SERVICE MANUAL

VOLVO
P 1800

Export Service Department

AKTIEBOLAGET

VOLVO

GÖTEBORG · SWEDEN

STEERING GEAR

DESCRIPTION

The arrangement of the steering gear on the Volvo P 1800 is shown in figures 6-16—6-18.

The movement of the steering wheel is transmitted to the wheels via the steering shaft (2), steering box mechanism (8), pitman arm (11), tie-rod (12), idler arm (15) with steering rods (7 and 17) and steering arms (5 and 18).

The steering box (Fig. 6-17) is of the "cam and roller" type. The idler arm (Fig. 18) is carried in needle bearings. The steering shaft is divided into two parts (2 and 6 respectively, Fig. 6-16) which are joined together by means of a coupling (3). The upper part of the steering shaft is carried in the jacket tube (1). The steering rod ball joints are lined with plastic which makes lubrication unnecessary.

The car has a turning circle of about 31' 2" (9.5 metres). The number of steering wheel turns from lock to lock is 3 1/4.

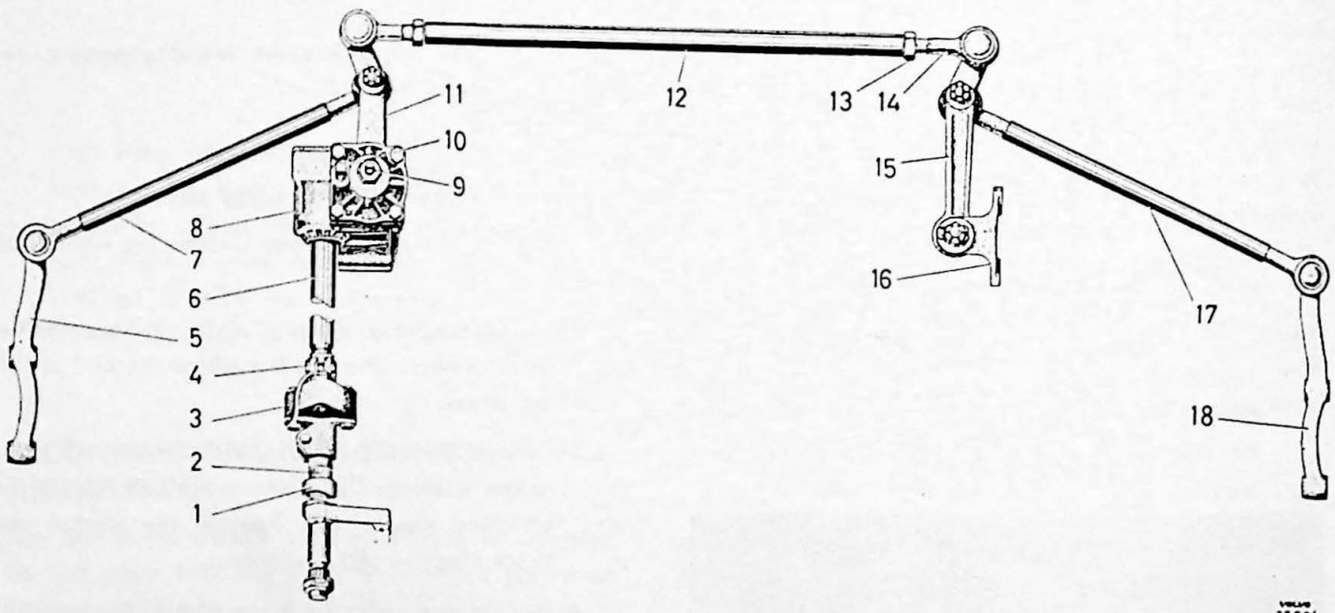

Fig. 6-16. Steering gear

1. Jacket tube
2. Upper steering shaft
3. Coupling
4. Flange
5. Left steering arm
6. Lower steering shaft
7. Left steering rod
8. Steering box
9. Adjusting screw
10. Oil filling plug
11. Pitman arm
12. Tie-rod
13. Locknut
14. Ball joint
15. Idler arm
16. Bracket
17. Right steering rod
18. Right steering arm

