary centre line at right angles to the slot in the casting. To adjust the position use an Allen key to turn the spindle, at the same time pushing the handle towards the left of the casting.



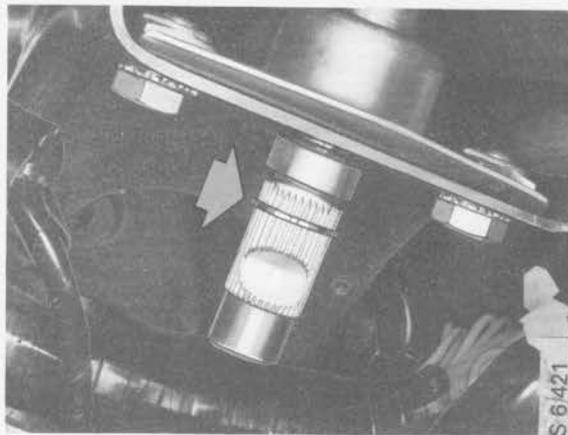
- Drive in the tubular dowel.



- Tighten the nut carefully until resistance can be felt when the assembly is pressed in or pulled out. With the friction device disengaged, the resistance should be 80 N (17.9 lbf). With the friction device engaged, the resistance should be at least 250 N (56.2 lbf).



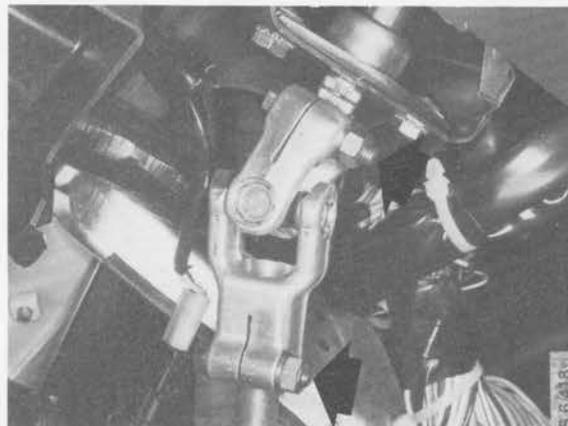
- 11 Fit the circlip to the bottom of the steering-column shaft.



- 12 Secure the UJ between the steering-column shaft and intermediate shaft. Ensure that the pinch-bolt at the bottom is below the stop on the end of the intermediate shaft. Adjust the clearance between the UJ and the steering-column bracket.

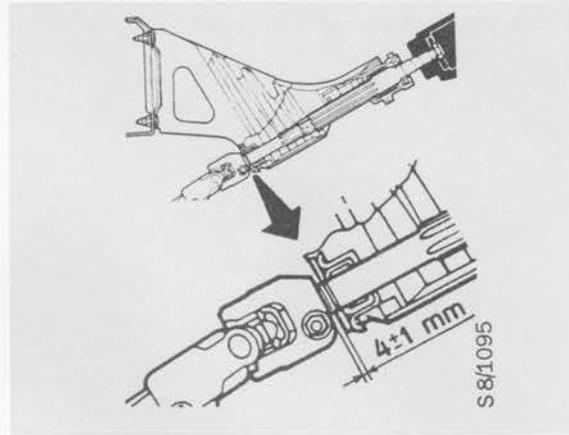
**Tightening torque:**

**23 - 30 Nm (17.0 - 22.1 lbf ft)**

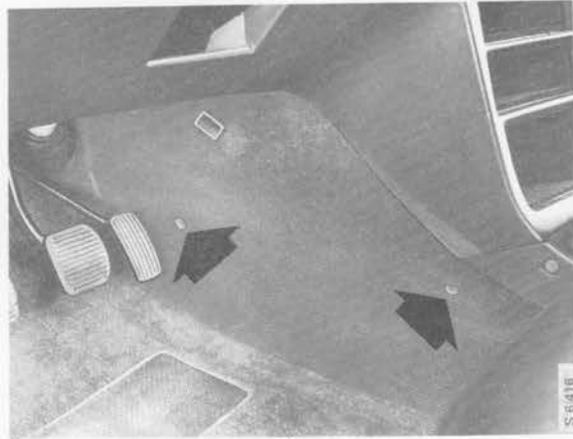


## 641-16 Steering column assembly

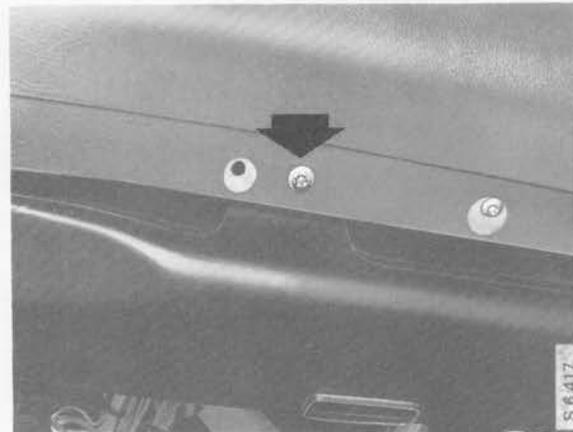
The clearance should be  $4 \pm 1$  mm ( $0.16 \pm 0.04$  in).



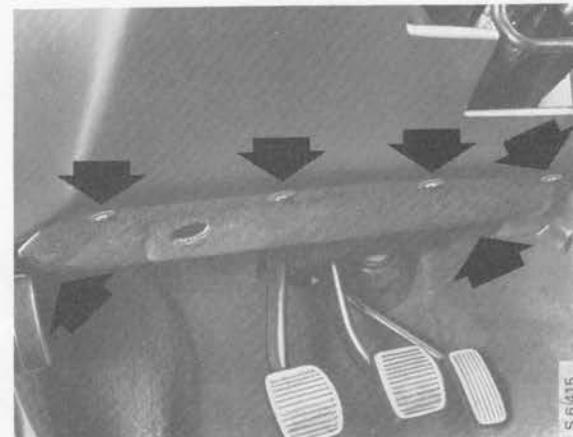
- 13 Refit the carpeting on the driver's side to the centre console and engage the fasteners.



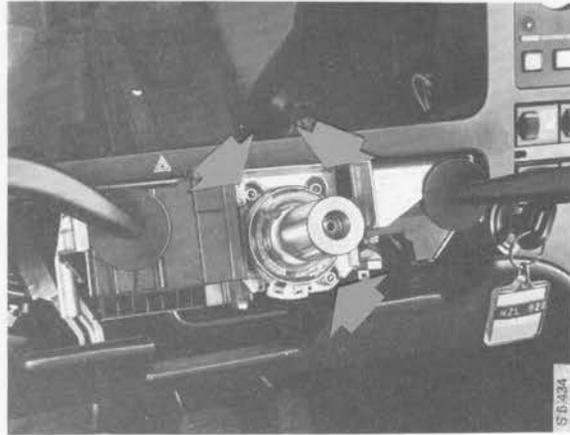
- 14 Refit the floor duct.



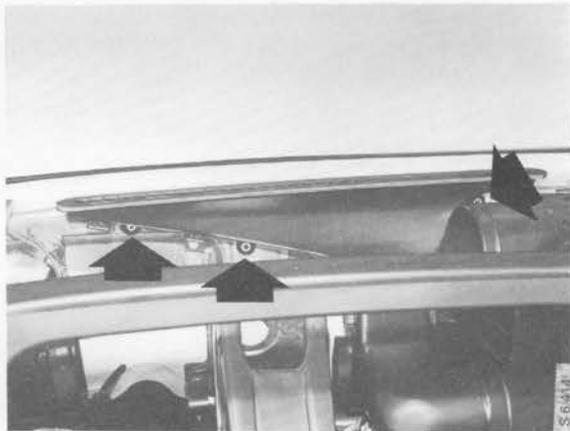
- 15 Refit the acoustic insulation underneath the dash panel.



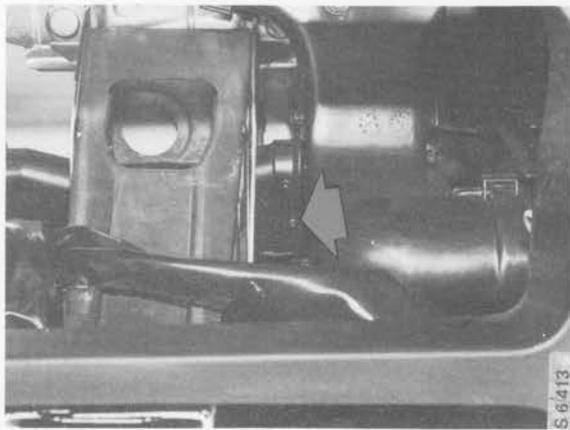
- 16 Offer up the stalk switch assembly, centre it using mandrel 84 71 138 and tighten the three screws.
- 17 Reconnect the leads to the unit in accordance with the labels.
- 18 Fit a cable tie around the leads.



- 19 Refit the defroster top vent to the fan casing and tighten the screws.



- 20 Fit the side defroster duct inside the steering-column bracket and tighten the screw securing the duct to the defroster vent.

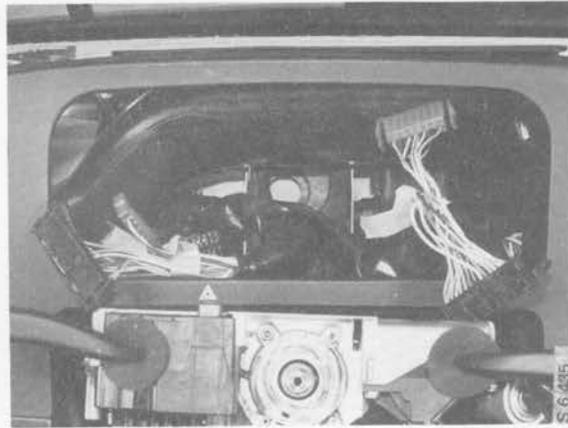


- 21 Reconnect the side defroster duct to the end piece and tighten the screw securing the end piece to the dash panel.

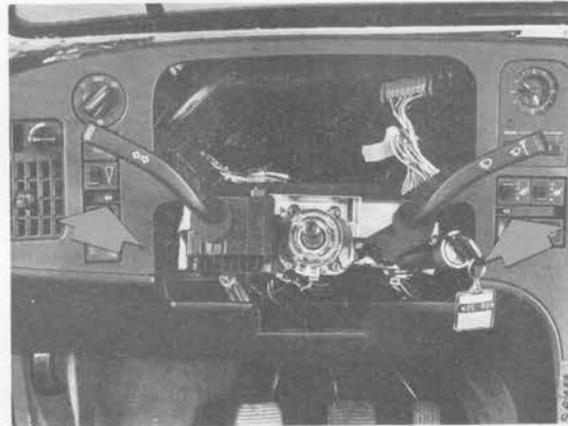


## 641-18 Steering column assembly

- 22 Lift out the connectors for the main instrument display panel.
- 23 Reconnect the duct to the fan casing and then to the panel vent.



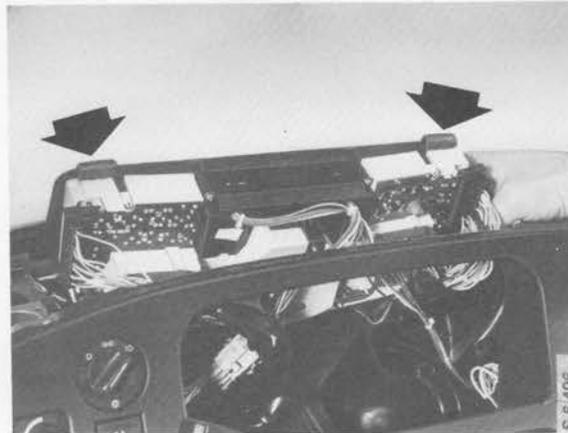
- 24 Press the panel surround into position, tighten the two screws and refit the blanks over the screws.



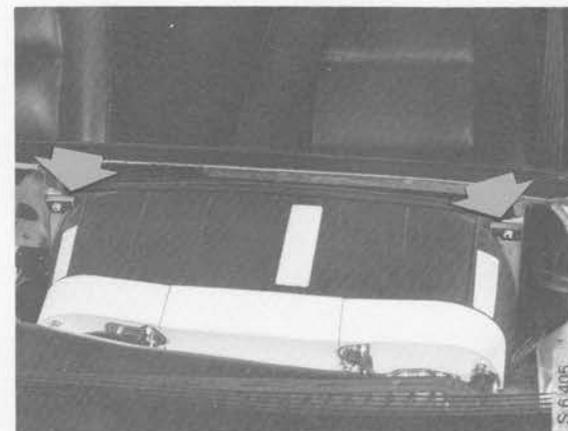
- 25 Stand the main instrument display panel upside down, with the face towards the wind-screen, and plug in the connectors.

Turbo cars: Reconnect the vacuum hose.

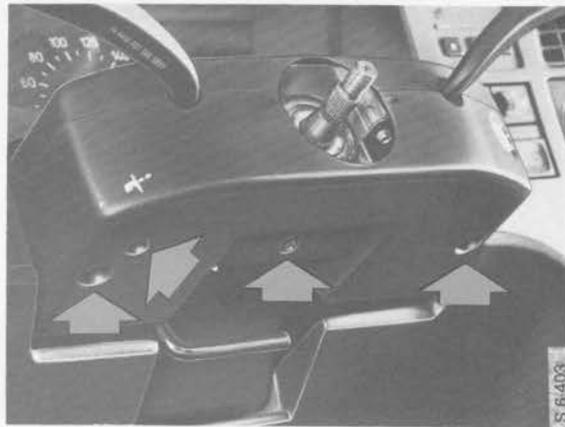
- 26 Fit the rubber feet onto the instrument display panel.



- 27 Lift the instrument display panel into position and tighten the two retaining screws.



- 28 Refit the steering-column cowls and tighten the four screws.



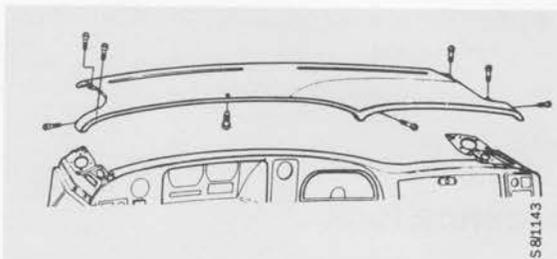
- 29 Fit the steering wheel, check that it is correctly centred and tighten the centre-nut.

**Tightening torque:**  
**30 Nm (22.1 lbf ft)**

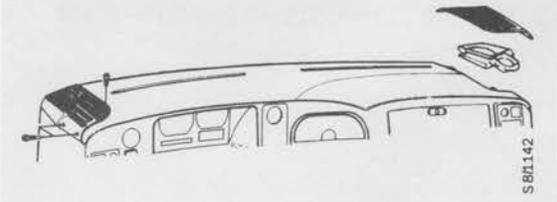
- 30 Reconnect the battery.  
31 Check all electrical systems.



- 32 Refit the fascia top.



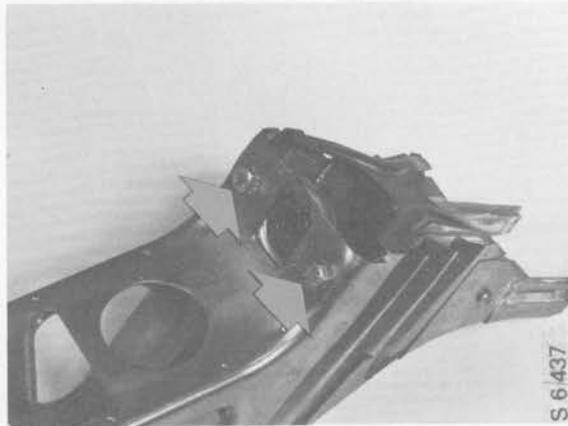
- 33 Refit the collars and speaker grilles.



