

STEERING GEAR

DESCRIPTION

The construction of the steering gear is illustrated in Fig. 20.

When the steering is turned, the movement is transmitted through the steering column (14) to the steering box (20) and pitman arm (4). From here the movement is transmitted through the tie-rod (7), idler arm (11), steering rods (3 and 9) and steering arms (1 and 10) to the wheels.

There are several different types of steering box on these vehicles. Constructionally they can be divided up into two main types, mainly "Ross, cam and levers" and "Gemmer, cam and roller". The Ross type steering box refers to those for PV 444—445, early production (part numbers 27690 and 250024). The Gemmer type steering box refers to PV 444, late production (part number 250051),

PV 445 intermediate production (part number 250051), PV 445, late production (part number 250081), PV 544 early production (part number 250080), PV 544 late production (part number 250084), P 210 early production (part number 250098) and for P 210 late production (part number 250096).

The turning circle is approx. 9.8—10.8 metres (34' 2"—35' 5") depending on the vehicle model and steering gear. With effect from PV 544 C and P 210 B, and on a small series of PV 444 L and PV 445 M, the rods are provided with plastic lined ball joints. This means that it is not necessary to lubricate them so that the ball joints concerned do not have grease nipples (2 Fig. 20).

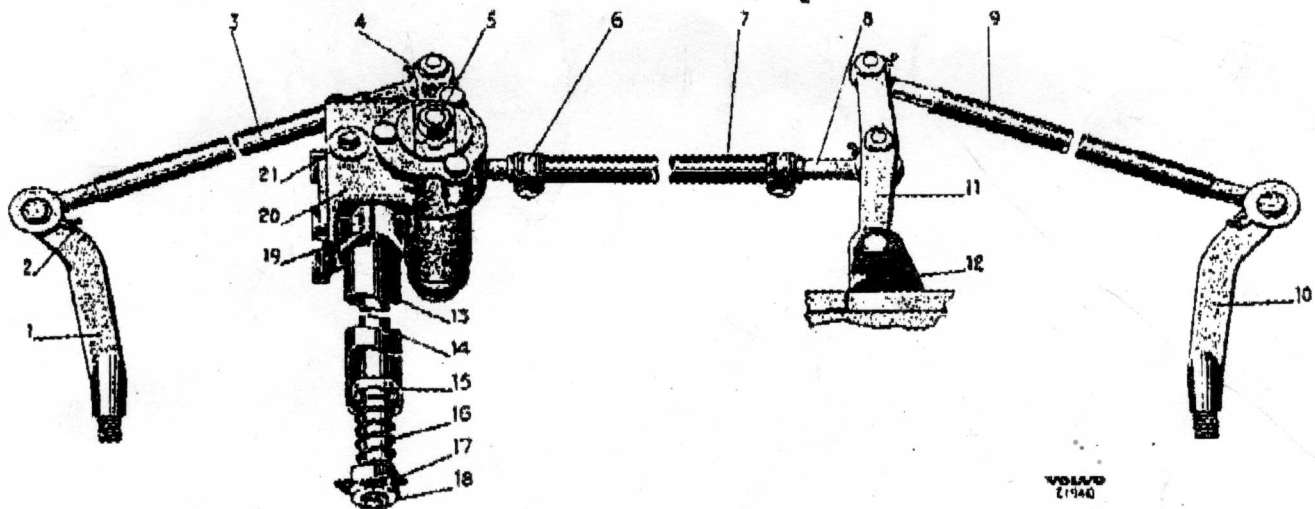


Fig. 20. Steering Gear.