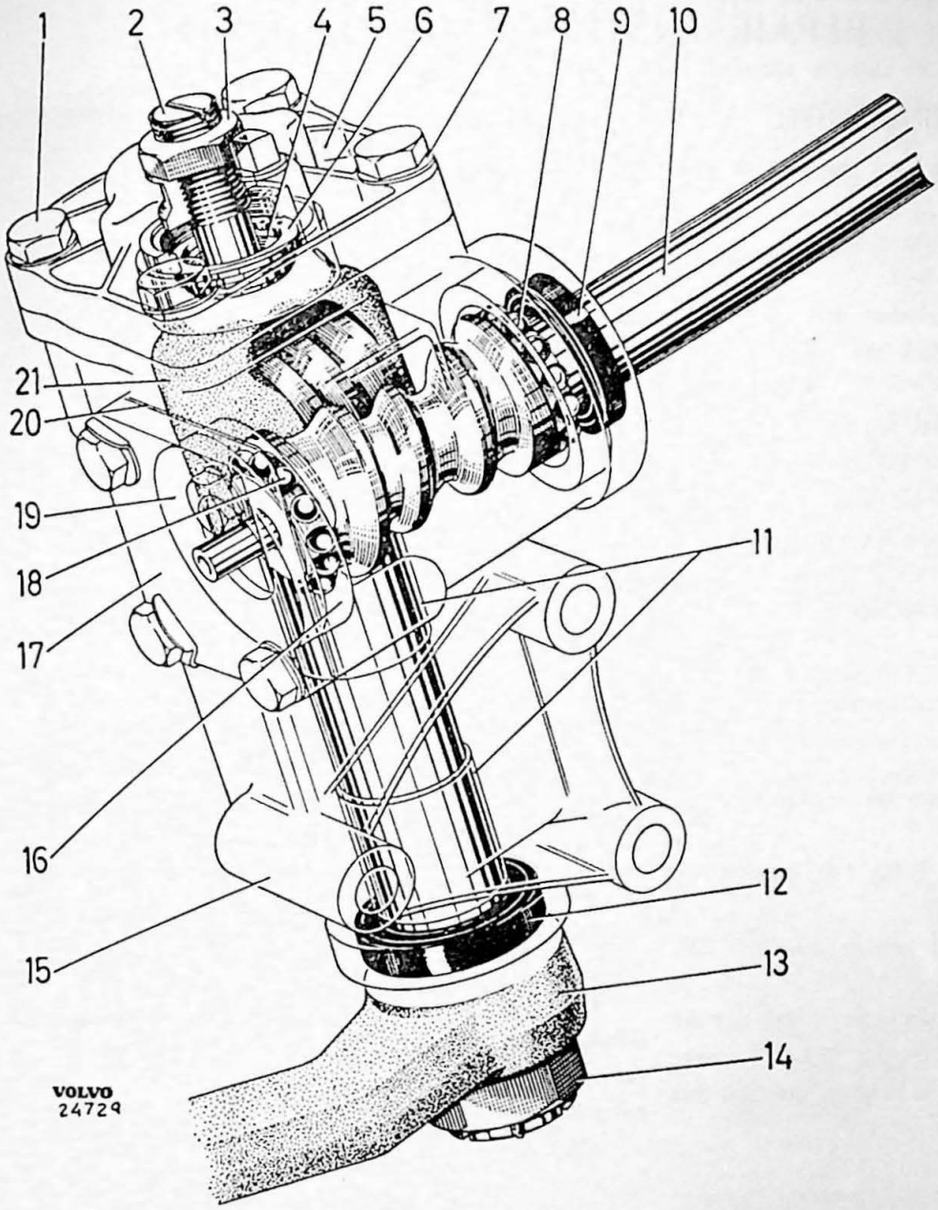

Fig. 6-17. Steering box

1. Bolt
2. Adjusting screw
3. Locknut
4. Washer
5. Cover
6. Locking ring
7. Tab washer
8. Steering shaft bearing (upper)
9. Steering shaft seal
10. Steering shaft
11. Pitman arm shaft bushings
12. Pitman arm shaft seal
13. Pitman arm
14. Nut
15. Steering box housing
16. Steering shaft lower bearing shell
17. End cover for steering shaft
18. Steering shaft bearing (lower)
19. Washer
20. Shim
21. Pitman arm shaft with roller

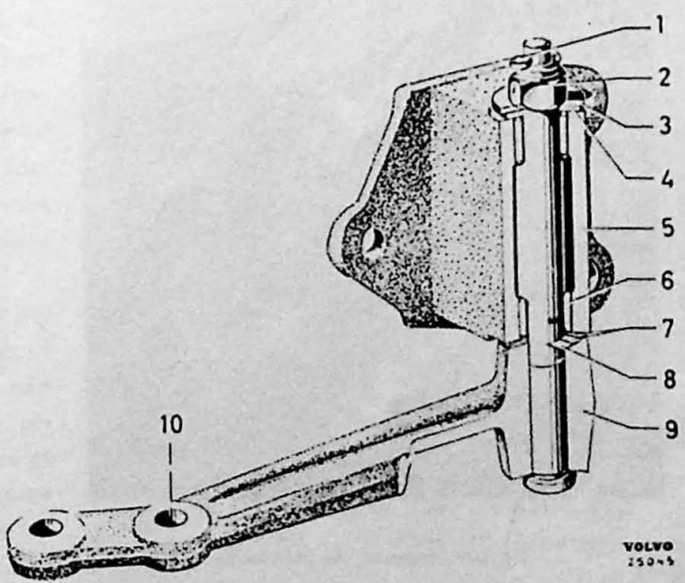

Fig. 6-18. Idler arm with bracket

1. Split pin
2. Nut
3. Plain washer
4. Vulcollan washer
5. Bracket for idler arm
6. Needle bearing
7. Adjusting washers
8. Vulcollan washer
9. Idler arm
10. Hole for steering rod

