

PROPELLER SHAFT DESCRIPTION

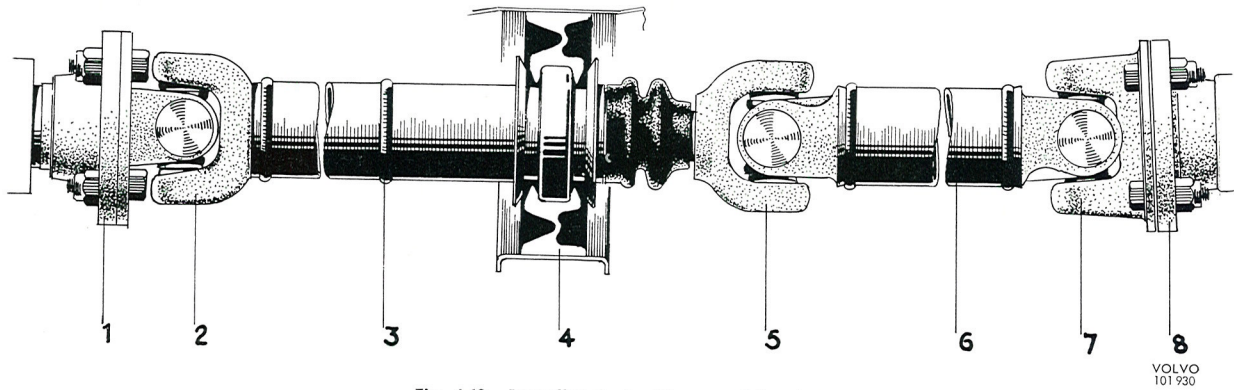


Fig. 4-69. Propeller shaft with support bearing

- | | |
|-------------------------------------|---------------------------------|
| 1. Flange on gearbox | 5. Intermediate universal joint |
| 2. Front universal joint | 6. Rear propeller shaft |
| 3. Front section of propeller shaft | 7. Rear universal joint |
| 4. Support bearing | 8. Flange on rear axle |

The propeller shaft is of the divided, tubular type, see Fig. 4-69. The rear end of the front section of the propeller shaft is in the form of a splined sleeve. In this there is a splined shaft which also forms one of the yokes on the intermediate universal joint. The rear end of the front section of the propeller shaft is carried in a ball bearing. The ball bearing is fitted

in a rubber bearing housing, which is attached to the propeller shaft tunnel with a cover, see Fig. 4-70. The propeller shaft is fitted with three universal joints. Each joint consists of a spider with four ground trunnions which are carried in flange yokes by means of needle bearings.

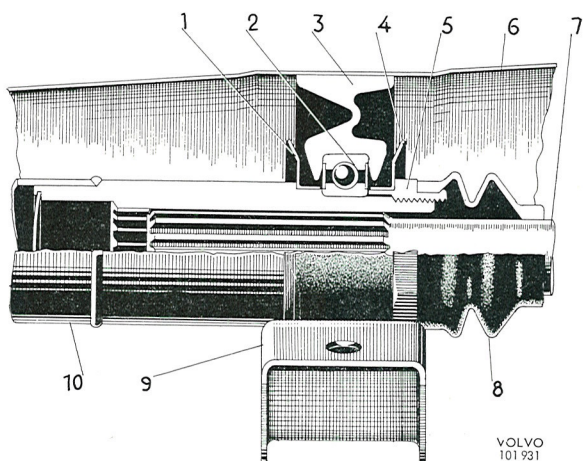


Fig. 4-70. Support bearing

- | | |
|-------------------|--------------------------------------|
| 1. Dust cover | 6. Floor tunnel |
| 2. Ball bearing | 7. Rear section of propeller shaft |
| 3. Rubber housing | 8. Rubber cover |
| 4. Dust cover | 9. Cover |
| 5. Nut | 10. Front section of propeller shaft |

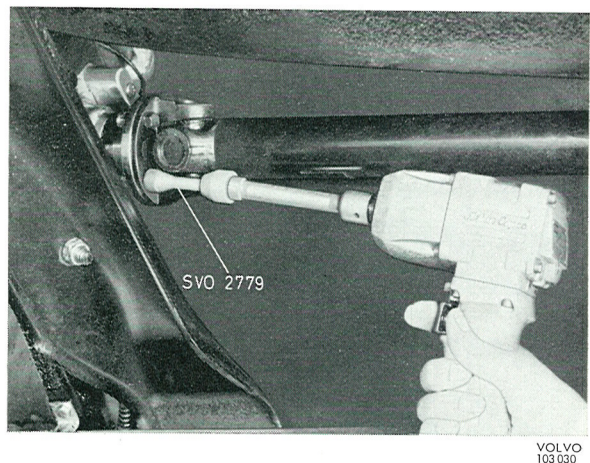


Fig. 4-71. Removing the bolts

REPAIR INSTRUCTIONS

REPLACING THE SUPPORT BEARING

1. Jack up the vehicle. Slacken the propeller shaft from the rear axle flange. Bend back the lock washer and unscrew the nut at the sliding joint. Pull out the propeller shaft to the rear.
2. Loosen the cover for the support bearing. Pull off the complete support bearing.
3. Press the old bearing out of the rubber housing. Fit in the new bearing.
4. Fit the support bearing and the other parts in the reverse order to removing. If the splined joint appears dry, lubricate it with grease mixed with molybdenum disulphide.

REMOVING

Jack up the car. Slacken the propeller shaft from the gearbox and rear axle flanges. The bolts can be loosened by an air impact wrench and special socket SVO 2779, see Fig. 4-71. Loosen the cover for the support bearing and take down the complete propeller shaft.

DISMANTLING

DISMANTLING THE PROPELLER SHAFT

1. Bend back the lock washer and unscrew the nut for the support bearing. Remove the rear section of the propeller shaft. Pull off the support bearing.
2. Take the support bearing out of the housing.

DISMANTLING THE UNIVERSAL JOINTS

1. Remove the snap rings which secure the needle bearings in the yokes, see Fig. 4-72.
2. Secure the shaft in a vice so that the universal joint comes as near as possible to the vice jaws. Remember that the propeller shaft is tubular and can easily be deformed.

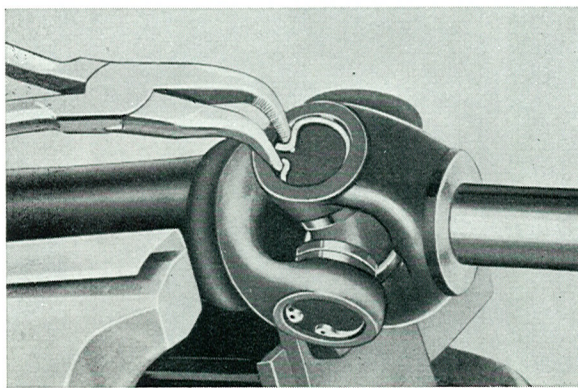


Fig. 4-72. Removing the snap ring

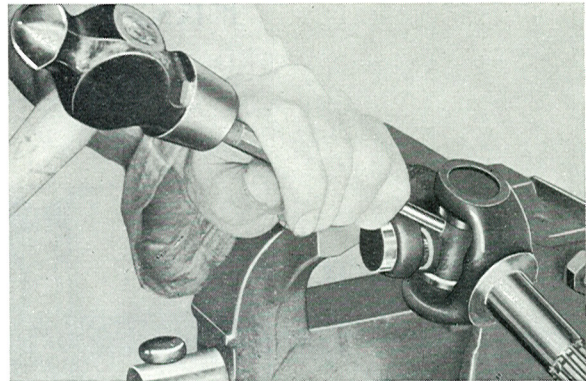


Fig. 4-73. Removing the spider, I

3. With a hammer and metal punch drive the spider as far as it will go in one direction. The needle bearing will then come about half way out.
4. Then drive the spider as far as it will go in the opposite direction, see Fig. 4-73.
5. Drive out one of the needle bearings with a thin metal punch. Remove the spider, see Fig. 4-74. Drive out the other needle bearing.

INSPECTING

It is extremely important to ensure that the propeller shaft is straight. Since even minor damage on a propeller shaft can cause vibration, inspection must be carried out very carefully. The shaft should be set up between centres and checked along its entire length with an indicator gauge while it is rotating. If it is out-of-true more than 0.25 mm (0.010"), the shaft must be replaced.

N.B. No attempt should be made to straighten a damaged propeller shaft — it should be replaced with a new one.

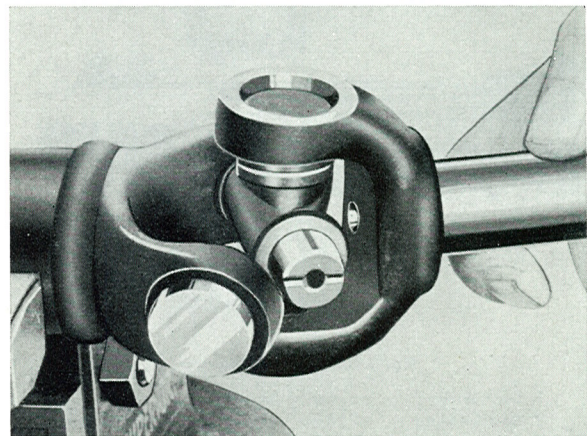


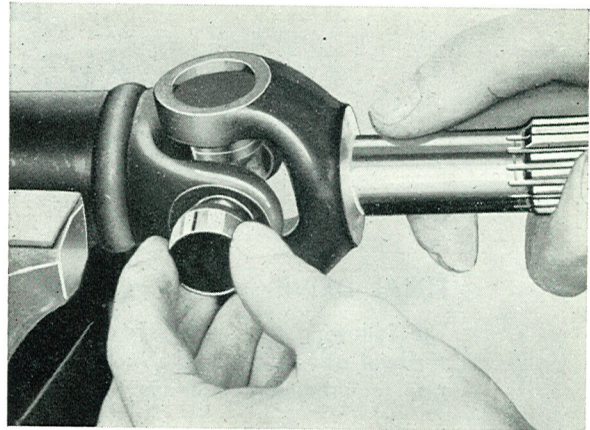
Fig. 4-74. Removing the spider, II

Examine the support bearing by pressing the bearing races against each other by hand and turning them in opposite directions. The bearing should run easily without binding at any point. If it does not, scrap the bearing and replace it with a new one. Check needle bearings and spiders. Worn or damaged parts should be replaced.

ASSEMBLING

ASSEMBLING THE UNIVERSAL JOINTS

1. During possibly the fitting of the old needle bearings, check that they are filled with grease and that the rubber seals are not damaged. New bearings should be half filled with grease.
2. Insert the spider in the flange yoke. Push over the spider in one direction so far that the needle bearing can be fitted onto the trunnion, see Fig. 4-75. Then press in the needle bearing so far that the snap ring can be fitted. Use a drift having a diameter slightly less than that of the needle bearing sleeve.
3. Fit the other needle bearing and snap ring in the



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Fig. 4-75. Fitting the spider

same way. Also the fitting of the spider in the other yoke should be carried out in the same way as described in the previous paragraph.

INSTALLING

Installing is done in the reverse order to removing.