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|--|--|---------------------------|
| 1. Left steering arm | 8. Ball joint | 15. Ball bearing |
| 2. Grease nipple (early production only) | 9. Right steering rod with ball joints | 16. Spring |
| 3. Left steering rod with ball joints | 10. Right steering arm | 17. Locking washer |
| 4. Pitman arm | 11. Idler arm | 18. Nut |
| 5. Cap nut over adjusting screw | 12. Bracket for idler arm | 19. Clamp for jacket tube |
| 6. Clamp (locknut in late production) | 13. Steering column jacket tube | 20. Steering box |
| 7. Tie-rod, early production | 14. Steering column | 21. Filling plug |

1. Tube for horn cable
2. Sealing washer
3. Locking ring
4. Bearing outer ring
5. Ball bearing
6. Cover
7. Bolt for cover
8. Adjusting screw
9. Locknut
10. Pitman arm shaft with levers
11. Gasket
12. Upper cover
13. Spring washer
14. Bolt for upper cover
15. Clamp for jacket tube
16. Locking ring
17. Shims
18. Bearing outer ring
19. Ball bearing
20. Bushings
21. Sealing ring
22. Pitman arm
23. Spring washer
24. Nut
25. Steering box housing
26. Steering worm

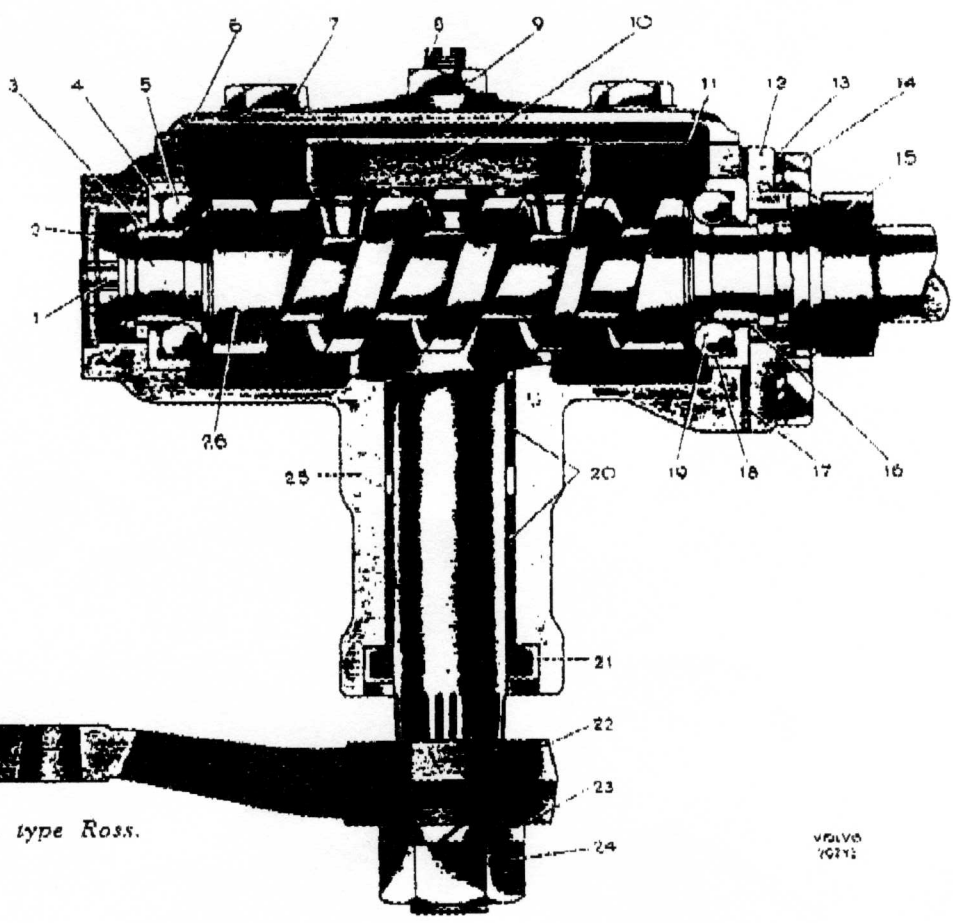


Fig. 21. Steering box, type Ross.