REPLACING THE STEERING WHEEL

1. Pull out the horn cable from the junction block on the steering box.
2. Carefully remove the horn button with a screwdriver or similar, see Fig. 6-19.
3. Bend up the locking washer and remove the steering wheel nut. Mark the position of the steering wheel.
4. Pull off the steering wheel, see Fig. 6-20. Unscrew the housing and hub from the steering wheel.
5. Fit the new steering wheel and other parts in the reverse order, observing the markings. Tighten the steering wheel nut to a torque of 25—35 lb.ft. (3.5—5.0 kgm) and then lock them.

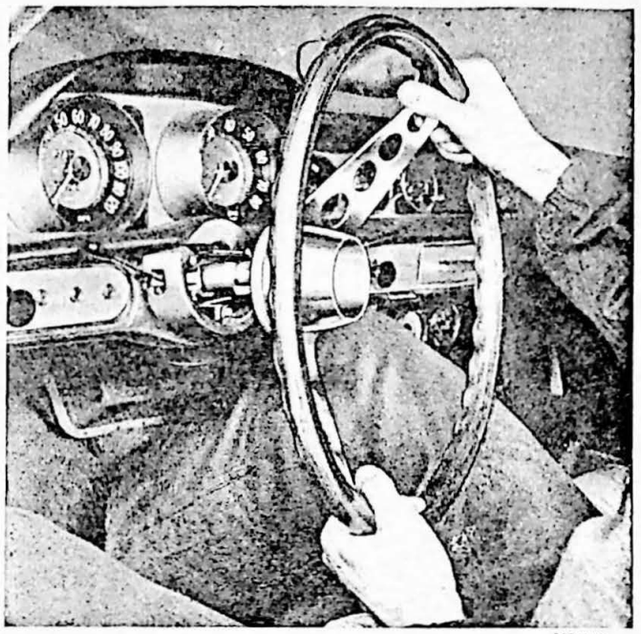

Fig. 6-20. Removing the steering wheel

STEERING BOX

Removing

1. Pull out the horn lead from the junction block on the steering box.
2. Remove the ground lead (8, Fig. 6-21) and the two nuts (4 and 7).
3. Remove the pitman arm with puller SVO 2282 (Fig. 6-4).
4. Unscrew the three attaching bolts (1). Pull out the horn lead through the steering box and lower steering shaft. If the cable terminal prevents this from being done, cut the lead at the terminal and fit on a new one after assembling. Lift off the steering box.

Fig. 6-19. Removing the horn button

Disassembling

1. Wash the steering box clean externally and remove the flange (6, Fig. 6-21) from the steering shaft after having marked up its position.