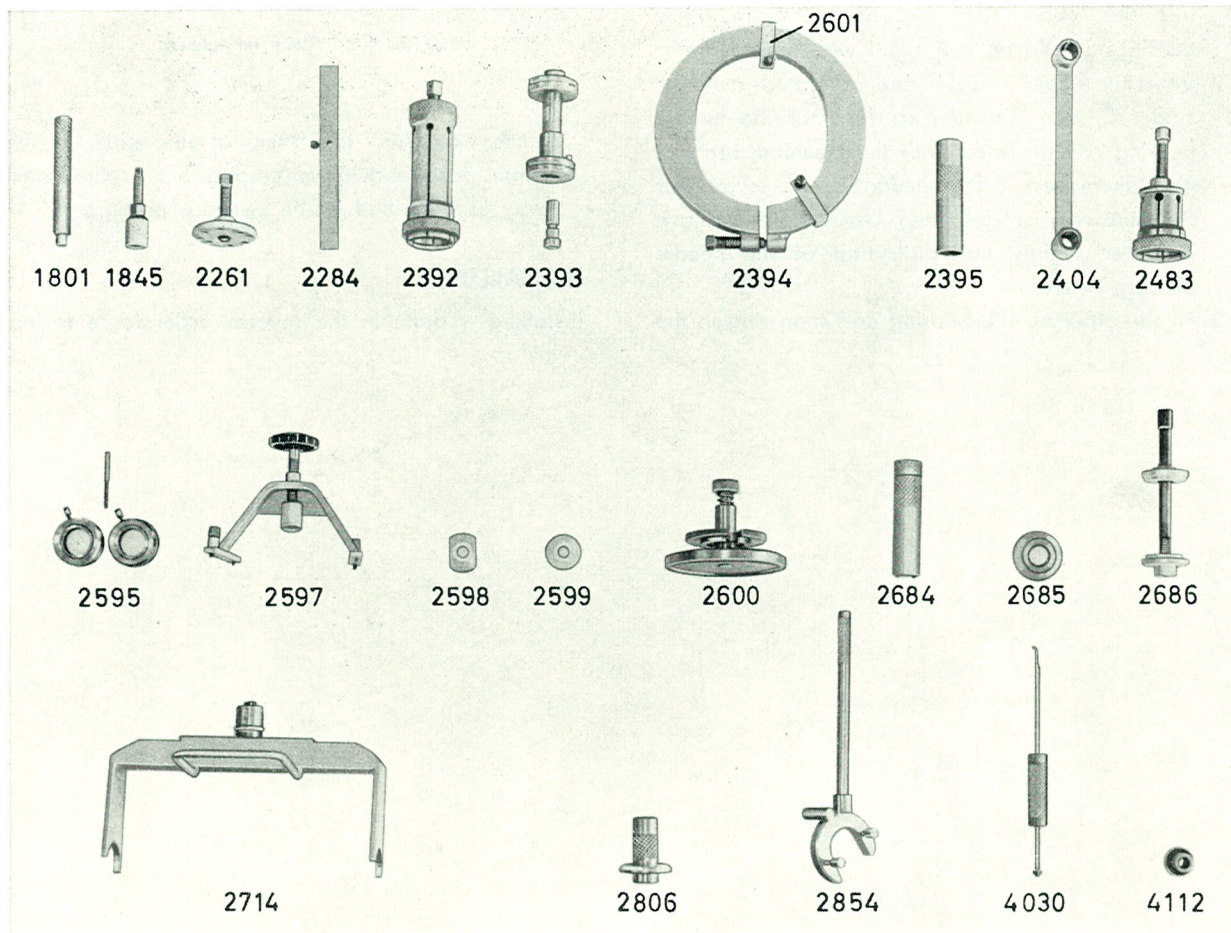
GROUP 46

REAR AXLE

TOOLS

FINAL DRIVE

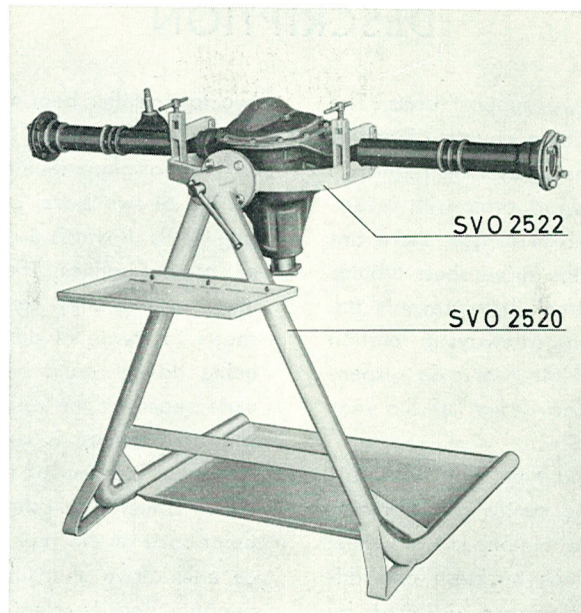
The following tools are used for repair work and adjustment of the final drive. For removal and fitting of the brake drums and drive shafts a number of other tools are also required, see under the heading "Drive shaft".



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Fig. 4-76. Special tools for rear axle

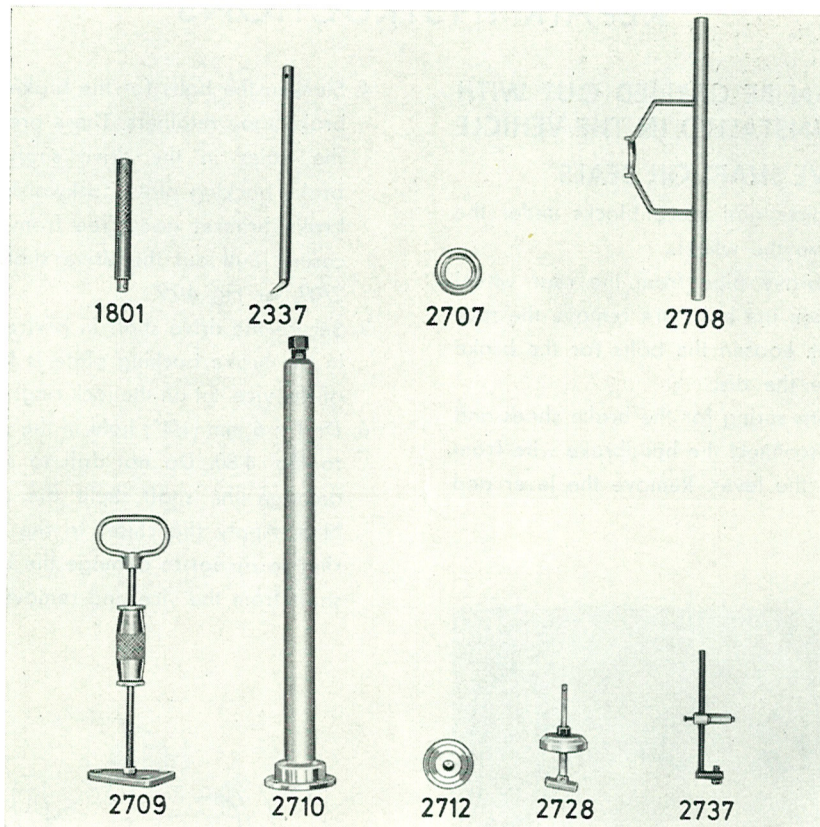
- | | | | |
|----------|---|----------|---|
| SVO 1801 | Standard handle 18×200 mm | SVO 2597 | Brake for crown wheel, used when checking tooth contact |
| SVO 1845 | Press tool for fitting flange | SVO 2598 | Drift for removing outer ring, rear pinion bearing |
| SVO 2261 | Puller for flange | SVO 2599 | Drift for removing outer ring, front pinion bearing |
| SVO 2284 | Retainer for dial indicator for final drive adjustment | SVO 2600 | Measuring fixture for adjusting rings |
| SVO 2392 | Puller for rear pinion bearing | SVO 2601 | Holder for expander tool SVO 2394 (fitted on tool) |
| SVO 2393 | Measuring tool for adjustment of pinion | SVO 2684 | Spanner for adjusting ring SVO 2685 |
| SVO 2394 | Expander tool used for removing and fitting differential | SVO 2685 | Adjusting ring for pinion |
| SVO 2395 | Sleeve for fitting inner ring rear pinion bearing | SVO 2686 | Press tool for fitting outer rings, pinion bearing |
| SVO 2404 | Tool for fitting front pinion bearing | SVO 2714 | Fixture for rear axle, used on garage jack for removing and fitting rear axle |
| SVO 2483 | Puller for differential carrier bearings | SVO 2806 | Tool for fitting oil seal at flange |
| SVO 2520 | Stand (Fig. 4-77) | SVO 2854 | Counterhold tool for flange |
| SVO 2522 | Fixture for rear axle (used together with stand SVO 2520 work on the final drive) (Fig. 4-77) | SVO 4030 | Puller for oil seal at flange |
| SVO 2595 | Adjusting rings for differential | SVO 4112 | Drift for fitting differential carrier bearings |



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Fig. 4-77. Stand and fixture for rear axle

DRIVE SHAFT



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Fig. 4-78. Special tools for drive shaft

- | | | | |
|----------|---|----------|--|
| SVO 1801 | Standard handle 18×200 mm | SVO 2710 | Puller for drive shaft bearing |
| SVO 2337 | Drift for removing outer oil seal | SVO 2712 | Tool for fitting outer and inner oil seals |
| SVO 2707 | Cushioning ring for fitting bearing and stop ring | SVO 2728 | Puller for inner oil seal |
| SVO 2708 | Spanner for adjusting nut | SVO 2737 | Retainer for dial indicator |
| SVO 2709 | Puller for drive shaft | | |

DESCRIPTION

The rear axle is carried in two support arms. The support arms are provided with a couple of robust bushes and are attached to the body. The rear axle housing is attached to the support arms with levers. In order to take up the rear axle torque, there are two torque rods attached to the drive shaft tubular covers and to the body. A track bar prevents the body and rear axle from moving sideways in relation to each other. The principle of the rear axle suspension is shown in Fig. 4-123. The design of the rear axle is shown in Illustration 4 D.

The final drive is of the hypoid type, that is to say, the drive pinion lies below the centre of the crown wheel. It consists of the drive pinion, crown wheel and differential gears. The gear backlash and differential carrier bearing tension are adjusted by means of shims inside the differential carrier bearings.

The differential carrier and the crown wheel are journalled in the final drive housing by means of

two taper roller bearings. The crown wheel is attached to the differential carrier by means of bolts. The differential gears themselves in the differential carrier consist of two bevel pinions on a trunnion and two side gears in which drive shafts are carried by means of internal splines. The differential gears are journalled so that they can rotate and permit the drive shafts to rotate at different speeds when the car is being driven round bends. There is a thrust washer under each of the differential gears.

The drive pinion is carried in taper roller bearings. The axial location of the drive pinion relative to the crown wheel is adjusted by means of shims under the outer race of the rear pinion bearing. The outer end of each drive shaft is journalled in a taper roller bearing. Bearing clearance is adjusted by means of an adjusting nut at the left-hand side.

There are oil seals on both sides of the drive shaft bearings.

REPAIR INSTRUCTIONS

WORK THAT CAN BE CARRIED OUT WITH THE REAR AXLE INSTALLED IN THE VEHICLE

REPLACING DRIVE SHAFT OIL SEALS

1. Jack up the vehicle and place blocks under the rear axle. Remove the wheel.
2. Disconnect the brake pipe from the rear wheel brake unit. Slacken the bolts and remove the rear wheel brake unit. Loosen the bolts for the brake disc and remove the disc.
3. Remove the return spring for the brake shoes and remove them. Disconnect the handbrake wire from the bracket and the lever. Remove the lever and wire.

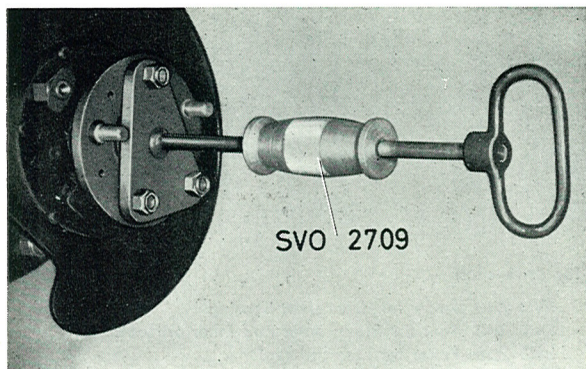


Fig. 79. Removing the drive shaft

4. Slacken the bolts for the brake backing plate and brake shoe retainers. These are slackened through the holes in the drive shaft flange. Turn the brake backing plate backwards so that the handbrake bracket goes free from the flange on the casing. Pull out the drive shaft with puller SVO 2709, see Fig. 4-79.
5. Secure the drive shaft in a vice so that the recess in the brake backing plate is facing the rear jaw of the vice. Fit on the lock ring.
6. Drill a 6 mm (1/4") hole in the lock ring according to Fig. 4-80. Do not drill to such a depth as to damage the shaft. Split the ring with a chisel. N. B. Apply the chisel to the outer edge of the ring so as not to damage the bearing. Loosen the shaft from the vice and remove the lock ring.

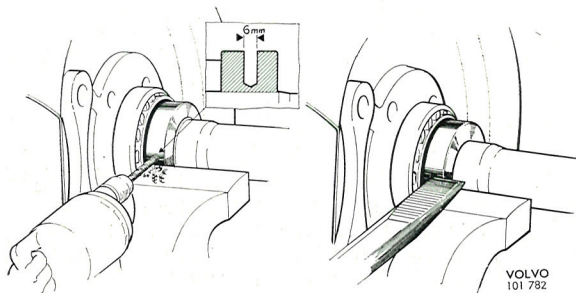


Fig. 4-80. Removing the lock ring

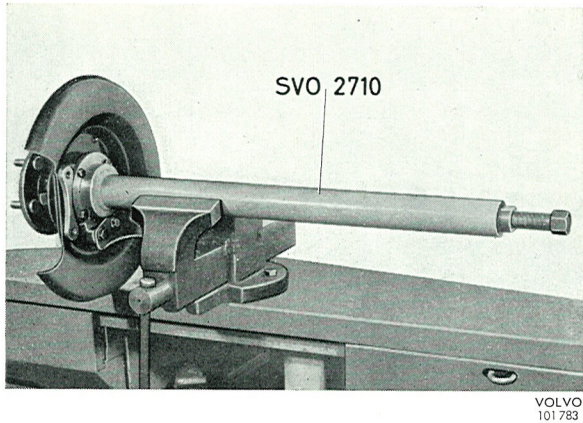


Fig. 4-81. Removing the drive shaft bearing

7. Place tool SVO 2710 in the vice. Insert the drive shaft and fit the attaching bolts for the brake backing plate and brake shoe retainers. With the puller, pull loose the bearing, see Fig. 4-81. Then remove the brake backing plate and brake shoe retainers.
8. Place tool SVO 2707 under the brake shoe retainer and drive out the oil seal with tool SVO 2337.
9. Clean and check all the parts. Especially make sure that no cuttings from the drilling remain as these would damage the bearing.
10. Drive in the new oil seal in the brake shoe retainer (adjusting nut) with drift SVO 2712, see Fig. 4-82.
11. Place the brake backing plate and brake shoe retainers on the drive shaft. Fit the lock ring and bearing in the cushioning ring SVO 2707. Fit in the drive shaft and place the whole assembly in a press. Press on the drive shaft until the bearing and lock ring are in position, see Fig. 4-83.
12. Pull out the inner oil seal with puller SVO 2728, see Fig. 4-84. Drive in the new seal ring with drift SVO 2712, which automatically locates the oil seal correctly in the drive shaft tubular cover, see Fig. 4-85.