valve
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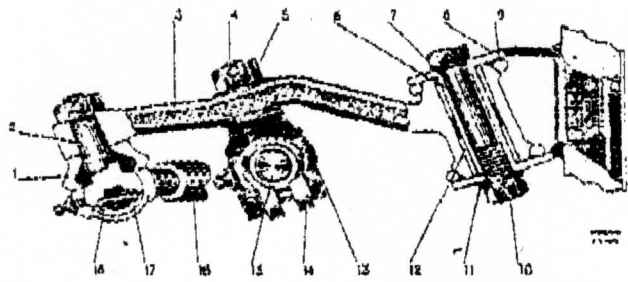


Fig. 22. Idler arm mounting, early production.

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|-----------------------|----------------------|----------------------------------|
| 1. Rubber dust shield | 7. Bolt | 15. Ball joint |
| 2. Ball stud | 8. Bracket | 14. Clamp |
| 3. Idler arm | 9. Rubber dust cover | 15. Tie-rod |
| 4. Split pin | 10. Nut | 16. Steering rod with ball joint |
| 5. Castle nut | 11. Washer | 17. Bearing unit |
| 6. Spacing sleeve | 12. Bushing | 13. Spring |

REPAIR INSTRUCTIONS

Replacing the steering wheel, PV 444-445 not fitted with direction indicator switch housing

1. Remove the fuse for the horn.
2. Remove the horn ring by pushing it down and turning it a quarter of a turn anti-clockwise. Screw off the steering wheel nut.
3. Pull off the steering wheel, see Fig. 25. Use puller SVO 2368 (previously number SVO 1185 B) together with spacer SVO 1103 and claw SVO 1187. Spacer SVO 1453 and claw SVO 1454 can also be used.
4. Place on the new steering wheel so that the spokes come horizontally when the wheels point straight forward. Fit the nut and tighten it to a torque of 3.5 kgm (25 lb. ft.). Place the horn ring in position, press it down and turn it a quarter of a turn clockwise. Fit the fuse.

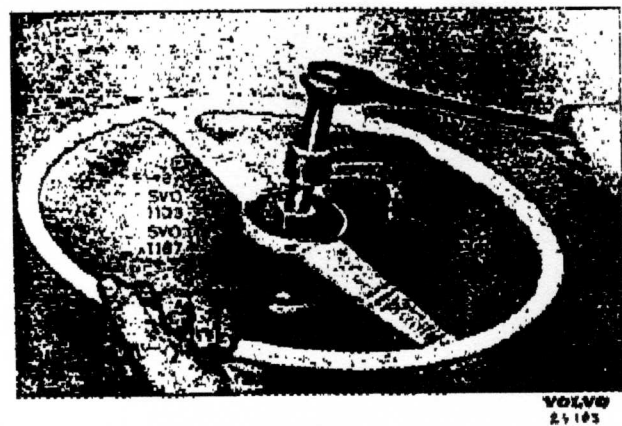


Fig. 25. Fitting the steering wheel
(PV 444-445 A).

PV 444-445 with direction indicator switch housing

1. Remove the fuse for the horn.
2. Slacken the bolt on the left side of the steering wheel hub, turn and pull the horn ring upwards. Unscrew the steering wheel nut. On late production the locking washer is first removed.
3. Pull off the steering wheel, see Fig. 26. When doing this the direction indicator switch must be in the neutral position, otherwise the internal parts will be damaged.
4. Fit the new steering wheel. Check that the switch is in the neutral position and that two of

the steering wheel spokes come horizontally when the front wheels are pointing straight forward. Tighten the steering wheel nut to a torque of 3.5-5 kgm (25-35 lb. ft.). On late production the nut is locked with a locking washer.

5. Check that the switch housing does not come too near the steering wheel after fitting. The distance between the upper edge of the housing and the steering wheel hub should be 1-1.5 mm (0.04-0.06 ins). The distance is adjusted by slackening the clamping bolt on the side of the switch housing and moving it in the required direction.
6. Fit the horn ring and screw in the locking bolt. Fit the fuse.