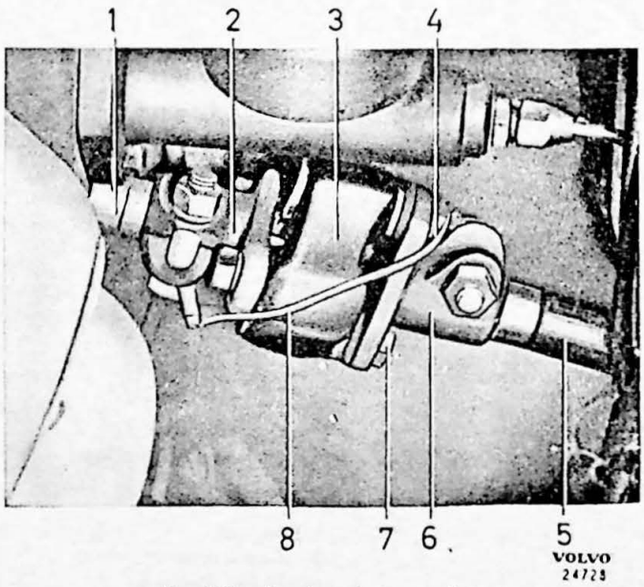

Fig. 6-21. Steering shaft coupling

1. Upper steering shaft
2. Flange
3. Coupling disk
4. Nut
5. Lower steering shaft
6. Flange
7. Nut
8. Ground lead

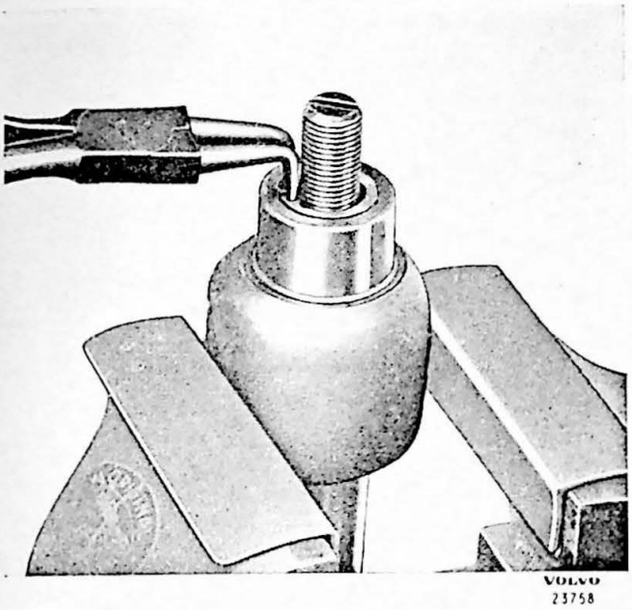

Fig. 6-22. Removing the adjusting screw

2. Remove the four bolts (1, Fig. 6-17) for the upper cover (5), pull up the cover and pitman arm shaft a little and drain off the oil. Pull out the cover and pitman arm shaft.
3. Remove the bolts and end cover (17). Preserve the adjusting shims (20).
4. Strike the steering shaft (10) carefully so that the outer race of the lower bearing comes out of the housing. Remove the steering shaft (10) with cam and bearings.
5. Slacken the locknut (3) and unscrew the adjusting screw (2) from the cover. The adjusting screw can be removed from the pitman arm shaft when the locking ring has been removed, see Fig. 6-22.

Inspection

Clean all parts in white spirit. Examine the sealing ring. If any of these show the least sign of wear or damage, they should be replaced. Removing is done with the help of puller SVO 4030 or with a screwdriver. Check the pitman arm shaft. The roller must not be scratched, scored or badly worn on the contact surfaces neither must it be loose in the pitman arm shaft. If so, or if the pitman arm shaft shows signs of other damage, replace it.

Examine the contact surfaces of the cam with the roller and the inner races of the ball bearings. If there are scratches, scoring or heavy wear, the cam with steering shaft should be replaced. Examine the outer rings and balls of the bearings. Any parts of the bearings which are scratched or otherwise damaged should be replaced. The outer ring of the upper bearing is removed with puller SVO 1819 or, if the sealing ring is removed, with drift SVO 1708. Examine whether the pitman arm shaft is loose in the bushings. If so replace the bushings in the housing, pulling them in their respective directions with puller SVO 1819 (Fig. 6-23). The bushing in the steering shaft end cover cannot be removed so that the complete cover must be replaced.

Assembling

1. Press in the pitman arm shaft bushings from their respective directions with drift SVO 2228 and standard handle SVO 1801, see Fig. 6-24. Ream the bushings with reamer SVO 2225. Use guide SVO 2254 which is fitted onto the housing with two bolts, see Fig. 6-25. Carefully clean out all metal chippings from the steering box after reaming.
2. Fit the pitman arm shaft sealing rings and steering shaft with the help of drift SVO 2227.
3. If the outer race of the upper bearing has been removed, press it in with a suitable drift. Press it

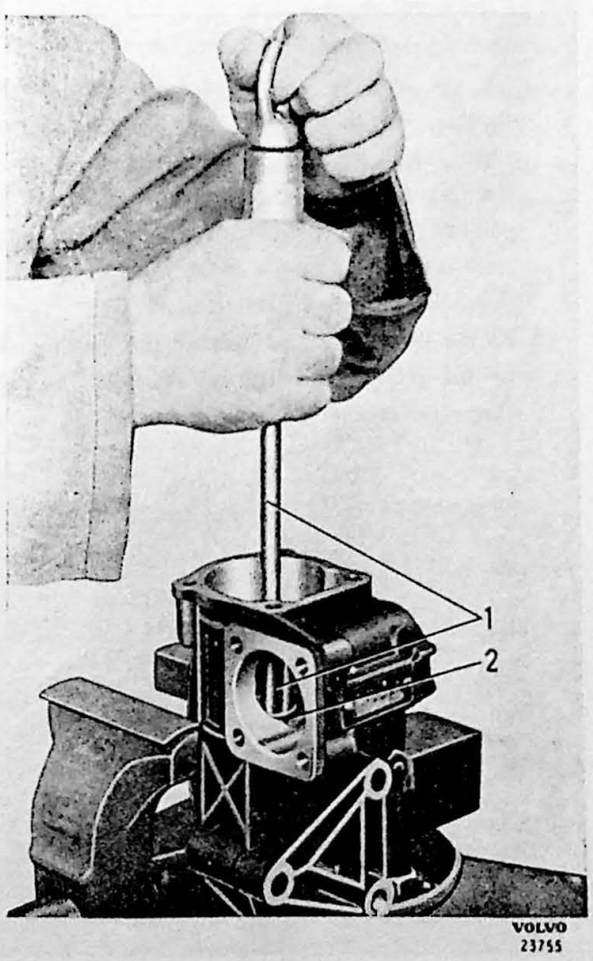

Fig. 6-23. Removing the pitman arm shaft bushings
1. SVO 1819 2. Pitman arm shaft bushing