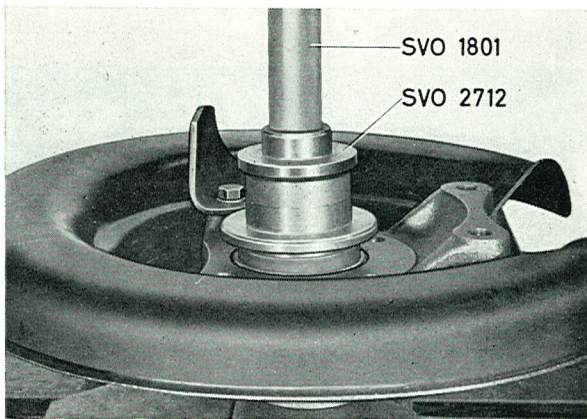


Fig. 4-82. Fitting the outer oil seal

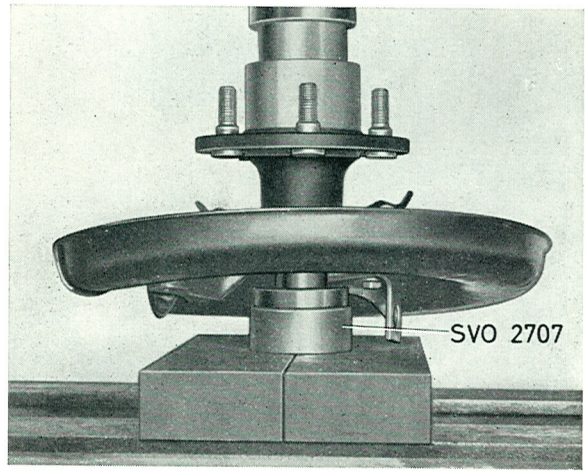


Fig. 4-83. Fitting the drive shaft bearing

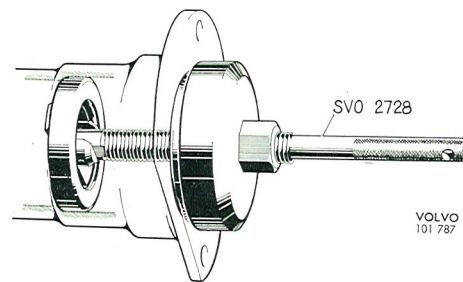


Fig. 4-84. Removing the inner oil seal

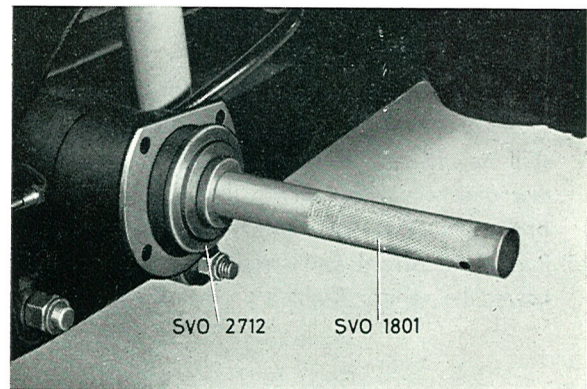


Fig. 5-85. Fitting the inner oil seal

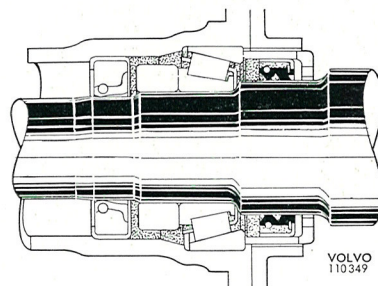


Fig. 86. Lubricating the rear axle bearings

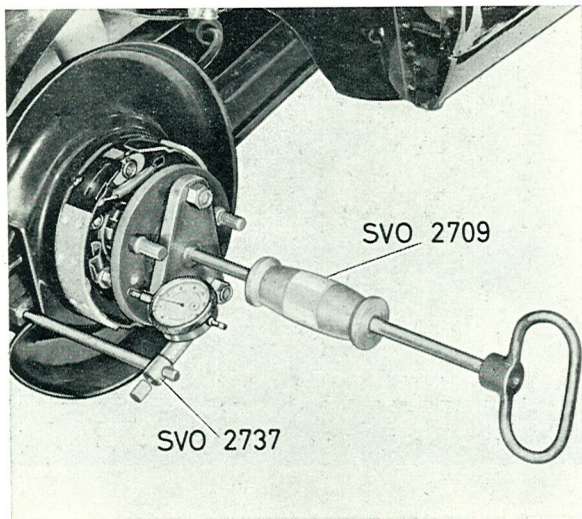


Fig. 4-87. Measuring the drive shaft end play

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13. Pack the bearing well with a high-class multi-purpose grease and then fit the drive shaft, the brake backing plate and brake shoe retainers. After fitting, the entire space between the oil seals should be filled with grease, see Fig. 4-86. Check the end play, which should be 0.05—0.13 mm (0.002—0.005"), with dial indicator and retainer SVO 2737, see Fig. 4-87. First press out the outer rings in their bearings with the help of the impact hammer on tool SVO 2709. Adjust if required. To do this use tool SVO 2708, see Fig. 88. Lock the adjusting nut with suitable tab.
14. Fit the lever, the brake shoes for the handbrake together with spring and the adjusting device as well as the handbrake wire. Then fit the brake disc and rear wheel brake unit. Connect up the brake line. Vent and adjust the brakes, see Part 5.
15. Put on the wheel and screw on the wheel nuts. Lower the vehicle. Tighten up the wheel nuts.

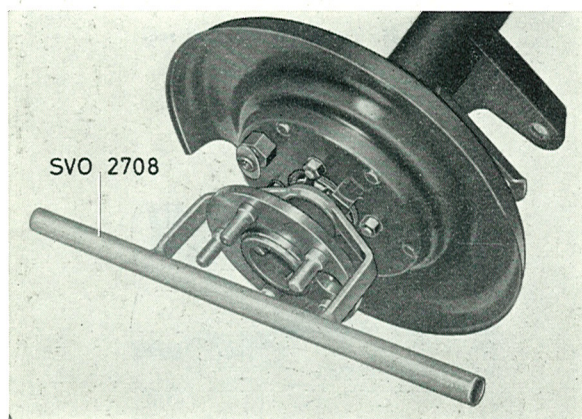


Fig. 4-88. Adjusting the drive shaft end-play

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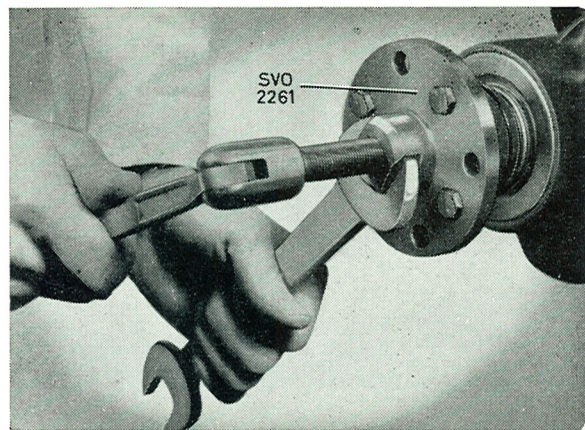


Fig. 4-89. Removing the flange

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REPLACING THE DRIVE SHAFT BEARING

When replacing the drive shaft bearing, follow points 1—7, 9, 11—15 in the description given above.

REPLACING THE PINION OIL SEAL

1. Disconnect the rear section of the propeller shaft from the flange on the pinion. Check for looseness of the pinion in its bearing. If it is loose, this must be remedied before a new oil seal is fitted. See the instructions under the heading "Assembling".
2. Remove the nut for the flange. For this purpose, use tool SVO 2854 as a counterhold. Pull off the flange with puller SVO 2261, see Fig. 4-89. Pull out the old oil seal with puller SVO 4030, see Fig. 90.
3. Coat the seal lips of the new ring with grease. Lubricate also the spring coil so that it does not jump off during fitting. Then fit the oil seal with SVO 2806, see Fig. 4-91.
4. Press on the flange with the help of press tool SVO 1845, see Fig. 4-92. Fit the washer and nut. Tighten the nut to a tightening torque of 28—30 kgm (200—220 lb.ft.).

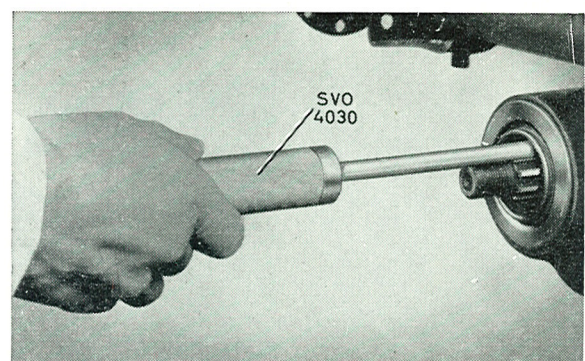


Fig. 4-90. Removing the oil seal

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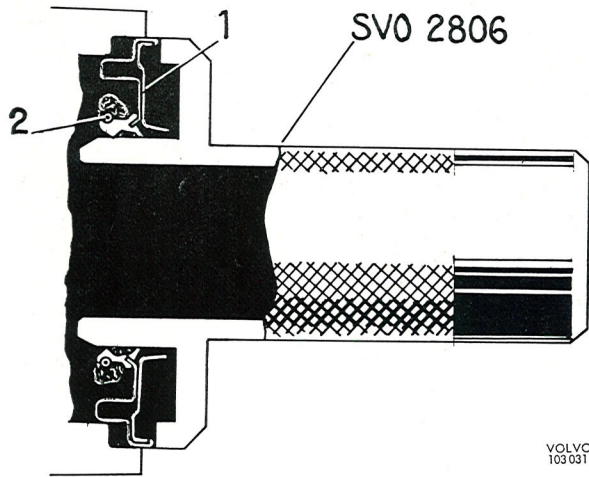


Fig. 4-91. Fitting the oil seal

1. Pinion oil seal
2. Spring coil with grease

REMOVING

1. Place blocks in front of the front wheels. Loosen the rear wheel nuts. Place fixture SVO 2714 on a garage jack and lift up the rear end with this. Compare with Fig. 4-122. Place blocks in front of the rear jack attachments, see Fig. 4-93, and then lower the jack slightly. Note that the blocks must not be placed at a point further than the dash line indicated in the figure. Remove the rear wheels.
2. Loosen the upper attaching bolts for the shock absorbers. Disconnect the handbrake wires from the levers and brackets on the brake backing plate. Use a spring fixture for this purpose, see Part 5.
3. Loosen the propeller shaft from the flange on the pinion. Remove the brake pipe union from the rear axle casing.

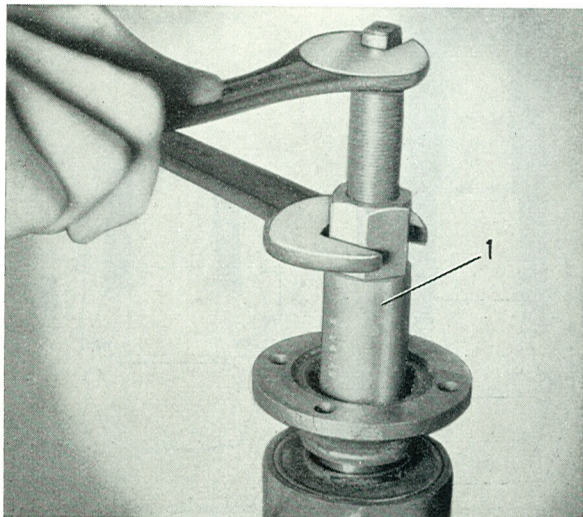


Fig. 4-92. Fitting the flange

1. Press tool SVO 1845

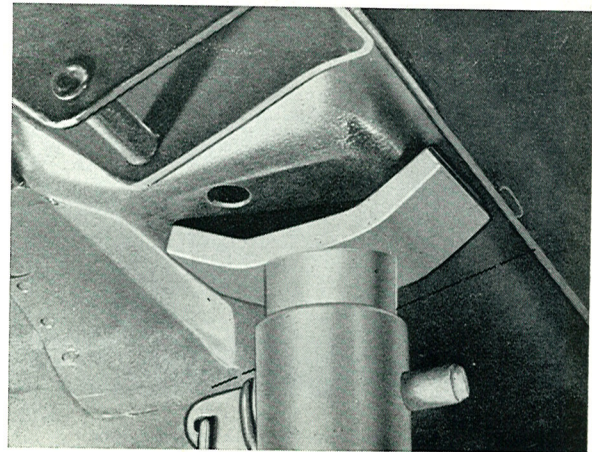


Fig. 4-93. Locating the block support

4. Loosen the front attaching bolts for the support arms about 1 turn. Unscrew the rear bolts for the torque rods. Loosen the track bar from the bracket on the rear axle casing. Remove the lower attaching bolts for the spring.
5. Lower the jack until the support arms release from the spring. Slacken the bolts holding the rear axle casing to the support arms. Lower the jack and pull the rear axle forwards.