Fig. 26. Fitting the steering wheel
(PV 444-445 late production).

PV 544, P 210

1. Remove the fuse for the horn.
2. Unscrew the two attaching bolts, turn the horn ring slightly and lift it up. Bend down the locking washer and remove the steering wheel nut and washer.
3. Check that the direction indicator switch is in the neutral position. Pull off the steering wheel with puller SVO 2325, see Fig. 27.
4. Fit the new steering wheel. Check that the switch is in the neutral position and that corresponding points on the steering wheel spokes come horizontally when the front wheels are pointing straight forwards. Place on the locking washer and tighten the steering wheel nut to a torque of 3.5-5 kgm (25-35 lb. ft.) Lock the nut.

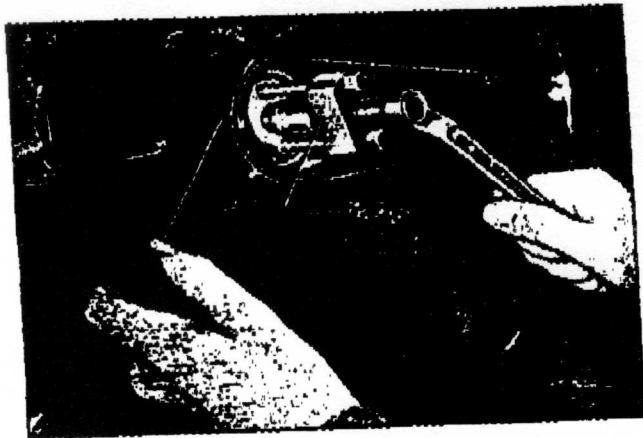


Fig. 27. Removing the steering wheel (PV 544 and P 210).

Steering box Removing

1. Remove the steering wheel, see points 1—3 under "Replacing the steering wheel".
2. Disconnect the horn lead on the steering box. Pull the lead with bushing, spring and cover up through the steering column. Unscrew the screw and remove the housing for the direction indicator switch in cases where this is fitted.
3. Remove the jacket tube support under the instrument panel. Lift the driving seat out of the way.

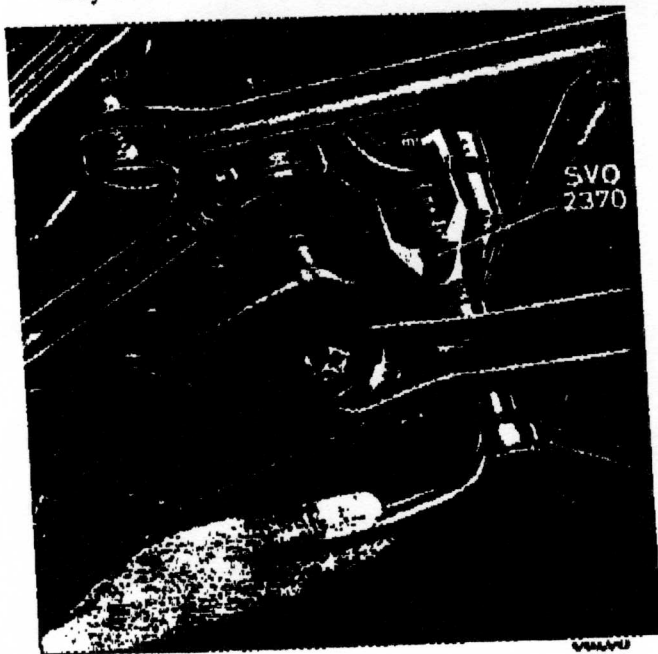


Fig. 28. Removing pitman arm.

4. Screw off the nut for the pitman arm. Pull off the pitman arm from the pitman arm shaft with puller SVO 2370 (Fig. 28). On PV 444-445, SVO 2195 can also be used.
5. Disconnect the steering box from the body (on PV 445 and P 210, the frame) and lift out the steering box with jacket tube forwards and upwards.

