



PART 6

FRONT END AND
STEERING SYSTEM

C3-series

SERVICE MANUAL

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GROUP 60 GENERAL

Data

WHEEL ANGLES

Caster	3.0°
Camber	1.0°
King-pin inclination	8.0°
Toe-in	0–3 mm (0–0.12")
Wheel inclination angle	31–32°

FRONT AXLE

Type	Rigid
Track	1540 mm (60.6")

STEERING KNUCKLE

Pre-load, lower steering pin	0.3 mm (0.012")
With play in steering pin adjust pin by removing shims until bushings are worn.	
Shims, steering knuckle support – lower ball shell, thicknesses in mm (in.)	0.35, 0.45, 0.60, 0.80 (0.014, 0.018, 0.024, 0.032)

STEERING GEAR

Make and type	ZF, worm and roller
Reduction ratio	22:1
Number of steering wheel turns from lock to lock	5.1
Pre-load, worm bearing	25–55 N (2.5–5.5 kp = 5.5–12 lbf)
Pre-load over centre position, complete steering gear	15–25 N (1.5–2.5 kp = 3.3–5.5 lbf)
Shims for worm bearing, thicknesses in mm (in.)	0.10, 0.12, 0.15, 0.30 (0.004, 0.005, 0.006, 0.012")
Adjuster washer between adjuster screw and sector shaft, thickness in mm (in.) in steps of 0.05 mm = 0.002"	2.1–2.5 mm (0.08–0.10")
Lubricant	Hypoid oil
Viscosity	MP 80 or MIL-L-2105 B, SAE 80
Capacity	0.5 litre (1 pint)

AUXILIARY STEERING ARM

Axial clearance	0 mm
Shims, relay arm, thicknesses in mm (in.)	0.1 and 0.35 (0.004 and 0.014)

TIGHTENING TORQUES

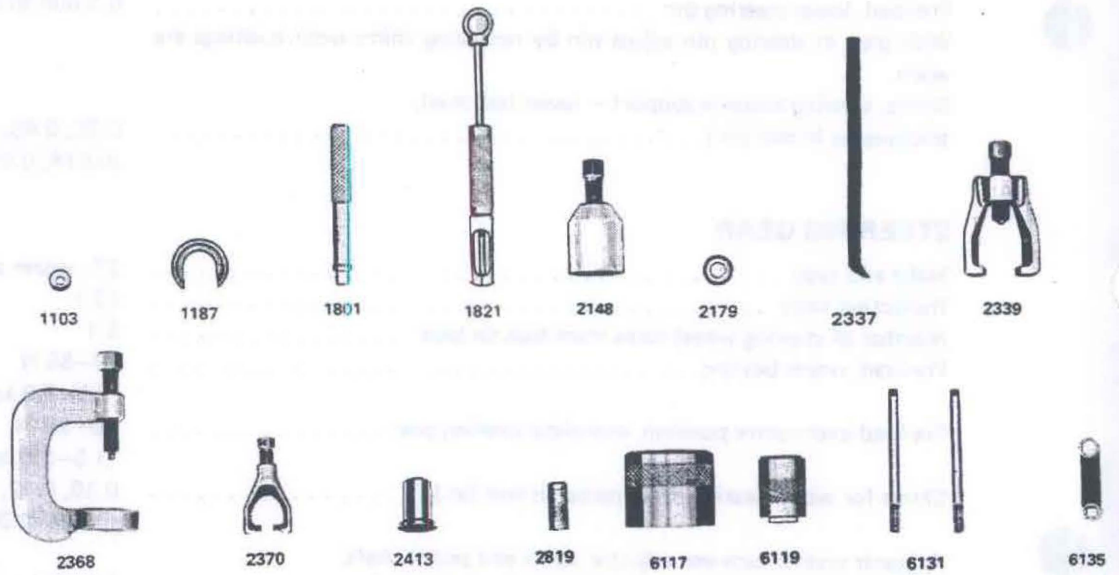
Steering wheel nut	35–35 Nm (3.5–4.5 kpm = 25–33 lbftf)
Nut, Pitman arm	250 Nm (25 kpm = 180 lbftf) and to next hex for locking
Crown nut, aux. steering arm journalling	80–100 Nm (8–10 kpm = 57–72 lbftf)
Nut, king pins	150–200 Nm (15–20 kpm = 108–145 lbftf)

Bolt, steering knuckle support — wheel carrier	100–120 Nm (10–12 kpm = 72–87 lbftf)
Nut, tie rod ¹⁾	140–180 Nm (14–18 kpm = 101–130 lbftf)
Nut, lower steering rod ¹⁾	100–120 Nm (10–12 kpm = 72–87 lbftf)
Nut, upper steering rod ¹⁾	140–180 Nm (14–18 kpm = 101–130 lbftf)

1) See Fig. 64–2.

Tools

The following special tools are required for service work on the front end and steering system.



- | | |
|--|--|
| 1103 Intermediate section for 2368 puller | 2413 Drift for installing auxiliary steering arm bushings |
| 1187 Clamp for 2368 puller | 2819 Drift for installing bushing on lower steering pin |
| 1801 Standard handle | 6117 Sleeve for installing rubber dust cover |
| 1821 Puller for removing auxiliary steering arm bushings | 6119 Sleeve for installing sector shaft sealing ring |
| 2148 Puller for steering joint at sector arm | 6131 Guide pins for removing and installing wheel carriers |
| 2179 Drift for fitting sector shaft bushings | 6135 Spanner for torque tightening |
| 2337 Drift | |
| 2339 Puller for removing pitman arm | |
| 2368 Puller for removing steering wheel | |
| 2370 Puller for removing steering pins | |

GROUP 63 FRONT END

Description

The ends of the front axle are provided with spherical steering knuckle supports (9, Fig. 63-1) on which the wheel carriers (1) are suspended in steering pins (6 and 14). The steering pins have ball shells (6 and 14) which are journaled in bushings (4 and 13) of synthetic material. The steering pins should be lubricated with grease of a quality specified according to the lubricating instructions. When being installed, the lower steering pin should be fitted with shims (12) so that there is pre-loading on the steering pins.

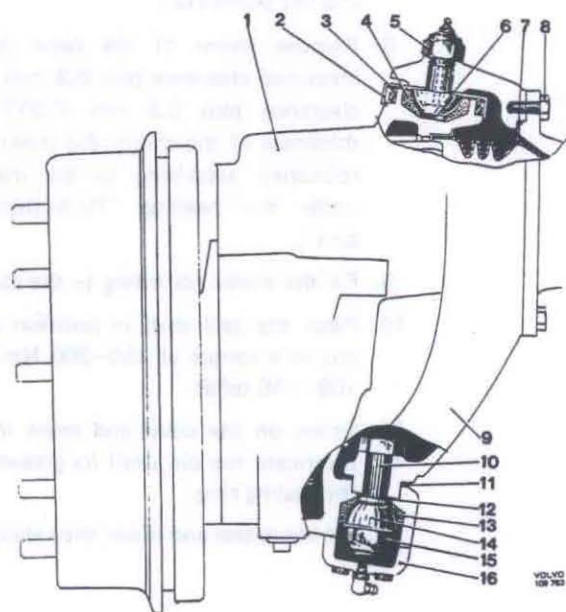


Fig. 63-1. Steering pins

- | | |
|---------------------|-----------------------------|
| 1. Wheel carrier | 9. Steering knuckle support |
| 2. Sealing washer | 10. Bolt |
| 3. Sealing ring | 11. Sealing ring |
| 4. Upper bushing | 12. Shims |
| 5. Nut | 13. Lower bushing |
| 6. Upper ball shell | 14. Lower ball shell |
| 7. Rubber bellows | 15. Nut |
| 8. Attaching bolt | 16. Cover |

SERVICE PROCEDURES

STEERING KNUCKLES

Adjusting the steering pins

The steering pins must be adjusted when loose. This is done as follows:

1. Jack up the vehicle.
2. Remove the wheel.
3. Remove the lubricator on the cover (16, Fig. 63-1).
4. Place a dial indicator as shown in Fig. 63-2.

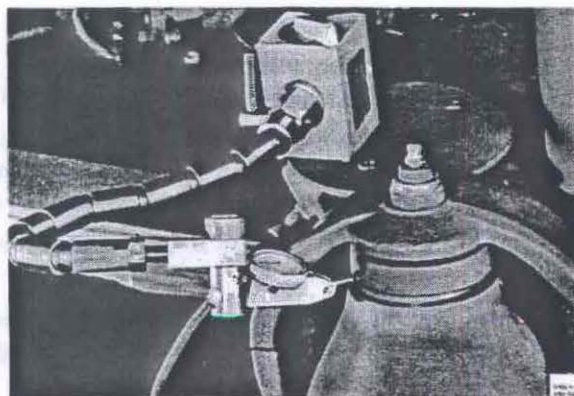


Fig. 63-2. Placing the dial indicator

5. Place a jack under the cover, Fig. 63-3. Push up the pin and release it entirely a couple of times. Read off the clearance measured.
6. Unscrew the cover (16).
7. Remove the nut (15), the lower ball shell (14) and the shims (12).
8. Remove shims of the same thickness as the measured clearance plus 0.3 mm (0.012"). If the clearance plus 0.3 mm (0.012") exceeds the thickness of the shims, the steering pins must be re-bushed according to the instructions given under the heading "Re-bushing the steering pins".
9. Fit the shims according to the above calculation.
10. Place the ball shell in position and tighten the nut to a torque at 150-200 Nm (15-20 kpm = 108-145 lbftf).
11. Screw on the cover and screw in the lubricator. Lubricate the pin until its grease squeezes out at the sealing ring.
12. Fit the wheel and lower the vehicle.

Re-bushing the steering pins

Special tools:

- 2370 Puller
- 2819 Drift
- 6131 Guide pins
- 6117 Sleeve
- 6135 Spanner

Removing the wheel carriers

1. Remove the wheel nuts on the wheel. Jack up the vehicle.
2. Remove the wheel.
3. Remove the steering joint from the steering arm with puller 2370, see Fig. 63-4.
4. Disconnect the brake lines from the brake hoses. Plug the hoses with sealing nipples. Remove the bracket with the hoses from the wheel carrier.
5. Remove the bracket plate for the hollow rubber spring.
6. Remove the upper bolts securing the wheel carrier to the front axle casing. Fit guide pins 6131 in the upper holes.
7. Remove the lower lubricator and place a jack under the wheel carrier.

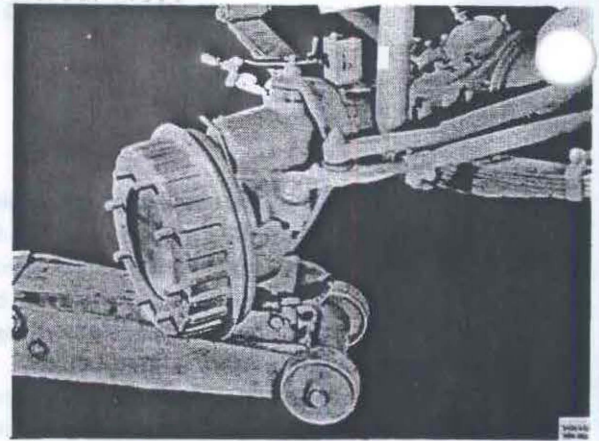


Fig. 63-3. Measuring the clearance

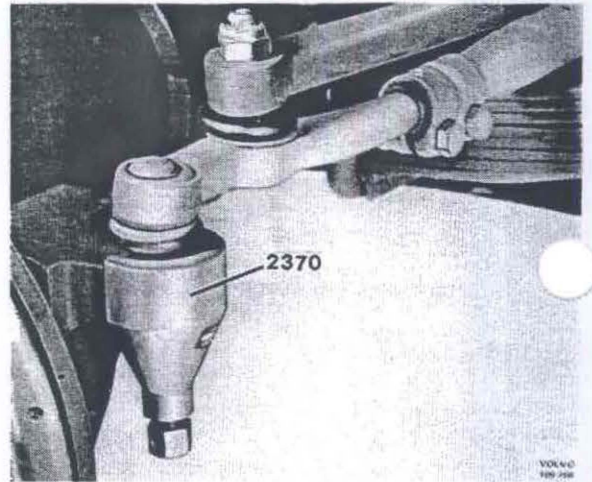


Fig. 63-4. Removing a steering joint

8. Remove the upper bolts and pull out the wheel carrier and drive shaft, see Fig. 63-5. NOTE! Observe care so that the rubber bellows do not get clamped between the drive shaft and steering knuckle support.