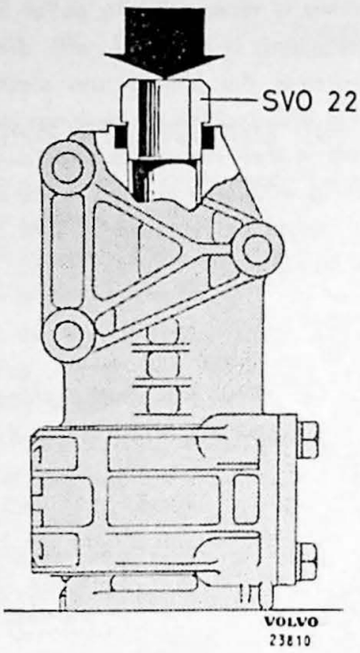

Fig. 6-24. Fitting the pitman arm shaft bushing

in so that it lies flush against the shoulder in the housing.

4. Fit the steering shaft with bearings in the housing carefully so that the sealing ring is not damaged. Clamp the steering box in a vise so that the steering shaft comes horizontal.
   Fit the steering shaft end cover and washer together with shims of the same thickness as were there previously. Tighten the cover checking all the time that the steering shaft turns easily but without any looseness. At correct bearing adjustment a maximum torque of 0.87 lb.in. (1 kg.cm.) is required to turn the steering shaft.
5. Fit the adjusting screw, washer and locking ring on the pitman arm shaft, see Fig. 6-26. The axial clearance of the adjusting screw should be as small as possible and not more than 0.004" (0.01 mm). The clearance is reduced by replacing the washer (2) with a thicker one. The adjusting screw should be easy to turn after fitting.
6. Apply sleeve SVO 2199 as shown in Fig. 6-27 and fit the pitman arm shaft in the steering box. Lubricate the adjusting screw in the pitman arm shaft with a few drops of oil.
7. Fit the cover and gasket over the pitman arm shaft. Screw in the adjusting screw far enough so that the pitman arm shaft is not gripped when the attaching bolts are tightened.
8. Set the steering wheel in the central position. Screw in the adjusting screw so far that a noticeable resistance is felt when turning the steering wheel either side of the central position.
   Place a spring balance at a distance of 8.3" (210 mm) from the center line of the shaft. The spring balance can also be placed on a lever fixture fitted to the steering shaft, see Fig. 6-28.

   Screw back the adjusting screw so that the spring balance gives a reading of 14—25 oz. (0.4—0.7 kg) when the steering shaft is pulled over the central position. The turning movement should be done at right-angles to the steering shaft (Fig. 6-28) and the steering box should be clamped so that the steering shaft is vertical when measuring. When

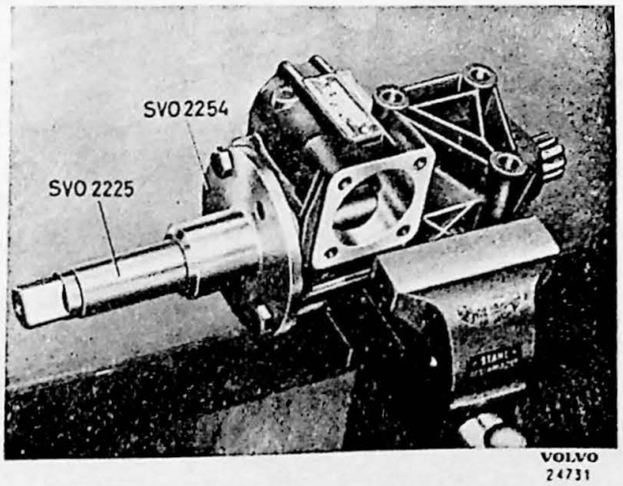

Fig. 6-25. Reaming the pitman arm shaft bushings

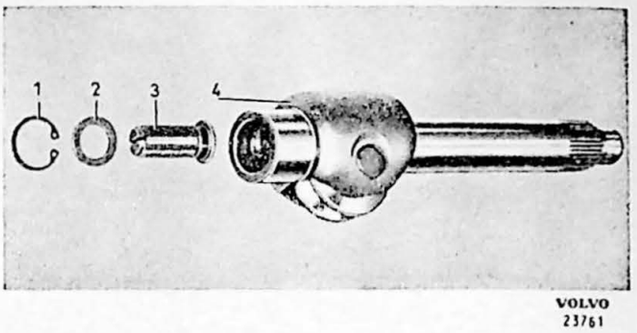

Fig. 6-26. Pitman arm shaft
1. Locking ring
2. Washer
3. Adjusting screw
4. Pitman arm shaft with roller