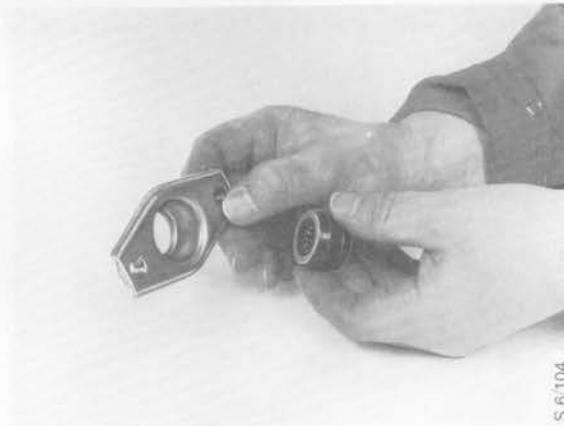
- 34 Refit the trim to the A pillars.  
35 Check the position of the steering wheel with the car on the road.

## To replace the lower steering-column bearing

- 1 Undo the two bolts securing the bearing bracket to the steering-column bracket.



- 2 Press the bearing out of the bracket.
- 3 Press the new bearing into the bracket.

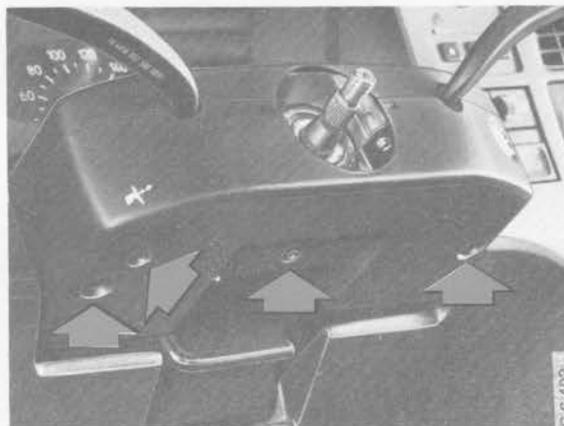


- 4 Refit the bearing bracket to the steering-column bracket.

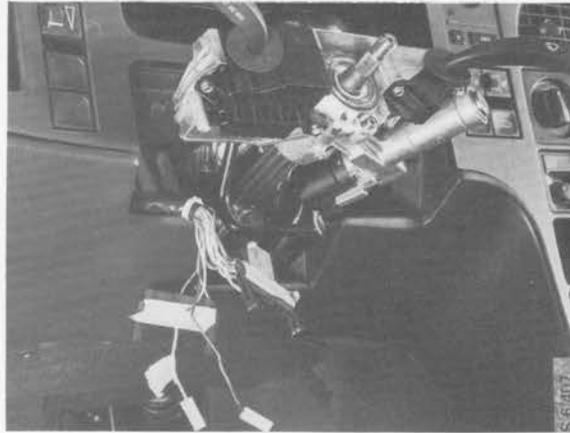
## Steering lock

### To remove

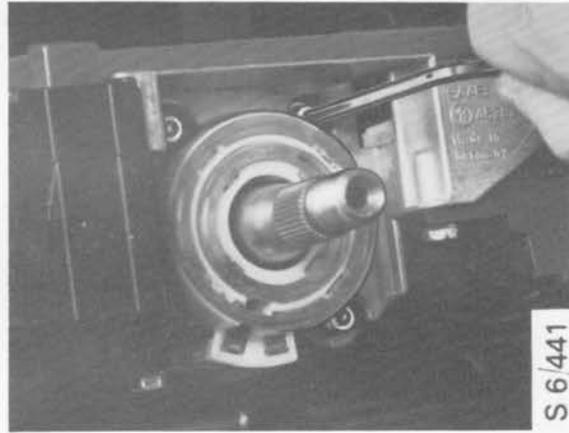
- 1 Remove the steering wheel (page 641-1 et seq refers).
- 2 Remove the two steering-column cowl.



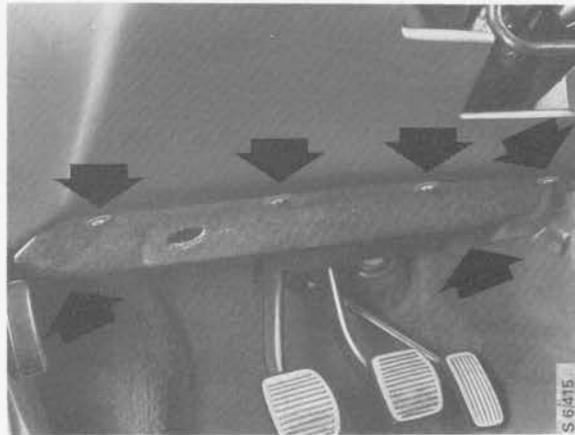
- 3 Snip off the cable tie securing the wiring loom to the steering column.
- 4 Unplug the connectors from the stalk switch unit and the leads from the horn contacts and ignition switch. Label the leads to ensure that they are reconnected correctly.



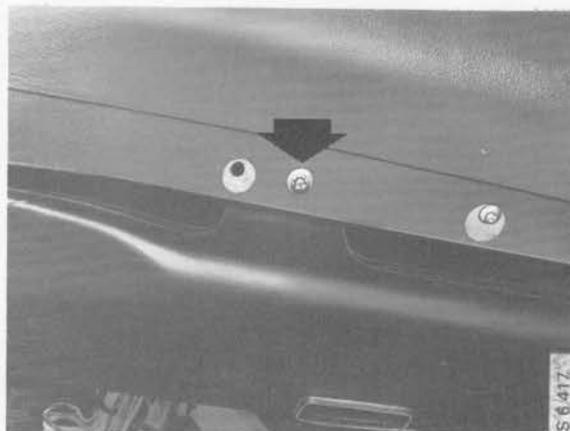
- 5 Undo the three securing screws and remove the stalk switch unit from the steering column.



- 6 Remove the acoustic insulation from under the dash panel.



- 7 Remove the floor duct.

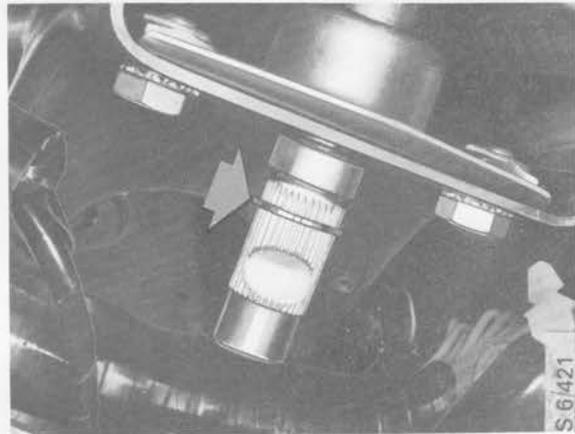


## 641-22 Steering column assembly

- 8 Remove the two pinch-bolts in the UJ between the steering-column shaft and the intermediate shaft and pull the joint off the splines on the shaft.

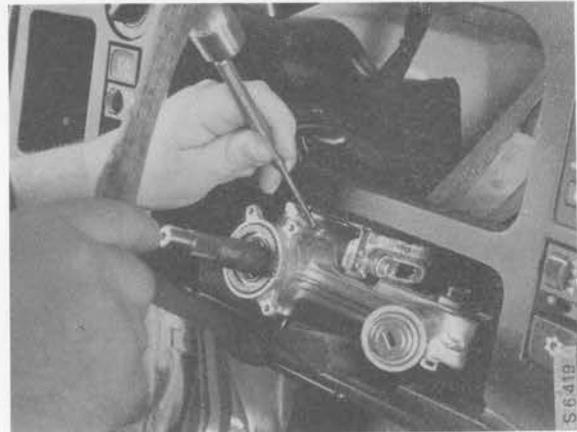


- 9 Remove the circlip from the bottom of the steering-column shaft.



- 10 Remove the steering-wheel adjustment assembly as follows:

- Tap out of the tubular dowel.



- Using a hexagon socket bit adaptor to stop the assembly turning, undo the nut and remove the washer.
- Withdraw the spindle.



- Push the steering-column shaft up and out of the lower bearing and withdraw it complete with the ignition switch and steering lock assembly.

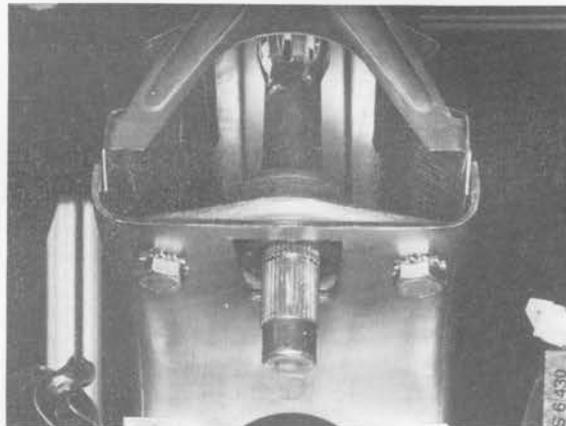
**N.B.**

Under no circumstances must the splined joint in the steering-column shaft be separated.



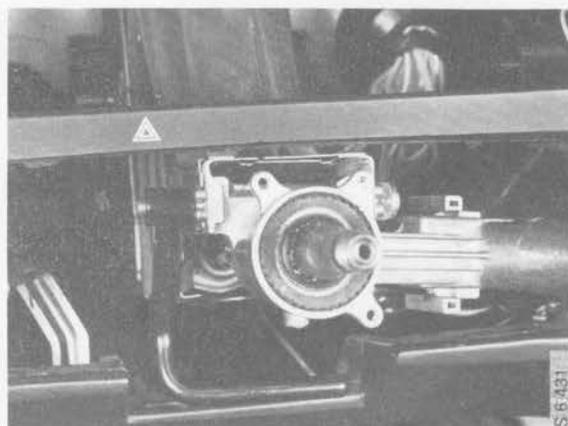
**To refit**

- 1 Lift the steering column and steering-lock assembly into position, ensuring that the column engages in the lower bearing in the bracket.



- 2 Refit the steering-wheel adjustment assembly as follows:

- Fit the flat washer onto the spindle and insert the spindle in the bore.
- Fit the washer, and screw on the nut on the RH end of the spindle.



## 641-24 Steering column assembly

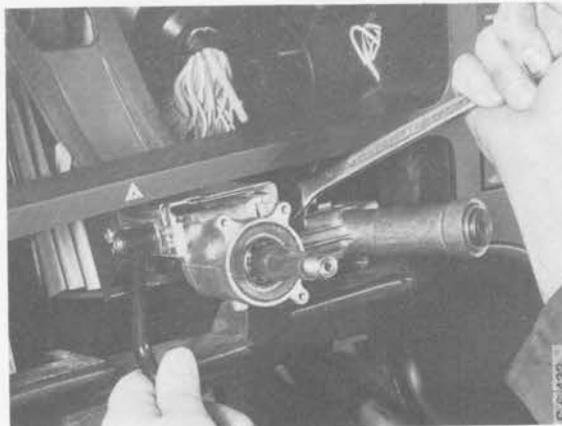
- Make sure that the hole for the tubular dowel is slightly to the right of the imaginary centre line at right angles to the slot in the casting. To adjust the position use an Allen key to turn the spindle, at the same time pushing the handle towards the left of the casting.



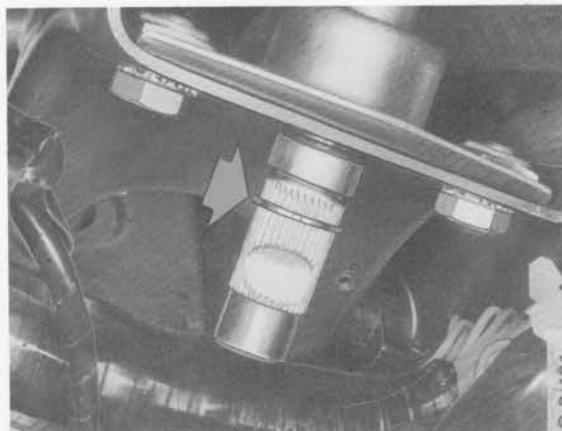
- Drive in the tubular dowel.



- Tighten the nut carefully until resistance can be felt when the assembly is pressed in or pulled out. With the friction device disengaged, the resistance should be 80 N (17.9 lbf). With the friction device engaged, the resistance should be at least 250 N (56.2 lbf).



- 3 Fit the circlip to the bottom of the steering-column shaft.

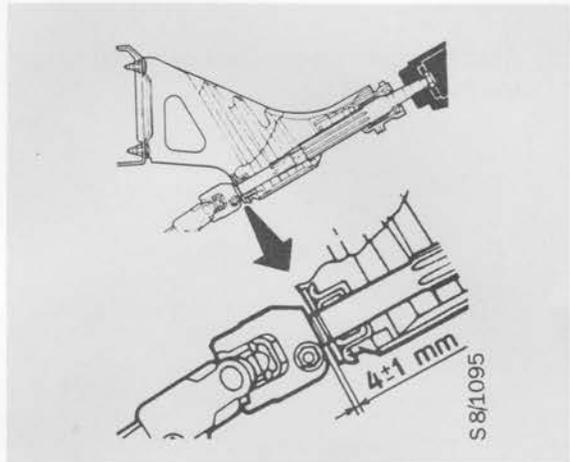


- 4 Secure the UJ between the steering-column shaft and intermediate shaft. Ensure that the pinch-bolt at the bottom is below the stop on the end of the intermediate shaft. Adjust the clearance between the UJ and the steering-column bracket.

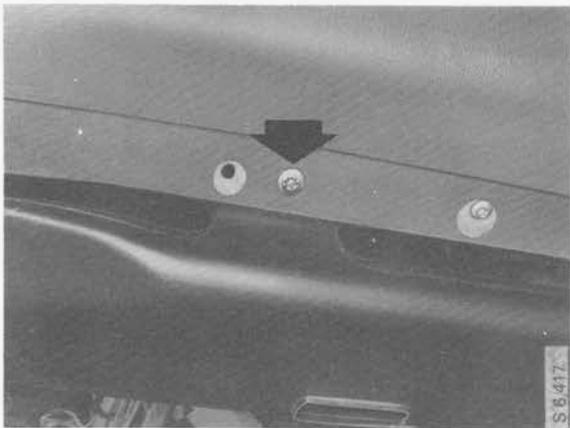
**Tightening torque:**

**23 - 30 Nm (17.0 - 22.1 lbf ft)**

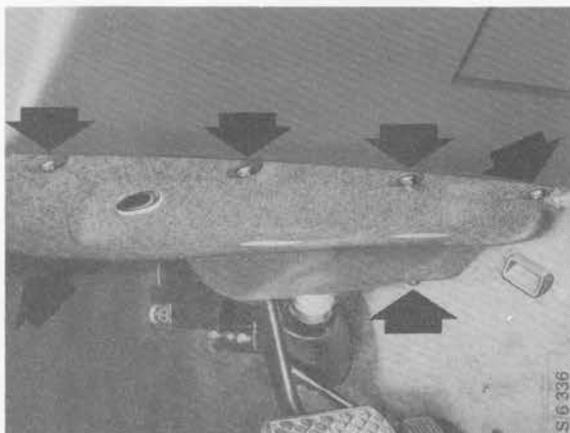
The clearance should be  $4 \pm 1$  mm (0.16  $\pm$  0.04 in).



- 5 Refit the floor duct.

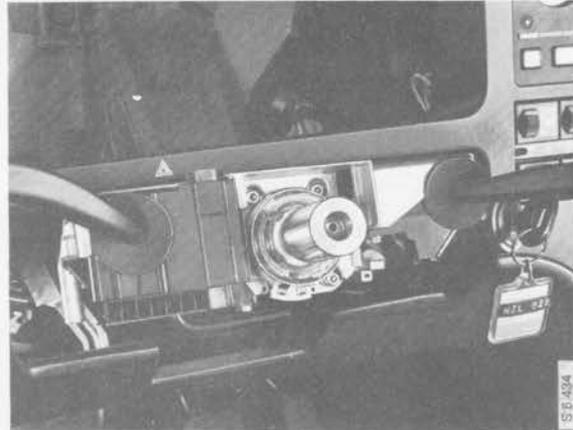


- 6 Refit the acoustic insulation underneath the dash panel.