Disassembling the steering pins

1. Clean well the removed unit.
2. Knock out the rubber bellows with a suitable tool.
3. Remove the cover (16, Fig. 63-1) under lower steering pin and unscrew the nut (15) holding the pin together. Pull out the bolt (10) and then the ball shell (14), also the shims (12). Take care of the shims.

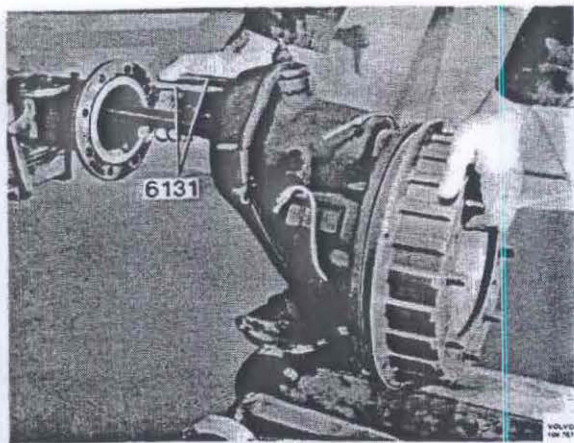


Fig. 63-5. Removing the wheel carrier

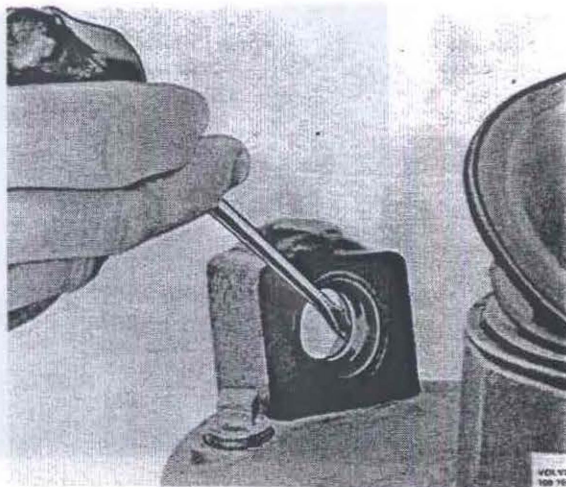


Fig. 63-7. Removing the lower bushing

4. Lift off the steering knuckle support (9) and remove the old sealing rings (3 and 11).
5. Knock out the old bushings (4 and 13) with a suitable tool, see Figs. 63-6 and 63-7.

Checking, replacing parts

1. Clean all parts thoroughly. Clean thoroughly the surfaces between the cover (16) and wheel carrier, and between the steering knuckle support and front axle.

2. Check the ball shells (6 and 14, Fig. 63-1) and the surface on the sealing washer (2) for the sealing ring. Replace worn parts.
3. Replace the upper ball shell and sealing washer by removing the nut (5). If necessary hold against the ball shell with an Allen spanner, see Fig. 63-8.
4. When assembling, tighten the nut to a torque of 150–200 Nm (15–20 kpm = 108–145 lbftf).

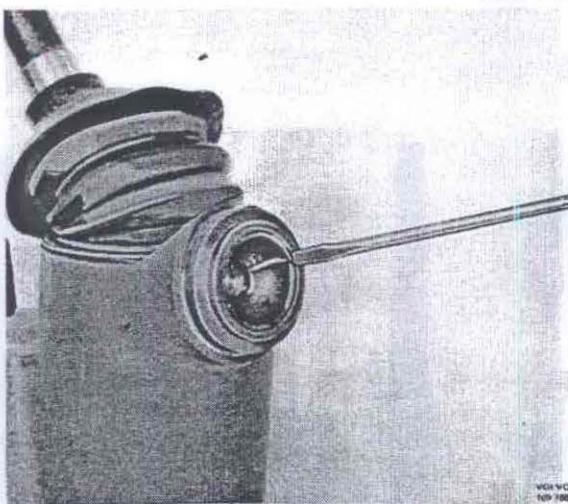


Fig. 63-6. Removing the upper bushing

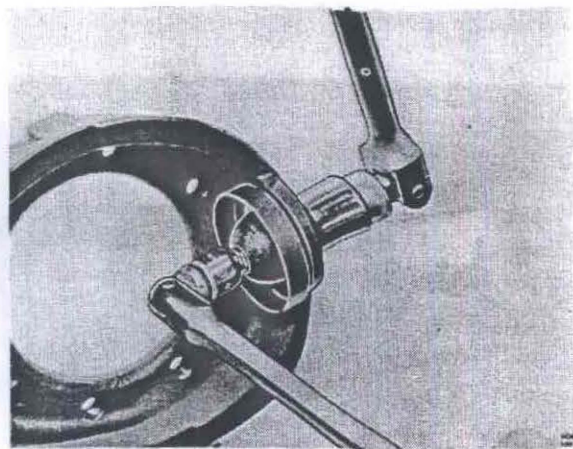


Fig. 63-8. Removing the upper ball shell

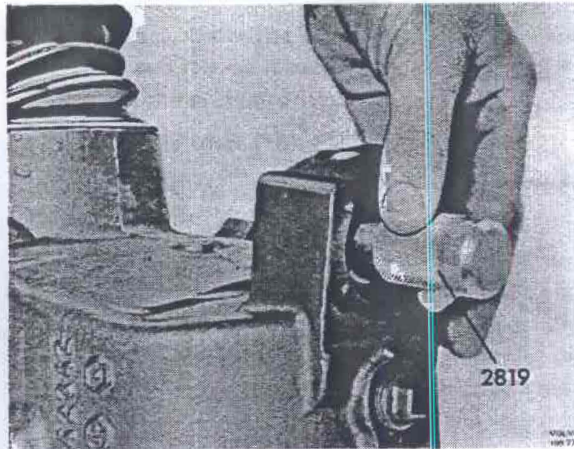


Fig. 63-9. Fitting the lower bushing

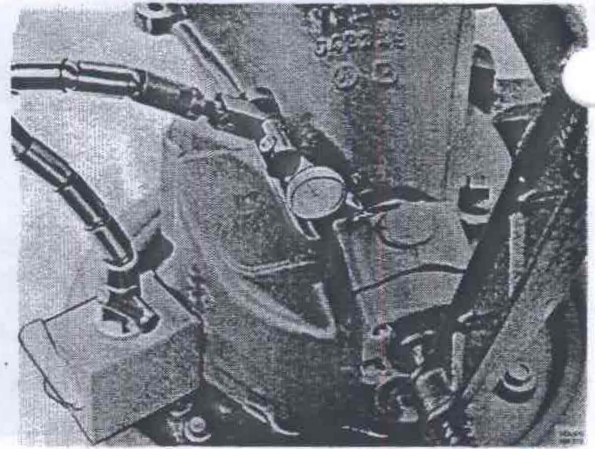


Fig. 63-11. Placing the dial indicator

Assembling the steering pins

1. Knock the new bushings into the wheel carrier. The upper bushing is carefully tapped in with a plastic mallet. The lower one is driven in with drift 2819 and a plastic mallet, see Fig. 63-9. Take care that the bushings are driven in properly all the way.
2. Place the steering knuckle support in position without any sealing rings. Fit the bolt through the lower pin. Place the old shims or new ones of the same thickness plus about 0.5 mm (0.02"). Place the ball shell and nut in position and tighten up the nut to a torque at 150–200 Nm (15–20 kpm = 108–145 lbftf).
3. Screw tight the cover under the lower pin and screw the lubricators out of the upper ball shell and the cover.
4. Place a screw clamp over the steering knuckle according to Fig. 63-10. Tighten up the clamp well (approx. 1500 N = 150 kp = 330 lbf) so that the knuckle does not have any clearance.
5. Place a dial indicator according to Fig. 63-11 and zero-set it. Note the measuring pointer position, see Fig. 63-12.
6. Slacken the clamp and press the steering knuckle support in the other direction while turning it at the same time, see Fig. 63-13. Read-off the indicator and note the clearance.
7. Remove the dial indicator and unscrew the lower steering pin. Take care of the shims and lift off the steering knuckle support.

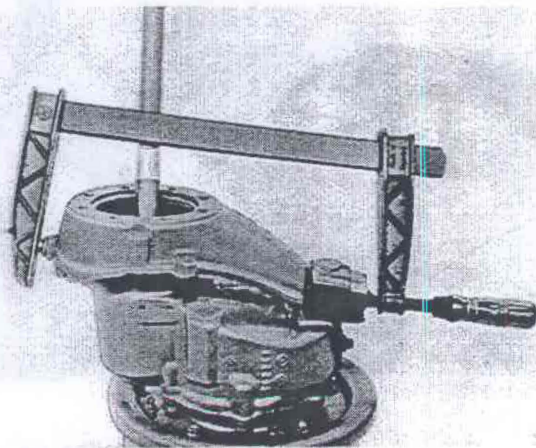


Fig. 63-10. Drawing together the steering pin assembly

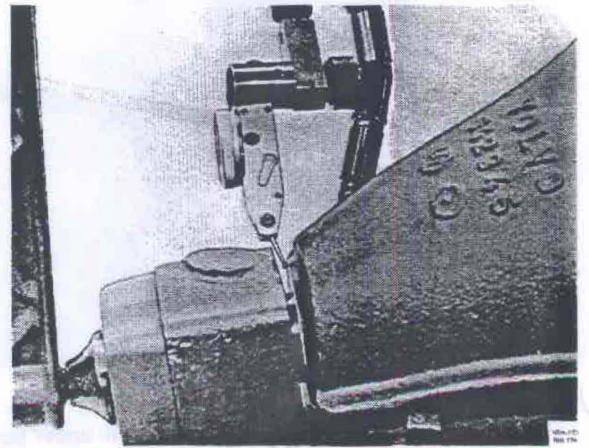


Fig. 63-12. Dial indicator pointer setting

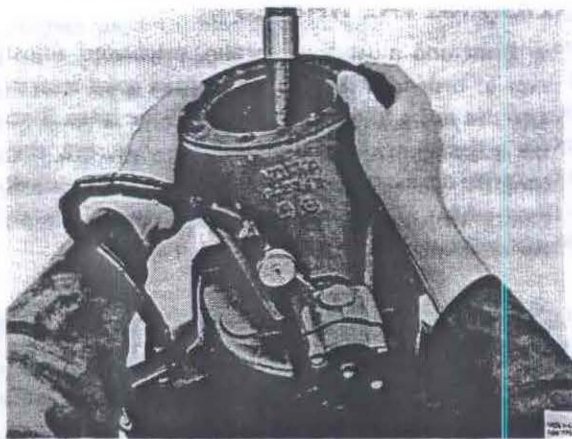


Fig. 63-13. Measuring the axial clearance

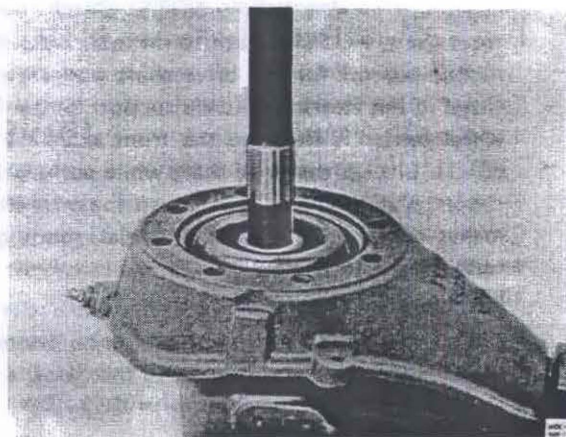


Fig. 63-15 Rubber bellows pushed down

8. Place new sealing rings on the wheel carrier and on the steering knuckle support, and fit the steering knuckle support in position. Insert the bolt through the lower steering pin.
9. Place shims of a thickness as follows: Shims when measured less measured clearance less 0.3 mm (0.012") (pre-load).
10. Place the lower ball shell and nut in position. Tighten up the nut to a torque of 150–200 Nm (15–20 kpm = 108–145 lbft).
11. Apply sealing agent to the contact surface between the cover and wheel carrier and screw tight the cover. Screw the lubricators into the cover and upper ball shell.
12. Lubricate the steering pins until grease squeezes out at the sealing rings. Unscrew the lower lubricator.

