



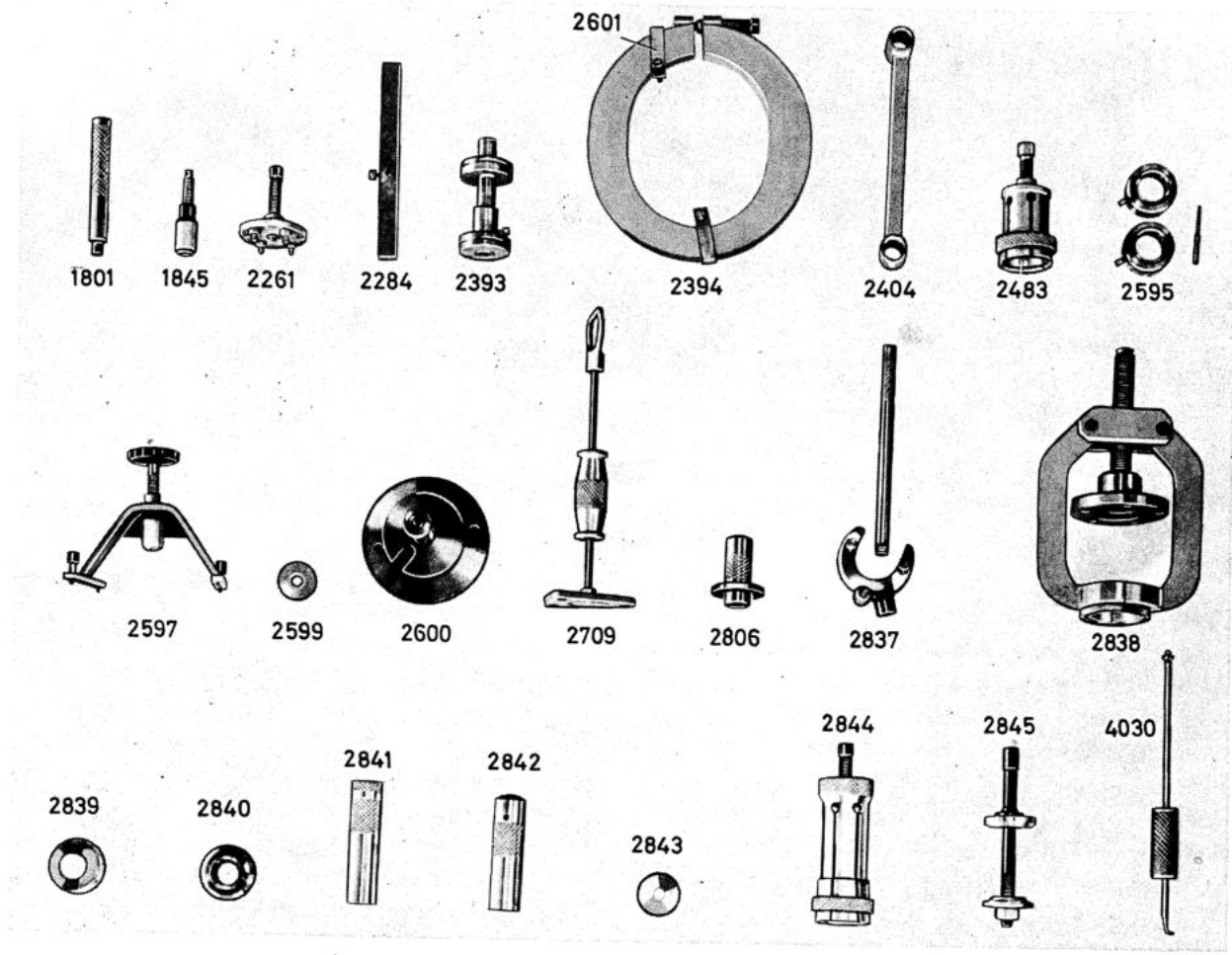
# **SERVICE MANUAL**

**VOLVO 164 1971**

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**GROUP 46**  
**REAR AXLE**  
**TOOLS**

The following tools are used for repair work on the rear axle



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**Fig. 4-131. Special tools for the rear axle**

- SVO 1801 Standard handle 18×200 mm
- SVO 1845 Press tool for fitting flange
- SVO 2261 Puller for flange
- SVO 2284 Retainer for dial indicator for final drive adjustment
- SVO 2393 Measuring tool for pinion adjustment
- SVO 2394 Expander tool used for removing and fitting differential
- SVO 2404 Tool for fitting front pinion bearing. Used also when checking tooth mesh
- SVO 2483 Puller for differential carrier bearings
- SVO 2520 Stand, see Fig. 4-132
- SVO 2522 Fixture for rear axle (used together with stand SVO 2520 for work on the final drive)
- SVO 2595 Adjusting rings for differential
- SVO 2597 Brake for crown wheel, used when checking tooth mesh
- SVO 2599 Drift for removing outer ring, front pinion bearing
- SVO 2600 Measuring fixture for adjusting rings

- SVO 2601 Holder for expander tool SVO 2394 (fitted on tool)
- SVO 2709 Puller for drive shaft
- SVO 2714 Fixture for rear axle, used on garage jack for removing and fitting rear axle, see Fig. 4-165
- SVO 2806 Tool for fitting oil seal at flange
- SVO 2837 Counterhold for flange
- SVO 2838 Press tool for removing and fitting bearing and lock ring on drive shaft
- SVO 2839 Ring for fitting bearing and lock ring on drive shaft. Used together with SVO 2838
- SVO 2840 Adjusting ring for pinion
- SVO 2841 Box spanner for adjusting ring SVO 2840
- SVO 2842 Sleeve for fitting inner ring, rear pinion bearing
- SVO 2843 Drift for removing outer ring, rear pinion bearing
- SVO 2844 Puller for rear pinion bearing
- SVO 2845 Press tool for fitting outer ring, pinion bearing
- SVO 4030 Puller for oil seal at flange

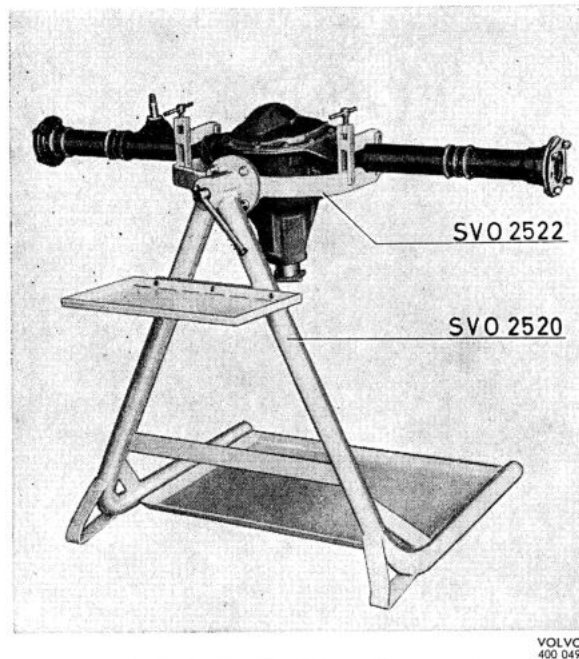


Fig. 4-132. Stand and fixture for rear axle

## DESCRIPTION

The rear axle is carried in two support arms. The supports 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 design of the rear axle is shown in Illustration 4 E.