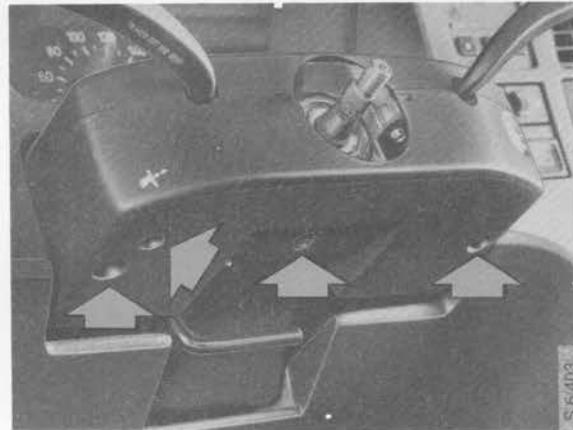


## 641-26 Steering column assembly

- 7 Offer up the stalk switch assembly, centre it using mandrel 84 71 138 and tighten the three screws.
- 8 Reconnect the leads to the unit in accordance with the labels.
- 9 Fit a cable tie around the leads.



- 10 Refit the steering-column cowls and tighten the four screws.



- 11 Fit the steering wheel and tighten the centre-nut.

**Tightening torque:**  
**30 Nm (22.1 lbf ft)**

- 12 Check the position of the steering wheel with the car on the road.



## To dismantle

- 1 Turn the ignition key to unlock the steering lock.
- 2 Pull the shaft out of the lock assembly.

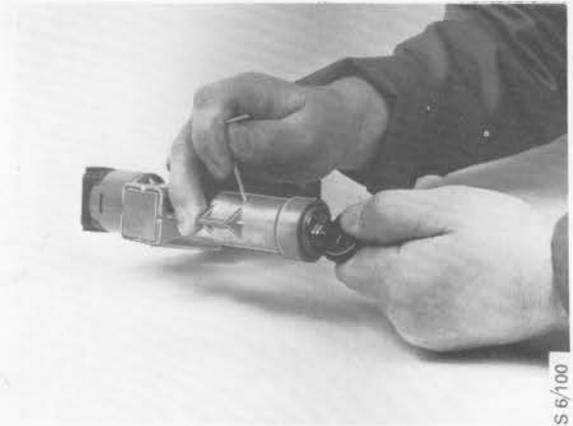
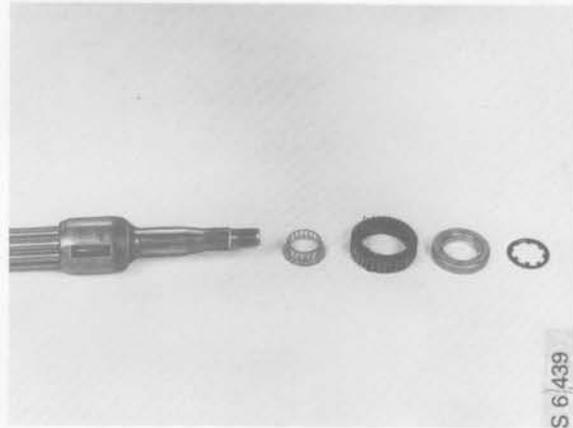
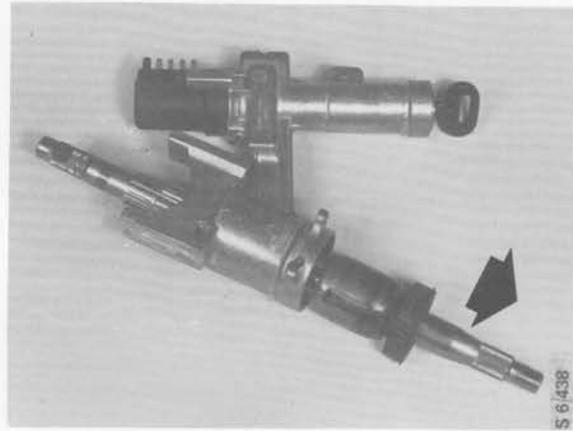
### **N.B.**

Under no circumstances must the splined joint in the steering-column shaft be separated.

- 3 Remove the shakeproof washer and the top bearing.

- 4 Undo the two socket-head screws and remove the ignition switch.

- 5 To remove the lock cylinder, turn the ignition key to position one, press in the locking tab and withdraw the cylinder.



## 641-28 Steering column assembly

### To reassemble

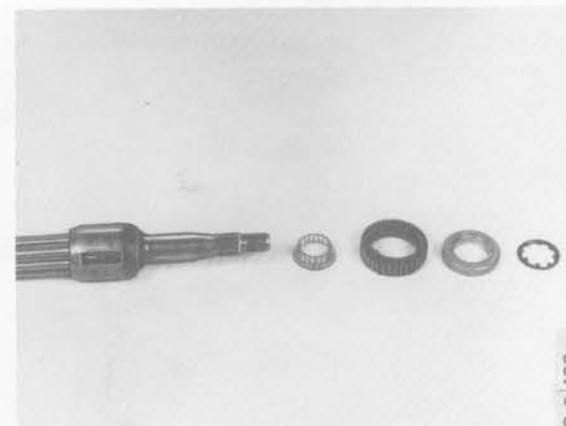
- 1 Push the lock cylinder down the bore.



- 2 Refit the ignition switch and tighten the two screws.



- 3 Refit the bearing and the shakeproof washer.



- 4 Insert the steering-column shaft into the steering lock assembly.

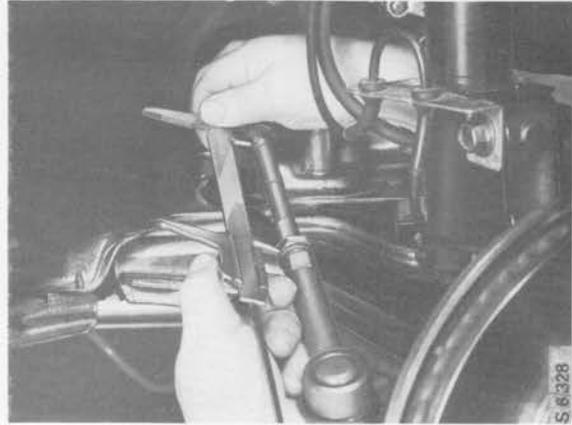


# Track-rod ends

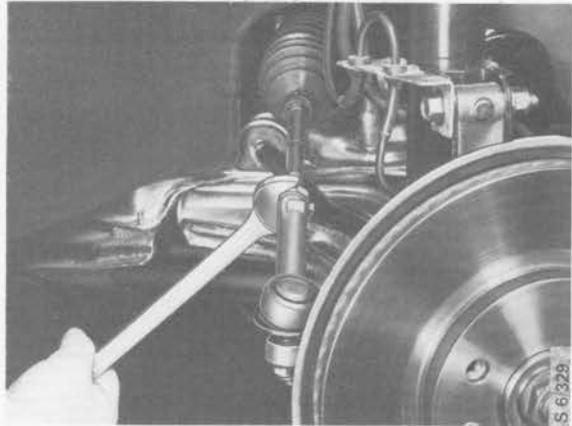
Replacing the track-rod ends . . . . 643-1

## To replace the track-rod ends

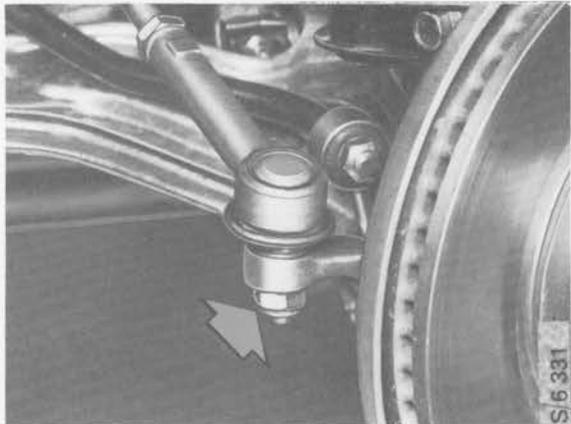
- 1 Raise the front of the car and remove the road wheel. If using a jack, support the car on axle stands.
- 2 Measure and note the distance between the track-rod end and the groove in the steering rack.



- 3 Undo the locknut.

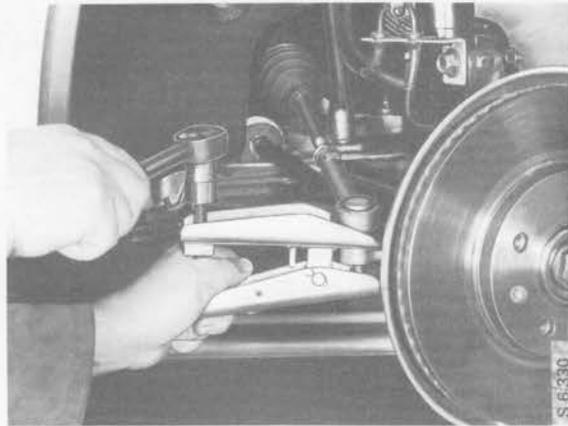


- 4 Remove the nut securing the track-rod end to the steering swivel member.



## 643-2 Track-rod ends

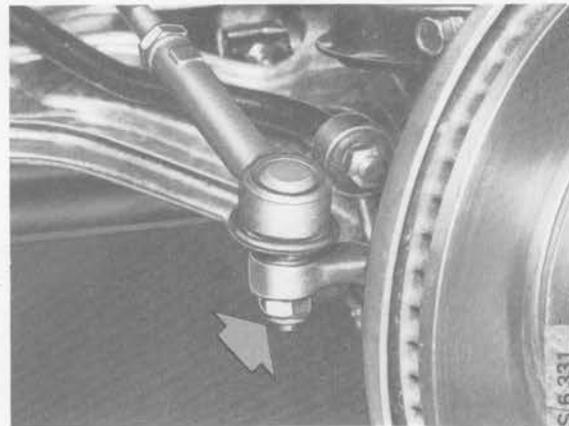
- 5 Separate the track-rod end from the steering swivel member using ball-joint separator 89 95 409. If necessary, insert a distance piece under the bolt.



- 6 Unscrew the track-rod end from the track rod.
- 7 Screw the new track-rod end onto the track rod. The new track rod must be the same distance from the groove in the rack as was the old one. Do not tighten the locknut yet.
- 8 Tighten the nut securing the track-rod end to the steering swivel member.

**Tightening torque:**

**50 - 60 Nm (36.9 - 44.2 lbf ft)**



- 9 Fit the road wheel and lower the car.

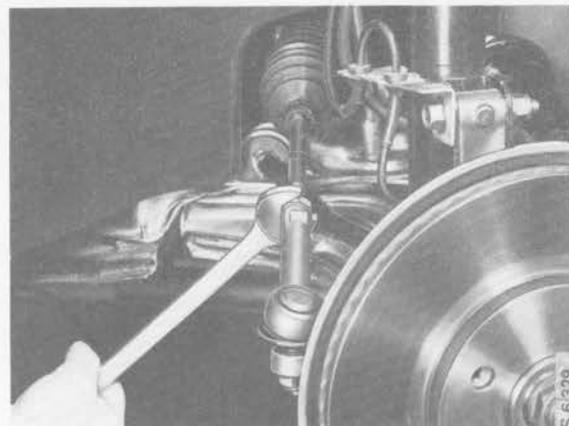
**Tightening torque:**

**105 - 125 Nm (77.4 - 92.2 lbf ft)**

- 10 Check and, if necessary, adjust the toe-in (section 601 refers).
- 11 Tighten the locknut.

**Tightening torque:**

**60 - 80 Nm (44.3 - 59.0 lbf ft)**





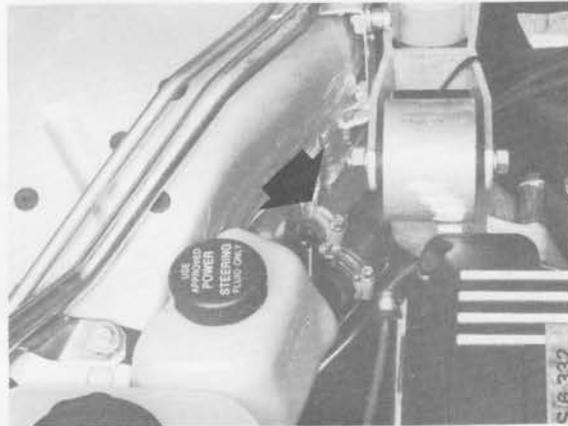
### To remove

#### **N.B.**

Scrupulous cleanliness must be observed in all work on hydraulic components.

#### 1 Drain the fluid from the system as follows:

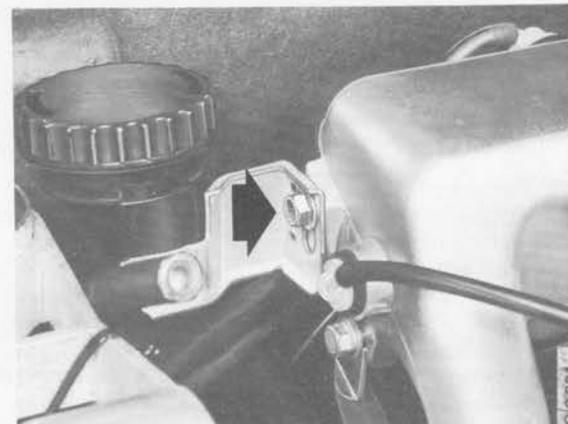
- Disconnect the return hose from the hydraulic servo pump. Plug the opening in the reservoir.



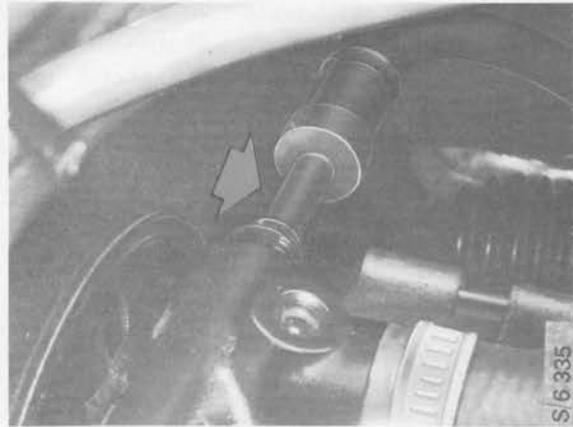
- Place the end of the return hose in a receptacle having a capacity of at least one litre.
- Start the engine and allow the fluid to be pumped out of the system. Turn the steering wheel twice from lock to lock to drain the system completely. As soon as the fluid has ceased to flow out, switch off the engine and plug the end of the hose.



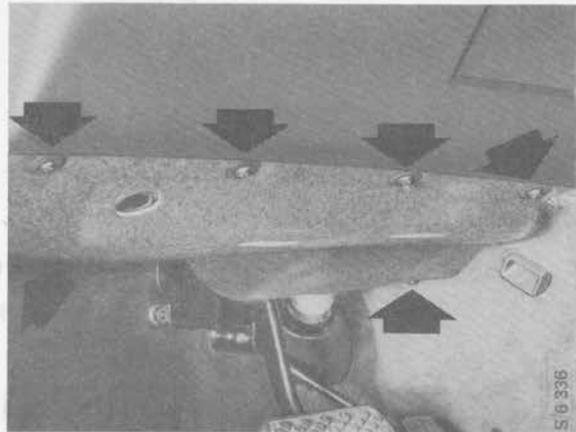
#### 2 Slacken the fixing for the oil filler tube and push the tube to one side.