DISMANTLING

1. Place the rear axle in fixture SVO 2522. The rear axle is placed with the underside of the final drive facing inwards to the fixture support, when the pinion is pointing downwards. Remove the brake pipes.
2. Slacken the bolts for the brake backing plates and brake shoe retainers. They are slackened through the holes in the drive shaft flanges. Pull

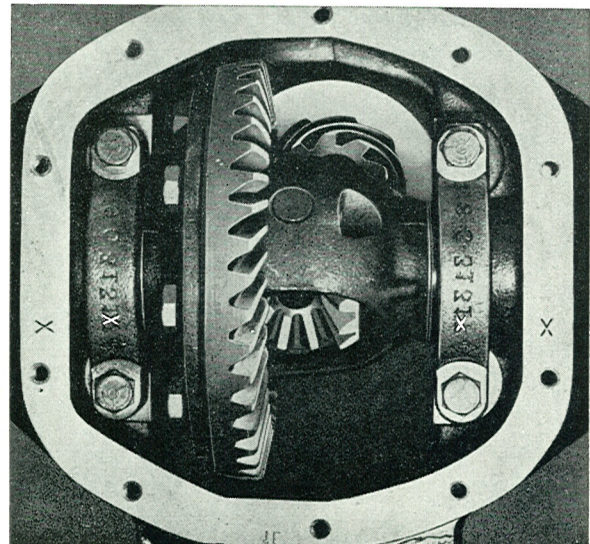


Fig. 4-94. Alignment marking on cap and carrier

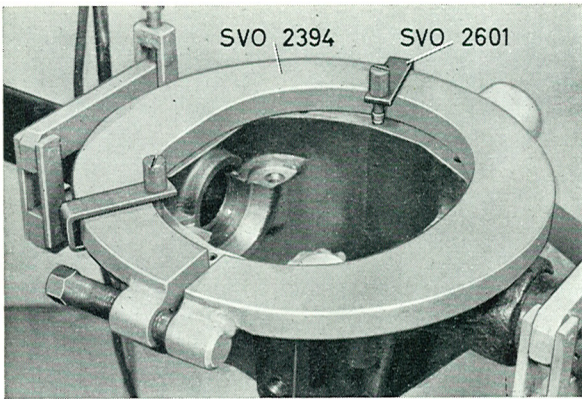


Fig. 4-95. Expanding the drive pinion carrier

out the drive shafts with puller SVO 2709, see Fig. 4-79.

3. Remove the inspection cover.
4. If the final drive is being reconditioned because of noise, the contact pattern should be checked before disassembling takes place, as this might assist in locating the fault. Before doing this, clean the teeth so that no misleading contact pattern is obtained.
5. Check the alignment markings on the cap and carrier, see Fig. 4-94. If there are no markings, or if they are difficult to see, mark one side with a punch. Remove the cap.
6. Fit tool SVO 2394 in the holes in the drive pinion carrier as shown in Fig. 4-95. Fit the tool with retainers SVO 2601. Tension the tool until it fits exactly in the holes in the carrier. Then tension the bolt a further 3—3½ turns. Lift out the differential carrier with crown wheel. Tool SVO 2337 can be used for this purpose.
7. Turn the final drive and let the oil run out into a container. Remove the nut for the flange. Use for this purpose tool SVO 2854 as a counterhold. Pull off the flange with puller SVO 2261, see Fig. 4-89. Press out the pinion.

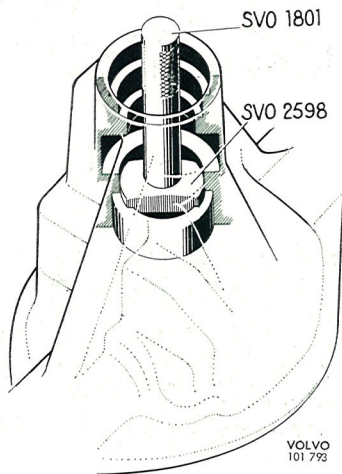


Fig. 4-96. Removing the rear pinion bearing race

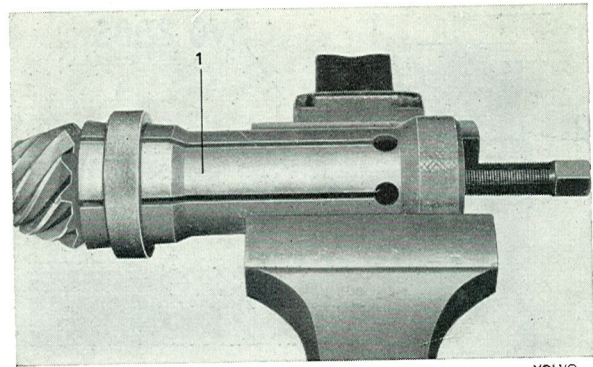


Fig. 4-97. Removing the rear pinion bearing
1. Puller SVO 2392

8. Drive out the front pinion bearing, the washer and the oil seal with standard handle SVO 1801 and drift SVO 2599.
9. If necessary, drive the rear bearing out of position, see Fig. 4-96. Use standard handle SVO 1801 and drift SVO 2598.
10. Clean the gasket surface. File off all burr on the surface on which the indicator retainer SVO 2284 will slide.
11. If necessary, pull off the rear bearing from the pinion with puller SVO 2392, see Fig. 4-97. The puller is fitted in the following way:

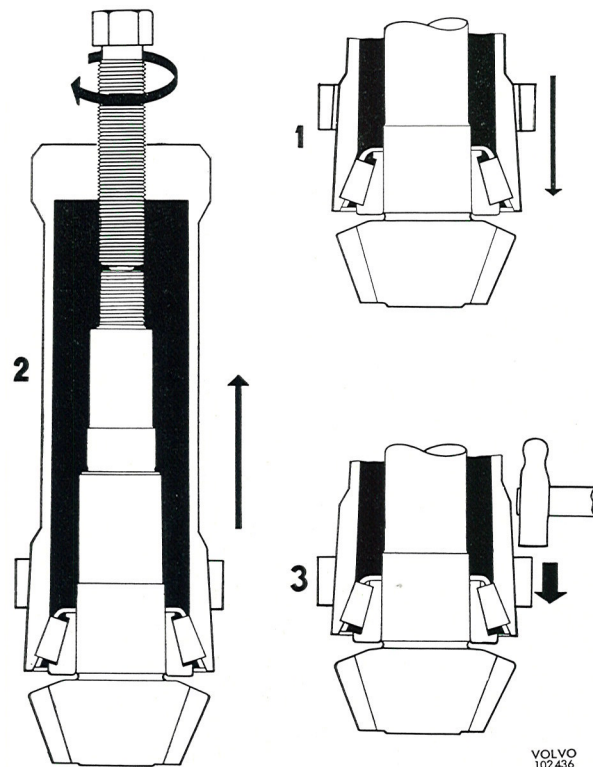


Fig. 4-98. Fitting the puller

1. The puller is pressed down over the rollers
2. The puller is pressed down over the rollers
3. The lock ring is secured by tapping

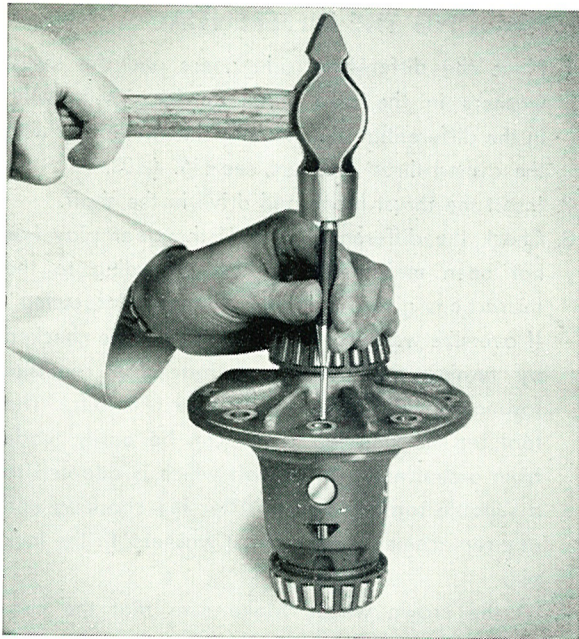


Fig. 4-99. Removing the lock pin

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Move the puller down over the rollers and press down the lock ring. Then pull up the puller with the bolt until the rollers lie flush with the edge of the inner race and the edge on the puller. Knock out the lock ring with a hammer. See also Fig. 4-98.

DISMANTLING THE DIFFERENTIAL

1. Loosen the ring gear bolts and remove the crown wheel.

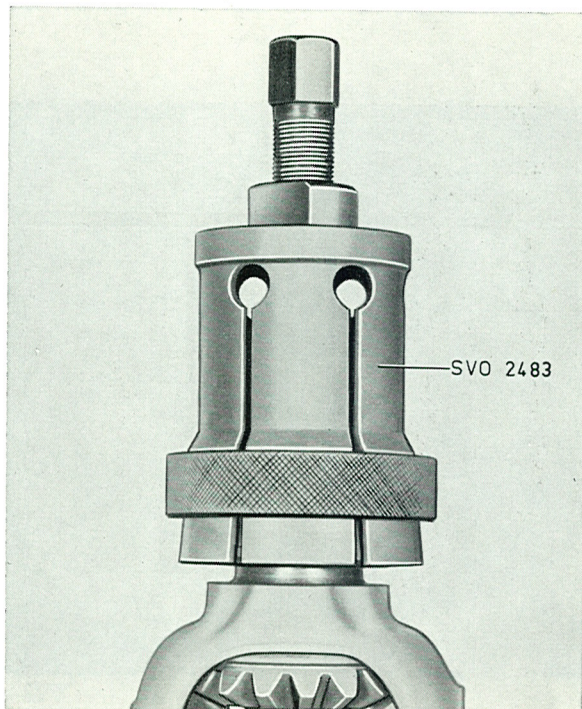


Fig. 4-100. Removing the differential carrier bearings

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2. Drive out the lock pin, see Fig. 4-99, and then the shaft for the differential gears. Take out the block, the differential gears and the thrust washers.
3. Pull off the differential carrier bearings with puller SVO 2483, see Fig. 4-100. Do not loosen the shims. Concerning the fitting of the puller, see also Fig. 4-98.

INSPECTING

First clean all the parts thoroughly. Check all the bearing races and bearings. The races, rollers or roller retainers must not be scratched or damaged. All damaged bearings and bearing races must be replaced.

Check both the pinion drive and crown wheel carefully for damage to the teeth. The most common damage is seizing gear teeth, see Figs. 4-101 and 4-102. This is caused by incorrect running-in, wrong oil, insufficient tooth flank clearance or faulty tooth contact. If the cause of the seizing is not remedied at an early stage, the whole gear wheel can be damaged.

The differential gears should also be examined for damage to the teeth. They should be fitted in a clean and dry condition in the differential carrier together with the shaft and thrust washers. Play should then be checked by means of marking blue behind both the differential side gears. If the play exceeds 0.06 mm (0.0024"), when the gears have been rotated to maximum play, replace with thicker washers. These are available in sizes 0.78 mm, 0.86 mm and 0.94 mm.

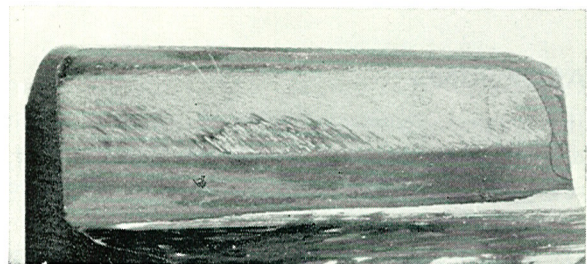


Fig. 4-101. Gear seizing

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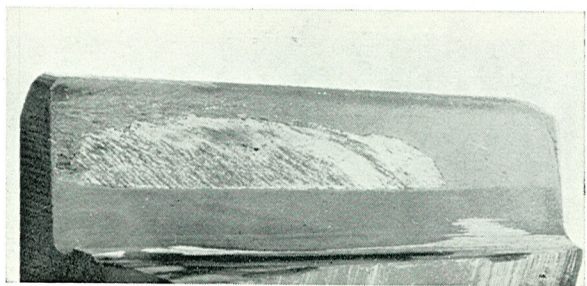


Fig. 4-102. Gear seizing

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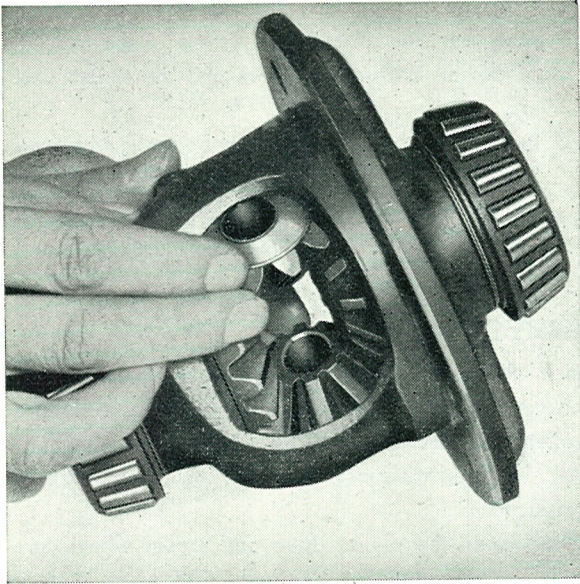


Fig. 4-103. Fitting the differential gear

Also check to see whether the cylindrical part of the flange which goes into the oil seal is worn or scratched. If so, replace the flange together with the oil seal.

The pinion nut is provided with a slit for locking. In time this slit loses its locking effectiveness. For this reason, the nut should be replaced if it has been removed a couple of times. The washer under the nut should also be replaced if it has become deformed.

Check the oil seals and replace them if they are damaged or worn.

Make sure that there are no cracks in the rear axle casing. Check that the brackets for the support arms and track rod are intact.

ASSEMBLING

The greatest cleanliness should be observed when assembling and adjusting final drives. Dirt in a tapered roller bearing can result in completely inaccurate measurement values.

On measuring the bearing clearance or pre-loading, the bearing should be oiled and rotated several turns loaded.