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 bolted to the differential carrier. The differential gears them-

selves 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 bearings. Application of the pinion bearings is by means of shims under the front pinion bearing inner ring. The outer end of each drive shaft is journalled in a taper roller bearing. Bearing clearance is not adjustable but is determined by the construction of the bearing, see Fig. 4-136. There are oil seals on both sides of the drive shaft bearings.

# REPAIR INSTRUCTIONS

## WORK WHICH CAN BE CARRIED OUT WITH THE REAR AXLE INSTALLED

### REPLACING BEARINGS AND DRIVE SHAFT OIL SEALS

1. Jack up the vehicle and prop up under the rear axle. Remove the wheels.
2. Disconnect the brake pipe from the brake caliper. Slacken the bolts for the brake disc and remove the disc.
3. Slacken the bolts for the thrust washer. These are slackened through the holes in the drive shaft flange. Pull out the drive shaft with puller SVO 2709, see Fig. 4-133.
4. Secure press tool SVO 2838 in a vice. Secure the drive shaft to the spindle plate. Screw in the spindle so that the tool arms can be placed against the bearing, see Fig. 4-134. Screw out the spindle and press off the bearing and lock ring. Remove the oil seal.

5. Fill the space between the seal lips on the new oil with grease. Then place it on the drive shaft. Fit the bearing and lock ring. Turn the bearing correctly, see Fig. 4-136.

N.B. Always use a new lock ring.

- Place fitting ring SVO 2839 against the bearing and the lock ring. Close the tool arms and lock them round the fitting ring, see Fig. 4-135. Press on the bearing and lock ring by screwing in the spindle.
6. Grease the bearing. Then fit the drive shaft. Tighten the bolts for the thrust washer to a torque of 5 kpm (36 lb.ft.). Fit the brake disc and brake caliper. Connect the brake line. Vent and adjust the brakes, see Part 5.
  7. Fit on the wheels and wheel nuts. Lower the vehicle. Tighten the wheel nuts.

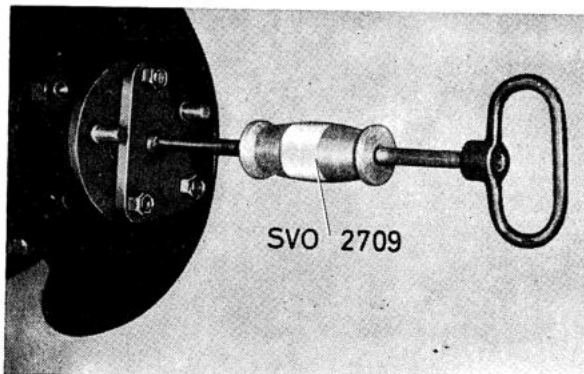


Fig. 4-133. Removing the drive shaft

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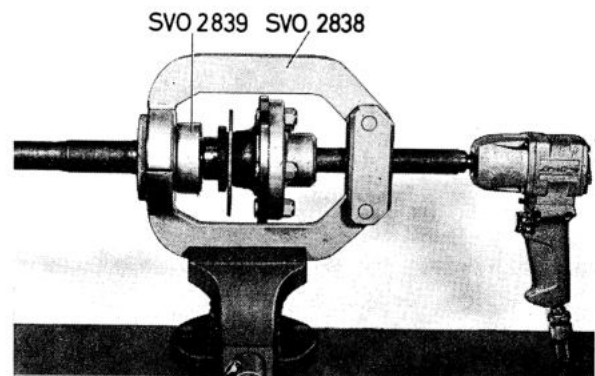


Fig. 4-135. Fitting the drive shaft bearing

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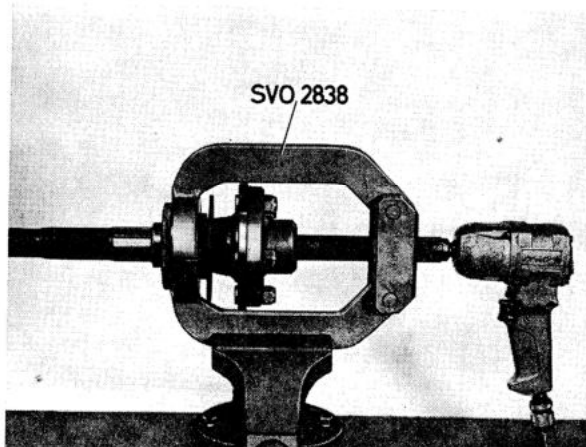


Fig. 4-134. Removing the drive shaft bearing

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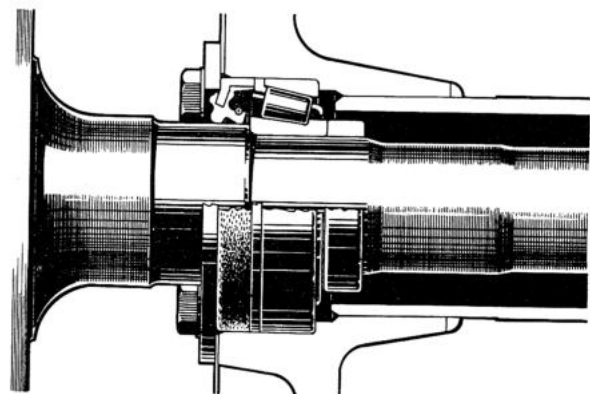


Fig. 4-136. Drive shaft journalling

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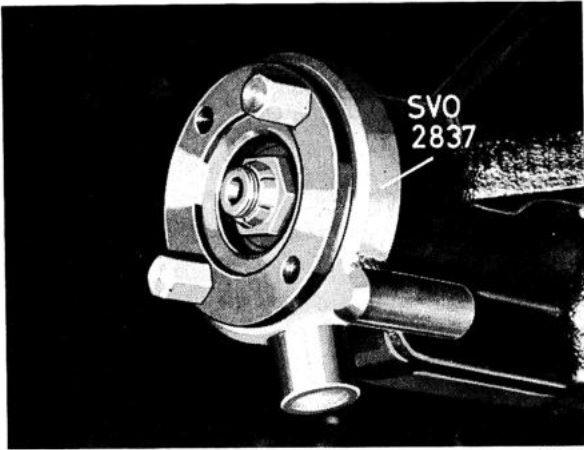