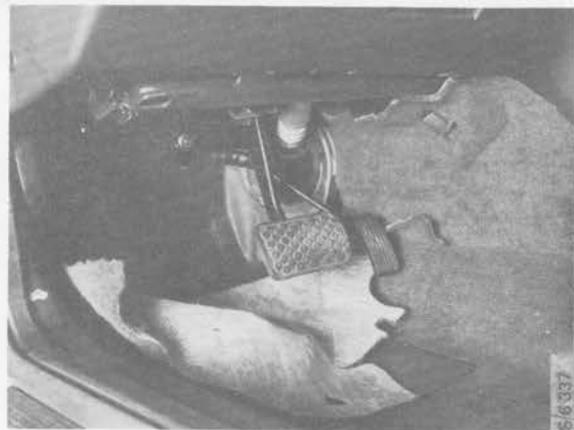
- 3 Disconnect the delivery hose from the servo pump and plug the opening.



- 4 Remove the acoustic insulation underneath the dash panel.



- 5 Release the carpet and fold it back.

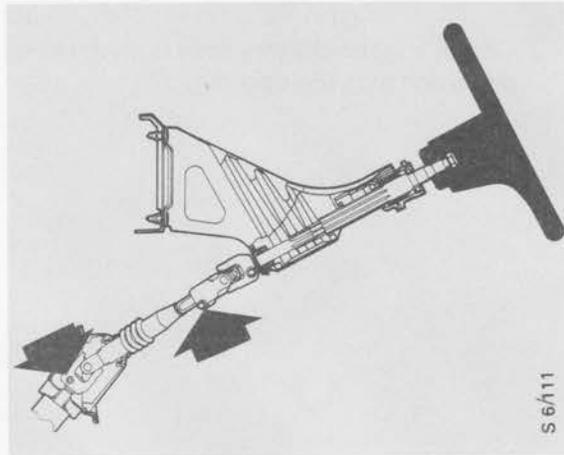


- 6 Peel back the rubber gaiter on the intermediate shaft.

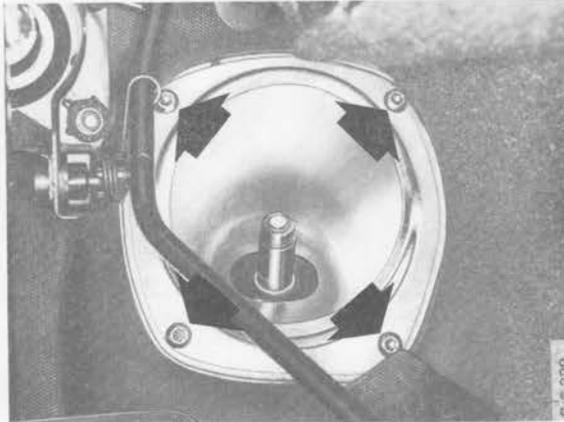


## 644-4 Power-assisted steering system

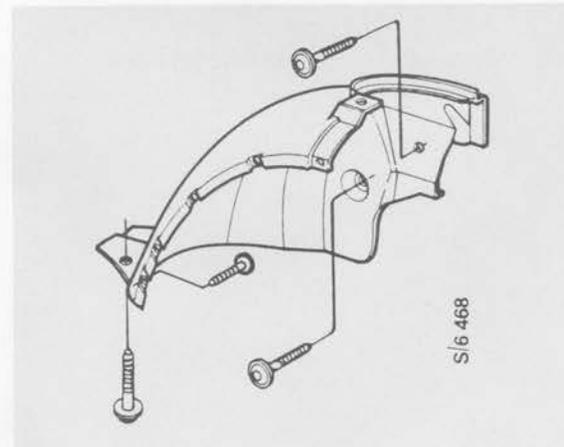
- 7 Remove the pinch-bolts from both universal joints on the intermediate shaft. Pull up the intermediate shaft and disconnect it from the pinion shaft and then from the steering-column shaft.



- 8 Remove the cover plate from the bulkhead. Save the gasket, seal and plastic bush.



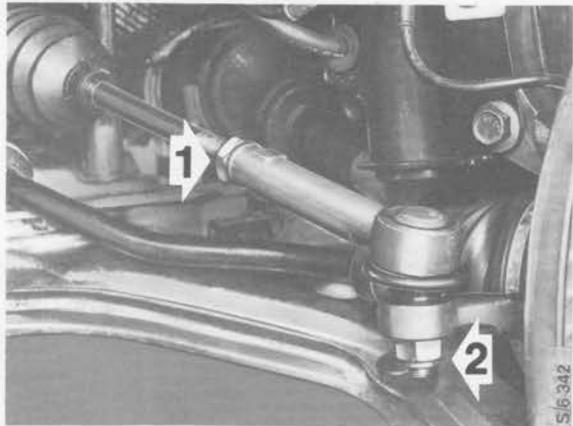
- 9 Remove the road wheels.
- 10 Remove the rear section of the RH wing liner.



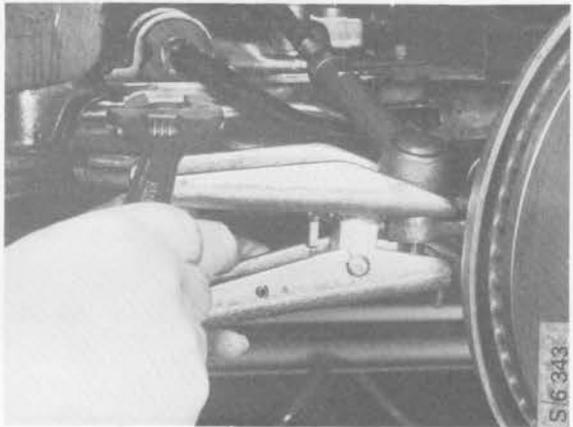
- 11 Measure and note the distance between the track-rod end and the groove in the rack.



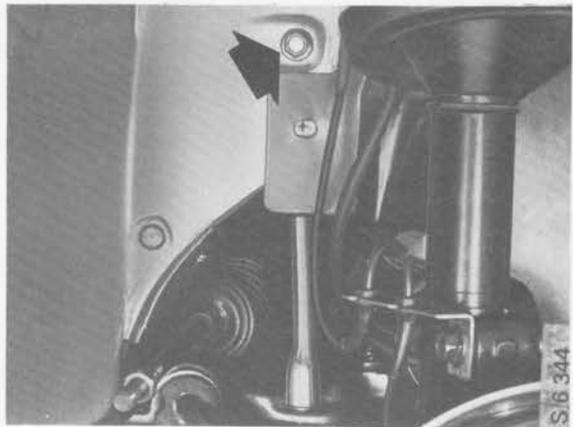
- 12 Undo the locknut (1).
- 13 Remove the nut securing the track-rod end to the steering swivel member (2).



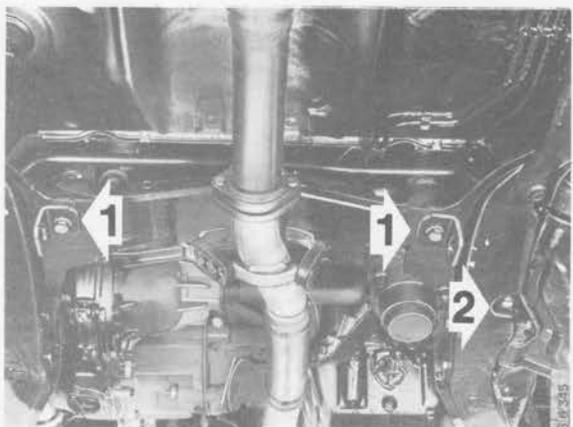
- 14 Separate the track-rod end from the steering swivel member using ball-joint separator 89 95 409. If necessary, insert a distance piece under the bolt.
- 15 Unscrew the track-rod end from the track rod.
- 16 Repeat steps 11 - 15 on the LH side of the car.



- 17 Remove the top fixing bolt for the steady bar between the subframe and the wheel arch on the RH side.

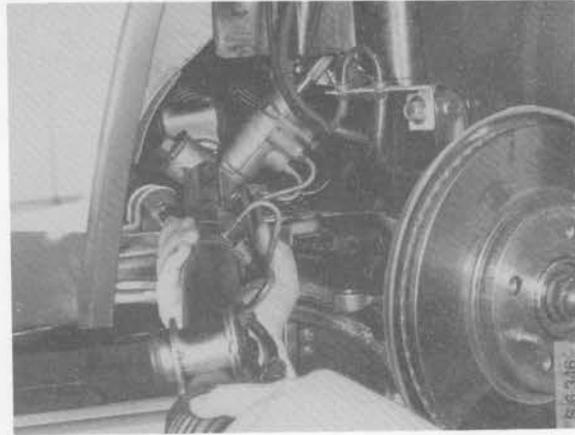


- 18 Remove the fixing bolts (1) for the rack-and-pinion assembly.
- 19 Unbolt the lower fixing (2) and remove the steady bar.



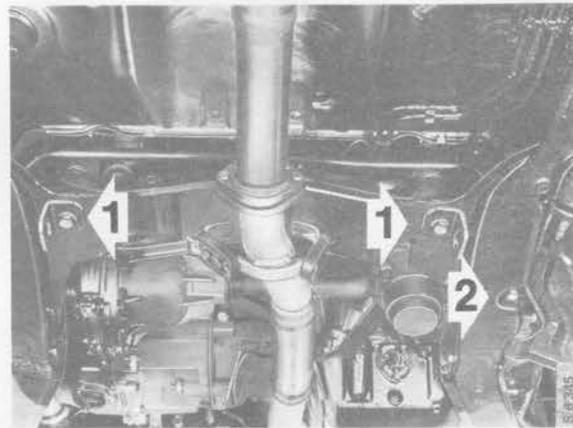
## 644-6 Power-assisted steering system

- 20 Pull down the flow and return hoses. Move all electrical leads and hoses clear and lift the rack-and-pinion assembly out through the RH wheel arch. Guide the leading end of the assembly forwards to prevent its fouling the wing liner. Take care not to damage the rubber gaiters.



### To refit

- 1 Lift the rack-and-pinion assembly in through the RH wheel arch. Take care not to damage the rubber gaiters on the rack and ensure that the control valve does not snag in electrical leads or hoses inside the engine bay. Feed the flow and return hoses up towards the top.
- 2 Tighten the two fixing bolts (1) for the assembly.



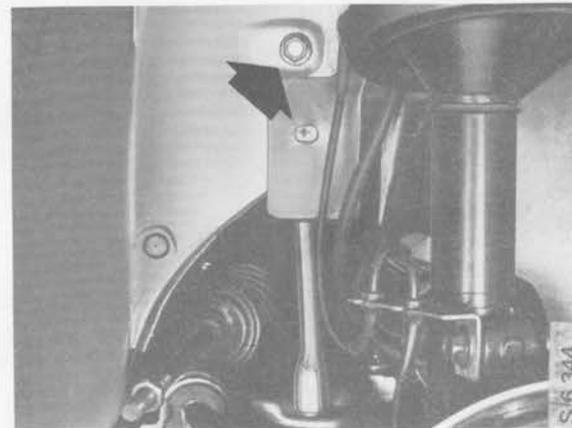
### N.B.

On M87 cars with chassis no. H 1003410 or earlier, a 2-mm-thick washer must be fitted between the LH mounting of the assembly and the body.

### Tightening torque:

**60 - 80 Nm (44.2 - 59.0 lbf ft)**

- 3 Offer up the steady bar between the sub-frame and the RH wheel arch and insert the bottom fixing bolt (2).
- 4 Tighten the top fixing bolt.
- 5 Tighten the bottom fixing bolt.

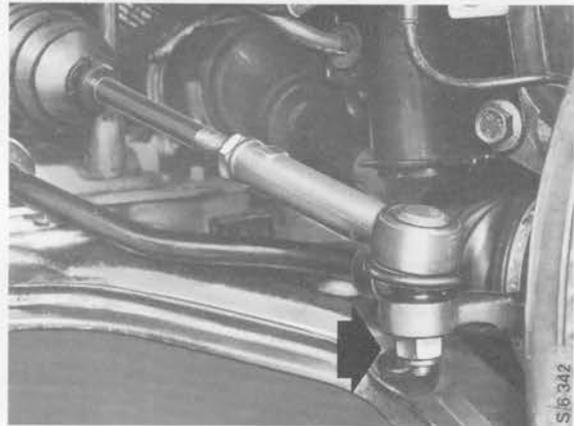


- 6 Screw the track-rod ends back onto the track rods and measure the distance between the track-rod end and the groove in the rack to ensure that both track-rod ends are back in the same position as before removal. Leave the locknuts slack.



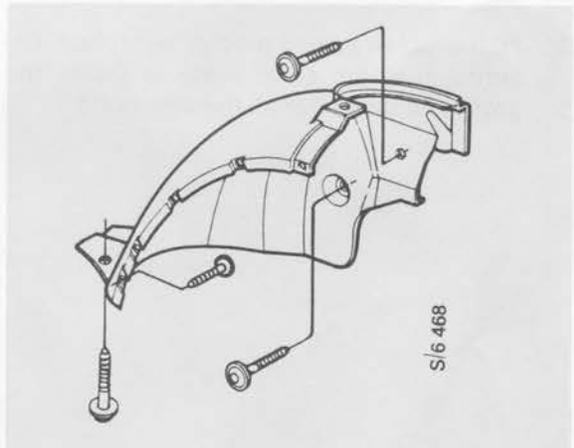
- 7 Tighten the nut securing each track-rod end to the steering swivel members.

**Tightening torque:**  
**50 - 60 Nm (36.9 - 44.2 lbf ft)**



- 8 Refit the rear section of the RH wing liner.  
9 Fit the road wheels.

**Tightening torque:**  
**105 - 125 Nm (77.4 - 92.2 lbf ft)**



- 10 Fit the plastic bush and seal on the pinion shaft.



## 644-8 Power-assisted steering system

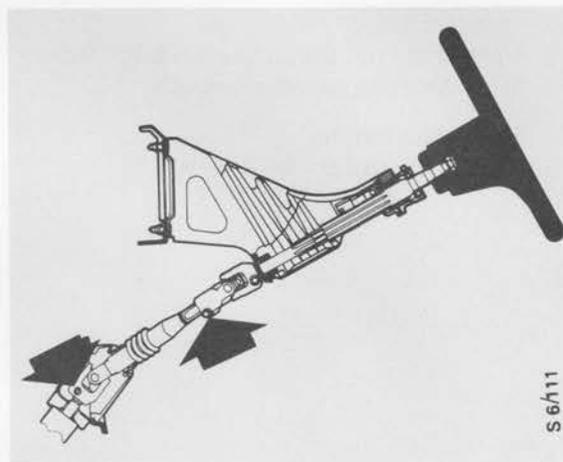
- 11 Inspect the rubber gasket to make sure it is in good condition and then fit the cover plate on the bulkhead, tightening the four screws.



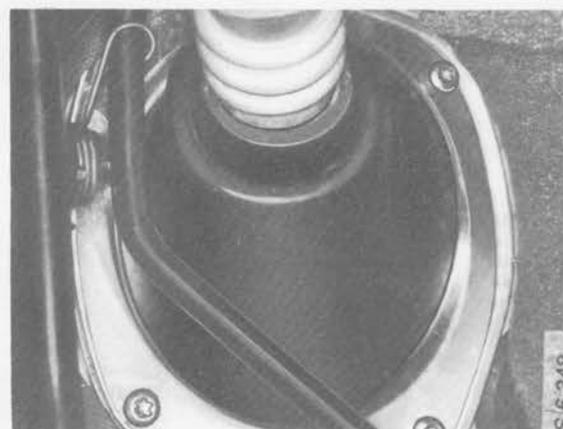
- 12 Ensure that the front wheels and steering wheel are dead centre. Refit the intermediate shaft and tighten the pinch-bolts in the two universal joints. Make sure that the top pinch-bolt is below the stop on the end of the shaft and that the lower bolt is seated in the slot in the end of the pinion shaft.