13. Fit the rubber bellows over the drive shaft and knock them into position with sleeve 6117, see Fig. 63-14.
NOTE! Observe great care that the rubber bellows are not clamped between the drive shaft and steering knuckle support.
14. Press down the rubber bellows as shown in Fig. 63-15. Let them remain pressed down until its shaft is in the support and the unit hangs on the guide pins.

Installing the wheel carrier

1. Apply sealing agent to the sealing surfaces on the steering knuckle support and front axle flange.
2. Fit the two guide pins 6131 in the upper holes of the steering knuckle support, see Fig. 63-16. Place the wheel carrier on a jack and lift the

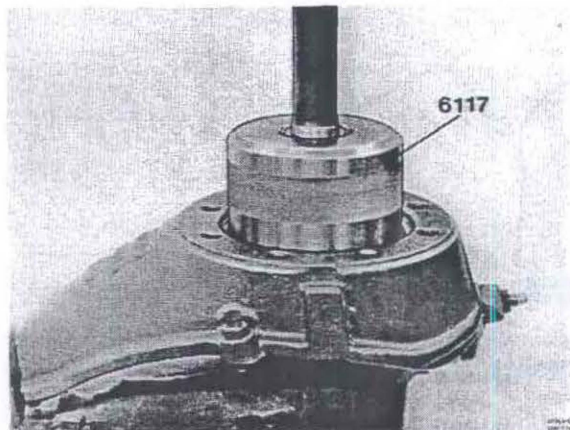


Fig. 63-14. Fitting the rubber bellows

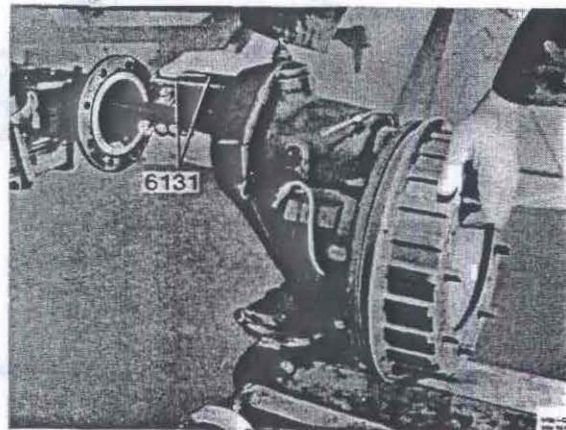


Fig. 63-16. Fitting the wheel carrier

carrier up so that the guide pins can fit in the front shaft. **NOTE!** Check to make sure that the rubber bellows for the drive shaft are properly fitted in the steering knuckle support before the wheel carrier is fitted to the front axle (7, Fig. 63-1). Lift up the drive shaft while pushing the carrier in at the same time. When the drive shaft makes contact with the differential, rotate the centre gear flange while pushing the carrier to the bottom.

3. Fit all the bolts between the steering knuckle support and front axle. Remove the guide pins. Tighten the bolts to a torque of 100–120 Nm (10–12 kpm = 72–87 lbftf).
4. Screw tight the shock absorber and the stop plate for the hollow rubber spring.
5. Screw in the lower lubricator. Screw tight the steering rod.
6. Screw tight the bracket for the brake lines and connect up the brake lines. Bleed the wheel cylinders whose brake lines have been disconnected. During the bleeding the contact for the pressure difference should be removed, see Fig. 63-17. If a bleeder unit is used, the working pressure should be 0.2 MPa (2 kp/cm² = 28 lbf/in²). For more detailed instructions concerning the bleeding, see Part 5.
7. Install the wheel and lower the vehicle.

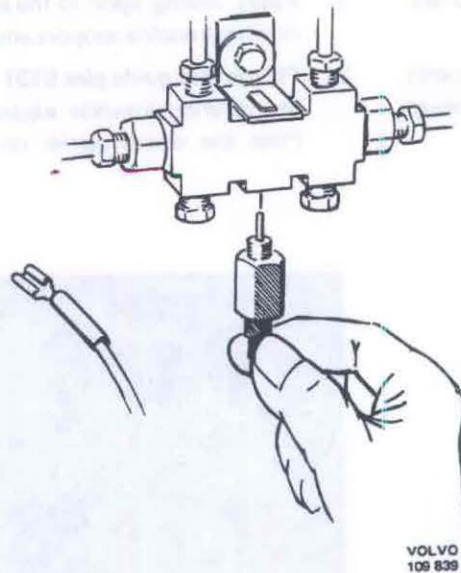


Fig. 63-17 Contact for pressure difference

ALIGNING THE WHEELS

The front end must have certain, calculated adjustments in order for the vehicle to have good steering properties and a minimum of wear on the tyres. Since these adjustments can alter due to wear, etc, they should be checked at regular intervals. Those adjustments which should be regularly checked are the caster, camber, king-pin inclination and toe-in.

Procedure before wheel adjusting

Before checking or adjusting the wheel adjustment, carry out the following checks and remedy any faults:

1. Check the front wheel tyres concerning pressure and wear.
2. Check that the radial and lateral throw on the wheels do not exceed 2.5 mm (0.10").
3. Check that the springs are in good condition and have equally efficient function.
4. Check the adjustment for the steering gear.
5. Check the steering rods for looseness and deformation.

Measuring and adjusting the wheel angles

The front wheel angles are measured with the instruments intended for this purpose. The only wheel angle which can be adjusted is the toe-in. It should be within the distance 0–3 mm (0–0.12"). Toe-in is adjusted on the lower steering rod (5, Fig. 64-2). The measuring is made in the middle of the wear tread and at hub height. If any of the other angles are faulty, examine which part is deformed and replace accordingly.

GROUP 64 STEERING SYSTEM

Description

STEERING GEAR

The steering gear is of the worm and roller type and its design can be seen from Fig. 64-1. The worm (5) is journaled in two ball bearings (7 and 14) and its pre-load is adjusted by means of shims (3) placed between the lower cover (15) and housing (6).

The sector shaft is journaled in three bushings (2, 4 and in the upper cover). The bushing in the cover cannot be replaced, so that the cover must be

changed complete if there is looseness. The roller (11) is journaled in the sector shaft. It cannot be replaced so if there is looseness the sector shaft must be changed complete.

The steering gear is adjusted by altering the axial location of the roller in relation to the worm. This is adjusted by means of the adjuster screw (12), which is journaled in the sector shaft.

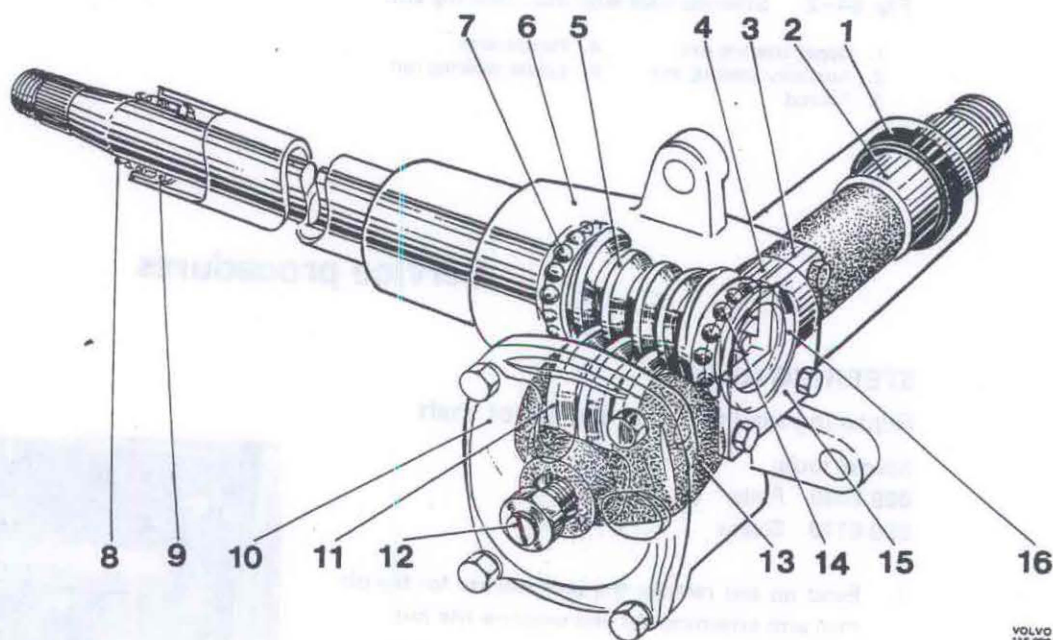


Fig. 64-1. Steering gear

- | | |
|-----------------|---------------------------|
| 1. Sealing ring | 9. Steering shaft bearing |
| 2. Bushing | 10. Upper cover |
| 3. Shims | 11. Roller |
| 4. Bushing | 12. Adjuster screw |
| 5. Worm | 13. Sector shaft |
| 6. Housing | 14. Ball bearing |
| 7. Ball bearing | 15. Lower cover |
| 8. Spring | 16. Spacer ring |

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STEERING RODS AND AUXILIARY STEERING ARM

The steering gear has three steering rods, a lower steering rod (5, Fig. 64-2), an upper steering rod (1) and a tie rod (3). The toe-in is adjusted on the lower steering rod. All steering joints are lubricated-for-life and are to be replaced when loose.

The auxiliary steering arm (2) links the tie rod to the upper steering rod. The auxiliary steering arm is journalled in the front tubular member by means of two bushings (5 and 7, Fig. 64-3). Any axial looseness on the auxiliary steering arm can be remedied with the help of shims (8).