Fig. 4-137. Counterhold for flange

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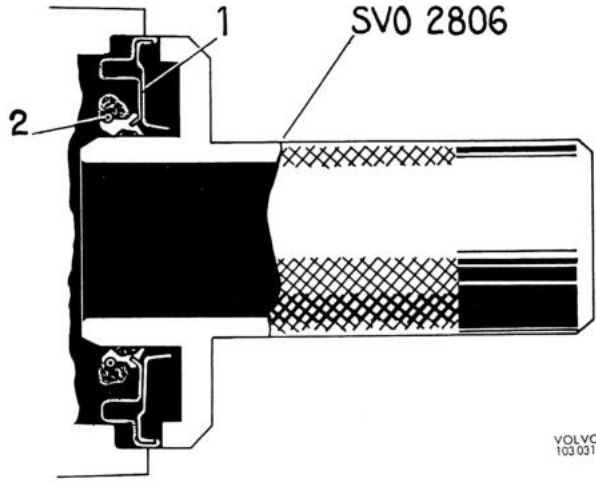


Fig. 4-139. Fitting the oil seal

- 1. Oil seal
- 2. Spring coil with grease coating

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**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 bearings. If there is looseness, this must be remedied before a new oil seal can be fitted. See the instructions under the heading "Assembling".
2. Remove the nut for the flange. Use for this purpose tool SVO 2837, see Fig. 4-137. Pull the flange off with puller SVO 2261, see Fig. 4-138. Pull out the old oil seal with puller SVO 4030.
3. Fit the new oil seal with tool SVO 2806. When fitting the oil seal, lubricate the seal lips with grease. At the same time apply a layer of grease to the spring coil. See Fig. 4-139. This last-mentioned measure is made to prevent the spring coil from jumping out during fitting.
4. Press on the flange with the help of press tool SVO 1845, see Fig. 4-140. Fit the washer and nut.

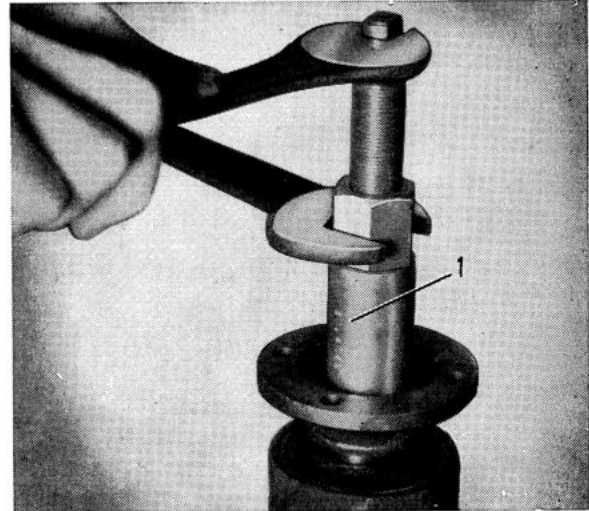


Fig. 4-140. Fitting the flange

- 1. Press tool SVO 1845

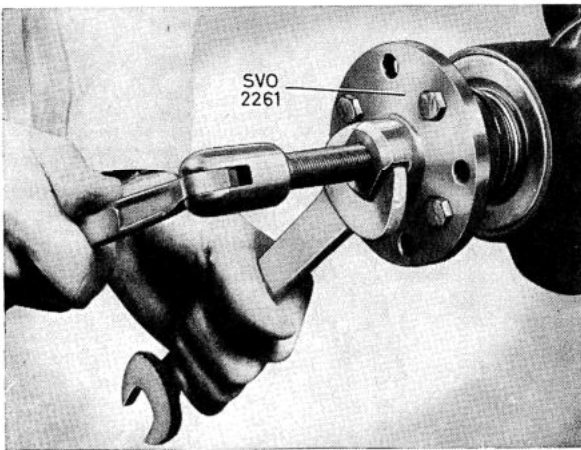


Fig. 4-138. Removing the flange

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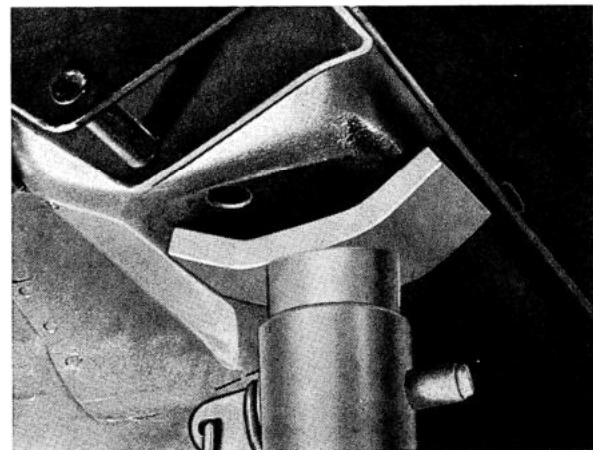


Fig. 4-141. Locating the axle prop

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Tighten the nut to a torque of 28—30 kpm (200—220 lb.ft.).

5. Connect the propeller shaft section.

## REMOVING THE REAR AXLE

1. Place chocks in front of the front wheels. Slacken the rear wheel nuts. Raise the rear end of the vehicle and place an axle prop under in front of the rear jack attachments, see Fig. 4-141. Note that the prop must not be placed at a point further than the dash line indicated in the figure. Take off the rear wheels.
2. Replace the lifting plate on the jack with fixture SVO 2714 (compare with Fig. 4-165) and raise the rear axle slightly. Slacken the upper attaching bolts for the shock absorbers. Disconnect the parking brake wires from the levers and brackets on the brake backing plates. Use for this purpose a spring fixture, see Part 5.
3. Disconnect the propeller shaft section from the flange on the pinion. Remove the brake pipe union from the rear axle casing.
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 springs.
5. Lower the jack until the support arms release from the spring. Slacken the bolts securing the rear axle casing to the support arms. Lower the jack and pull the rear axle forwards.

## DISMANTLING THE REAR AXLE

1. Place the rear axle in fixture SVO 2522. The rear axle is placed with the underside of the drive

facing inwards to the fixture support, when the pinion is pointing downwards. Remove the brake pipes.