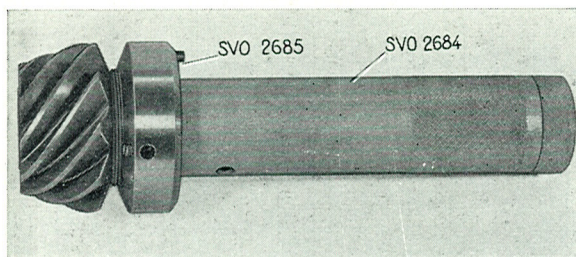


Fig. 104. Adjusting ring and tool for piston location

ASSEMBLING THE DIFFERENTIAL

1. Place the differential side gears and the thrust washers in the differential carrier. Then "roll" in the differential pinions both simultaneously with the dished thrust washers, see Fig. 4-103.
2. Insert the thrust block and drive in the shaft.
3. Check the differential unit. If the gear play has not been measured, check it according to the instructions given under the heading "Inspecting". If oversize washers are fitted, this can be checked by turning the gears one turn. The requisite torque should not exceed 1 kgm (7.0 lb.ft.). The tool for marking this check can be easily made from a shortened drive shaft which is adapted to a suitable torque wrench. After the checking and any replacement of the thrust washers, fit the lock pin.
4. Fit the crown wheel. Make sure that the contact surfaces are clean and without burr. Tighten the bolts. The tightening torque is 6.5—8.5 kgm (47—72 lb.ft.)

NOTE. Always use new bolts for those gears where the bolts are locked only by means of friction in the thread and the contact surface of the screw head. To achieve the effect intended, the bolts are tightened to their limits. A certain permanent elasticity is thereby obtained in the bolt which becomes distorted for further fitting.

FITTING THE PINION

1. Clean the marking surface on the pinion with extremely fine emery cloth. Fit the adjusting ring SVO 2685 and tool SVO 2684 on the pinion, see

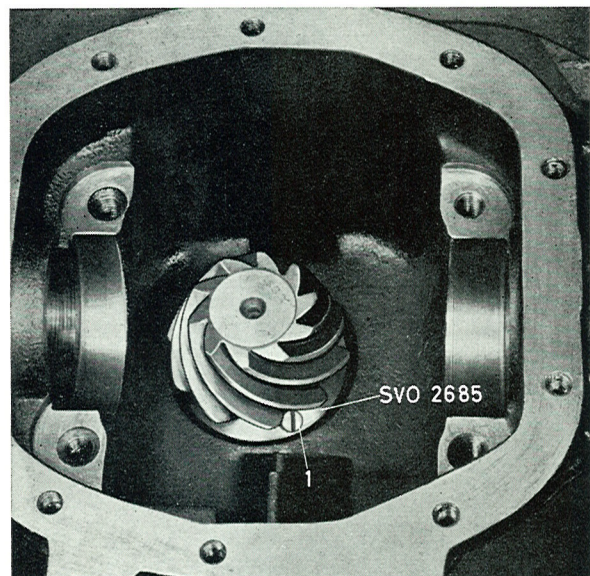


Fig. 4-105. Locating the pinion with adjusting tool

1. Lock screw

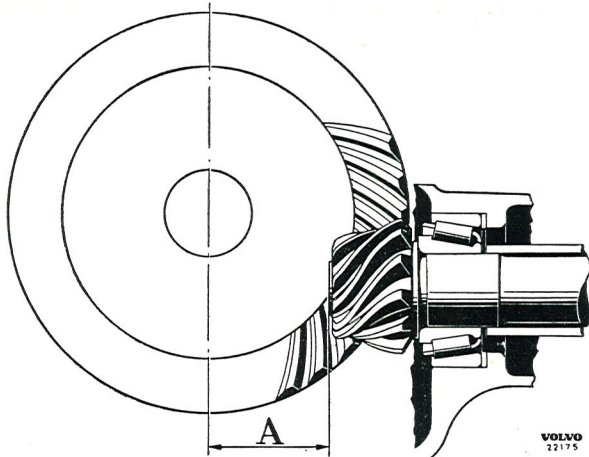


Fig. 4-106. Pinion location
A Nominal measurement = 2.55"

Fig. 4-104. Place the pinion in the carrier so that the bolt on the adjusting ring faces the larger side of the carrier, see Fig. 4-105.

- The pinion should have a certain nominal measurement (A, Fig. 4-106) to the centre line of the crown wheel. Due to tolerances in the manufacturing, there are deviations from the nominal measurement.

This is indicated on the ground surfaces on the pinion with a figure. Here there is an important difference between Volvo-manufactured and other types of rear axles.

On final drive units made by Volvo, the surface is generally ground down 0.30 (0.012") so that the deviation is always indicated by plus tolerance and in hundredths of a millimetre. The plus sign is excluded. On other final drive units, the deviation is indicated in thousandths of an inch and with plus or minus sign. If there is a plus sign in front of the figure, the nominal measurement is to be increased and, in the case of a minus sign, the nominal measurement is to be decreased.

To check the location of the pinion, use a dial indicator, indicator retainer SVO 2284 and a

measuring tool SVO 2393, which consists of two parts: a pinion gauge and an adjuster fixture.

The check is carried out in the following way: Place the pinion on the ground surface of the

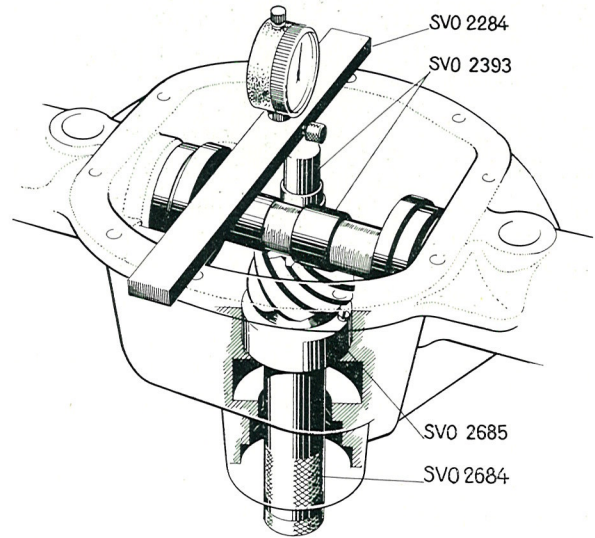


Fig. 4-107. Locating the measuring tools

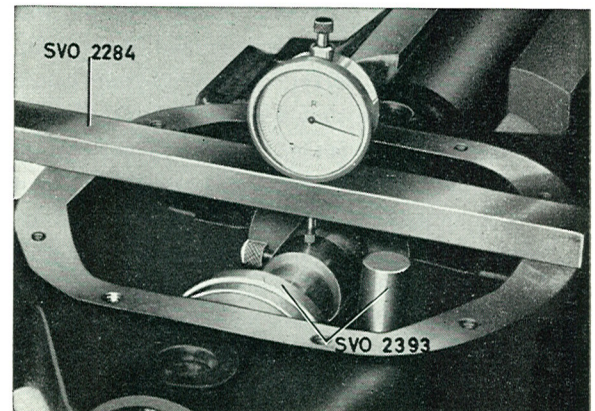


Fig. 4-108. Zero-setting the indicator

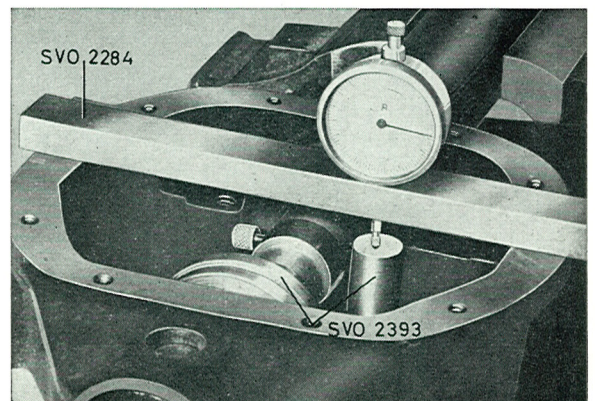


Fig. 4-109. Measuring the pinion location

Conversion table, inches to millimetres	
inches	millimetres
0.001	0.025
0.002	0.051
0.003	0.076
0.004	0.102
0.005	0.127
0.006	0.152
0.007	0.178
0.008	0.203
0.009	0.229

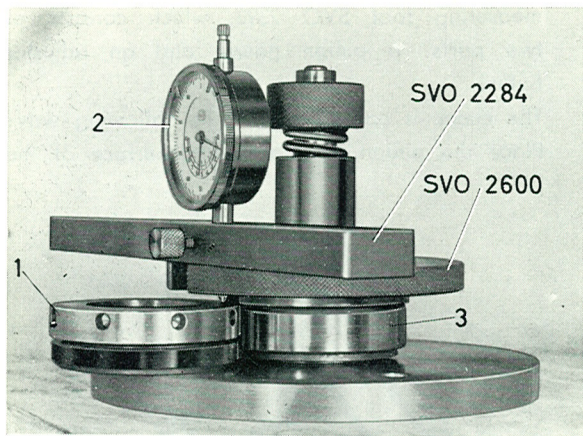


Fig. 4-110. Determining the shim thickness

1. Adjusting ring 2. Dial indicator 3. Bearing, complete

pinion and the adjusting jig in the differential bearing position as shown in Fig. 4-106. Place the indicator retainer on the drive pinion carrier and zero-set the gauge against the adjusting jig, see Fig. 4-108. Then move the indicator retainer over so that the indicator comes against the pinion gauges, see Fig. 4-109.

If a Volvo final drive unit is fitted and the pinion is, for example, marked 33, the pinion gauge should lie 0.33 mm (0.013") under the adjuster fixture. Concerning the other final drive units, if the pinion is marked O, the adjuster fixture and pinion gauge should be at the same height; if the pinion is marked —, the pinion gauge should be higher than the adjuster fixture; and if it is marked +, the pinion gauge should be lower than the adjuster fixture with correct setting. The setting is adjusted by turning the cam on the pinion until the gauge dial shows the correct value. Then lock the adjusting ring with the lock screw. Remove the measuring tool and pinion.

3. Place the complete rear pinion bearing with the

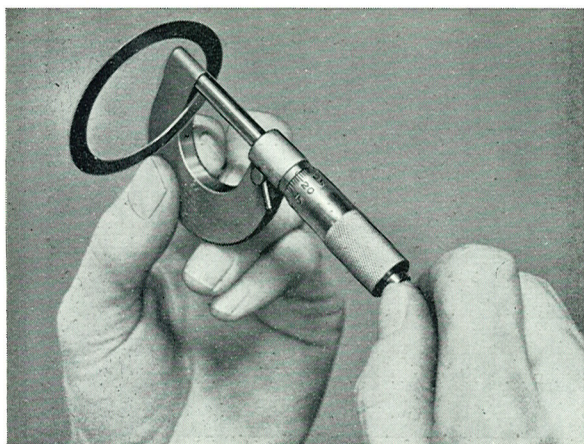


Fig. 4-111. Measuring the shims

outer ring in measuring fixture SVO 2600. Put on the plate, spring and nut. Turn the nut with the flat side facing upwards. The plate, and thereby the bearing, is turned forwards and backwards several times so that the rollers take up the correct position. Place the adjusting ring in the measuring fixture as shown in Fig. 4-110. Use retainer SVO 2284 and dial indicator, place the measuring point of the indicator opposite the adjusting ring and zero-set the indicator. Then set the pointer of the indicator to the outer ring of the bearing. The dial indicator now shows directly the thickness the shims should have. Measure shims for the correct thickness with a micrometer, see Fig. 4-111. N.B. It is almost impossible to obtain a shim with exactly the correct thickness. However, they must not be 0.03 mm (0.0012") thicker than the measured value, but up to 0.05 mm (0.002") thinner.

4. Press the rear bearing on the pinion with sleeve SVO 2395, see Fig. 4-112. N.B. The washer under the rear bearing inner ring on a Volvo final drive must **not** be fitted when reconditioning. Place on the measured shims and press in both the outer rings of the bearings with tool SVO 2686, see Fig. 4-113.
5. Insert the pinion in the casing and fit on three 0.75 mm (0.03") thick shims and the front pinion bearing. Fit tool SVO 2404 and press tool SVO 1845 on the front end of the pinion and pull in

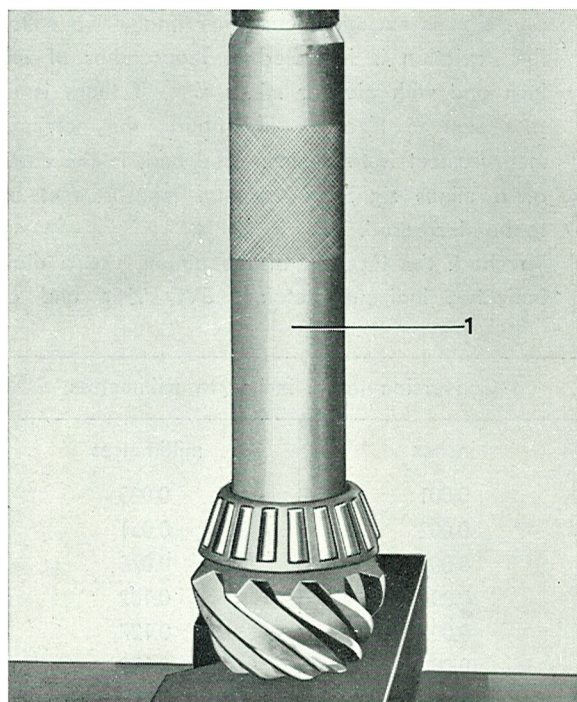


Fig. 4-112. Fitting the rear pinion bearing

1. Fitting sleeve SVO 2395

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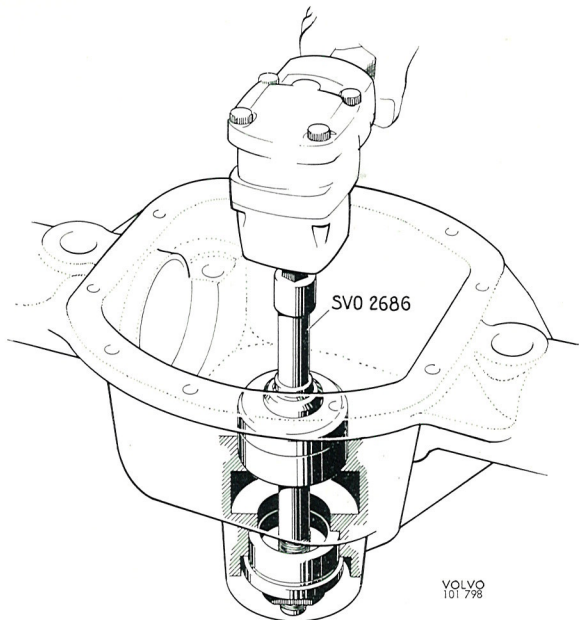


Fig. 4-113. Fitting the bearing races

the pinion, see Fig. 4-114. Use the nut tightener until it presses the pinion forwards so that it does not strike the bearing positions.