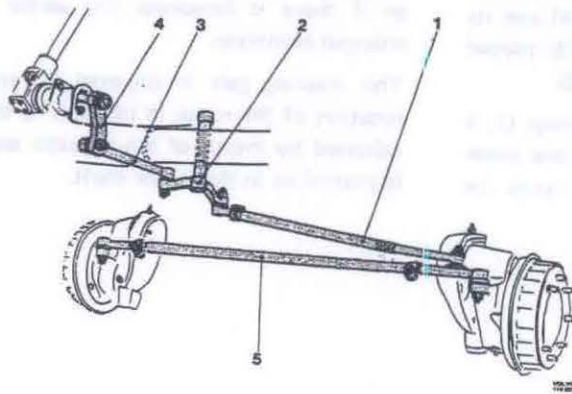


Fig. 64-2. Steering rods with aux. steering arm

- | | |
|---------------------------|-----------------------|
| 1. Upper steering rod | 4. Pitman arm |
| 2. Auxiliary steering arm | 5. Lower steering rod |
| 3. Tie rod | |

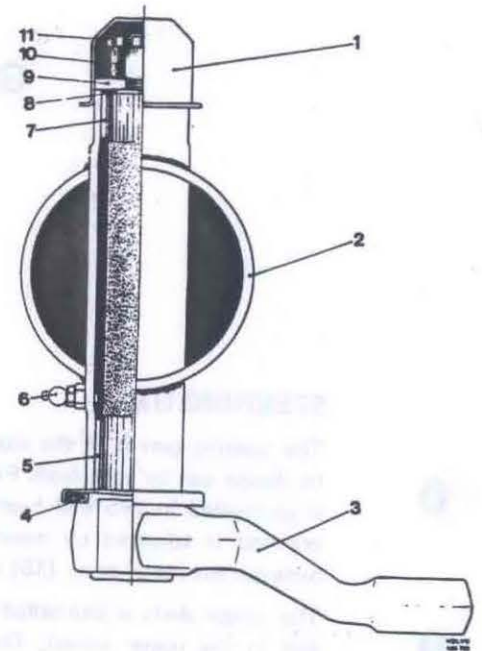


Fig. 64-3. Auxiliary steering arm

- | | |
|----------------------|------------------|
| 1. Cover | 7. Upper bushing |
| 2. Tubular member | 8. Shims |
| 3. Aux. steering arm | 9. Washer |
| 4. Sealing ring | 10. Nut |
| 5. Lower bushing | 11. Split pin |
| 6. Lubricator | |

Service procedures

STEERING GEAR

Replacing sealing ring at the sector shaft

Special tools:

- 999 2339 Puller
- 999 6119 Sleeve

1. Bend up and remove the lock washer for the pitman arm attaching nut and unscrew the nut.
2. Pull off the pitman arm with puller 2339, see Fig. 64-4.

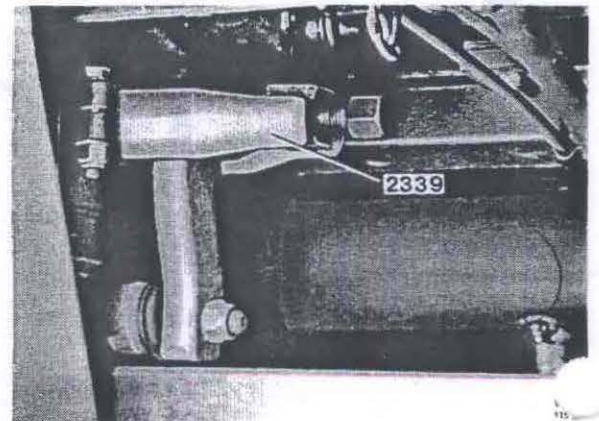


Fig. 64-4. Removing the pitman arm

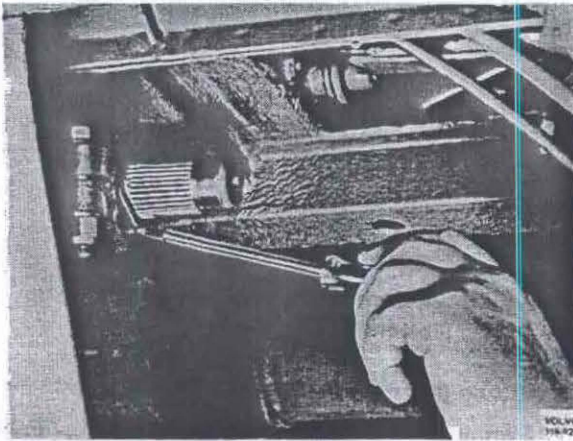


Fig. 64-5. Removing the sealing ring

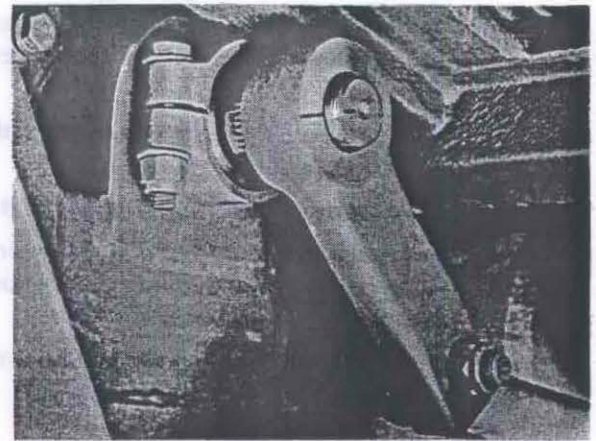


Fig. 64-7. Marking up pitman arm - sector shaft

3. Lever out the sealing ring with a screwdriver as shown in Fig. 64-5. Do not knock in the screwdriver too far otherwise it might damage the bushing for the sector shaft.
4. Knock the sealing ring in with sleeve 6119, see Fig. 64-6.
5. Place the pitman arm according to the marking on Fig. 64-7. Tighten the nut to a torque of 250-350 Nm (25-35 kpm = 180-253 lbft) and lock the nut with the lock washer.

Replacing upper steering column bearing

Special tools:

- 999 2368 Puller
- 999 1187 Clamp
- 999 1103 Intermediate section

1. Remove the horn button with a screwdriver, see Fig. 64-8. Disconnect the electric cable from the horn button.
2. Mark the location of the steering wheel on the steering column with punch pops and unscrew the steering wheel nut.

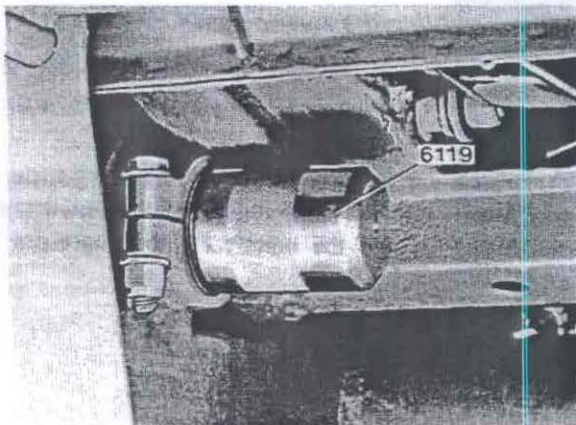


Fig. 64-6. Fitting the sealing ring

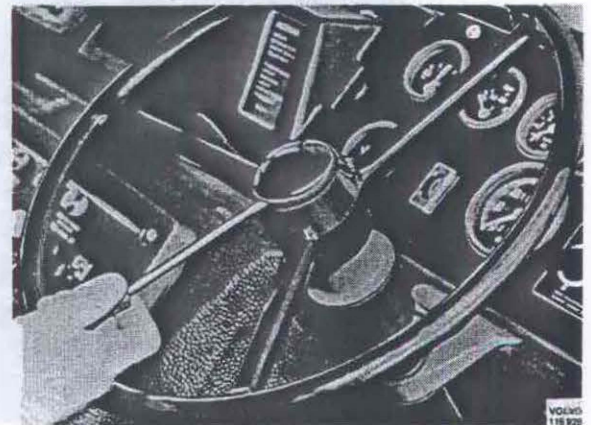


Fig. 64-8. Removing the horn button

3. Pull off the steering wheel with puller 2368, clamp 1187 and intermediate section 1103, Fig. 64-9.
4. Lift off the spring and drive out the bearing with a screwdriver, Fig. 64-10.
5. Knock down the bearing and fit the spring.
6. Re-fit the steering wheel according to the marking and tighten the nut to a torque of 35-45 Nm (3.5-4.5 kpm = 25-33 lbftf).
7. Connect up the electric cable to the horn button and press the button in position.

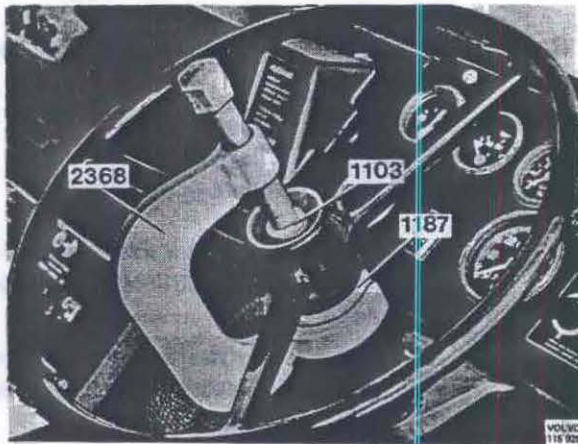


Fig. 64-9. Removing the steering wheel

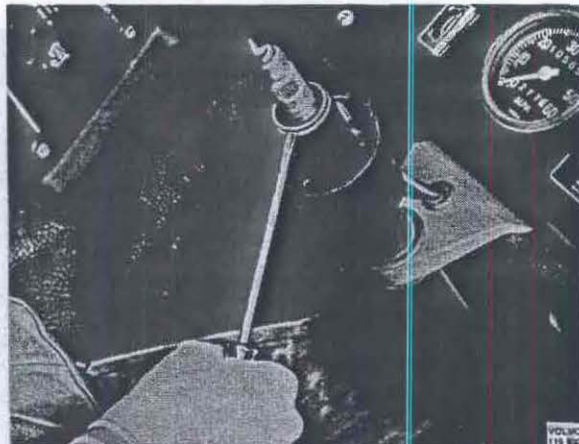


Fig. 64-10. Removing the upper steering shaft bearing

Reconditioning the steering gear

Special tools:

999 2368	Puller
999 1187	Clamp
999 1103	Intermediate section
999 2339	Puller
999 2337	Drift
999 2179	Drift
999 1801	Standard handle
999 6119	Sleeve

Removing the steering gear

1. Remove the horn button with a screwdriver, Fig. 64-8. Disconnect the electric cable from the horn button.
2. Mark the location of the steering wheel on the steering column with punch pops and unscrew the steering wheel nut.
3. Pull the steering wheel off with puller 2368, clamp 1187 and intermediate section 1103, Fig. 64-9. Remove the spring.
4. Remove the bracket for the direction indicator lever and steering wheel bracket. Disconnect the connections for the direction indicator lever under the dashboard and pull out the cable.
5. Fold aside the mat and remove the floor cover over the steering gear.
6. Bend off the lock washer for the pitman arm attaching nut and unscrew the nut.
7. Pull off the pitman arm with puller 2339, Fig. 64-11.
8. Remove the stay between the bumper and frame.
9. Release the clamp bolt over the sector shaft pipe. Pull out the horn cable.
10. Remove the three attaching bolts for the attachment round the sector shaft pipe and lower the steering gear.

Disassembling the steering gear

1. Clean the outside of the steering gear.
2. Fix the steering gear in a vice as shown in Fig. 64-12.
3. Place the steering gear in the centre position. Unscrew the lock nut for the adjuster screw (12, Fig. 64-1) and the bolts for the upper cover (10).