2. Release the bolts for the brake backing plates and brake shoe retainers. They are slackened through the holes in the drive shaft flanges. Pull out the drive shafts with puller SVO 2709, see Fig. 4-133.
3. Remove the inspection cover.
4. If the final drive is being reconditioned because of noise, the mesh pattern should be checked before dismantling takes place, as this might assist in locating the fault. Before carrying this out, clean the teeth so that no misleading mesh pattern is obtained.
5. Check the alignment markings on the cap and carrier, see Fig. 4-142. If there are no markings, or if they are difficult to see, mark one side with a punch. Remove the caps.
6. Fit tool SVO 2394 in the holes in the drive pinion carrier as shown in Fig. 4-143. 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. Use tool SVO 2837 as a counterhold for this purpose, see Fig. 4-137. Pull off the flange with puller SVO 2261, see Fig. 4-138. Press out the pinion.
8. Drive out the front pinion bearing, the washer and the oil seal with standard handle SVO 1801 and drift 2599.
9. If necessary, drive out the rear bearing outer ring out of position, see Fig. 4-144. Use standard handle SVO 1801 and drift SVO 2843.
10. Clean the gasket. File off all burr on the surface on which the indicator retainer SVO 2284 is to slide.

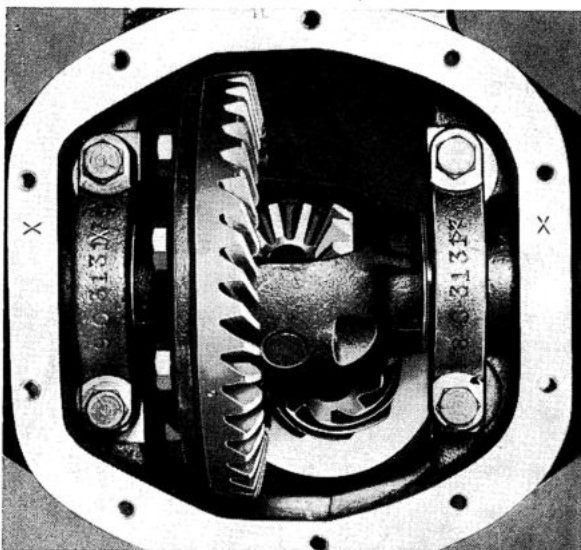


Fig. 4-142. Alignment marking on cap and carrier

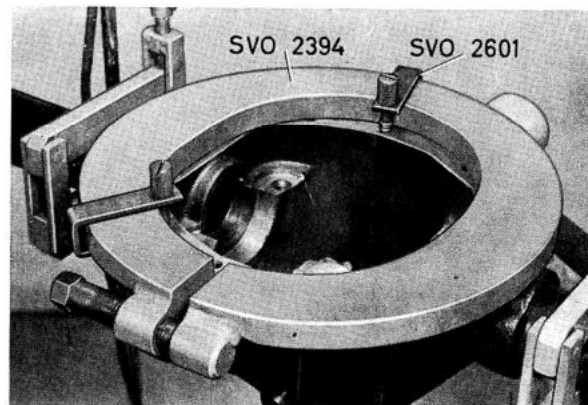
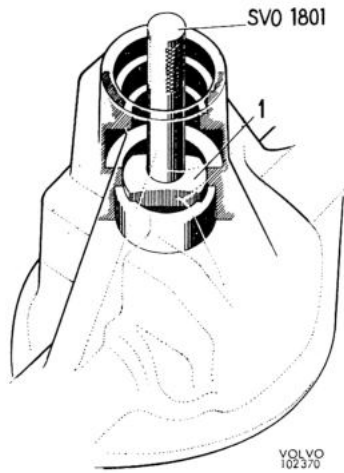
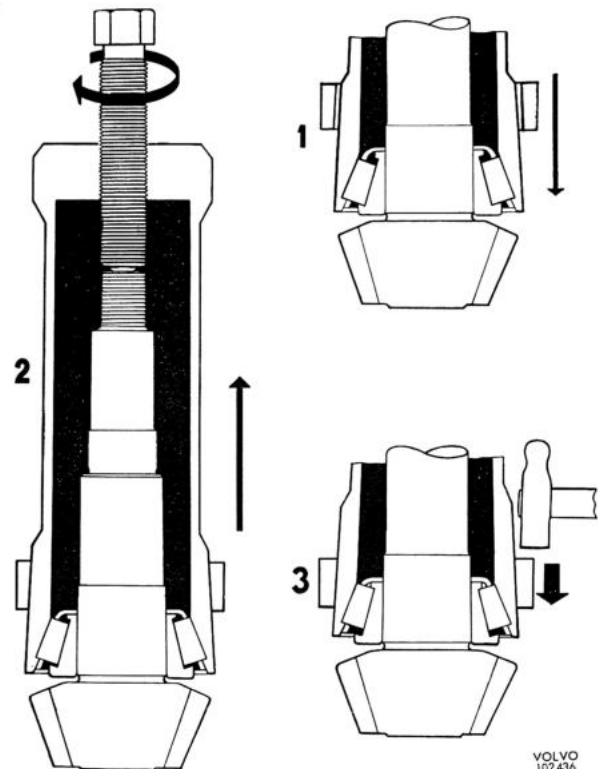


Fig. 4-143. Expanding the drive pinion carrier



**Fig. 4-144. Removing the rear pinion bearing race**  
1. Removing drift SVO 2843

11. If necessary, pull off the rear bearing from the pinion with puller SVO 2844, see Fig. 4-145. The puller is fitted in the following way (see Fig. 4-146): 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. Tap out the lock ring with a hammer.



**Fig. 4-146. Puller fitted**

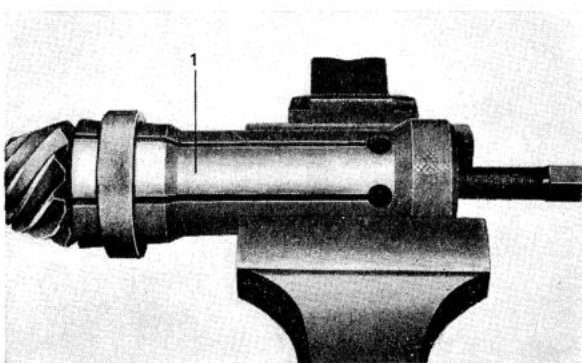
1. Puller is pressed down over the rollers
2. Rollers are pulled up
3. Lock ring knocked securely into position

## DISMANTLING THE DIFFERENTIAL

1. Release the ring gear bolts and remove the crown wheel.
2. Drive out the lock pin, see Fig. 4-147, and then the shaft for the differential gears. Take out the differential gears and the thrust washers.
3. Pull off the differential carrier bearings with puller SVO 2483, see Fig. 4-148. Take care of the shims.