Dismantling

Ross

1. Wash the steering box clean externally.
2. Slacken the clamp for the jacket tube and pull this out.
3. Remove the cover (6, Fig. 21) and drain off the oil. Lift out the pitman arm shaft.
4. Unscrew the three bolts for the cover (12) and lift this off. Take care of the adjusting shims.
5. Pull out the steering column with steering worm. The ball bearings with outer rings come out at the same time.
6. Remove the locking rings and ball bearings.
7. If necessary, pull out the bearing in the jacket tube with puller SVO 4078.

Germer

1. Wash the steering box clean externally.
2. Remove the bolts for the upper cover, 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 lower cover and take care of the adjusting shims. In the case of steering box part number 250051, remove the clamp and take out the jacket tube. Knock the steering

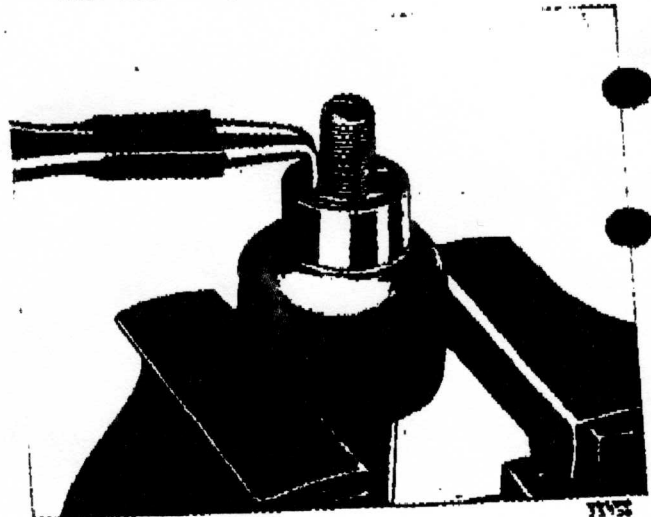


Fig. 29. Removing the adjusting screw.

column carefully and pull out the steering worm with bearings.

Slacken the locknut (on early production, the cap and locking washer) and screw the adjusting screw out of the cover. The adjusting screw can be removed from the pitman arm shaft after the locking ring has been removed, see Fig. 29.

Inspecting Ross

Clean all parts in white spirit.

Check the levers on the pitman arm shaft. If these are scratched, scored or worn the pitman arm shaft must be replaced.

Examine the contact surfaces of the steering worm with the levers and the inner races of the ball bearings on the bolt. If there is any scoring or other damage, the steering worm with steering column must be replaced.

Check to see whether the pitman arm shaft is loose in the bushing. If so, replace the bushings. Use drift SVO 4075 when removing (see Fig. 30).

Examine the outer rings and balls of the bearings.

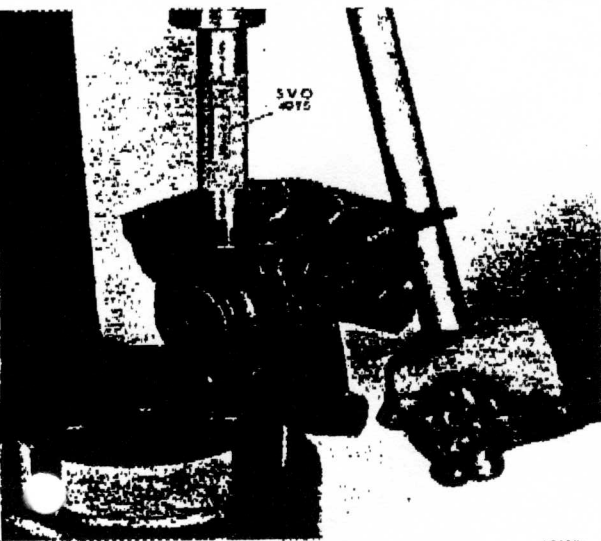


Fig. 30. Removing bushings.