**Tightening torque:**

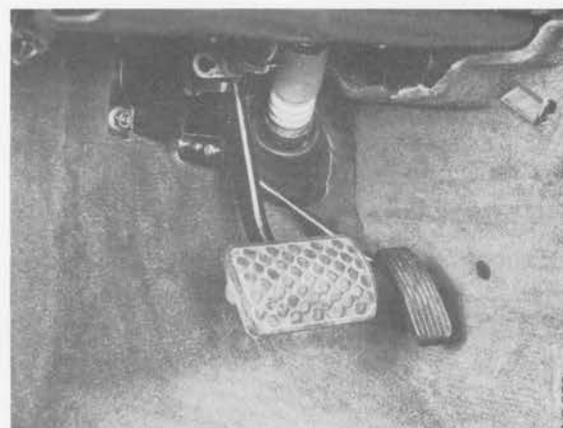
**23 - 30 Nm (17.0 - 22.1 lbf ft)**



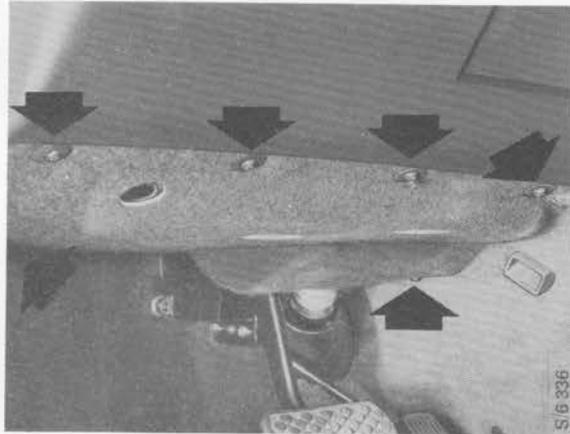
- 13 Fit the rubber gaiter onto the cover plate, ensuring that the cover plate is inside the groove on the gaiter all the way round.



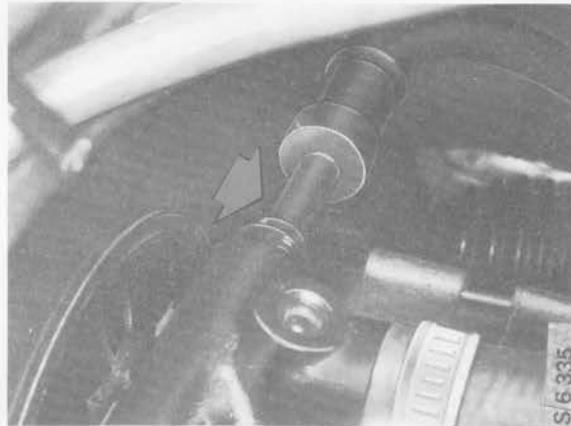
- 14 Put back the carpet.



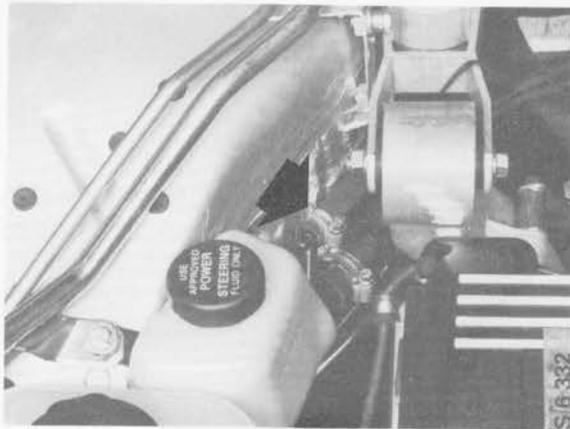
15 Refit the acoustic insulation.



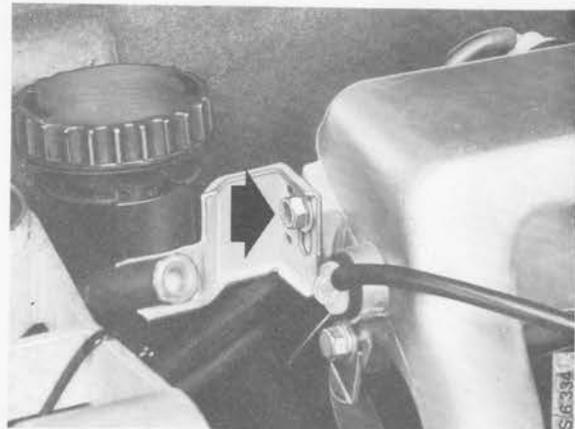
16 Thoroughly clean the areas around the hydraulic connections at the pump and reservoir. Check the condition of the 'O' ring on the delivery hose, lubricate it lightly with hydraulic fluid and connect the hose to the pump.



17 Reconnect the return hose to the fluid reservoir and tighten the hose clip.

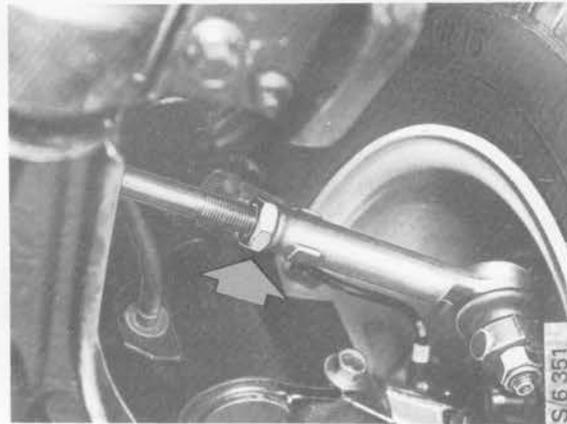


18 Tighten the fixing for the oil filler tube.



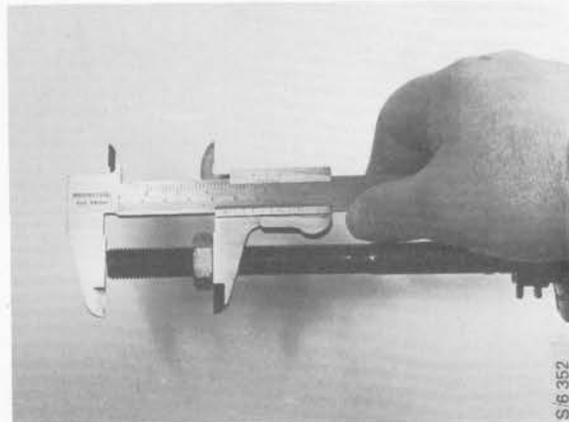
## 644-10 Power-assisted steering system

- 19 Top up the system with fluid: 75 cl (0.8 liq qt) of Texaco 4634 Power Steering Fluid.
- 20 With the engine off and the front wheels off the ground, bleed the system by turning the steering wheel lock to lock, three or four times.
- 21 Lower the car, start the engine and turn the steering wheel lock to lock a couple of times more to check that the system is functioning properly.  
Check the level in the power steering fluid reservoir.
- 22 Check and, if necessary, adjust the toe-in (section 601 refers).
- 23 Tighten the locknuts on the track rods.  
**Tightening torque:**  
**60 - 80 Nm (44.3 - 59.0 lbf ft)**
- 24 Check the position of the steering wheel and the operation of the steering system with the car on the road.
- 25 Inspect the system for signs of leakage.

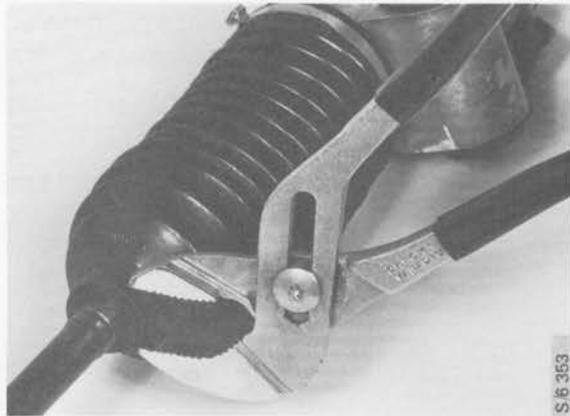


### To dismantle

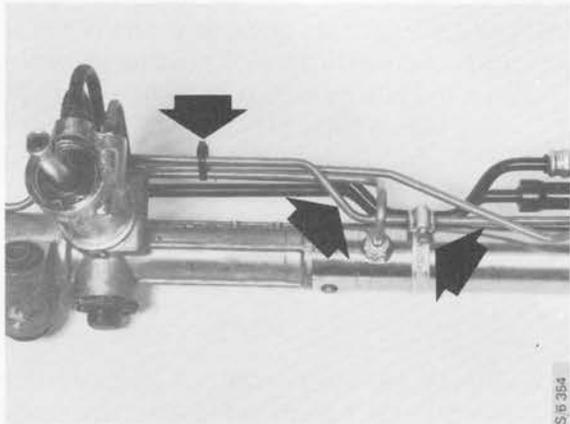
- 1 Measure and note the distance between the locknut and the end of the track rod (on both sides of the car) to minimize adjustment of toe-in on refitting, and then remove the nuts.



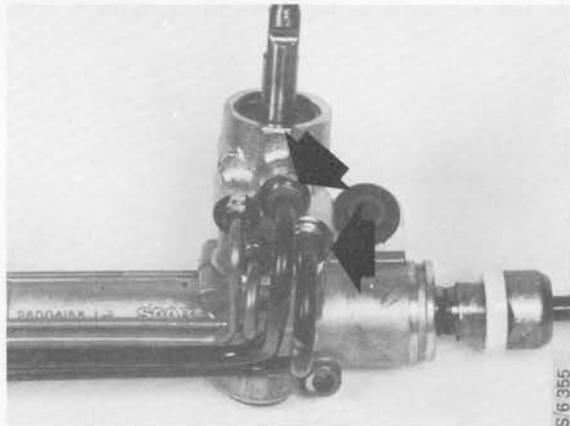
2 Remove the rack gaiters.



3 Remove the cable tie, clip and capillary tube.



4 Disconnect the flow and return pipes and blank off the openings in the control valve body.



5 Remove the inner ball joint at the greater distance from the pinion as follows:

- Clamp the rack in a soft-jaw vice.
- Tap down the thrust washer.



## 644-12 Power-assisted steering system

- Using tool 8996 480, unscrew the inner ball joint and remove the thrust washer.

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### **N.B.**

Under no circumstances hold the pinion when undoing or tightening the ball joint.

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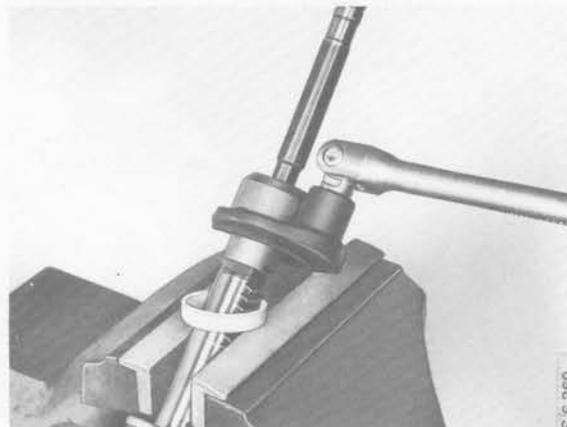
- 6 Using a small drift, press down on the end of the circlip inside the rack housing and withdraw the clip by means of pliers or a hook made from a piece of piano wire.

- 7 Remove the other inner ball joint (the one nearer to the pinion) as follows:

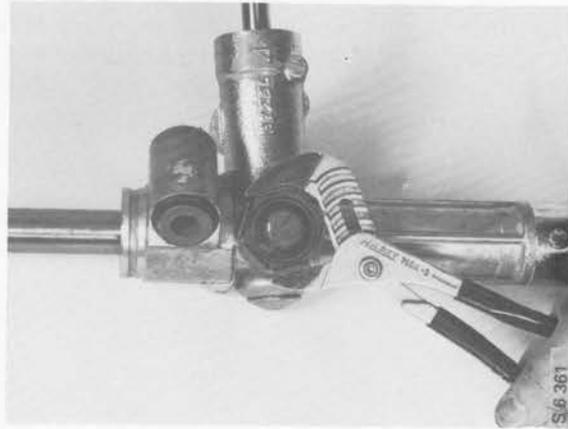
- Clamp the rack in a soft-jaw vice.
- Tap down the thrust washer.



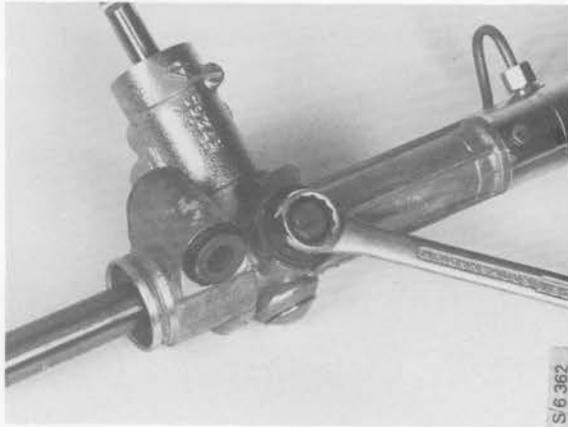
- Using tool 8996 480, unscrew the inner ball joint and remove the thrust washer.



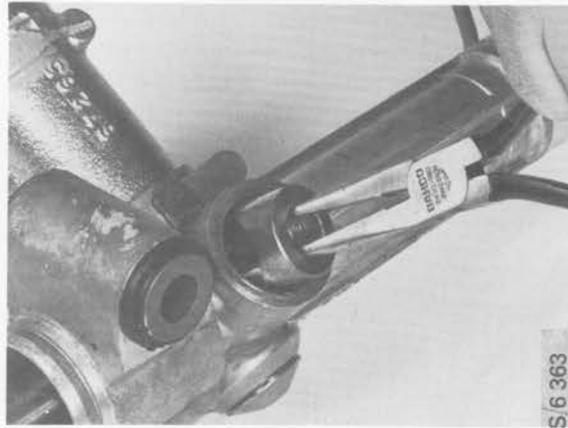
8 Undo the locknut for the damper yoke.



9 Remove the adjusting screw with locknut and the spring.



10 Remove the damper yoke.  
If it proves obstinate, tap the housing gently on the workbench.

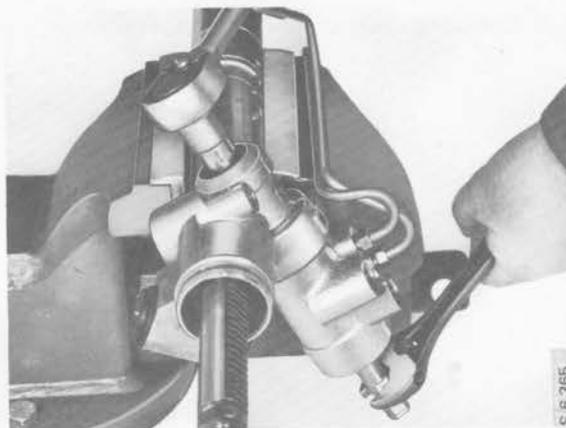


11 Tap off the end cap from the bottom of the pinion housing.



## 644-14 Power-assisted steering system

- 12 Remove the locknut. Use an adjustable spanner on the flats to hold the pinion shaft.



- 13 Remove the circlip for the dust cap at the top of the valve.

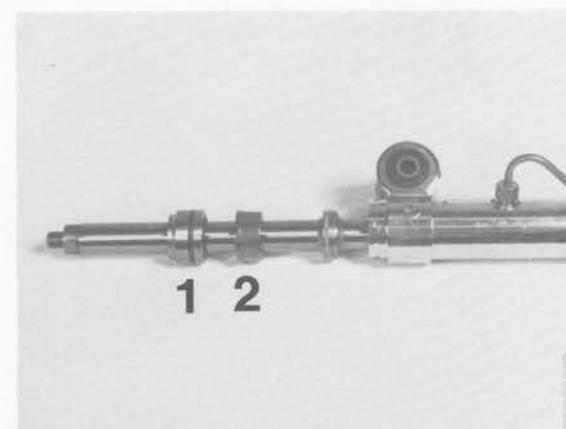


- 14 Press out the pinion complete with valve, seals and bearing. Use tool 83 91 849 (special tool for engine) and tool 87 90 644 (special tool for gearbox) as a support.