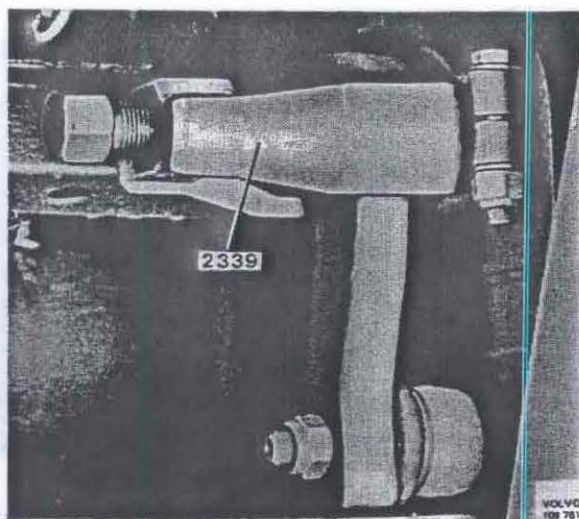


Fig. 64-11. Removing the pitman arm



Fig. 64-13. Removing the sector shaft



Fig. 64-12. Fixing steering box in vice

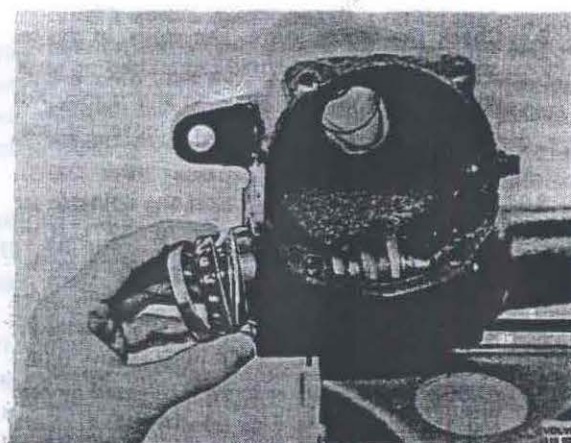


Fig. 64-14. Removing the worm

4. Screw in the adjuster screw until its cover slackens from the housing and empty the oil. Screw in the adjuster screw farther until its cover releases fully from the adjuster screw.
5. Carefully tap out the sector shaft (13) with a plastic mallet, see Fig. 64-13.
6. Remove the lower cover (15) at the end of the steering column and take care of the spacer ring (16) and shims (3).
7. Carefully knock out the steering column with a plastic mallet. Take hold of the worm's lower bearing race and bearing, see Fig. 64-14, and pluck the upper bearing (7) out of the housing.
8. Lever out the sector shaft sealing ring (1) with drift 2337, see Fig. 64-15.

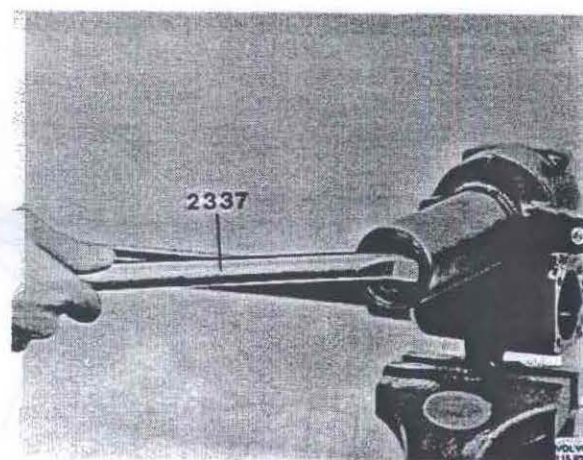


Fig. 64-15. Removing the sealing ring

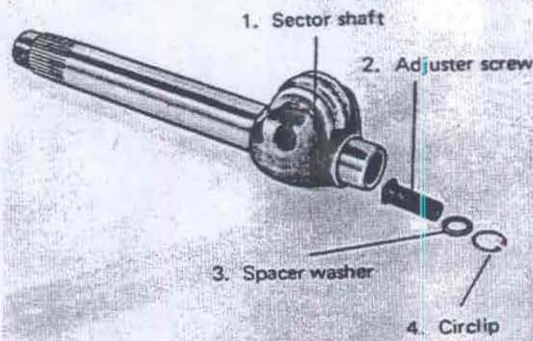


Fig. 64-16. Sector shaft

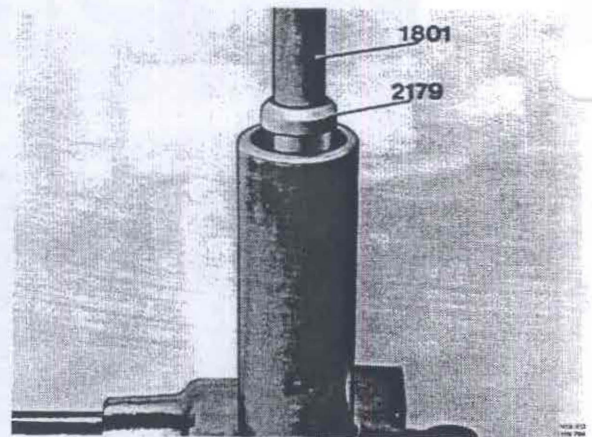


Fig. 64-18. Fitting the bushing

Checking, replacing parts

1. Clean all parts thoroughly.
2. Check the sector shaft. The roller in the sector shaft may not be scored, scratched or severely worn on the contact surfaces and it may not be loose on its shaft. If worn or loose, replace the sector shaft.
3. Check the axial clearance on the adjuster screw. It may not exceed 0.05 mm (0.002"). If this is the case, adjust the axial clearance with the spacer washer (3) according to Fig. 64-16. Spacer washers are available in thicknesses 2.10–2.50 mm (0.083–0.098") in steps of 0.05 mm (0.002"). The adjuster screw is released by removing the circlip (4, Fig. 64-16). The clearance should be as small as possible. However, it is important that the adjuster screw can be turned easily after adjustment.
4. Check the sector shaft bushings (2, 4 and the one in the upper cover), see Fig. 64-1. If loose, replace the bushings. Knock out the bushings (2 and 4) with drift 2337 in their own direction, see Fig. 64-17. The bushing in the upper cover cannot be replaced, and for this reason the cover must be replaced complete. The bushings are pressed in each from their own direction with drift 2179 and standard handle 1801, see Fig. 64-18.
5. Check the contact surfaces of the worm against the roller and the inner races for the ball bearings (7 and 14). If there are scratches, scoring or severe wear, replace the worm and shaft. Check the balls of the bearings and outer rings. If scored or damaged in any other way, replace the bearing parts. The upper bearing outer ring is pulled out with the help of a Kukko standard jackknife No. 21-6 kit 24B, see Fig. 64-19. Tap the ring in

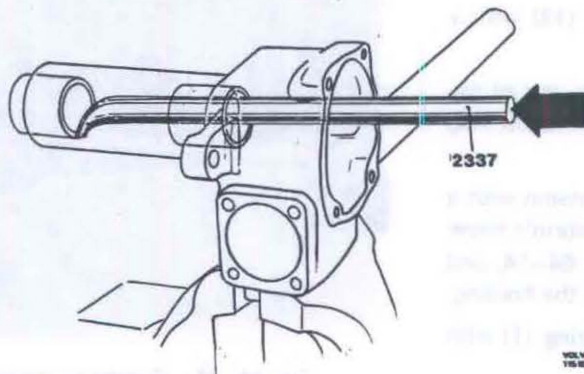


Fig. 64-17. Removing the bushing

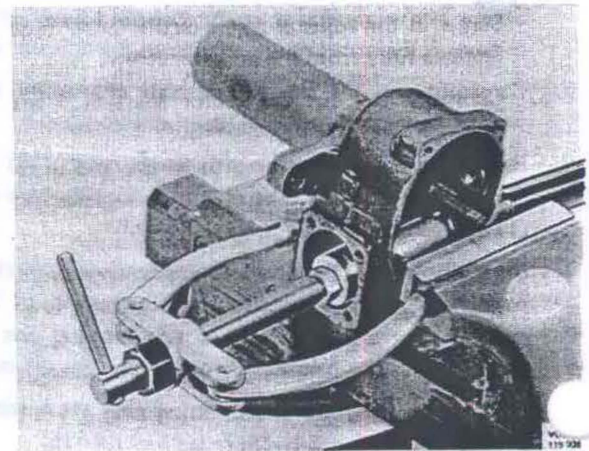


Fig. 64-19. Removing the upper bearing adjuster ring

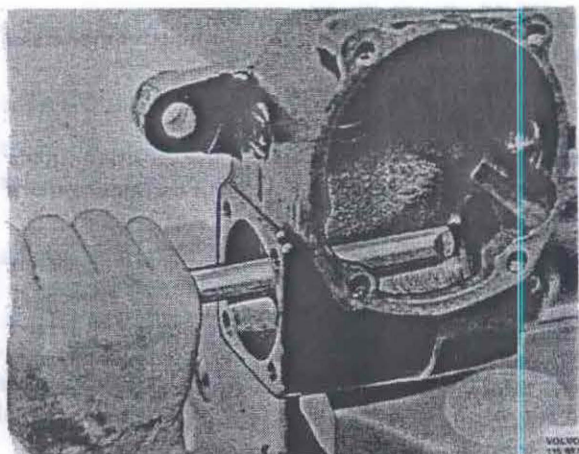


Fig. 64-20. Fitting the upper bearing outer ring

with a brass drift, see Fig. 64-20. Tap with light taps round the bearing race so that the key does not stick.

6. Check the bearing at the top of the steering column jacket. To replace the bearing, knock it out with a screwdriver, see Fig. 64-21. Knock in the new bearing with a plastic mallet.

Assembling the steering gear

1. Place the upper bearing on the steering column and place the steering column in position. Fit the lower bearing and its bearing race, the spacer ring and shims. Fit the same number of shims which were removed.
2. Fit the lower cover and tighten up the bolts while checking that the steering column can be rotated without any notable resistance.

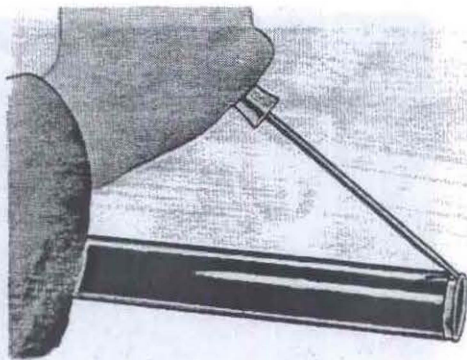


Fig. 64-21. Removing the upper steering shaft bearing

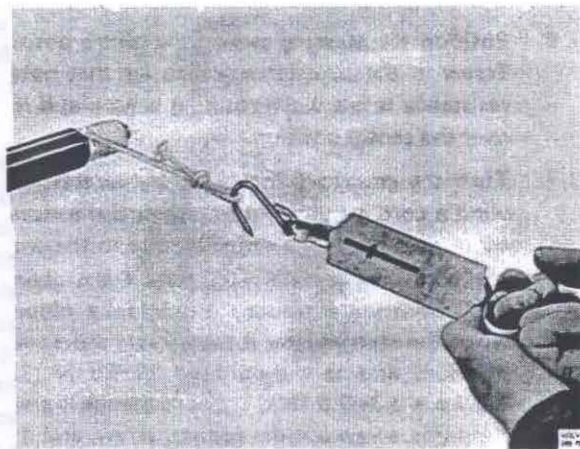


Fig. 64-22. Checking the pre-load

3. Wind a cord a couple of times round the steering column and attach a spring balance to the end of the cord, see Fig. 64-22. Rotate the steering column and read off the force on the bearings, which should be between 2.5-5.5 kp (5.5-12 lbf). With excessive pre-load, add shims, and with too little pre-load, remove some.
4. Oil the sector shaft bushings and place the sector shaft in position in the housing. Coat the cover contact surface against the housing with sealing glue and screw the cover on the adjuster screw. Screw out the adjuster screw so far that the sector shaft is not clamped when the cover attaching bolts are tightened up.
5. Knock in the sealing ring for the sector shaft with sleeve 6119, see Fig. 64-23.