Gemmer

Clean all parts in white spirit.

Check the pitman arm shaft. The roller must not be scratched, scored or worn on the contact surfaces or be loose in the pitman arm shaft. If so, the pitman arm shaft must be replaced.

Examine the steering worm contact surfaces against the roller and the inner races of the ball bearings. If there are any scratches, scoring or heavy wear, the steering worm with steering column must be replaced.

Examine the outer rings and balls of the bearings. Any bearing parts which are scored or otherwise damaged must be replaced. The upper bearing outer ring is removed with puller SVO 1819.

Check to see whether the pitman arm shaft is loose in the bushings. If so, replace bushings. On steering box part number 250051 both the bushings in the housing are pressed out at the same time in the direction of the cover with drift SVO 2228 and standard handle SVO 1801. The bushings in other steering boxes are removed independently in either direction with puller SVO 1819, when the sealing ring also comes out, see Fig. 31.

The bushing in the cast iron cover is slotted and is removed with a screwdriver or similar. The bushing in the light alloy cover is cast in so that the complete cover must be replaced.

If the pressed-in jacket tube has to be separated from the housing for any reason, this is pressed out with a suitable drift.

Assembling

Ross

1. Press in the pitman arm shaft bushings with drift SVO 4075. Ream the bushings with reamer SVO 4076. After reaming, clean off all metal chippings from the steering box.

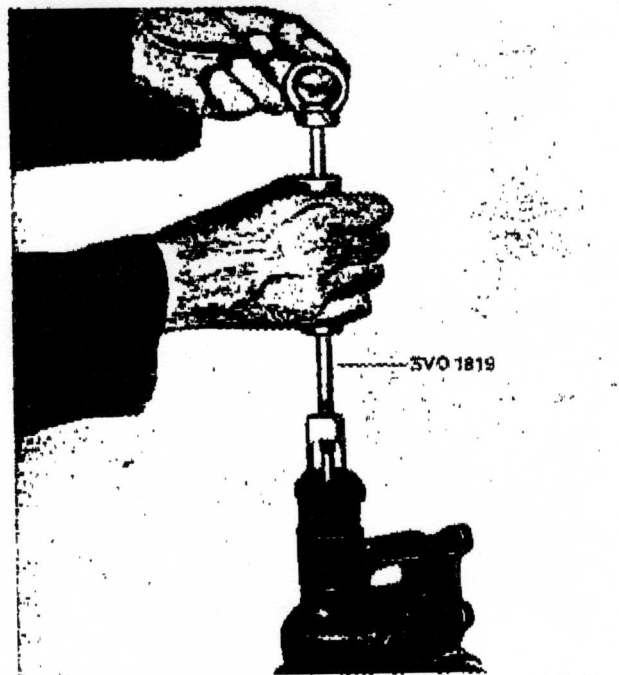


Fig. 31. Removing pitman arm shaft bushing and sealing ring.

2. Fit the new sealing ring with drift SVO 4079.
3. Fit the ball bearings (11 balls in each bearing) onto the steering worm and place on new locking rings.
4. Place the steering worm in the housing. Fit the upper cover, see Fig. 32. Adjust with shims so that the steering column moves easily but without any play when the bolts are tightened. Be careful to ensure that the bearings are not damaged if too many shims are removed.
5. Place the pitman arm shaft in the housing. Check that the levers run easily in the steering worm when this is turned.
6. Unscrew the adjusting screw in the cover and fit it with a new gasket.
7. Turn the steering column until the pitman arm shaft levers come about in the centre of the steering worm. Tighten the adjusting screw while turning the steering column backwards and forwards until slight binding is felt. Then screw back the adjusting screw until this binding just disappears. Lock the adjusting screw in this position.
8. Fit the bearing and clamp for the jacket tube and place the felt ring on the steering column. Fit the jacket tube with the slot turned upwards but only tighten the clamp on the type with direction switch housing.
9. Fill up with oil, see the specifications. Due to the viscosity of the oil, the whole amount cannot as a rule be filled in at once. First fill up as far as possible and then check the level after about 15 minutes, topping up afterwards as necessary.