## INSPECTING THE REAR AXLE

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



**Fig. 4-145. Removing the rear pinion bearing**  
1. Puller SVO 2844



**Fig. 4-147. Removing the lock pin**

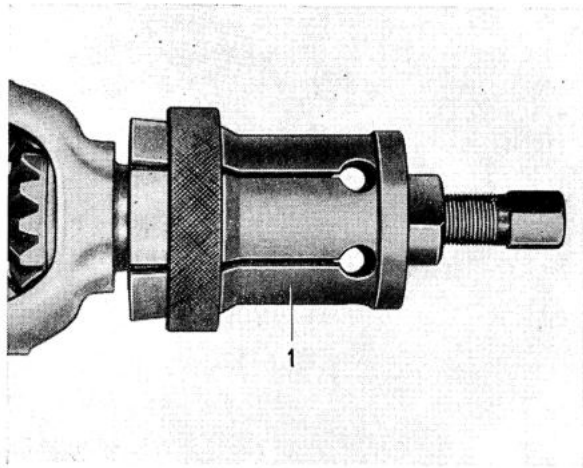


Fig. 4-148. Removing the differential carrier bearings

1. Puller SVO 2483

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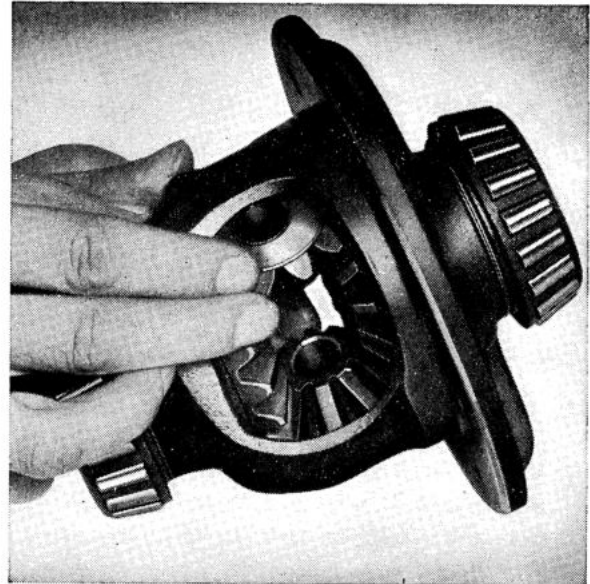


Fig. 4-149. Fitting the differential gear

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damaged bearings and bearing races should be replaced.

Note that both parts of the outer ring for the drive shaft bearings are stuck together with new bearings. This adhesion may loosen after driving for some time, but it does not influence the usability of the bearing. Check both the pinion drive and crown wheel carefully for damage to the teeth. The most damage is seizing gear teeth. This is caused by incorrect running-in, wrong oil, insufficient tooth flank or faulty tooth contact. If the cause of the seizing is not remedied at an early stage, the entire 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 (0.031, 0.034 and 0.038").

Check also to see whether the cylindrical part of the flange which goes into the oil seal is worn or scratched. If this is the case, 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 casing.

Check that the brackets for the support arms and track rod are intact.

Inspect the drive shafts. Drive shafts which are warped or damaged in any other way should be replaced with new ones.

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

Check the rear axle casing for cracks. Check that the brackets for the support arms and track rod are not damaged.

## ASSEMBLING

### ASSEMBLING THE DIFFERENTIAL

1. Place the differential side gears together with the thrust washers in the differential carrier. Then "roll" in both the side pinions simultaneously with the dished thrust washers, see Fig. 4-149.
2. Drive in the shaft. Check the differential. If there is any play, fit new dished thrust washers, see Fig. 4-149.
3. Fit the crown wheel. Make sure that the contact surfaces are clean and without any burr. Tighten the bolts to a torque of 6.5—9.0 kpm (47—65 lb.ft.).

### FITTING THE PINION

1. Clean the marking surface on the pinion with extremely fine emery cloth. Fit the adjusting ring SVO 2840 and tool SVO 2841 on the pinion, see Fig. 4-150. Place the pinion in the carrier, see Fig. 4-152, and secure the adjusting ring by screwing in the lock screw.
2. The pinion should have a certain nominal measure-

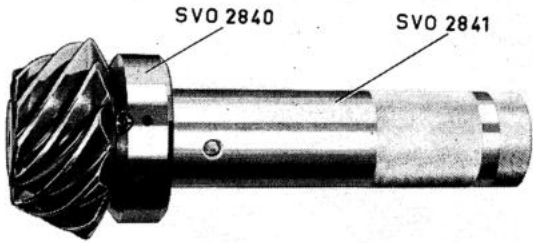


Fig. 4-150. Adjusting ring and tool for pinion location

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ment (A, Fig. 4-151) 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 provided with a plus or minus sign. If there is a plus sign in front of the figure, the nominal measurement should be increased, and if the sign is minus, the nominal measurement should be decreased. The figure indicated on the pinion shows the deviation in thousandths of an inch.

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

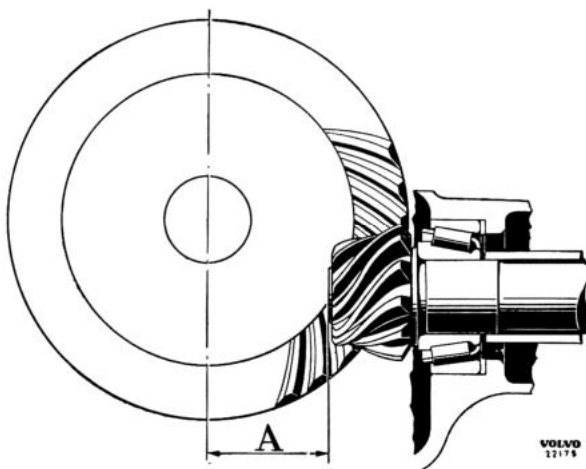


Fig. 4-151. Pinion location  
A. Nominal measurement

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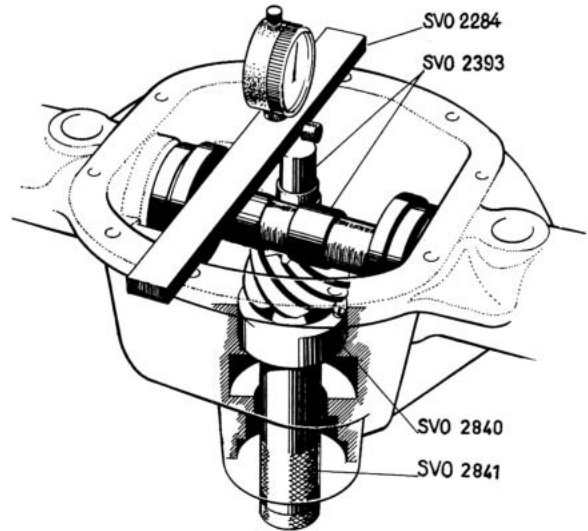


Fig. 4-152. Locating the measuring tools

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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 adjusting jig.