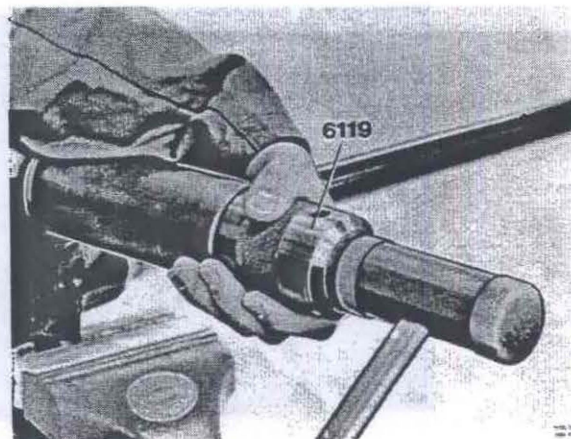


Fig. 64-23. Fitting the sealing ring

6. Position the steering gear in the centre position. Screw in the adjuster screw so far that notable resistance is felt when rotating it back and forth over the centre position.
7. Turn the gear to full lock in one direction and wind a cord a couple of times round the steering column and attach a spring balance to the end of the cord, see Fig. 64-22. Rotate the steering shaft. Maximum resistance should be obtained when the steering gear is turned across the centre position, and this should be 15-25 N (1.5-2.5 kp = 3.3-5.5 lbf). If the resistance is greater than this, screw out the adjuster screw, and if the resistance is too small, screw in the adjuster screw. When the correct value has been obtained, tighten up the lock nut. Re-check the value after having tightened up the lock nut.
8. Fill with 0.5 litre (1 pint) MP 80 oil.

Installing the steering gear

1. Position the steering gear with the attachment round the steering shaft pipe.
2. Screw the attachment tight to the frame with the three attaching bolts.
3. Screw tight the steering wheel bracket to the dashboard.
4. Tighten up the clamp bolt round the sector shaft pipe.
5. Screw tight the pitman arm according to the marking, see Fig. 64-24, and lock the nut with the lock washer.
6. Screw tight the stay between the bumper and frame.

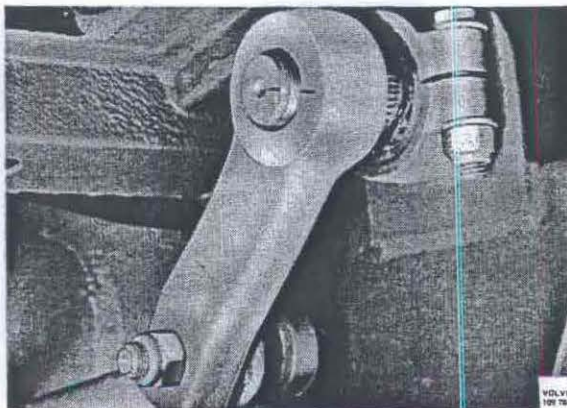


Fig. 64-24. Marking up pitman arm - sector shaft

7. Route the horn cable through the steering column jacket.
8. Put back and screw tight the floor cover.
9. Screw tight the bracket for the direction indicator lever and connect up the cables under the dashboard.
10. Place the spring in the steering column jacket and fit the steering wheel according to the marking, if the old steering shaft is still fitted. If the steering shaft has been replaced, point the wheels straight forwards and fit the steering wheel straight, that is, with one of the spokes pointing straight downwards.
11. Tighten the steering wheel nut to a torque of 35-45 Nm (3.5-4.5 kpm = 25-33 lbftf).
12. Connect up the electric cable to the horn button and push the button securely into position.

AUXILIARY STEERING ARM

Replacing the bushings for the auxiliary steering arm

Special tools:

- 999 2370 Puller
- 999 1821 Impact tool
- 999 2337 Drift
- 999 2413 Drift

Disassembling

1. Remove the nuts for both the steering rods attached to the auxiliary steering arm.
2. Pull off the steering rods from the auxiliary steering arm with puller 2370, see Fig. 64-25.

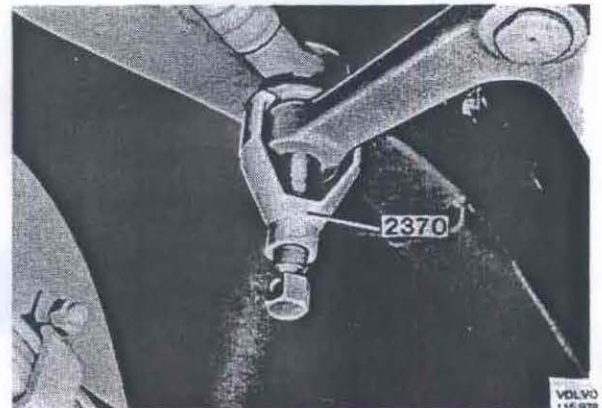


Fig. 64-25. Removing the steering rod

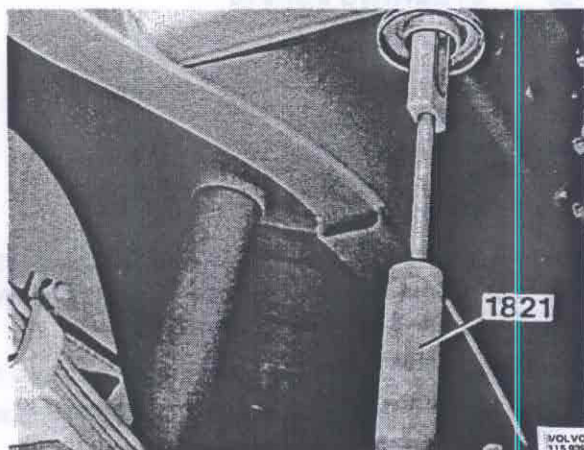


Fig. 64-26. Removing the lower bushing

3. Remove the cover (1, Fig. 64-28) at the top of the shaft.
4. Remove the split pin (11) and unscrew the nut (10).
5. Take down the auxiliary steering arm and take care of the washer (9) and shims (8).
6. Knock out the lower bushing (5) with impact tool 1821, see Fig. 64-26.
7. Knock out the upper bushing (7) with drift 2337, see Fig. 64-27.

Checking, replacing parts

1. Replace the sealing ring (4, Fig. 64-28). Check the contact surface of the sealing ring against the protector ring, and if necessary replace the ring. The ring is tapped securely in position with a plastic mallet.
2. Check the slide surfaces on the auxiliary steering arm. If they are damaged, replace the arm.

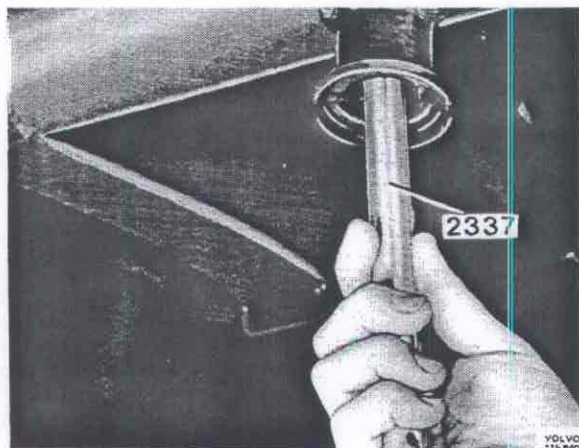


Fig. 64-27. Removing the upper bushing

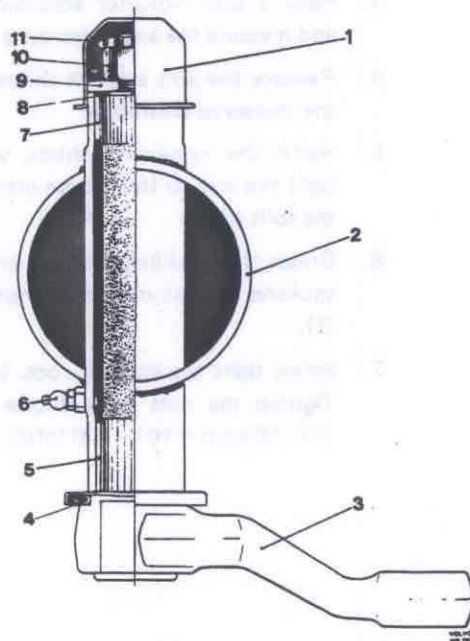


Fig. 64-28. Auxiliary steering arm

- | | | |
|---------------------------|------------------|---------------|
| 1. Cover | 5. Lower bushing | 9. Washer |
| 2. Tubular member | 6. Lubricator | 10. Nut |
| 3. Auxiliary steering arm | 7. Upper bushing | 11. Split pin |
| 4. Sealing ring | 8. Shims | |

Assembling

1. Knock in the bushings with drift 2413, Fig. 64-29. NOTE! Make sure that the bevel on the inside points downwards.
2. Ream the bushings so that the auxiliary steering arm can be fitted. Use an adjustable reamer approx. \varnothing 30 mm (1 3/16") and ream as little as possible. It is important that both bushings are reamed at the same time. Fit the auxiliary steering arm in position. Place shims of the same thickness at those that were removed plus about 0.5 mm (0.02"). Fit the washer (9, Fig. 64-3) and tighten up the nut to a torque of 80-100 Nm (8-10 kpm = 57-72 lbf^{ft}).



Fig. 64-29. Fitting the bushings

3. Place a dial indicator according to Fig. 64-30 and measure the axial clearance on the arm.
4. Remove the arm and the shims corresponding to the measured clearance.
5. Re-fit the remaining shims, washer and screw tight the nut to the torque mentioned above. Fit the split pin.
6. Grease the auxiliary steering arm until the grease squeezes out at one of the ends. Fit the cover (1).
7. Screw tight the steering rods. Use new lock nuts. Tighten the nuts to a torque of 140-180 Nm (14-18 kpm = 101-130 lbftf).

STEERING JOINTS

Replacing

Special tools:

- 999 2370 Puller
- 999 2148 Puller

1. Unscrew the nut.
2. Pull loose the steering joint with puller 2370, see Fig. 64-31. Pull off the steering joint at the sector arm with puller 2148.
3. Release the clamp bolts and screw out the joint.
4. Screw on the new joint and tighten up the clamp bolts.
5. Screw tight the steering joint to the torque given in the specifications.
6. Check the toe-in.