- 15 Withdraw the rack.

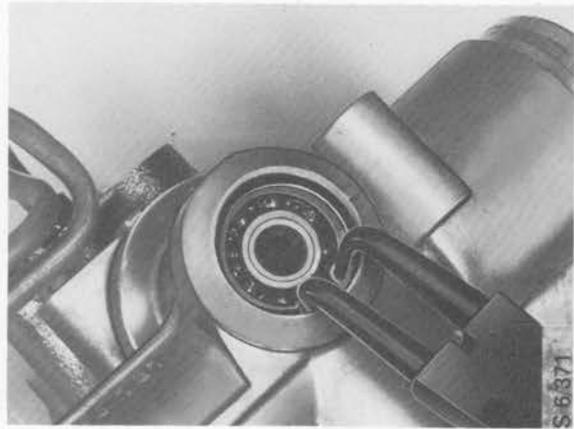
- 16 Remove the outer hydraulic seal retainer (1) and the bush (2).



- 17 Remove the inner seal using tool 89 96 399 and a long drift.



- 18 Remove the circlip from inside the pinion housing.



- 19 Tap out the lower pinion bearing.



20 Tap out the bush and seal using a drift.



### To assemble

Before reassembly, lubricate the parts as follows:

- Lubricate the pinion, rack teeth, bearing and seal with 60 g (approx. 7 cl) of lithium grease type Shell EPB2 (code 71303), Shell Retinax or the equivalent.
- Lubricate the hydraulic components with Saginaw hydraulic fluid, Texaco 4634 Power Steering Fluid or the equivalent.

1 Fit the bush using tool 89 96 407.



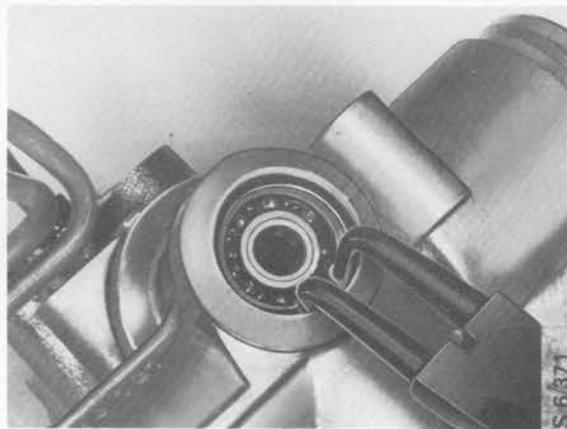
2 Tap in the seal, with the chamfered side up.



- 3 Tap in the lower pinion bearing using a suitable socket (e.g. 19 mm) as a drift.



- 4 Fit the circlip.



- 5 Inspect the condition of the piston ring on the rack.

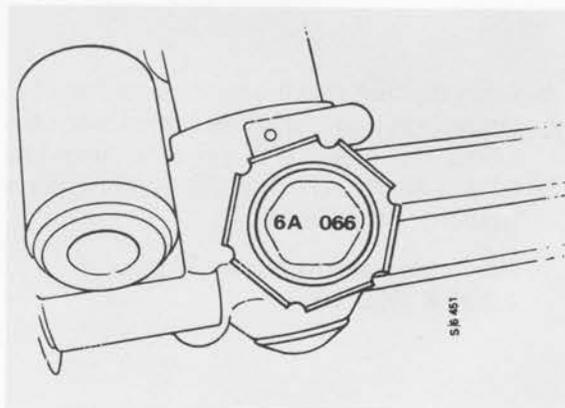
**N.B.**

Two piston variants are in use: one fitted with piston ring 89 37 070 alone; and the other with both a piston ring (89 70 873) and an 'O' ring (89 70 865).

As from date code 6A 066 on the steering gear, the piston must be fitted with both a piston ring (89 70 873) and an 'O' ring (89 70 865). The date code is stamped on the damping yoke adjusting screw; the first digit denotes the year of manufacture, and the last three digits the day of manufacture.

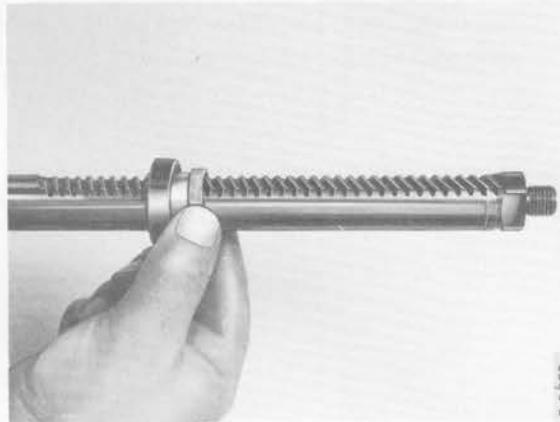
Pistons requiring both a piston ring and an 'O' ring also carry a groove adjacent to the groove for the piston ring.

**Neither the piston rings nor the 'O' ring are interchangeable.**



## 644-18 Power-assisted steering system

- 6 Slide the inner hydraulic seal onto the rack followed by the plastic end stop. Use tool 89 95 946 to prevent the rubber seal being damaged by the teeth on the rack.

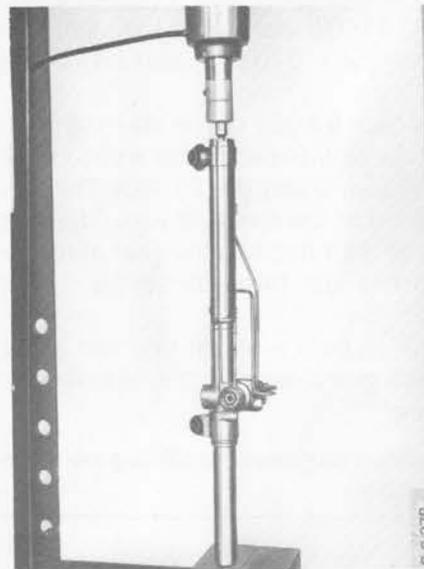


- 7 Insert the rack into the housing.



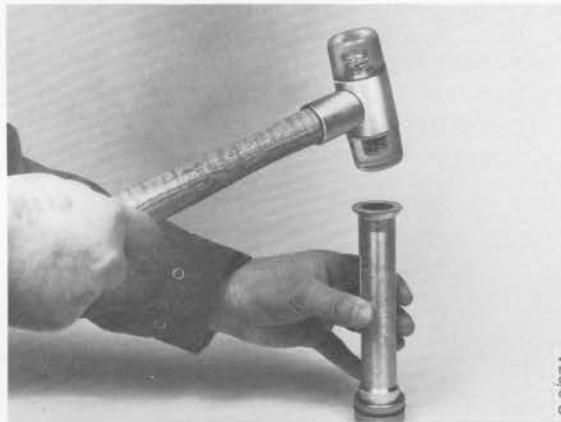
- 8 Press the rack into the housing, using a 17-mm socket and a short extension piece between the press and the rack, and tool 8390148 (special tool for gearbox) as a support.

**Maximum pressing force:  
2,200 N (506 lbf)**



- 9 Fit a new 'O' ring onto the outer seal retainer.

Inspect the seal itself; if it is in good condition it can be refitted. If a new seal is required, use tool 89 96 407 to fit it.



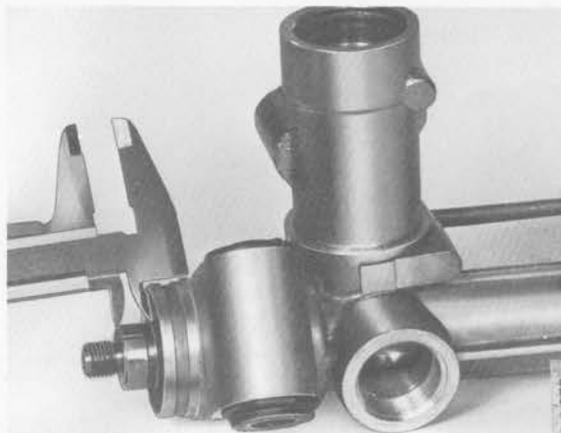
S 6/074

- 10 Slide the bush (1) and the outer seal retainer (2) onto the rack.



S 6 368

- 11 Centre the rack and rotate it to bring the teeth on the rack in mesh with those on the pinion.



S 6 378

- 12 Fit the needle bearing and seals onto the valve.

Inspect the four PTFE rings on the valve to see whether they are split. If not, use a razor blade to make a 5-7-mm-long slit through each ring. Cut the slits by applying pressure - do not use a sawing action.

The slits serve to compensate for the loss of power assistance that can occur immediately after starting at low ambient temperatures.

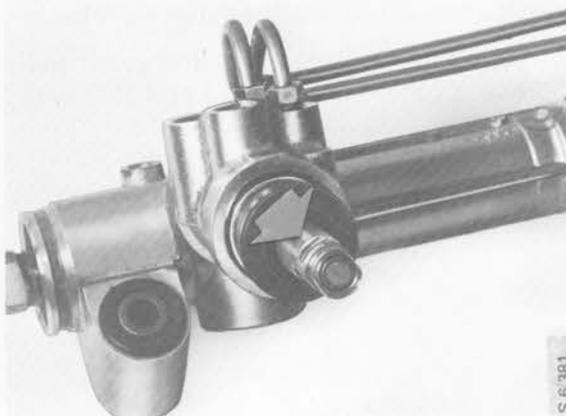


S 6 380

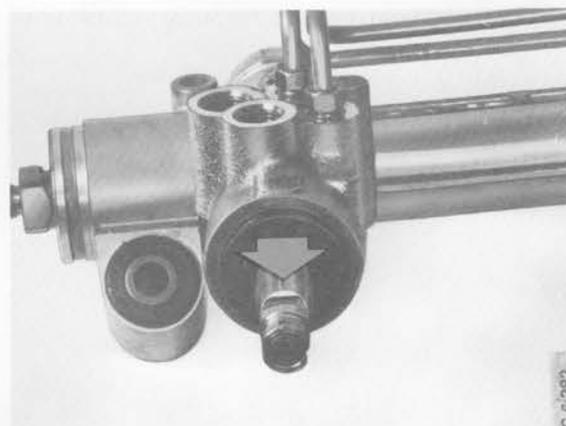
## 644-20 Power-assisted steering system

13 Fit the servo valve and pinion unit as follows:

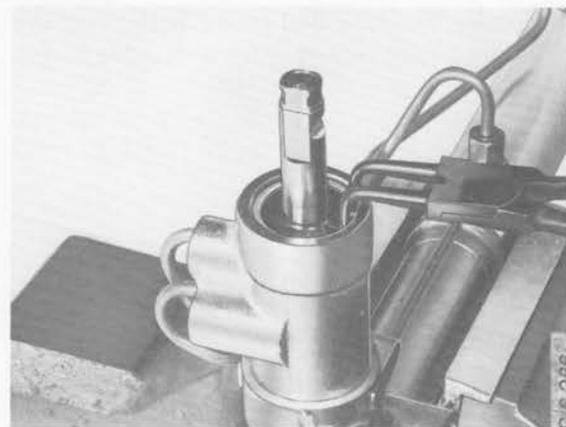
- Hold the valve body with the slot in the end of the shaft pointing diagonally up to the left (11 o'clock position) as the teeth are enmeshed.



- Slide the valve unit in as far as it will go and then tap it home using sleeve 78 41 067 (special tool for gearbox). The pinion should now be rotated to bring the slot in the end of the shaft into the 12 o'clock position when the rack is centred.

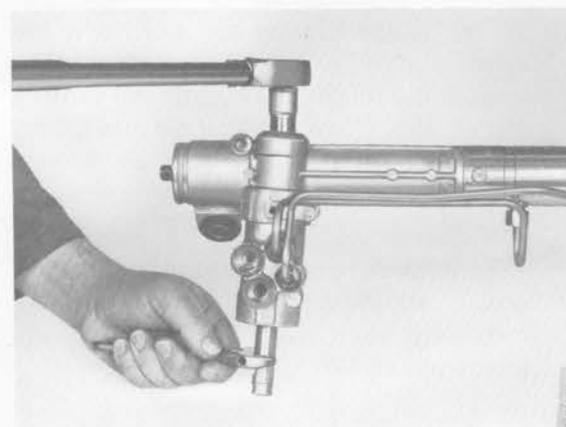


- Fit the circlip.



14 Fit and tighten the locknut on the pinion shaft, using an adjustable spanner to grip the other end of the shaft.

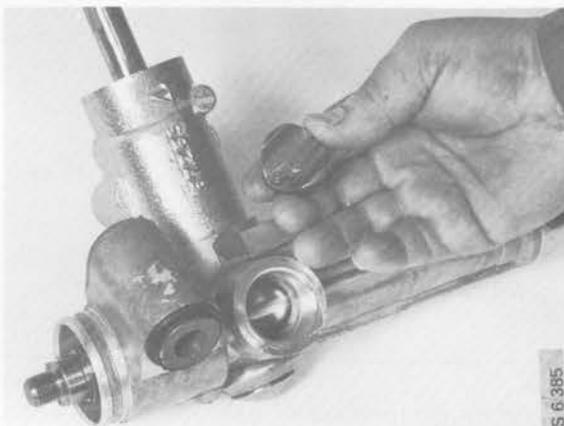
**Tightening torque:**  
**25 - 35 Nm (18.4 - 25.8 lbf ft)**



- 15 Fit the bottom end cap by tapping it home using sleeve 7841067 (special tool for gearbox).



- 16 Apply grease to the damper yoke and then fit the yoke, followed by the spring, adjusting screw and locknut.  
Lubricant: Shell EP B2 lithium grease (code 71303), Shell Retinax A or the equivalent.



- 17 Adjust the radial pressure on the rack as follows:

- Centre the rack.
- Tighten the adjusting screw.

**Tightening torque:**

**8 - 15 Nm (5.9 - 11.1 lbf ft)**

- Back off the adjusting screw through 40° - 60°.



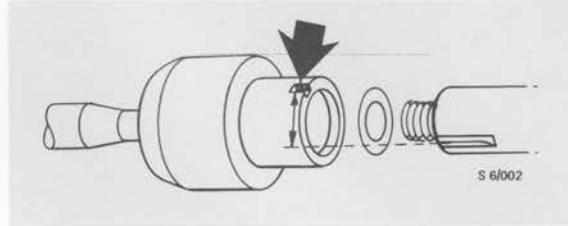
- Tighten the locknut.

**Tightening torque:**

**60 - 90 Nm (44.4 - 66.6 lbf ft)**



- 18 Move the rack to the end of its travel in the direction of the pinion.
- 19 Mount the rack housing in a soft-jaw vice. Screw on the inner ball joint complete with end stop.
  - When refitting the old ball joint, a special spacer, part no. 89 46 360, must be fitted to offset the old peening marks by 90°.



*Old peening mark offset by 90°*

- 20 Tighten the ball joint using tool 89 96 480 and a torque wrench.

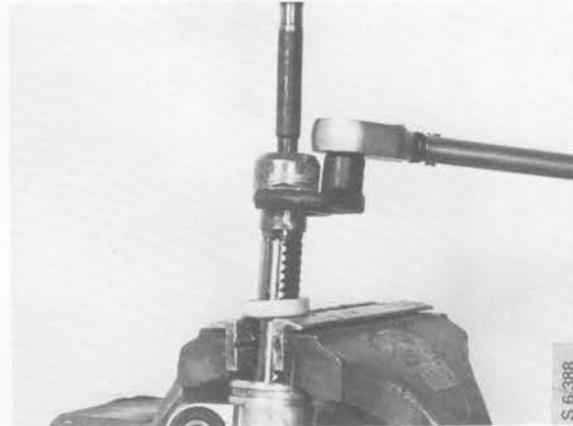
**Tightening torque:**  
**80 - 100 Nm (59.2 - 74.0 lbf ft)**

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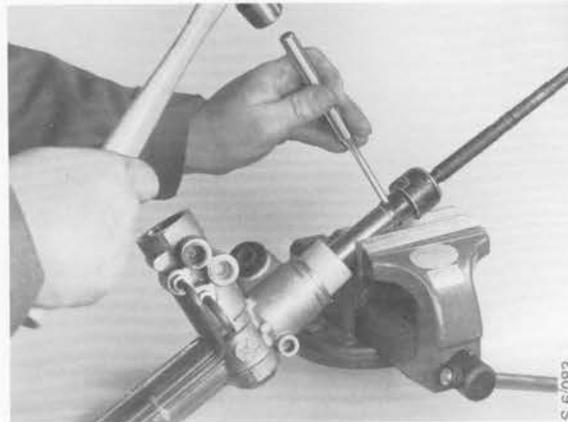
**N.B.**

Under no circumstances hold the pinion when undoing or tightening the ball joint.