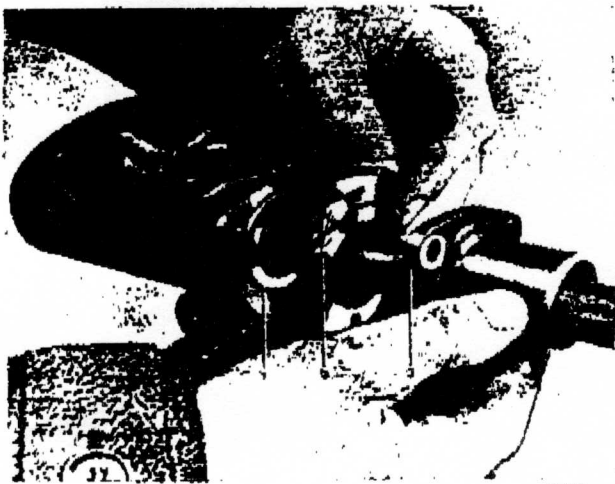


Fig. 32. Adjusting bearing clearance.

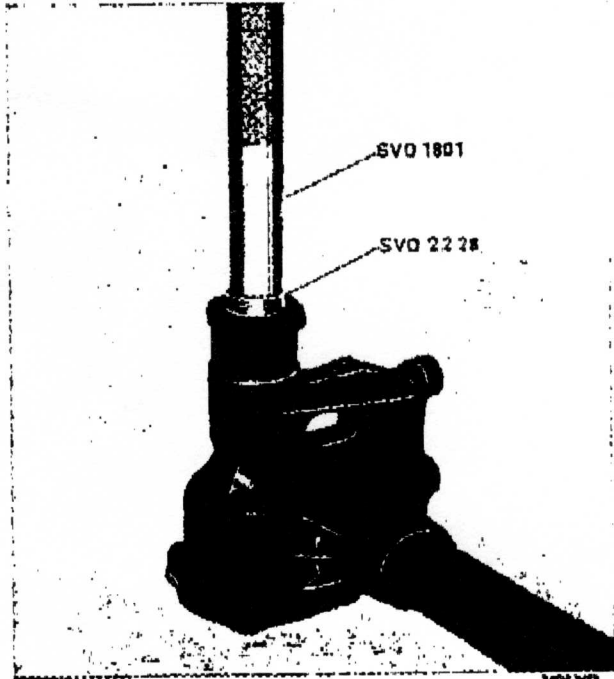


Fig. 33. Fitting bushing.

Germer

1. Press the pitman arm shaft bushings into the housing from each direction with tool SVO 2228 and SVO 1801, see Fig. 33. In steering box part number 250031, the longer bushing is placed below. In late production steering boxes the upper of the original bushings is provided with oil grooves. In this way the bushings receive slightly better lubrication when they are new. Such oil grooves are not, however, necessary and in order to avoid the risk of faulty fitting the bushings are alike and without oil grooves when they are sold separately. In the case of cast iron upper covers, the bushing is pressed in with drift SVO 2227.
2. Ream the bushings in the housing with reamer SVO 2225. First insert the reamer in the housing after which the guide SVO 2254 is screwed on and reaming can begin, see Fig. 34. In the case of cast iron covers (earlier production), the bushing is pressed in with drift SVO 2227, after which it is reamed with reamer SVO 2226. This is first inserted through the bushings of the housing as shown in Fig. 35. The cover is then fitted into position and reaming carried out. After reaming all metal chippings must be removed from the steering box. In the case of light alloy covers, the bushing is ready machined.