6. Replace press tool SVO 1845 with washer and nut. Tighten the nut to a tightening torque of 28—30 kgm (200—220 lb.ft.) Fit on the pinion gauge and the dial indicator retainer. Pull down the pinion while turning it forwards and backwards at the same time. Zero-set the indicator. Then press the pinion upwards, turning it at the same time forwards and backwards. Read off the clearance.

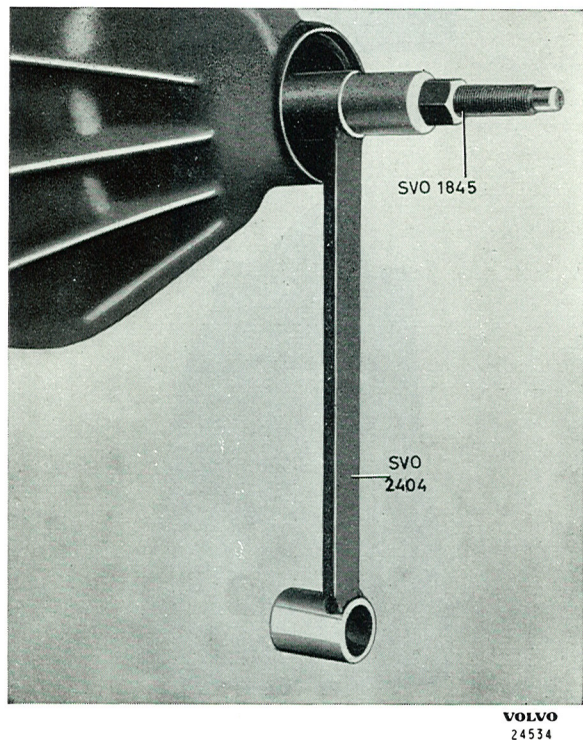


Fig. 4-114. Fitting the pinion

7. Remove the pinion. Remove the shims corresponding to the measured clearance + 0.07 mm (0.003"). Fit on the pinion.
8. Then check the pinion bearing fit with the torque gauge. The torque gauge should show 6—11 kgcm (5.20—9.55 lb. in.) for used bearings, and 11—23 kgcm (9.55—20 lb. in.) for new bearings when the pinion rotates. On new final drive units, stresses can be higher due to another type of installation method. In other words, there is no fault. Often an alteration in the thickness of the shims is required because of the tolerances which must be present.
9. Check the location of the pinion with the dial indicator, retainer SVO 2284 and measuring tool SVO 2393, see also point 2.

FITTING THE DIFFERENTIAL

1. Lubricate the inside of the adjusting rings SVO 2595 and put them on the differential carrier. The ring with the black-oxidized adjusting ring should be placed on the crown wheel side. Also lubricate the bearing location in the carrier. Place the differential carrier and the adjusting rings in the final drive housing, see Fig. 4-115. Use the dial indicator and adjust in the rings so that the correct backlash 0.15 mm (0.006") is obtained. The tooth flank clearance may vary between 0.13 mm (0.005") and 0.20 mm (0.008"), but should be kept as near 0.15 mm (0.006") as possible. Tighten the lock screws in the adjusting rings.
2. Fit on brake tool SVO 2597 as shown in Fig. 4-116. Mark with colour several teeth at three points on the crown wheel. This can act as a check for possible crown wheel warping. Rotate the pinion 10—12 turns in both directions and check the contact marking pattern. At the correct tooth contact, the contact marking pattern should be horizontally in the middle of the tooth but some-

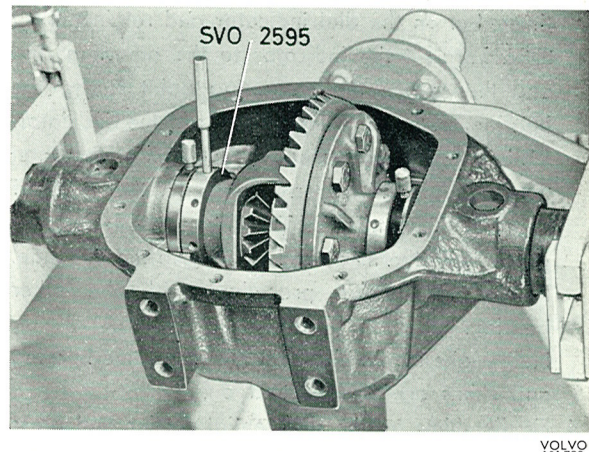


Fig. 4-115. Adjusting rings for differential

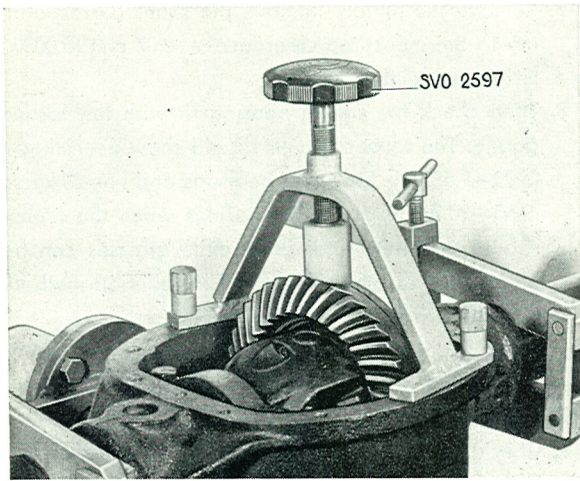


Fig. 4-116. Brake tool for differential

what nearer to the toe than the heel. The pattern on the reverse side and driving side should coincide with each other. See Fig. 4-117. If the patterns do not coincide, the location of the pinion must be adjusted before assembling is continued. If the patterns lie too far towards the heel on the driving side and too far towards the toe on the reverse side, see Fig. 4-118, the pinion should be moved inwards.

If the contact patterns lie too far towards the toe on the driving side and too far towards the heel on the reverse side, see Fig. 4-119, the pinion should be moved outwards. Note that the patterns will lie somewhat nearer the toe when the adjusting rings are fitted than when the bearings are fitted.

3. When the correct backlash and contact pattern are obtained, remove the differential and adjusting ring. Then place the centre washer on the measuring fixture. Fit a bearing into the measuring fixture, likewise the plate, spring and nut. Fit the nut with the flat side facing downwards. Rotate the plate forwards and backwards several times. Put on the dial indicator and retainer SVO 2284. Zero-set the indicator to the adjusting ring and then place the measuring point facing the bearing, see Fig. 4-110. Read off the indicator. With a micrometer measure the shims, the total thickness of which corresponds to the read-off value + 0.07 mm (0.003"). Place the shims together with the measured bearing to the one side. Repeat the above procedure with the other bearing.

N. B. Make sure which side the respective bearing and shims are to be fitted on.

4. Fit the shims on the differential carrier and press on the bearings. For this purpose use drift SVO

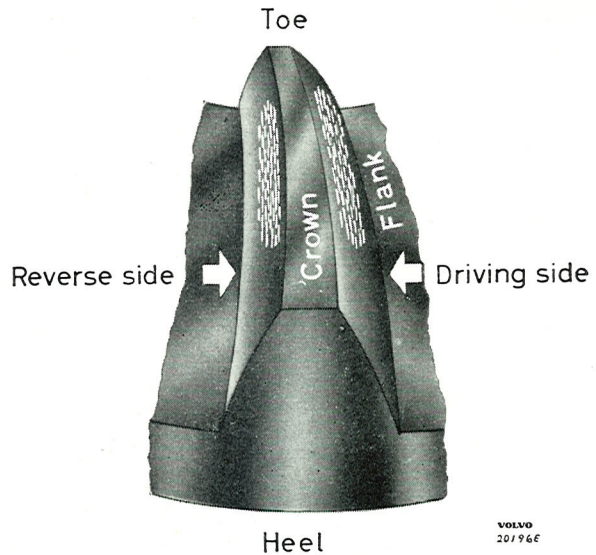


Fig. 4-117. Correct tooth contact

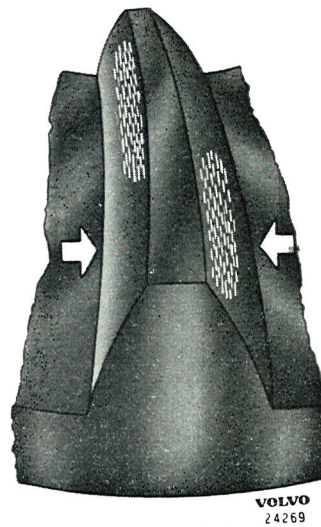


Fig. 4-118. Faulty tooth contact

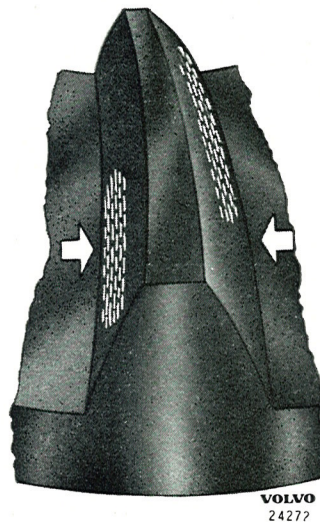


Fig. 4-119. Faulty tooth contact

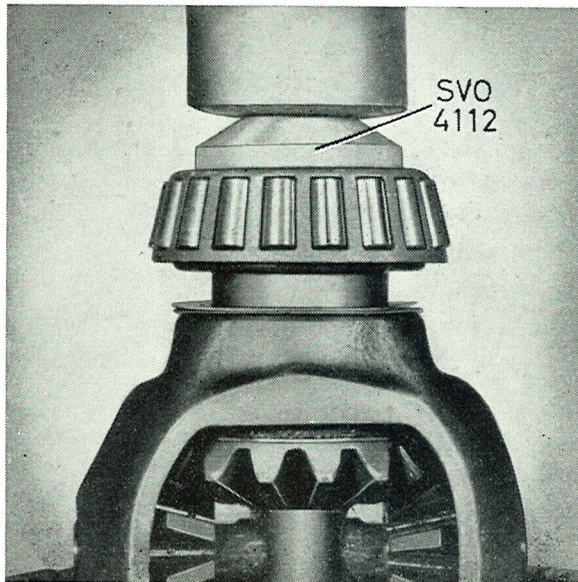


Fig. 4-120. Fitting the differential bearings

4112, see Fig. 4-120. When fitting the second bearing, use drift SVO 2599 as a cushioning ring so as not to damage the first bearing already pressed on.

5. Fit tool SVO 2394 on the drive pinion carrier, see Fig. 4-95. Expand the tool until the pins are exactly flush against the hole edges in the carrier and then tighten the screws a further 3—3½ turns. Fit the differential and outer rings. Remove tool SVO 2394. Fit the cap and tighten the bolts to a torque of 5.0—7.0 kgm (36—50 lb.ft.).
6. Check the backlash and the contact marking patterns.

ASSEMBLING THE REAR AXLE

1. Remove spanner SVO 2404. Fit the oil slinger. Smear the oil seal lips with grease. Lubricate the spring coil also with grease to prevent it from jumping out during fitting. Then fit the oil seal with drift SVO 2806. Press on the flange with the help of tool SVO 1845, see Fig. 4-114. Fit the washer and nut. Tighten the nut to a tightening torque of 28—30 kgm (200—220 lb.ft.).
2. Fit the inspection cover and gasket.
3. If the inner oil seals for the drive shaft are not fitted, drive them in with drift SVO 2712, see Fig. 4-85.
4. Fill the bearing well with a high-class multi-purpose grease and then fit the drive shaft, the brake backing plate and brake shoe retainers. After the fitting, the entire space between the oil seals should be filled with grease, see Fig. 4-86. Check the end play, which should be 0.05—0.13 mm (0.002—0.005") with a dial indicator and retainer

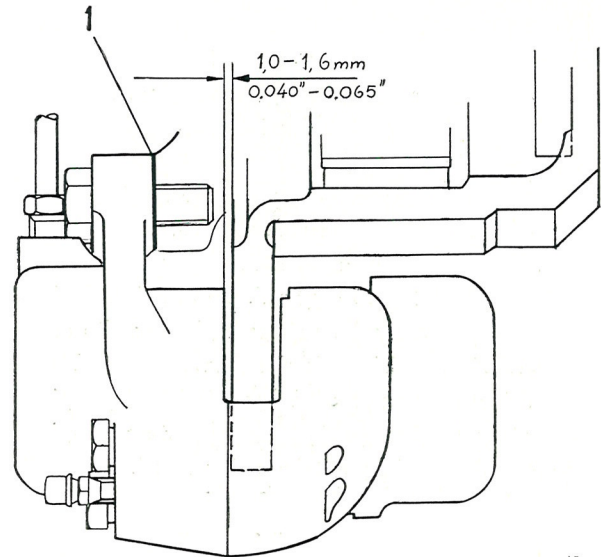


Fig. 4-121. Clearance between brake caliper and disc
1. Shim

SVO 2737, see Fig. 4-89. When making this check, first press out the outer rings in their bearings with the help of the impact hammer on SVO 2709. Adjust if necessary. To do this use tool SVO 2708, see Fig. 4-88. Lock the adjusting nut with a suitable tab.