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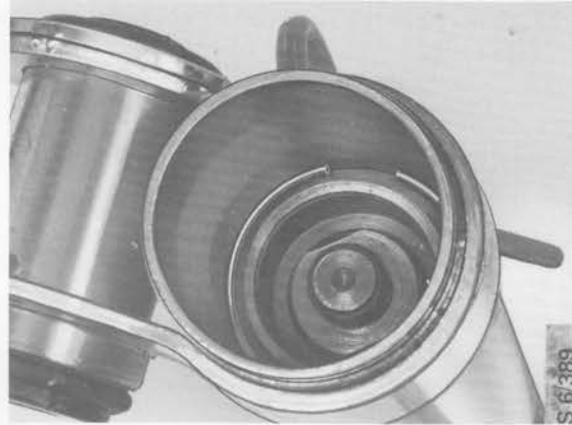
- 21 Lock the inner ball joint by tapping down the tabs onto the two flats on the rack. Push the end stop into position.



- 22 Fit the circlip inside the end of the rack housing.

**N.B.**

To enable the circlip to be removed again in the future, one end of the circlip must be directly in line with the hole in the rack housing.



- 23 With the rack mounted in the soft-jaw vice, fit the inner ball joint complete with end stop on the other end.

- When refitting the old ball joint, a special spacer, part no. 89 46 360, must be fitted to offset the old peening marks by 90°.

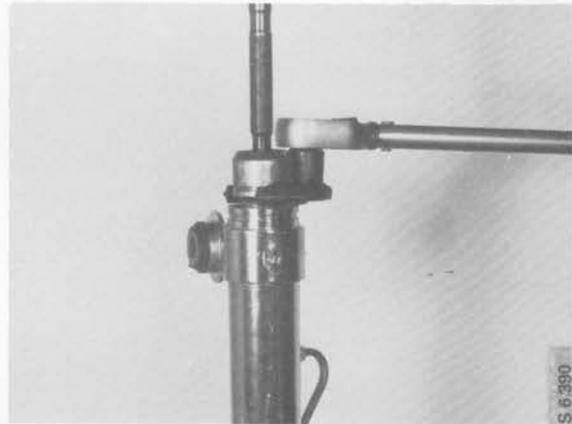
- 24 Tighten the ball joint using tool 89 96 480 and a torque wrench.

**Tightening torque:**

**80 - 100 Nm (59.2 - 74.0 lbf ft)**

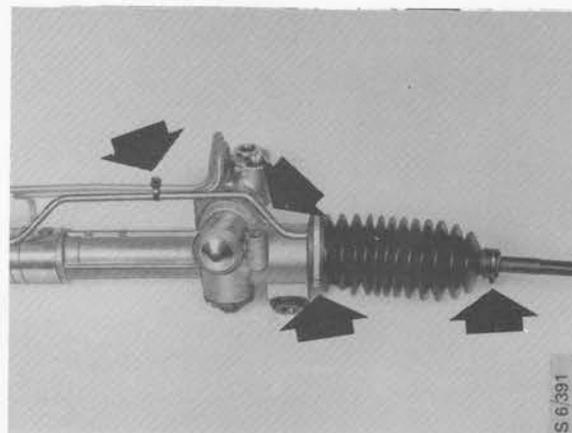
**N.B.**

Under no circumstances hold the pinion when undoing or tightening the ball joint.



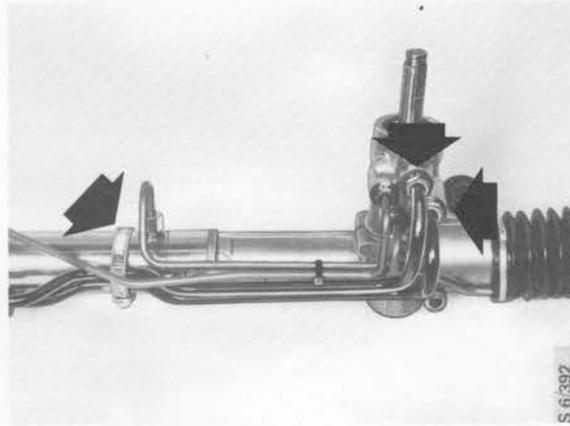
- 25 Lock the inner ball joint by tapping down the tabs onto the two flats on the rack. Push the end stop into position.

- 26 Refit the rack gaiters, capillary tube and cable tie.

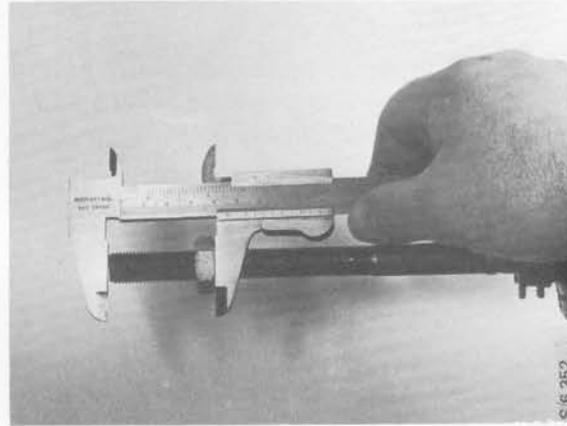


## 644-24 Power-assisted steering system

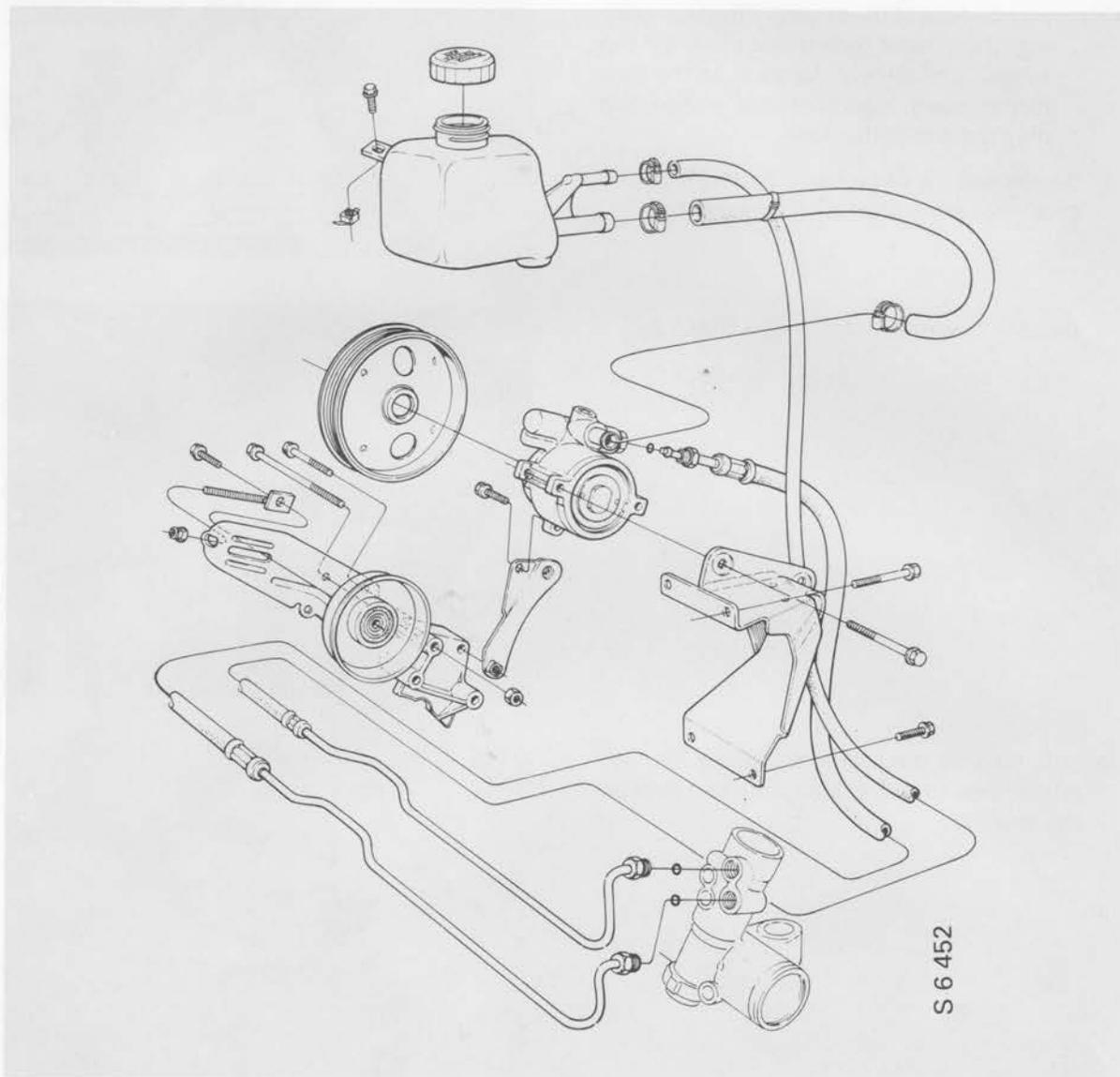
- 27 Reconnect the flow and return pipes and fit the clip.



- 28 Screw on the locknuts the same distance as that measured before removal.

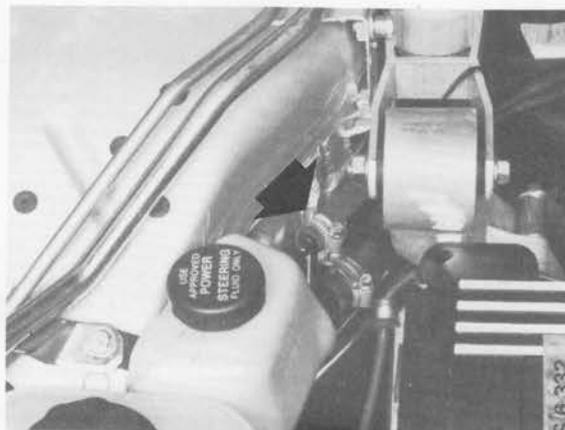


## Servo pump



### To remove

- 1 Drain the power steering fluid as follows:
  - Thoroughly clean the area around the connection of the return hose to the power steering fluid reservoir.
  - Disconnect the return hose from the reservoir and plug the opening.

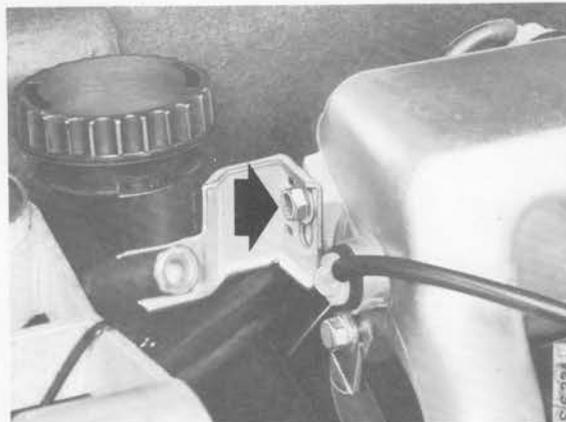


## 644-26 Power-assisted steering system

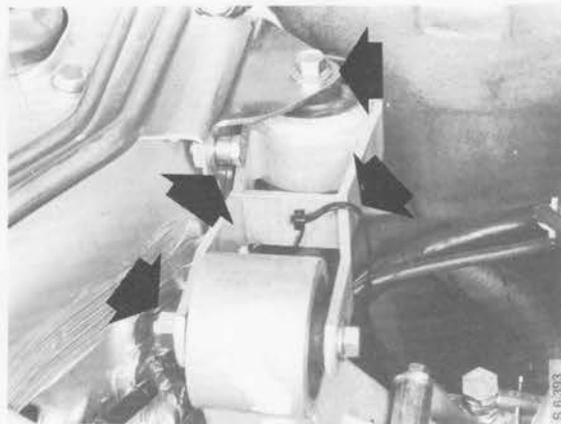
- Place the end of the return hose in a receptacle having a capacity of at least one litre.
  - Start the engine and allow the fluid to be pumped out of the system. Turn the steering wheel twice lock-to-lock to drain the system completely. As soon as the flow has stopped, switch off the engine and plug the end of the hose.
- 2 Disconnect the negative (-) battery lead and cover the terminal pole on the battery.



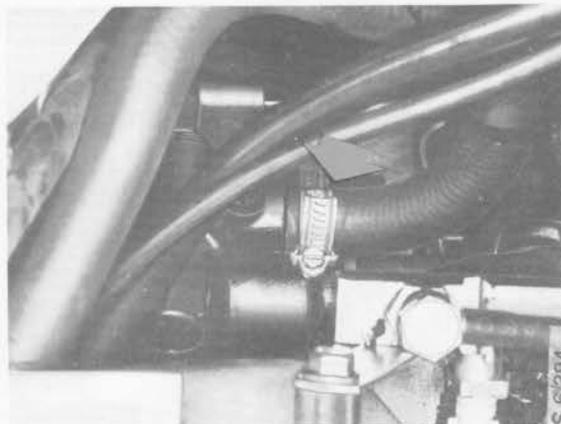
- 3 Remove the bracket for the oil filler tube.



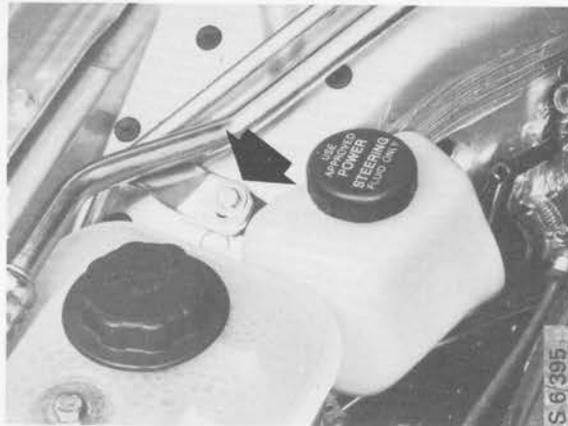
- 4 Snip through the cable tie holding the hydraulic lines to the engine stay and remove the stay.



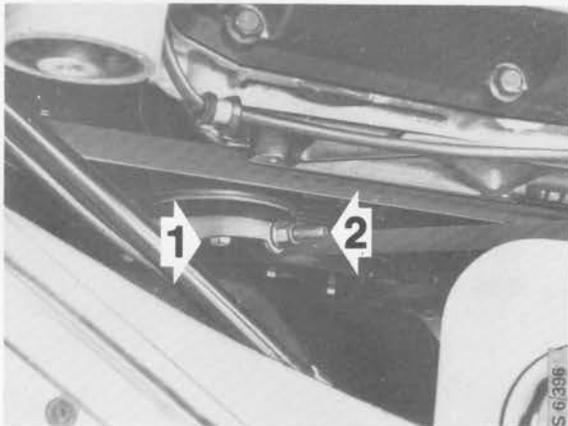
- 5 Carefully clean the area around the hose connection to the inlet side of the pump.
- 6 Disconnect the inlet hose (hose between reservoir and pump). Plug the opening in the pump.