Checking is as follows:

Place the pinion gauge on the ground surface of the pinion and the adjusting jig in the differential bearing positions as shown in Fig. 4-152. Place the indicator retainer on the drive pinion carrier and zero-set the gauge against the adjusting jig, see Fig. 4-153. Then move the indicator retainer over so that the indicator comes against the pinion gauge, see Fig. 4-154. If the pinion is marked 0, the adjusting jig and pinion gauge should be at the same height; if the pinion is marked —, the pinion gauge should be higher than the adjusting jig; and if it is marked +, the pinion gauge should be lower than the adjusting jig with correct setting. The setting is adjusted by turning the cam on the pinion until the gauge dial shows the correct value according to the marking. Then lock the

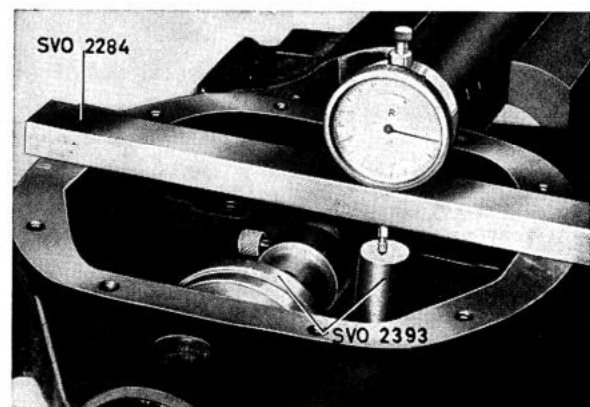


Fig. 4-153. Zero-zetting the indicator

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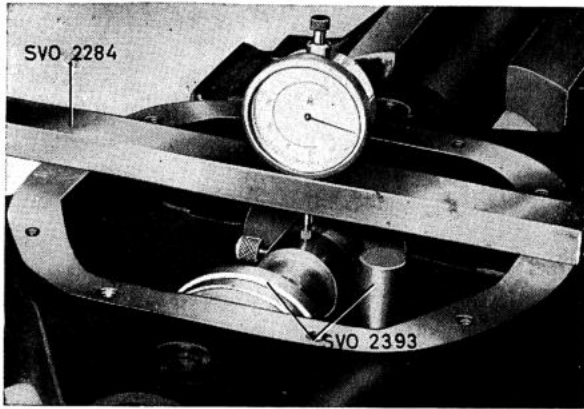


Fig. 4-154. Measuring the pinion location

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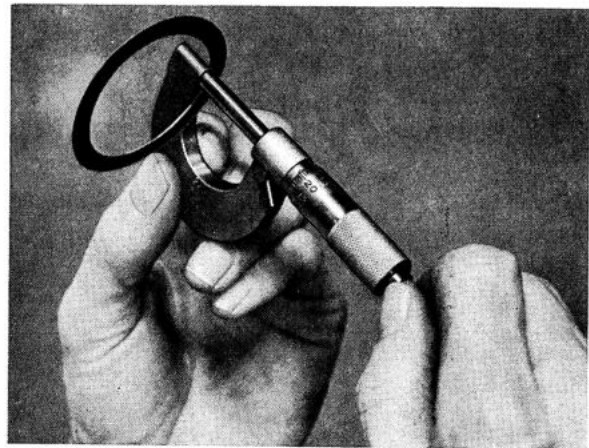


Fig. 4-156. Measuring the shim

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adjusting ring with the lock screw. Remove the measuring gauge and pinion.

- Place the rear pinion bearing complete with the 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. 4-155. 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 the shims for the correct thickness with a micrometer, see Fig. 4-156. 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 0.08 mm (0.0032") thinner.

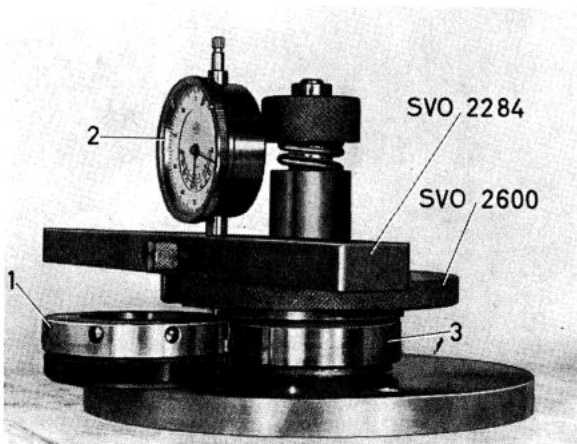


Fig. 4-155. Determining the shim thickness

- Adjusting ring
- Dial indicator
- Bearing, complete

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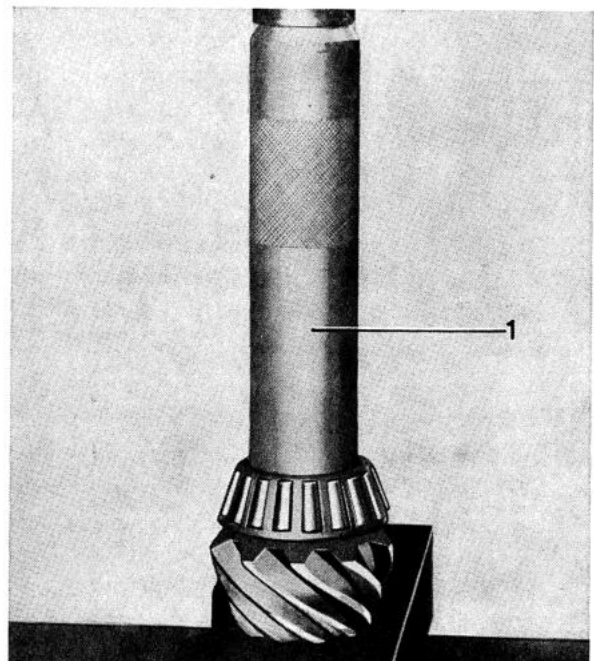
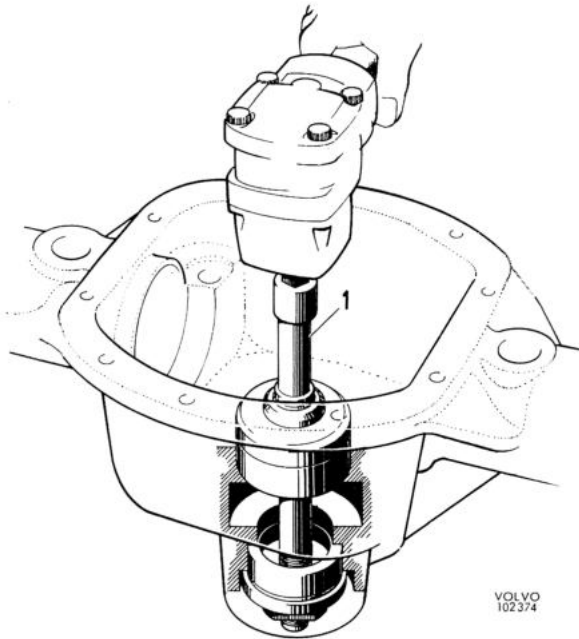