5. Fit the brake discs and the brake calipers. N.B. There should be a clearance of 1.0—1.6 mm (0.040"—0.065") between the inner edge of the brake disc and the inner edge of the brake caliper. On the right-hand side, this clearance is altered by adjusting the axial play of the drive shaft. The clearance should, therefore, be checked and, if necessary, adjusted when working with the drive shaft on the right-hand side. The clearance is adjusted with shims, see Fig. 4-121, which are available in thicknesses of 0.6, 1.2 and 1.8 mm (0.024, 0.048 and 0.072"). On the left-hand side the correct clearance is obtained without shims. Fit the brake pipes.

FITTING THE REAR AXLE

1. Place the rear axle on fixture SVO 2714, which is mounted on a garage jack, see Fig. 4-122. Move the rear axle in under the vehicle and fit on the bolts for the support arms and torque rods.
2. Raise the jack until the track bar attachment on the rear axle is at the same level with the attachment on the body. Fit the track rod.
3. Fit the attaching bolts for the spring. Tighten the nuts for the torque rods and support arms.
4. Fit bracket, union and brake hoses. Fit the universal joint to the flange.

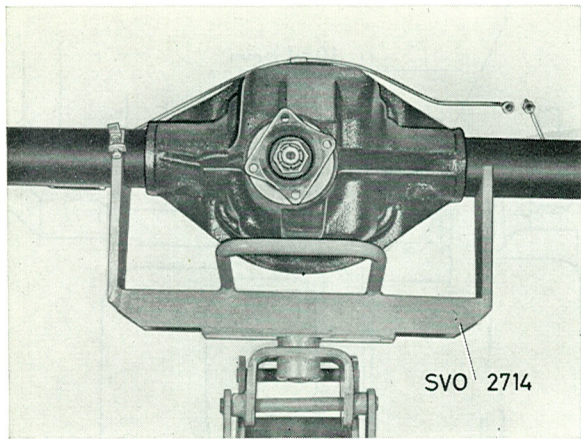


Fig. 4-122. Fixture for rear axle

5. Fit the upper bolt for the shock absorbers. Fit the handbrake wire in the brackets and at the levers. Adjust the handbrake and vent the brake, see Part 5.
6. Fit on the wheels and wheel nuts. Lower the vehicle. Tighten the wheel nuts to a tightening torque of 10—14 kgm (70—100 lb.ft.). Fill with oil. Use only hypoid oil.

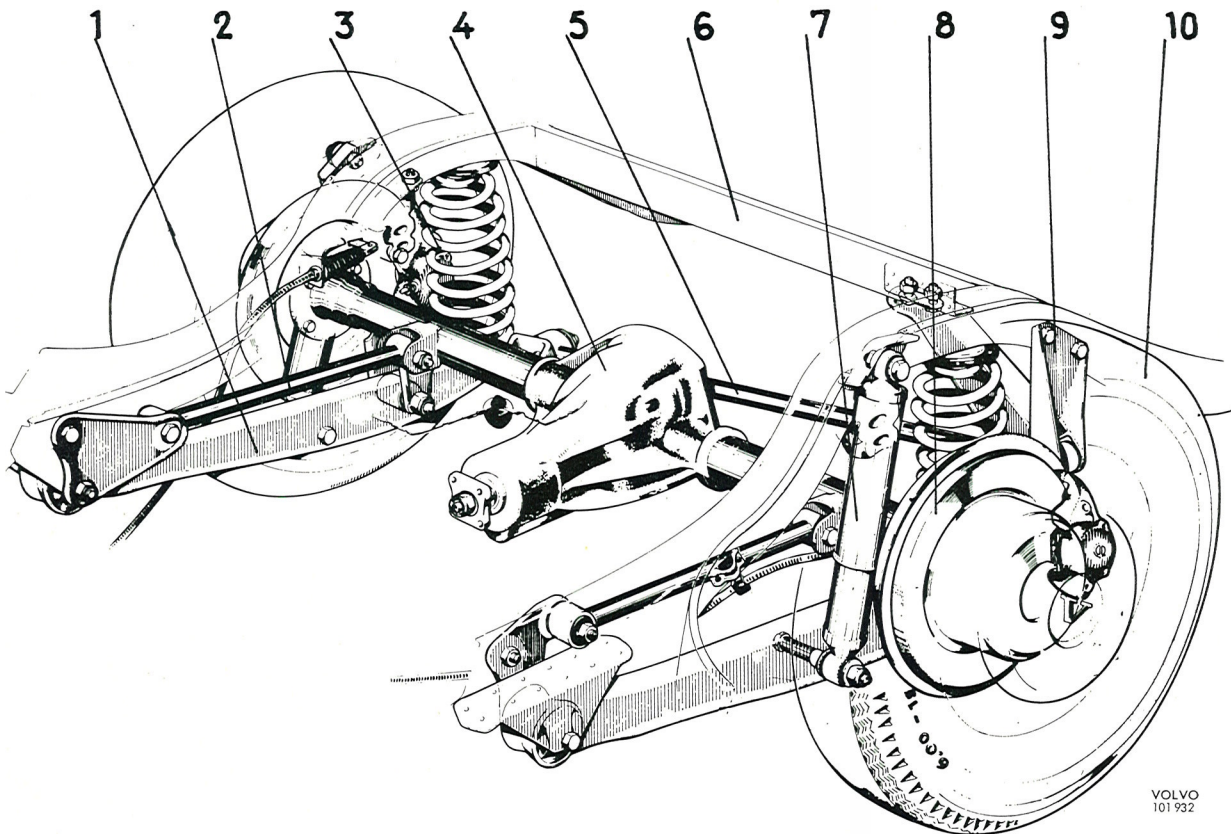


Fig. 4-123. Rear axle with suspension

- | | |
|----------------|--------------------------|
| 1. Support arm | 6. Member system in body |
| 2. Torque rod | 7. Shock absorber |
| 3. Spring | 8. Disc brake |
| 4. Rear axle | 9. Bracket for track rod |
| 5. Track rod | 10. Wheel |

1. Flywheel casing
2. Clutch cover
3. Clutch plate
4. Flywheel
5. Crankshaft
6. Support bearing in crankshaft
7. Circlip
8. Adjusting nuts
9. Return spring
10. Release fork
11. Dust cover
12. Release bearing
13. Clutch plate shaft (input shaft gearbox)
14. Cover, gearbox
15. Support rings
16. Thrust spring
17. Pressure plate
18. Retainer
19. Clutch wire
20. Washer
21. Rubber bush
22. Washer
23. Nut
24. Pedal stop
25. Rubber sleeve
26. Bracket
27. Screw for pedal shaft
28. Return spring
29. Clutch pedal

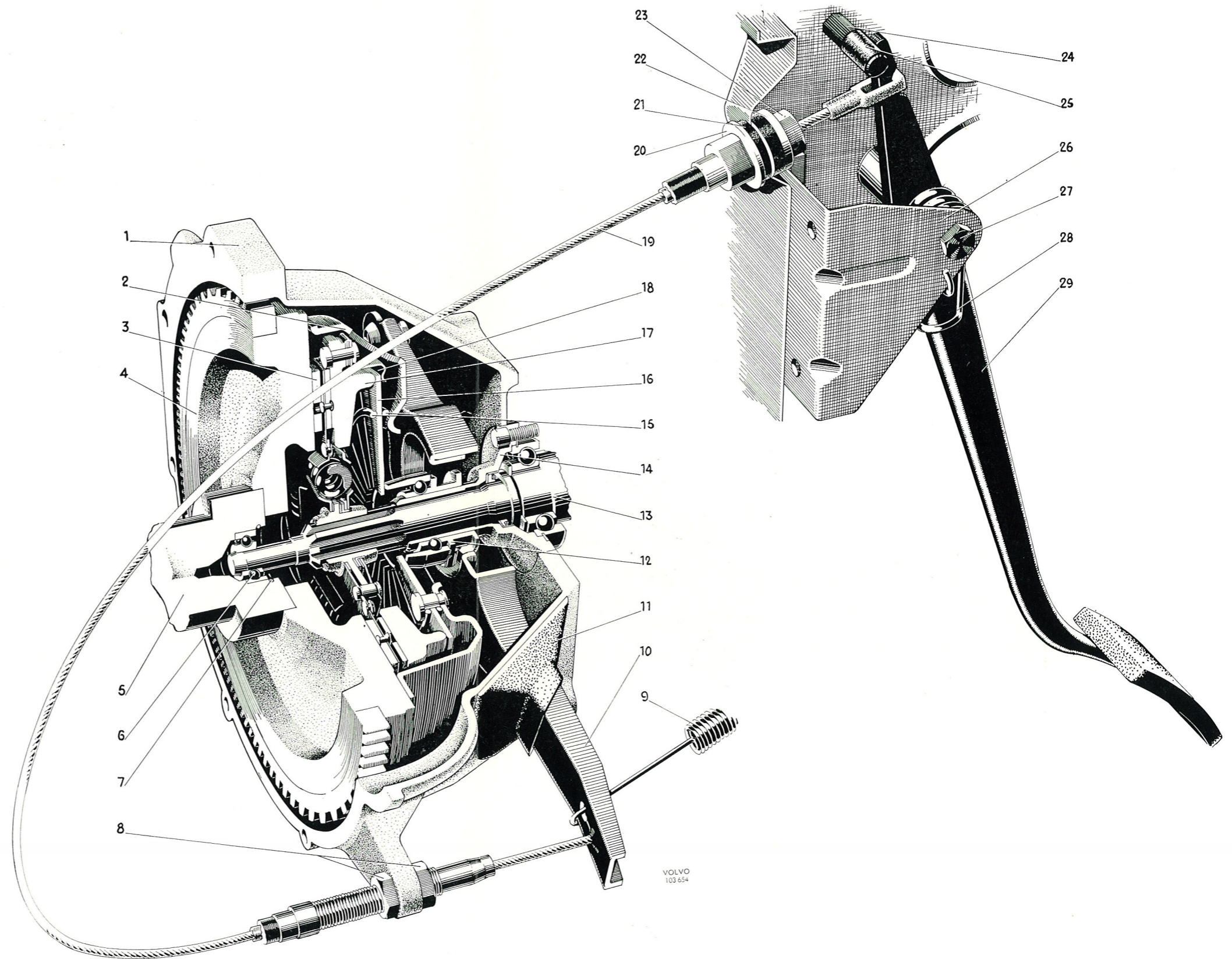


Illustration 4-A. Clutch and clutch controls

1. Flange
2. Oil seal
3. Speedometer worm gear
4. Rear cover
5. Venting nipple
6. Ball bearing
7. Striker ("X-ray" view)
8. End casing
9. Selector fork, 1st and 2nd speeds
10. Striker
11. Gear lever
12. Cover
13. Washer
14. Spring
15. Cover
16. Sliding plate
17. Spring
18. Sleeve (reverse catch)
19. Sleeve
20. Spring
21. Engaging spring
22. Engaging sleeve and gear wheel for reverse
23. Synchronizing cone
24. Bush
25. Gear wheel for 2nd speed
26. Thrust washer
27. Circlip
28. Thrust washer
29. Gear wheel for 3rd speed
30. Bush
31. Selector fork, 3rd and 4th speeds
32. Mainshaft
33. Synchronizing hub
34. Engaging spring
35. Spring
36. Interlock ball
37. Selector rail for 3rd and 4th speeds
38. Selector rail for 1st and 2nd speeds
39. Selector rail for reverse
40. Engaging sleeve
41. Snap ring
42. Synchronizing cone
43. Ball bearing
44. Roller bearing
45. Oil seal
46. Front cover
47. Input shaft
48. Spacing washer
49. Thrust washer
50. Housing
51. Needle bearing
52. Spacing washer
53. Countershaft
54. Idler gear
55. Reverse shaft
56. Reverse gear
57. Bush
58. Striker lever ("X-ray" view)
59. Bush
60. Gear wheel for 1st speed
61. Thrust washer