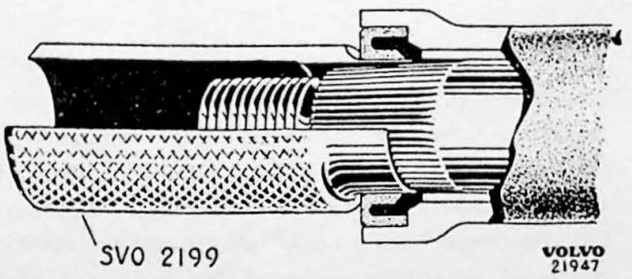

Fig. 6-27. Fitting the pitman arm shaft

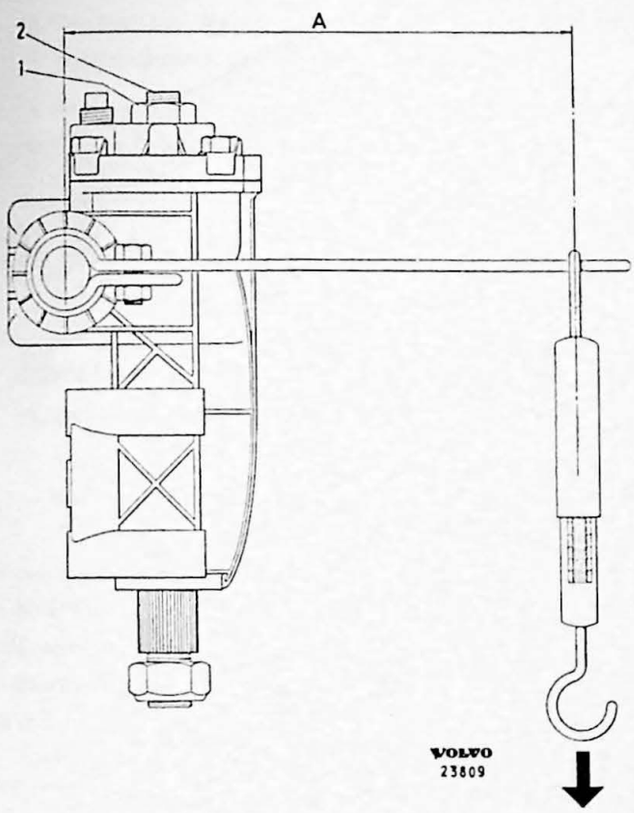

Fig. 6-28. Checking the bearing adjustment
"A" = 8.3" (210 mm)
1. Locknut 2. Adjusting screw

the correct adjustment has been obtained, the adjusting screw is locked with the stop nut. Repeat the test after the stop nut has been tightened.

9. Fit the flange on the steering shaft in the same position it had before removing.
10. Fill up the steering box with 3/8 Imp. pint = 1/2 U.S. pint (0.2 litre) of hypoid oil SAE 80.

Fitting

1. Insert the horn lead, which runs through the lower steering shaft, through the steering box, using a piece of wire if necessary. Place the steering box in position and fit on all attaching bolts, washers and nuts which have been removed.
2. Fit the flange to the coupling disk, see Fig. 6-21. Do not forget the ground lead.
3. Adjust the position of the steering box so that there is the least possible tension on the coupling disk. Tighten the steering box attaching nuts.
4. Fit the pitman arm so that the mark on the pitman arm shaft coincides with the mark on the pitman arm.
5. Check that the spokes of the steering wheel are horizontal when the wheels face directly forward. If not, remove the steering wheel and alter its position. See under "Replacing the steering wheel." Connect the horn lead.