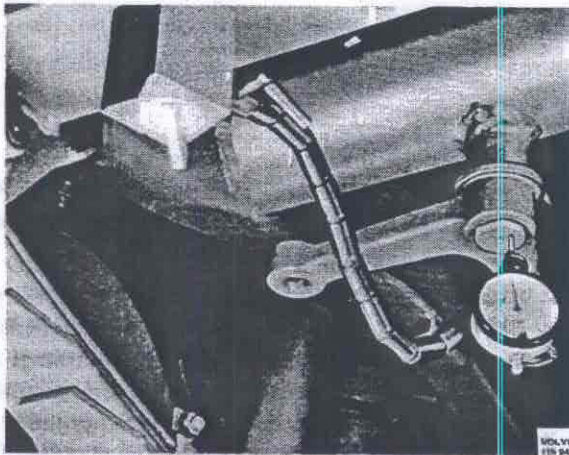


Fig. 64-30. Placing the dial indicator

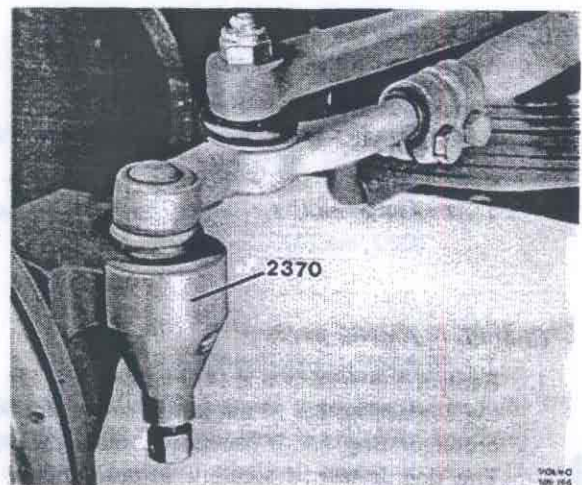
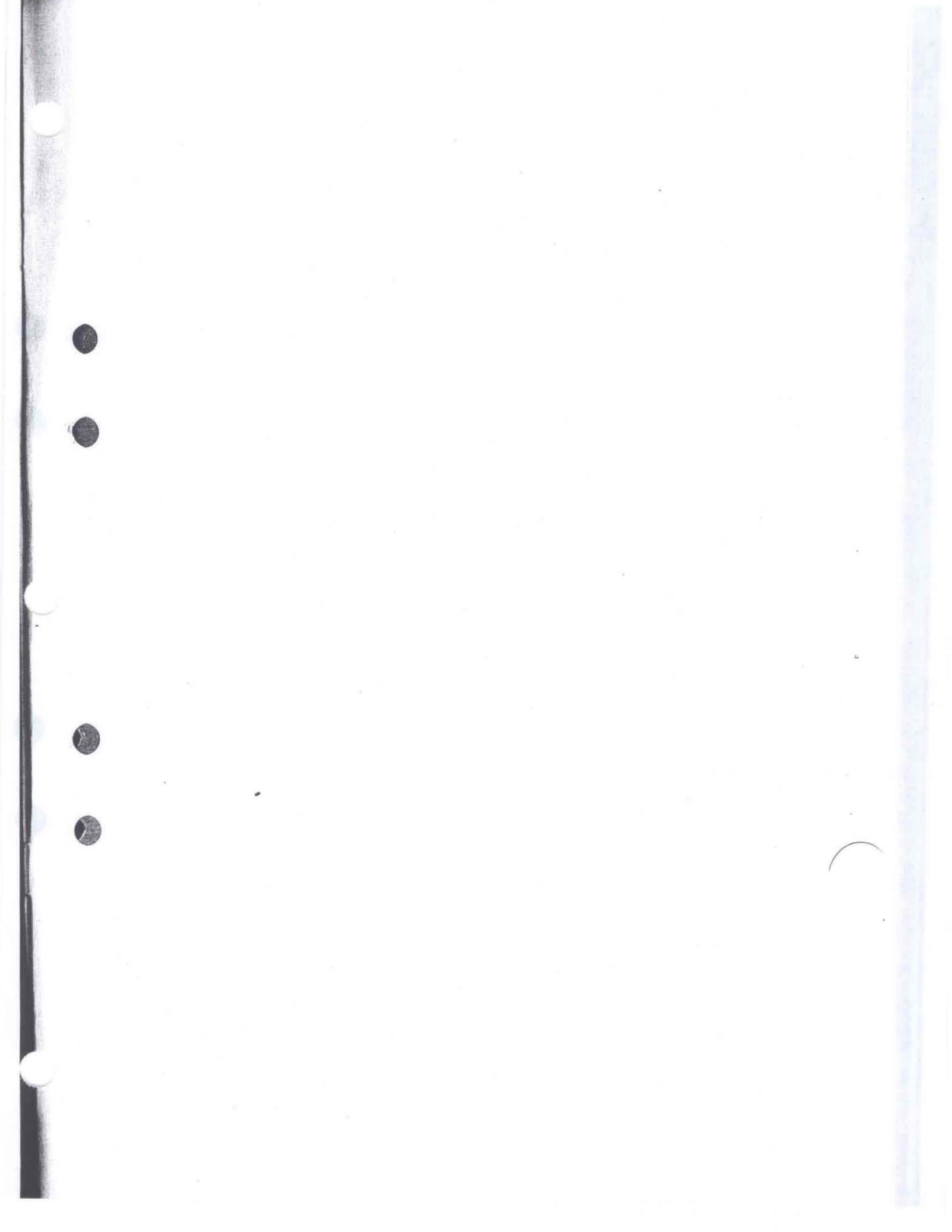
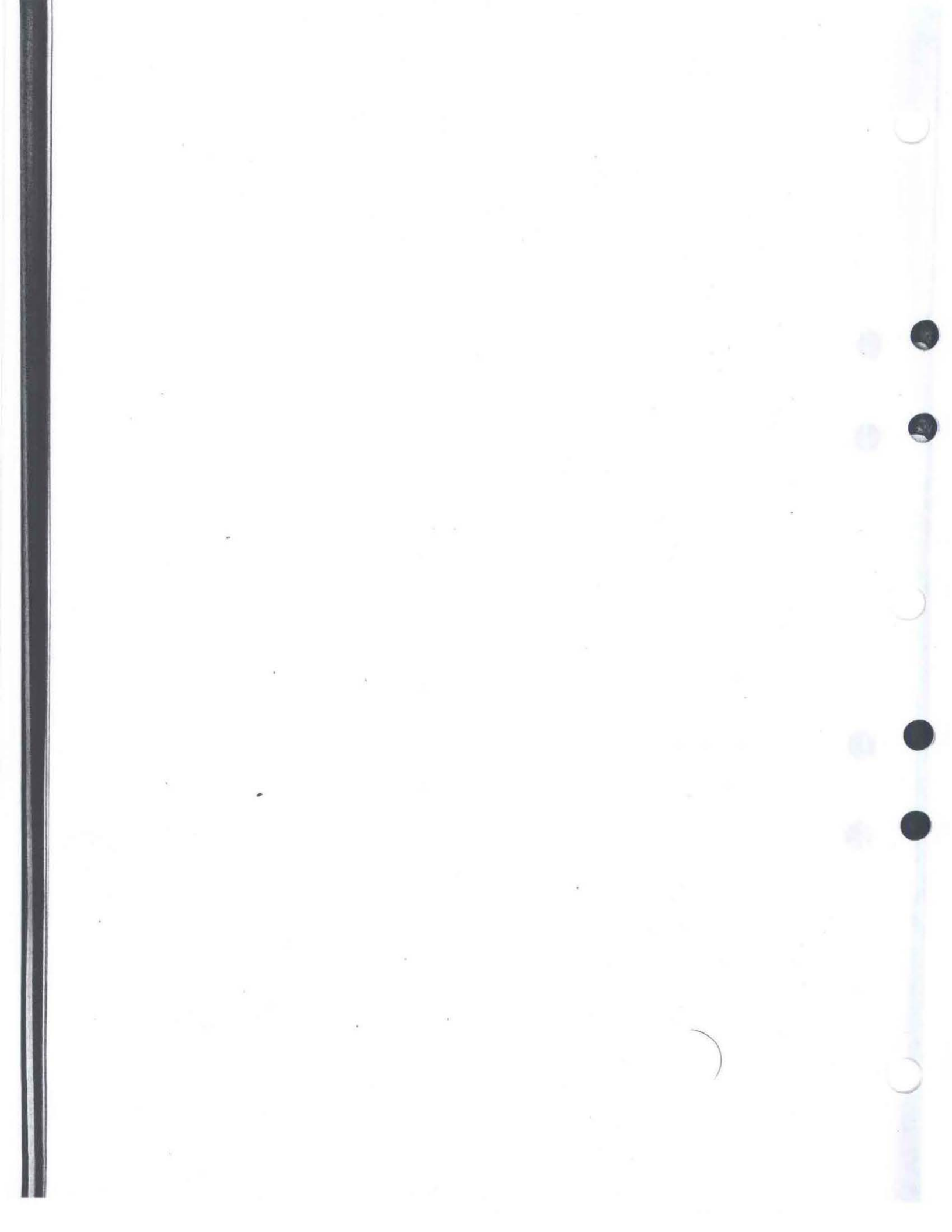
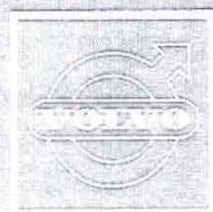


Fig. 64-31. Removing the steering joint







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PART 7
FRAME
SUSPENSION
WHEELS
C 3-series

SERVICE MANUAL

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Part 7

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GROUP 70 GENERAL

Data

FRAME

Type	Fully welded with box-section side members
Length, 2-axle vehicle, wheelbase 2300 mm (90.5")	2530 mm (100")
, 2-axle vehicle, wheelbase 2530 mm (100")	3990 mm (157")
, 3-axle vehicle, wheelbase 2720 + 1050 mm (107 + 41")	5674 mm (223")

Front springs

2-axle vehicle, wheelbase 2300 mm (90.5")

Type	Leaf springs
Length between anchorage centres	1300 mm (51")
Width	76 mm (3")
Number of leaves	7
Thickness of leaves:	
Leaves 1-7	7 mm (0.28")
Test values (complete spring)	
Load with deflection of 1 cm (0.4")	560 N (56 kp = 123 lb.)
Load for straight spring (spring must first be loaded to negative deflection of 150 mm = 6")	5900 N (590 kp = 1300 lb.)

2-axle vehicle, wheelbase 2530 mm (100")

Type	Leaf springs
Length between anchorage centres	1300 mm (51")
Width	76 mm (3")
Number of leaves	8
Thickness of leaves:	
Leaves 1-8	7 mm (0.28")
Test values (complete spring)	
Load with deflection of 1 cm (0.4")	640 N (64 kp = 140 lb.)
Load for straight spring (spring must first be loaded to negative deflection of 150 mm = 6")	7000 N (700 kp = 1400 lb.)

3-axle vehicle

Type	Leaf springs
Length between anchorage centres	1300 mm (51")
Width	76 mm (3")
Number of leaves	8
Thickness of leaves:	
Leaves 1-8	7 mm (0.28")
Test values (complete spring)	
Load with deflection of 1 cm (0.4")	640 N (64 kp = 140 lb.)
Load for straight spring (spring must first be loaded to negative deflection of 150 mm = 6")	7000 N (700 kp = 1400 lb.)