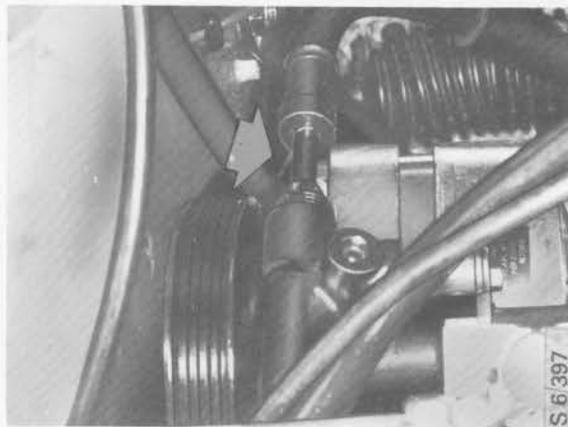
- 7 Unscrew the reservoir and lift it to one side to provide better access to the pump.



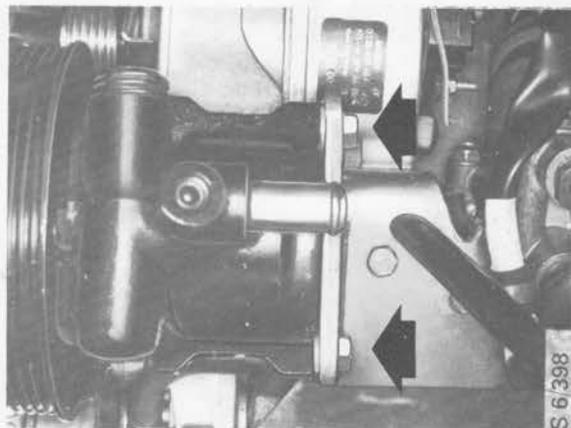
- 8 Slacken the belt adjuster locknut (1).
- 9 Slacken the nut on the adjuster bolt (2).
- 10 Remove the belt from the pump pulley.



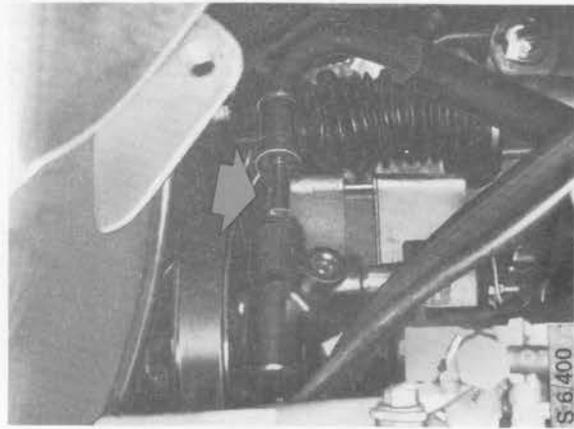
- 11 Carefully clean the area around the connection of the delivery hose to the pump.
- 12 Disconnect the delivery hose and plug the opening in the pump.  
Automatics only: Remove the clip for the kick-down cable.



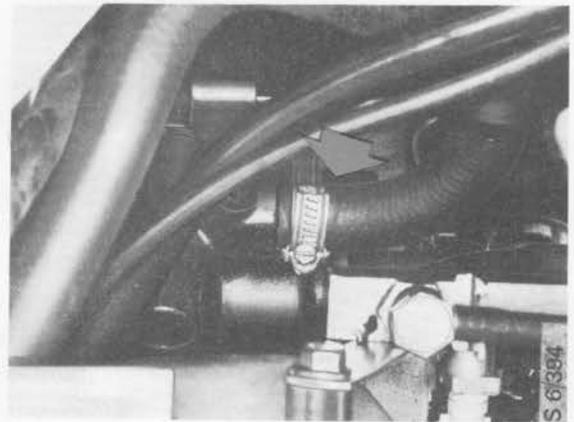
- 13 Undo the three pump fixing bolts and lift up the pump. The third bolt is accessible through the hole in the pulley.



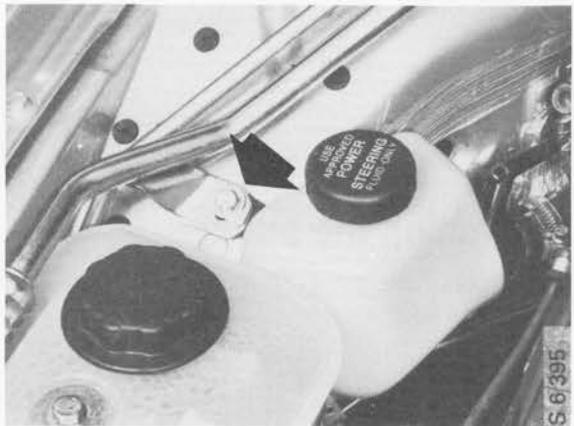
- 6 Inspect and lubricate the 'O' ring on the delivery hose and reconnect the hose to the pump.



- 7 Reconnect the inlet hose to the pump.  
Automatics only: Refit the clip for the kick-down cable.



- 8 Refix the fluid reservoir.

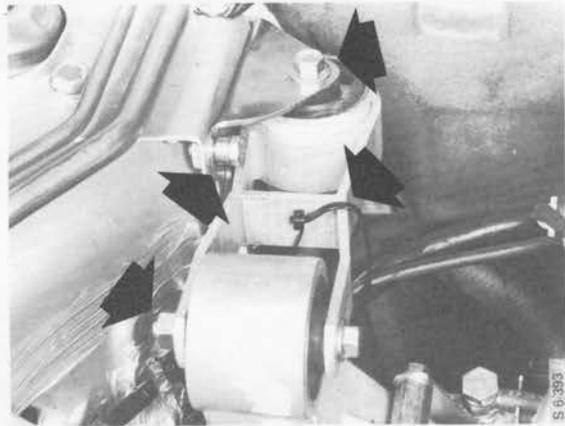


- 9 Clean the area of the reservoir around the connection for the return hose.
- 10 Reconnect the return hose to the reservoir and secure it in the clip.

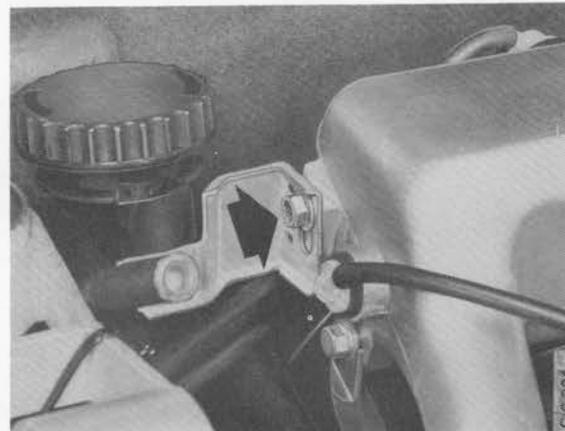


## 644-30 Power-assisted steering system

- 11 Fit the engine stay.
- 12 Fit a cable tie round the hydraulic lines, the two vacuum hoses and the engine stay.



- 13 Refit the bracket for the oil filler tube.
- 14 Fill the system with power steering fluid: 75 cl (0.8 liq qt) of Texaco 4634 Power Steering Fluid.
- 15 Bleed the system as follows: With the engine switched off and the front wheels off the ground, turn the steering wheel from lock-to-lock three or four times.
- 16 Lower the car, start the engine and turn the steering wheel lock-to-lock twice more to check that the system is working properly.  
Check the fluid level.



### Replacing the pulley

- 1 Remove the pulley from the shaft using tool 89 96 423.



- 2 Refit the pulley onto the shaft using tool 89 96 415. Make sure that the outside edge of the pulley hub is flush with the end of the shaft.

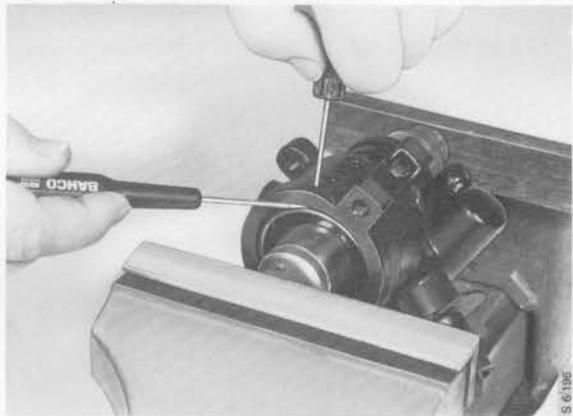
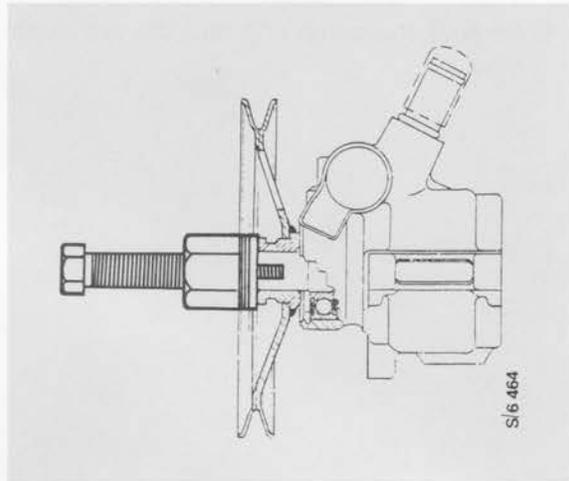
**N.B.**

Never apply any force to the pump shaft during removal/refitting of the pulley.

Test drive the car and check the operation of the steering system. At the end of the test, inspect the system for leaks.

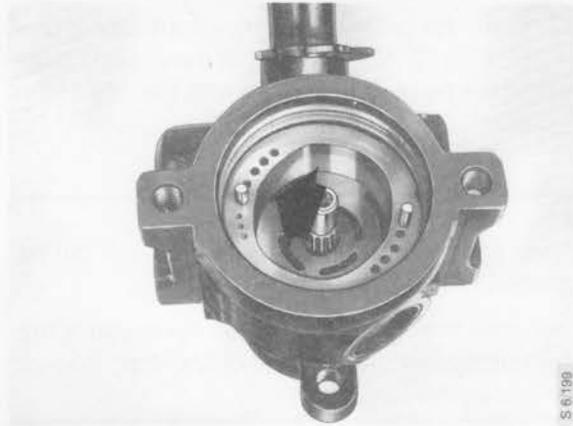
**To dismantle the servo pump**

- 1 Press in the end cover and prise the circlip out of the groove by inserting a screwdriver through the hole in the pump casing.
- 2 Remove the end cover by tapping the pump casing against the workbench.
- 3 Remove the 'O' ring.
- 4 Remove the rotor complete with vanes.

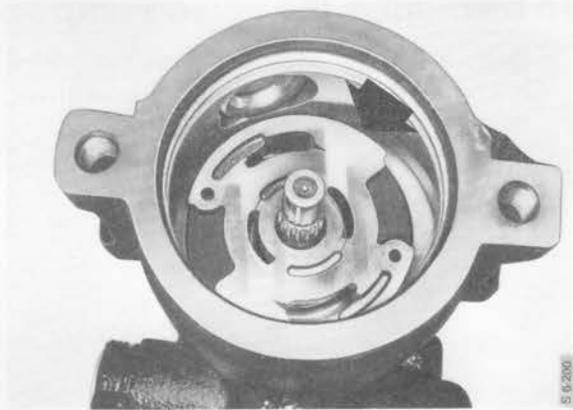


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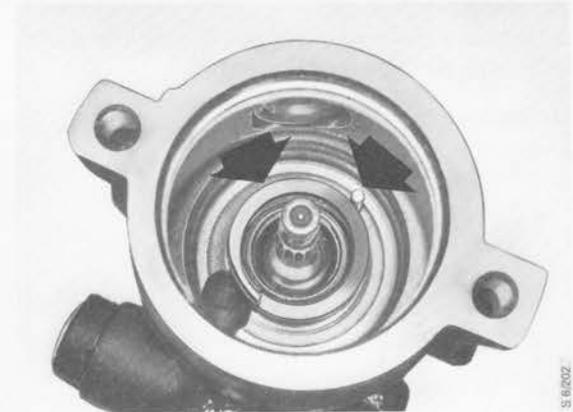
- 5 Remove the pump ring and the two dowel pins.



- 6 Remove the end plate.
- 7 Remove the 'O' ring from the end plate.



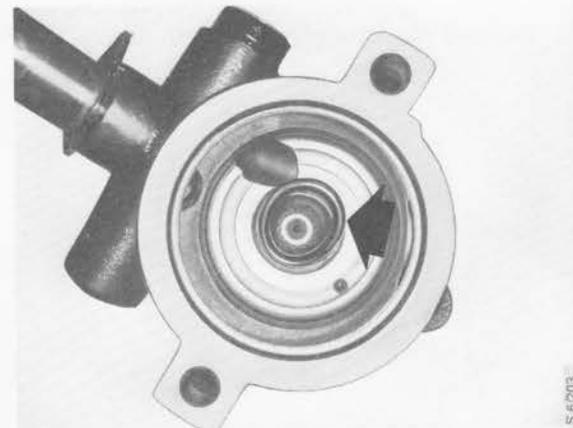
- 8 Remove the spring and pin.



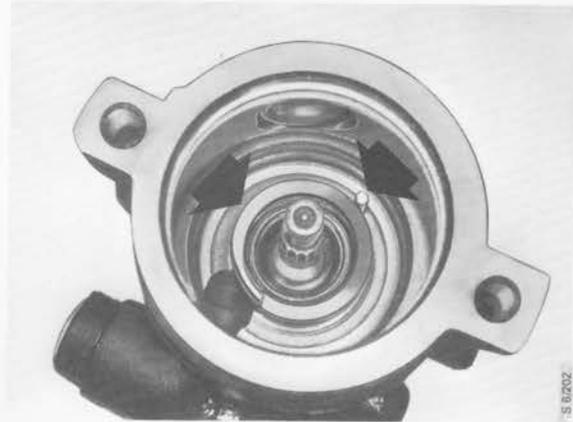
- 9 Remove the 'O' ring.

### To reassemble the servo pump

- 1 Fit the 'O' ring.

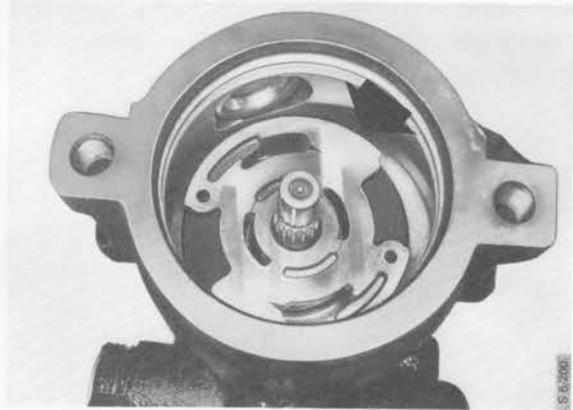


2 Fit the pin inside the casing and insert the spring.



3 Fit the 'O' ring onto the end plate.

4 Fit the end plate over the pin.



5 Fit the two dowel pins into the holes in the end plate and fit the pump ring on the dowel pins.



6 Fit the rotor and vanes.



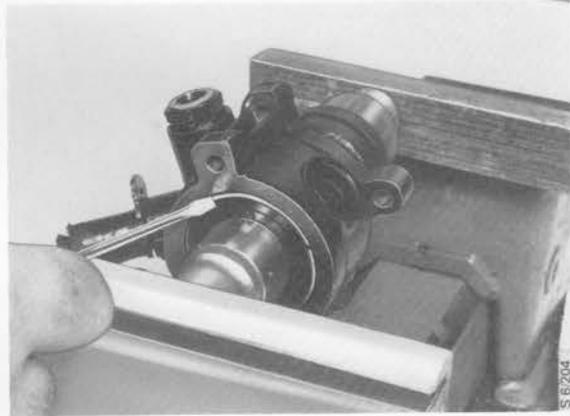
## 644-34 Power-assisted steering system

7 Fit the 'O' ring.



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8 Fit the end cover over the dowel pins, press it in and fit the circlip.



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