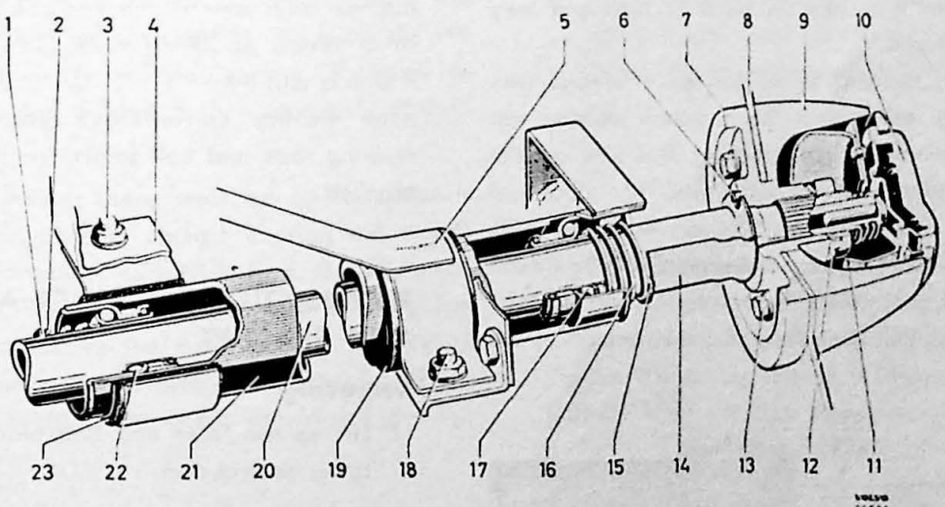

Fig. 6-29. Journaling of steering shaft

1. Locking ring
2. Spring
3. Bolt
4. Lower attachment
5. Upper attachment
6. Guide pin
7. Steering wheel hub
8. Steering wheel
9. Housing
10. Horn button
11. Steering wheel nut
12. Locking washer
13. Bolt
14. Actuator
15. Washer
16. Spring
17. Upper bearing
18. Bolt
19. Rubber bushing
20. Steering shaft
21. Jacket tube
22. Lower bearing
23. Rubber bushing

REPLACING THE JACKET TUBE AND JACKET TUBE BEARINGS

1. Remove the steering wheel, see under "Replacing the steering wheel".
2. Unscrew the bolts (3, Fig. 6-29) for the lower attachment and the bolts (18) for the upper attachment. Pull up the jacket tube (21) slightly and remove the traffic indicator switch and lever, see Part 10. Then pull off the jacket tube from the steering shaft (20).
3. If only the bearings (17 and 22) in the jacket tube are to be replaced, first knock out the old ones with the help of a suitable punch or pull them out with a puller. The new bearings should then be pressed into the packet tube carefully.
4. Check that the rubber bushings (19 and 23) for the jacket tube attachment are intact and that the locking ring (1) is located in its groove. Then fit the jacket tube and other parts in the reverse order to removing and as shown in Fig. 6-29. Tighten the steering wheel nuts to a torque of 25—35 lb.ft. (3.5—5.0 kgm) and do not forget to lock them.

RECONDITIONING STEERING ROD AND TIE ROD

The steering rod and tie-rod must not be straightened. If they are bent or damaged in any other way, they must be replaced.

The ball joints cannot be disassembled or adjusted so that when they become worn or damaged they must be replaced.

The steering rod ball joints are made integral with the steering rod so that the complete steering rod must be replaced. When removing, first take out the split pins and unscrew the castle nuts. Then place tool SVO 2294 on the ball joint as shown in Fig. 6-30. Press in the tool properly and ensure that the thread on the ball joint enters the countersink on the tool. Screw in the bolt until the ball joint slackens. If the steering rod is removed with the wheel in position, first disconnect the ball joint at the pitman arm and idler arm respectively as described above. When doing this, turn the steering rod forwards and upwards and place the tool on the ball joint as shown in Fig. 6-31.

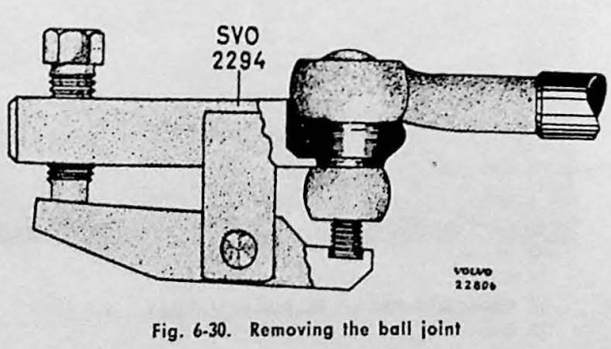

Fig. 6-30. Removing the ball joint

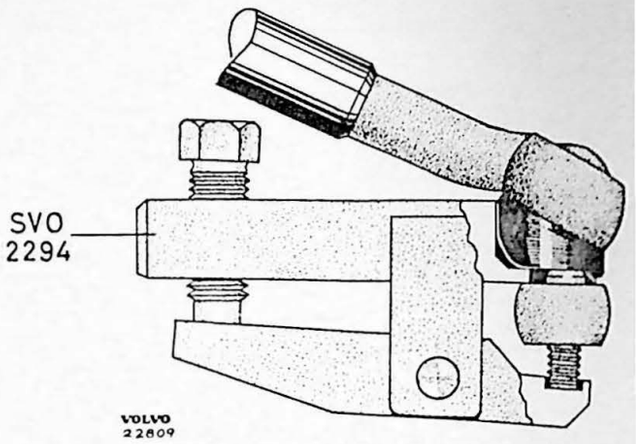

Fig. 6-31. Removing the steering rod

The tie-rod ball joints can be replaced individually. When replacing, first disconnect the ball joint from the pitman arm and idler arm respectively as described above (Fig. 6-30). Then slacken the locknut and screw out the ball joint. The new ball joint should be screwed in an equal number of turns to facilitate adjusting the toe-in. Lock the ball joint to the rod.