Fig. 4-157. Fitting the rear pinion bearing

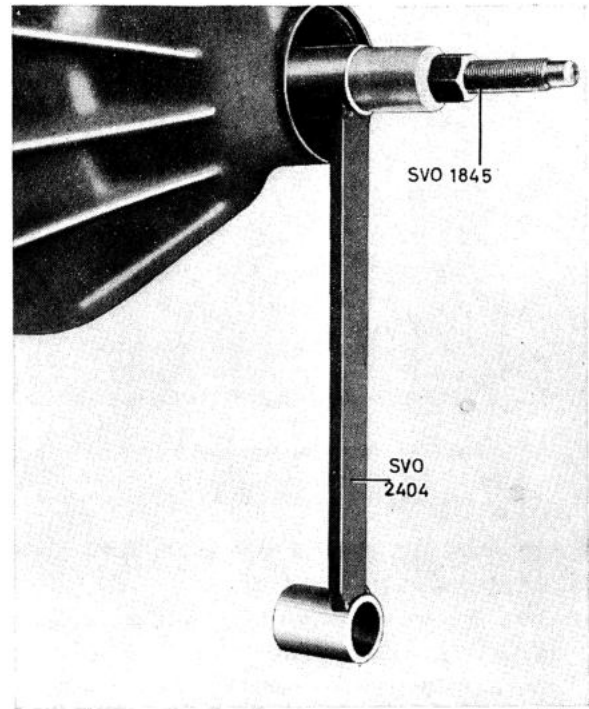
- Fitting sleeve SVO 2842

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- Press the rear bearing on the pinion with sleeve SVO 2842, see Fig. 4-157. Fit the measured shims and press in both the outer rings of the bearings with tool SVO 2845, see Fig. 4-158.
- 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 the pinion, see Fig. 4-159. Apply the nut tightener until it must press the pinion forwards so that it does not strike against the bearing positions.
- Replace press tool SVO 1845 with a washer and nut. Tighten the nut to a torque of 28—30 kpm (200—220 lb.ft.). Fit on the pinion gauge and the



**Fig. 4-158. Fitting the bearing rings**  
1. Press tool SVO 2845



**Fig. 4-159. Fitting the pinion**

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.

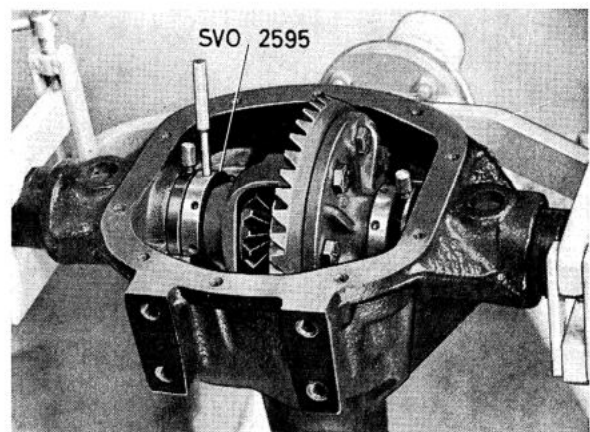
7. Remove the pinion. Remove the shims corresponding to the measured clearance + 0.07 mm (0.003"). Re-fit the pinion.
8. Then check the pinion bearing fit with the torque gauge. The torque gauge should show 6—11 kpcm (5.20—9.55 lb.in.) for used bearings and 11—23 kpcm (9.55—20 lb.in.) for new bearings when the pinion rotates.  
Often an alteration in the thickness of the shims is required because of the tolerances which must be present.
9. Check the locating of the pinion with the dial indicator, retainer SVO 2284 and measuring tool SVO 2393, see also operation 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. 4-160. Use the dial indicator and adjust in the rings so that the correct tooth flank clearance 0.13—0.20 mm (0.005—

0.008") is obtained. Tighten the lock screws in the adjusting rings.

2. Fit on brake tool SVO 2597 as shown in Fig. 4-161. Apply marking blue to several teeth at three points on the crown wheel. This can serve as a check on the crown wheel for possible warping. Rotate the pinion 10—12 turns in both directions and check the mesh marking pattern. With correct tooth mesh, the mesh marking pattern should be horizontal in the middle of the tooth but somewhat nearer to the toe than the heel. The patterns on the coast side and drive side should coincide too far towards the toe on the coast side, see not coincide, the pinion location must be adjusted



**Fig. 4-160. Adjusting rings for differential**  
1. Adjusting rings SVO 2595

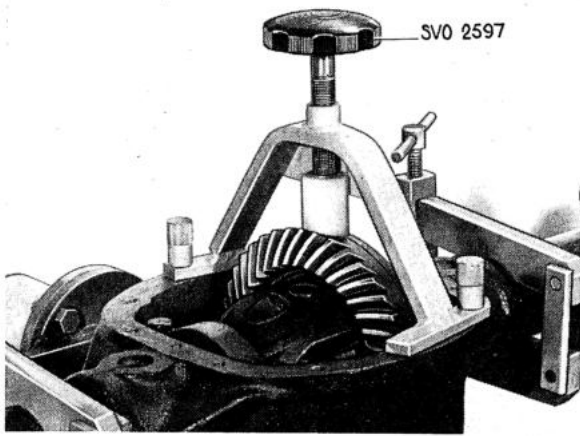


Fig. 4-161. Brake tool for differential

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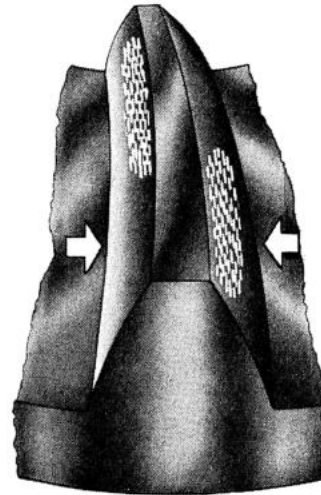


Fig. 4-163. Faulty tooth contact

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before assembling is continued. If the patterns lie too far towards the heel on the drive side and too far towards the toe on the coast side, see Fig. 4-163, the pinion should be moved inwards. If the mesh patterns lie too far towards the toe on the drive side and too far towards the heel on the coast side, see Fig. 4-164, 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 installed.

- When the correct tooth flank clearance and mesh 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, also 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. 4-155. 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.