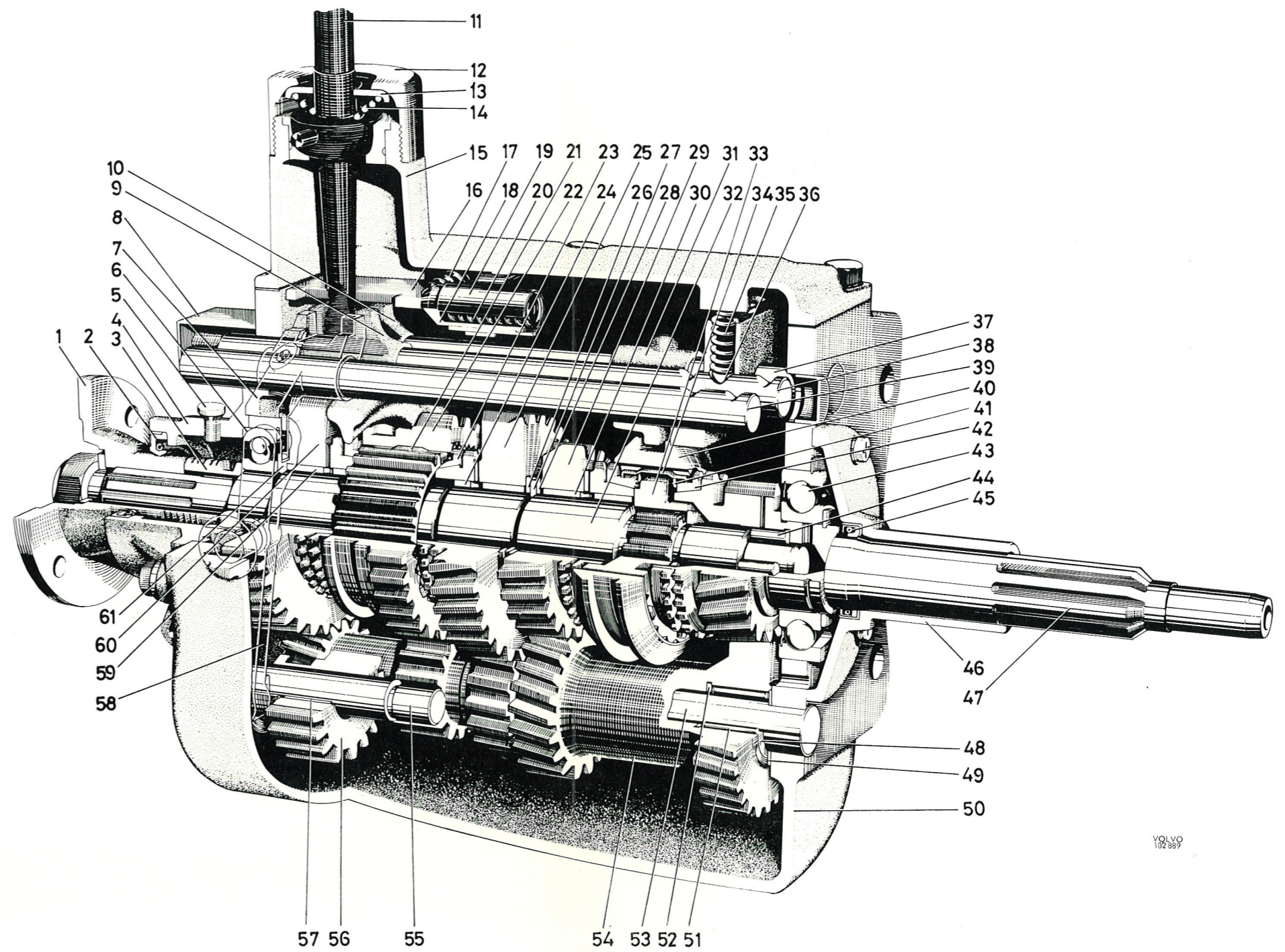


Illustration 4-B. Gearbox M40

- | | |
|-----------------------------|-------------------------------|
| 1. Nut | 56. Washer |
| 2. Lock washer | 57. O-ring |
| 3. Bridge piece | 58. Cylinder |
| 5. Breather | 59. O-ring |
| 6. Front casing | 60. Plug |
| 7. Gasket | 61. Spring |
| 8. Brake ring | 62. Ball |
| 9. O-ring | 63. Non-return body |
| 10. O-ring | 64. O-ring |
| 11. Seal | 65. Pump body |
| 12. Gasket | 66. Pump plunger |
| 13. Solenoid | 67. Washer (2) |
| 14. Bolt | 68. Fine filter |
| 15. Thrust bearing retainer | 69. Seal |
| 16. Spring | 70. Plug |
| 17. Ball bearing | 71. Data plate |
| 18. Circlip | 72. Screw |
| 19. Circlip | 73. Planet gear and carrier |
| 20. Circlip | 74. Sunwheel |
| 21. Stud | 75. Clutch sliding member |
| 22. Piston seal | 76. Pre-filter |
| 23. Piston | 77. Gasket |
| 24. Connecting rod | 78. Magnet |
| 25. Non-return ball | 79. Base plate |
| 26. Non-return valve spring | 80. Bolt |
| 27. Plug | 81. Resilient washer |
| 28. Key | 84. Bush |
| 29. Resilient ring | 85. Thrust washer |
| 30. Circlip | 86. Oil thrower |
| 31. Eccentric | 87. Circlip |
| 32. Piston pin | 88. Uni-directional clutch |
| 33. Gasket | 89. Stud |
| 36. Stud | 90. Resilient washer |
| 37. Orifice nozzle | 91. Nut |
| 38. Seal | 95. Speedometer pinion |
| 39. Plug | 96. O-ring |
| 40. O-ring | 97. Bush |
| 41. End piece | 99. Bolt |
| 42. Piston | 100. Retainer |
| 43. Washer | 101. Oil seal |
| 44. Spring | 102. Stud |
| 45. Retainer | 106. Speedometer driving gear |
| 46. Spring | 110. Output shaft |
| 47. Screw | 111. Ball bearing |
| 48. Screw | 112. Spacer |
| 49. Holder | 113. Rear casing |
| 50. Spring | 114. Ball bearing |
| 51. O-ring | 115. Oil seal |
| 52. Plug | 116. Flange |
| 53. Nut | 117. Washer |
| 54. Piston | 118. Nut |
| 55. Spring | |

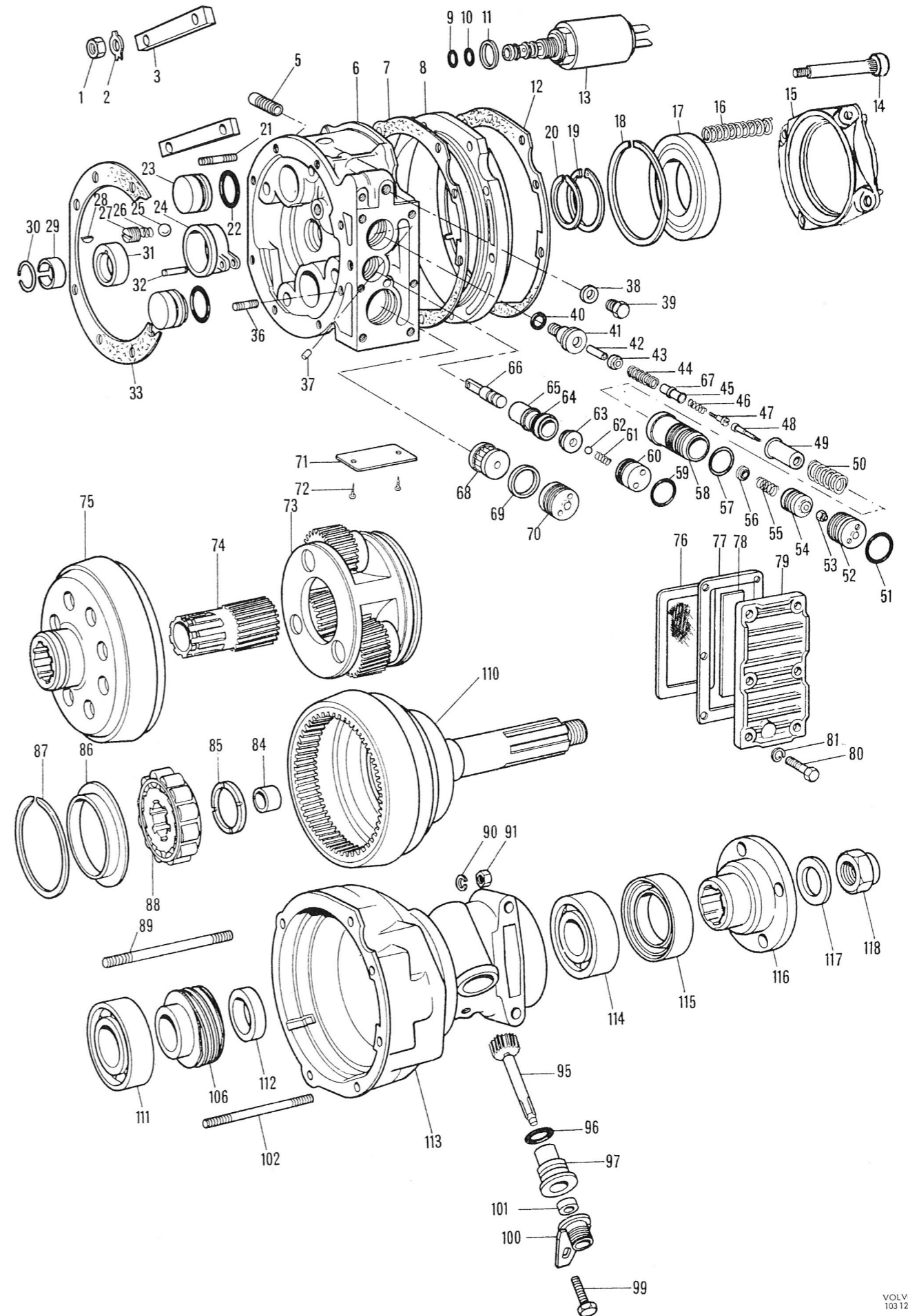


Illustration 4-C. Overdrive

1. Tubular shaft
2. Differential carrier bearing
3. Bearing cap
4. Shims
5. Differential carrier
6. Thrust washer
7. Differential side gear
8. Lock pin
9. Differential pinion
10. Crown wheel
11. Shaft
12. Thrust washer
13. Rear axle casing
14. Flange
15. Dust cover plate
16. Oil slinger
17. Oil seal
18. Shims
19. Front pinion bearing
20. Pinion
21. Rear pinion bearing
22. Shims

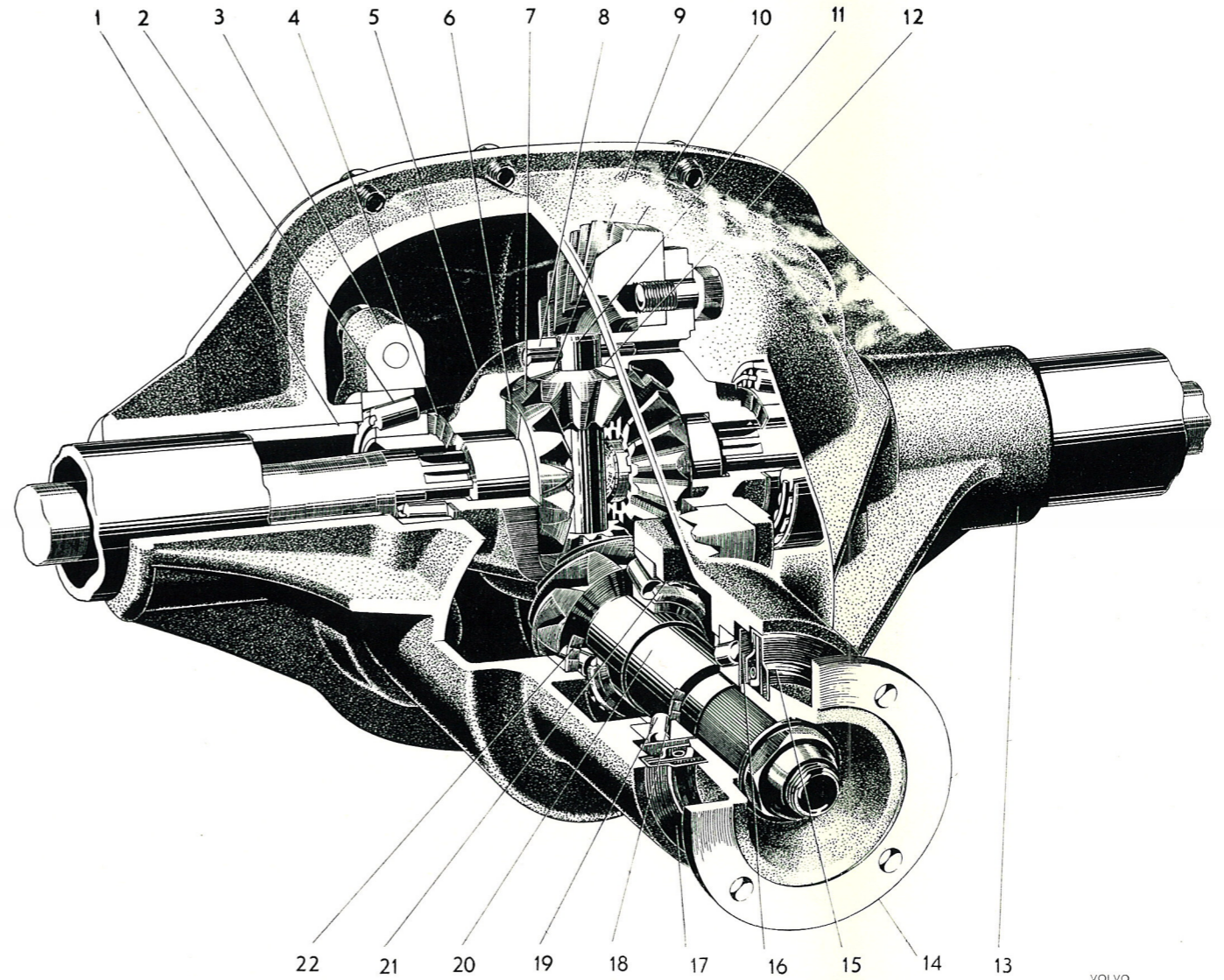


Illustration 4-D. Final drive