When replacing the ball joint rubber covers, these should be filled with grease.

When fitting the ball joint to the arm, turn the ball stud so that the split pin hole is across the longitudinal direction of the rod. Tighten the castle nut to a torque of 23—27 lb.ft. (3.2—3.7 kgm) and lock it with a split pin.

After having carried out reconditioning work on steering rods and ball joints, toe-in should always be checked.

RECONDITIONING IDLER ARM AND BRACKET

Removing

1. Lift up the front end and place blocks under the lower control arm.
2. Screw back the bolt on puller SVO 2294 and place the tool on the tie-rod ball joint at the idler arm as shown in Fig. 6-30. Press in the tool properly and ensure that the thread on the ball joint enters the countersink on the tool. Screw in the bolt until the ball joint releases from the idler arm.

3. Remove the steering rod from the idler arm in a corresponding manner.
4. Remove the three bracket attaching bolts and lift off the bracket with idler arm.

Disassembling

1. Remove the split pin (1, Fig. 6-18) and nut (2). Pull out the idler arm (9) with shaft. Preserve the washers and shims.
2. Clamp the bracket in a vise and pull out the needle bearings with a bearing puller, for example, SVO 4090 (Fig. 6-32).

Inspection

Clean all parts free from grease and dirt. Check the bracket bearing seatings, idler arm bearing surfaces and other parts for wear and damage. Replace damaged or worn parts.

Assembling

1. Press in the new needle bearings flush with the outer side with the help of a suitable drift. Check the idler arm shaft fit in the bearings. The shaft should turn easily but without any looseness.
2. Fill the bearings and the space between them with chassis grease. Also lubricate the vulcollan washers (4 and 8, Fig. 6-18) on both sides. Place the washer (8) and shims (7) on the shaft and insert this into the bracket (5). Place on the vulcollan washer (4) and flat washer (3). Screw on the nut (2) and tighten it to a torque of 60 lb.ft. (8.5 kgm).
3. After assembling there must be no looseness in the journaling. With correct bearing adjustment, a turning torque of 4.34±3.04 lb.in. (5±3.5 kg.cm.) is required. For example, if the idler arm is pulled at right-angles in the hole for the rod (10), a spring balance should give a reading of 3 1/2—21 oz. (0.1—0.6 kg). If the check should not give this result, the journaling should be disassembled and adjusted with shims (7) of suitable thickness.
When the correct torque is obtained, fit the split pin (1).

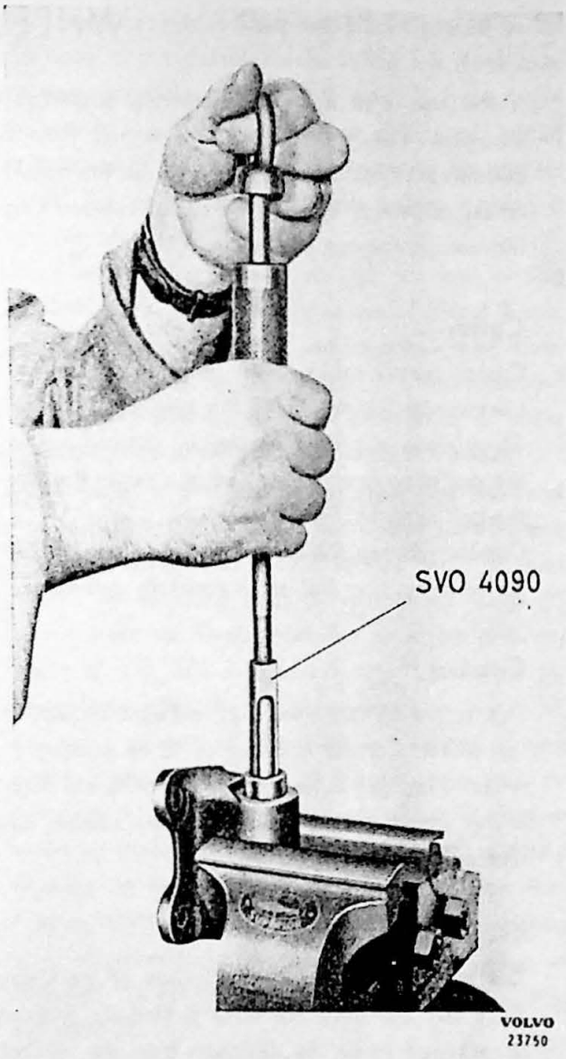

Fig. 6-32. Removing needle bearing

Fitting

Fit the bracket in position and tighten the attaching bolts properly. Fit the steering rod in the inner hole of the idler arm and the tie-rod in the outer hole. Tighten the castle nuts to a torque of 23—27 lb.ft. (3.2—3.7 kgm) and lock them with split pins.