- Fit the shims on the differential carrier and press on the bearings.
- Fit tool SVO 2394 on the drive pinion carrier, see Fig. 4-143. Expand the tool until the pins are exactly flush against the hole edges in the carrier

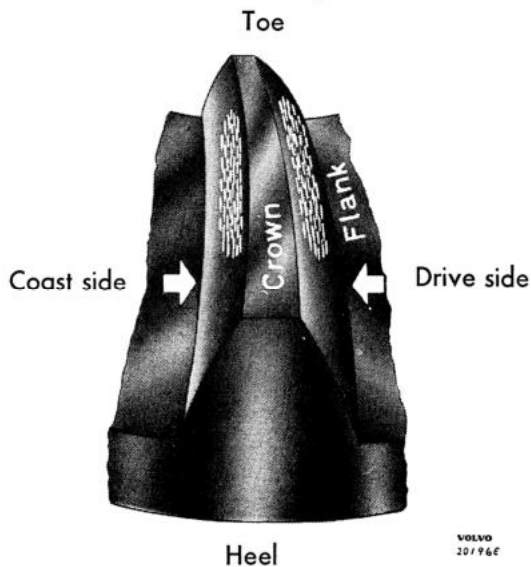


Fig. 4-162. Correct tooth contact

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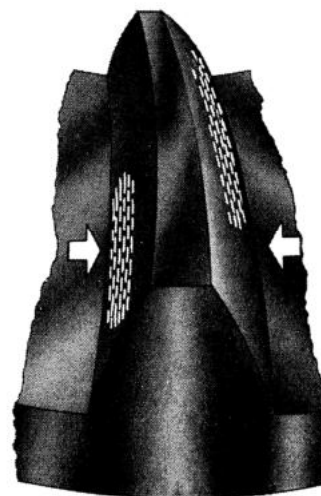


Fig. 4-164. Faulty tooth contact

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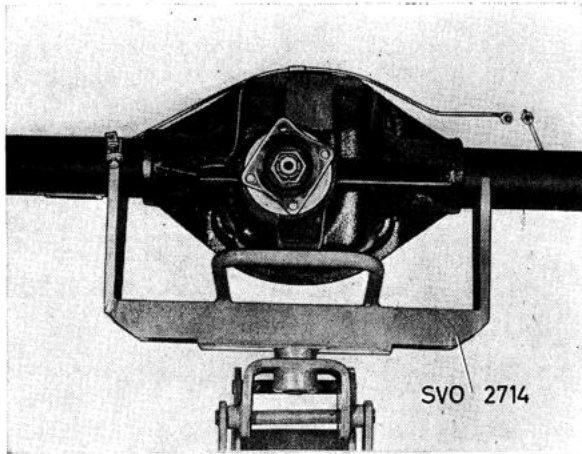


Fig. 4-165. Fixture for rear axle

and then tighten the screws a further 3—5½ 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 kpm (36—50 lb.ft.).

6. Check the tooth flank clearance and the mesh pattern.

#### ASSEMBLING THE REAR AXLE

1. Remove spanner SVO 2404. Fit the oil slinger and oil seal. The oil seal is fitted with tool SVO 2806, see Fig. 4-139.

When fitting the oil seal, smear the seal lips with grease. At the same time apply a layer of grease to the spring coil. This last-mentioned measure is

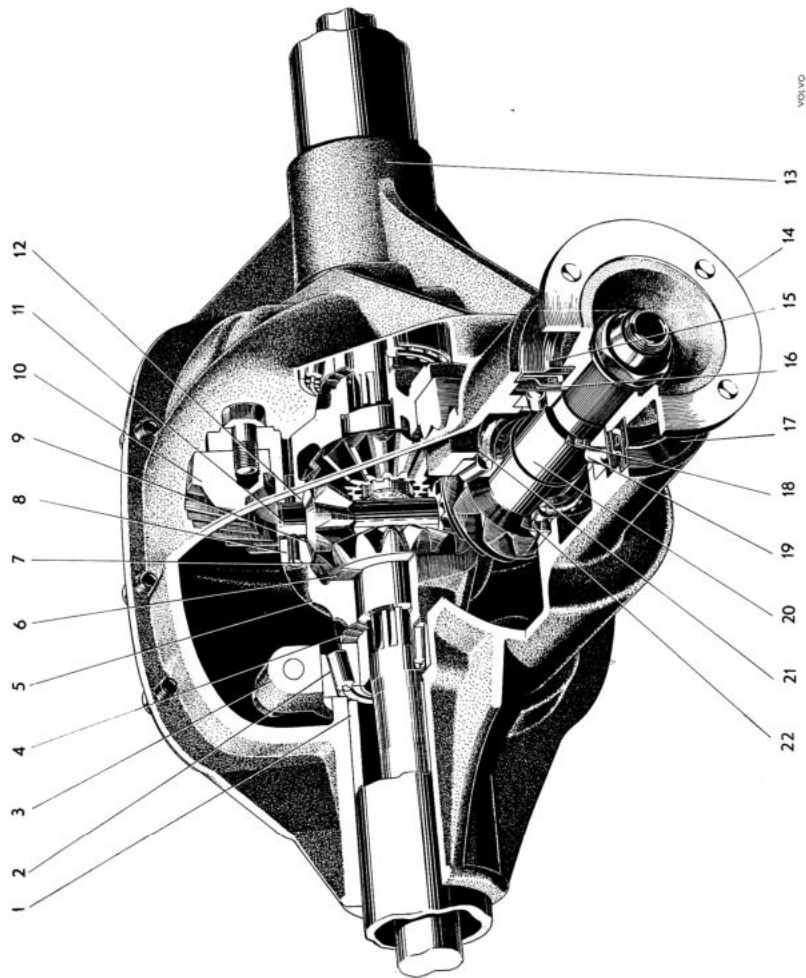
to prevent the spring coil from jumping out of position during the fitting.

Then press on the flange with the help of tool SVO 1845, see Fig. 4-140. Fit the washer and nut. Tighten the nut to a torque of 28—30 kpm (200—220 lb.ft.).

2. Fit the inspection cover and gasket.
3. Fit the drive shafts. Tighten the bolts for the thrust washers to a torque of 5 kpm (36 lb.ft.). Grease the bearing.
4. Then fit the brake discs and brake caliper. Finally 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. 4-165. 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 on the same level with the attachment on the body. Fit the track rod.
3. Fit the attaching bolts for the springs. Tighten the nuts for the torque rods and support arms.
4. Fit the bracket, screw union and brake hoses. Fit the universal joint to the flange.
5. Fit the upper bolts for the shock absorbers. Fit the handbrake wire in the brackets and at the levers. Adjust the handbrake and bleed the brakes, see Fig. Part 5.
6. Fit on the wheels and wheel nuts. Lower the vehicle. Tighten the wheel nuts to a final torque of 10—14 kpm (70—100 lb.ft.).



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- 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. Flange
- 14. Rear axle casing
- 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-E. Final drive