Rear springs

2-axle vehicle, wheelbase 2300 mm (90.5")

Type	Leaf springs
Length between anchorage centres	1300 mm (51")
Width	76 mm (3")
Number of leaves	8

Hubs (front and rear)

Pre-load, new wheel bearings	42–48 N (4.2–4.8 kp = 9–10 lbftf) + friction of sealing rings
, run-in wheel bearings	24–28 N (2.4–2.8 kp = 5–6 lbftf) + friction of sealing rings
Bearing clearance when about to adjust	0.08 mm (0.0032")

Bogie

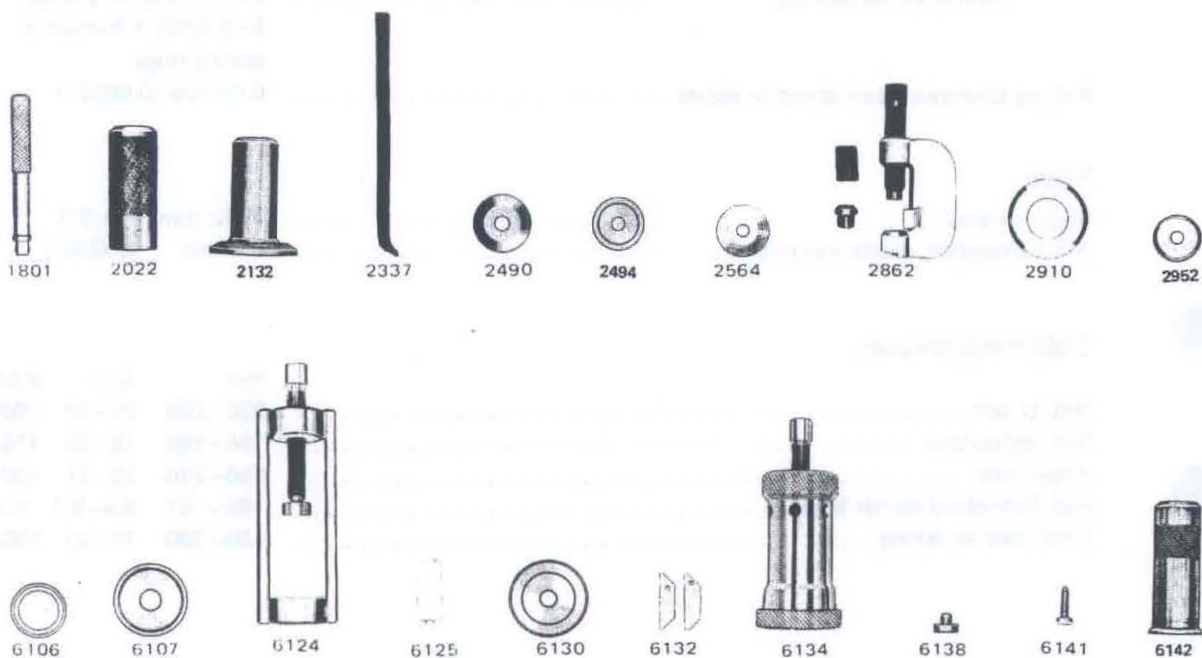
Bogie distance	1050 mm (41.3")
Axial clearance, cradle journalling	0.1 mm (0.004")

Tightening torques

	Nm	kpm	lbftf
Nut, U-bolt	230–280	23–28	166–202
Nut, spring bolt	160–190	16–19	115–137
Wheel nuts	150–210	15–21	108–152
Nut, hub-wheel carrier housing	55– 67	5.5–6.7	40– 48
Lock bolt for spring	180–230	18–23	130–166

Tools

The following special tools are required for work on the frame, suspension, wheels



- | | | | |
|------|---|------|--|
| 1801 | Standard handle | 6107 | Drift for installing inner bearing outer ring in hub |
| 2022 | Sleeve for pressing on gear wheel | 6124 | Press tool for removing and installing spring bushings |
| 2132 | Sleeve for pressing sealing ring into cradle | 6125 | Drift. Used together with 6124 when removing spring bushing and for removing and installing rubber bushings on reaction rods |
| 2337 | Drift | 6130 | Drift for installing inner seals in hub |
| 2490 | Drift for removing outer bearing outer ring in hub | 6132 | Press washers for removing outer bearing outer ring in hub |
| 2494 | Drift for pressing needle bearing into cradle | 6134 | Puller for removing outer bearing inner ring in hub |
| 2564 | Drift for removing inner bearing outer ring in hub | 6138 | Guide. Used together with 6124 and 6125 |
| 2862 | Press tool for removing and installing wheel studs | 6141 | Bolt for pressing out hub |
| 2910 | Sleeve for installing outer sealing ring in hub | 6142 | Sleeve for installing bearing races |
| 2952 | Drift for pressing needle bearing out of cradle | | |
| 6106 | Sleeve for installing inner and outer bearing inner ring in hub | | |

GROUP 71 FRAME

Description

The frame is made up of two box-profile side members which are joined together by means of four crossmembers. The front and rear crossmembers are

of box-section while the two intermediate are gas-tight tubular members which function as vacuum tanks.

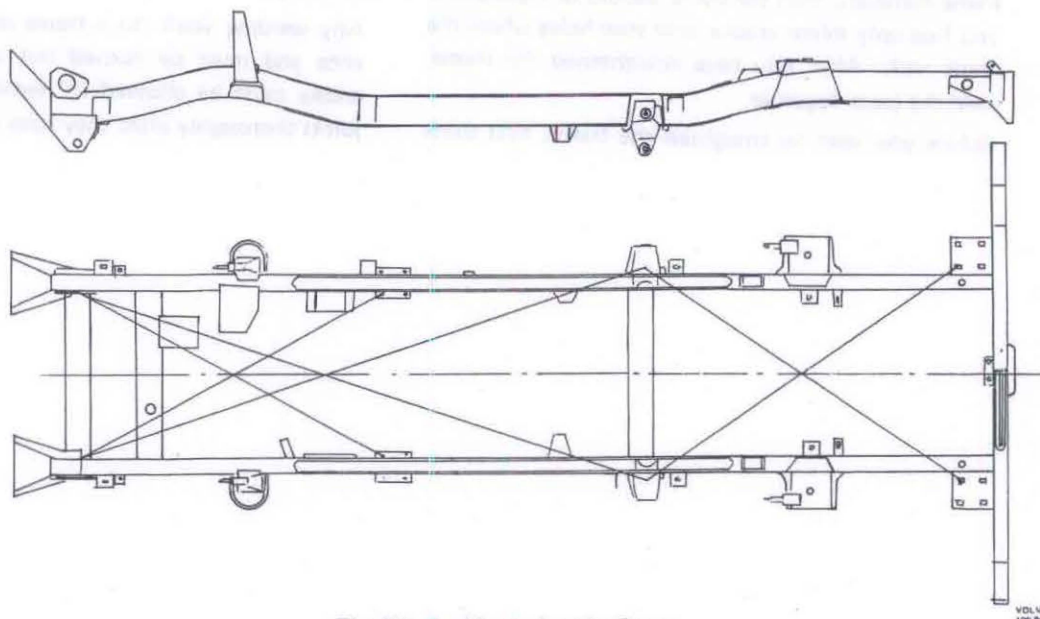


Fig. 71-1. Measuring the frame

Service Procedures

Measuring the frame

If it is suspected that for some reason or other the frame is faulty, it should be check-measured. This can be done by transferring the position for certain fixed points to a flat, clean floor. Measuring is then done on the floor. The points shown in Fig. 71-1, for example, can be used.

Suspend a pointed plumb over one of the points. The vehicle must be securely parked with the parking brake or blocks behind the wheels. At the point on the floor over which the plumb hangs mark clearly with chalk. Then with a pencil or scribe make a cross on this mark, immediately below the plumb pointer. Repeat this procedure at the other points. Then remove the vehicle. Take a piece of string and stretch this between two of the points. Pull up the middle of the string slightly and let it strike against the floor. This will cause the tacked string to make a white line between the points. Do the same between the other

points so that you get diagonal lines as shown on Fig. 71-1. When measuring between the points marked where the plumb was suspended, the length of two diagonals crossing each other should agree with a permitted deviation of max. 3 mm (1/8"). If the deviation exceeds this, then the frame is crooked and must be straightened.

To find out whether the frame is twisted or bent, place it on trestles with the side members straight upper edges parallel with the floor and both sides at the same height. Measure the distance from the floor to the straight upper edge on the frame. This measurement is then to be used as a basic measurement when check-measuring. If this measuring is to be reliable, the floor must be absolutely flat. Be particularly thorough when marking and measuring. A faultless frame should be flat and the side members straight and in parallel.

Straightening and repairing the frame

The frame should preferably be straightened when in a cold condition. If it must be heated, do not go too far with this. Under no circumstances may the frame be heated to more than a cherry colour, that is, a dark red heat.

Before you start to straighten the frame, examine it for cracks, etc. If you find major cracks in any of the frame members, then the frame should be replaced. If you find only minor cracks, drill stop holes where the crack ends. After you have straightened the frame, weld the crack together.

Before you start to straighten the frame, first think

carefully the best way for doing this. Special jacks are available for straightening and these are fixed to the frame by means of hooks and chains.

If any part of the frame is to be cut off, the cutting must be done 10–15 mm (3/8–9/16") from the material that has to remain. The rest of the material to be removed must be removed by filing and sand-papering.

Any welding work on a frame requires great experience and must be carried out with great care. No cracks must be allowed to remain. Inspect the weld joints thoroughly after they have cooled.

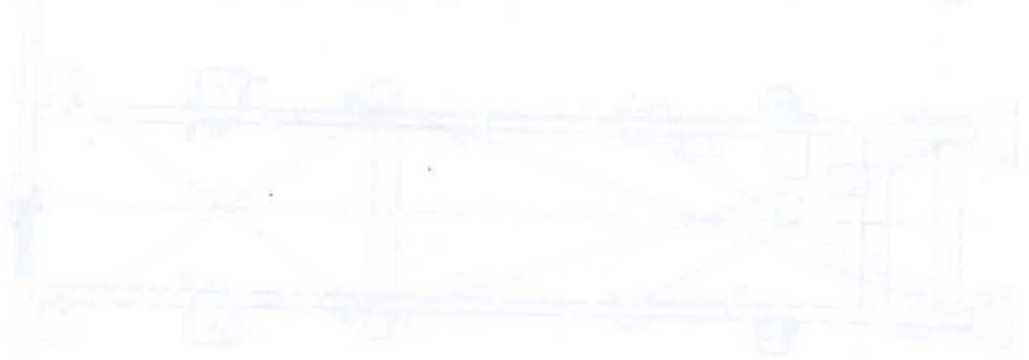


Fig. 11-2 Straightening the frame

Service Procedures

When the frame is straightened, it should be checked for cracks. If any cracks are found, they should be repaired. The frame should be painted after it has been straightened. The paint should be a rust-inhibiting type. The frame should be checked for alignment after it has been straightened. The alignment should be checked at the front and rear of the frame. The frame should be checked for squareness after it has been straightened. The squareness should be checked at the front and rear of the frame. The frame should be checked for levelness after it has been straightened. The levelness should be checked at the front and rear of the frame. The frame should be checked for straightness after it has been straightened. The straightness should be checked at the front and rear of the frame. The frame should be checked for roundness after it has been straightened. The roundness should be checked at the front and rear of the frame. The frame should be checked for flatness after it has been straightened. The flatness should be checked at the front and rear of the frame. The frame should be checked for squareness after it has been straightened. The squareness should be checked at the front and rear of the frame. The frame should be checked for levelness after it has been straightened. The levelness should be checked at the front and rear of the frame. The frame should be checked for straightness after it has been straightened. The straightness should be checked at the front and rear of the frame. The frame should be checked for roundness after it has been straightened. The roundness should be checked at the front and rear of the frame. The frame should be checked for flatness after it has been straightened. The flatness should be checked at the front and rear of the frame.

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GROUP 72 SPRINGS

Description

2-axle vehicle

Both the front and rear springs are of the conventional leaf type. The front end of the springs is rigidly suspended in spring bolts. The rear ends hang from spring shackles. The vehicle is provided with hollow-rubber springs, both front and rear.

3-axle vehicle

The design and suspension of the front springs is the same as for 2-axle vehicles. But the rear springs are of the parabel type. Rear springing is progressive with slip suspension at both ends, see Fig. 76-2. The vehicle has hollow-rubber springs front and rear.

Service Procedures

SPRINGS

2-axle vehicle and 3-axle vehicle (front)

Removing a spring

1. Jack up the vehicle.
2. Unbolt the wheel covering the spring.
3. Remove the front spring bolt.
4. Remove the four bolts for the rear spring anchorage so that the entire spring shackle is also removed at the same time.
5. Unscrew the nuts on the U-bolts and lift out the spring.

Installing a spring

1. Place the spring in position.
2. Bolt on the front spring bolt, but only a couple of threads. **IMPORTANT!** Make sure that the spring bolt in the rear spring takes the right thread in order not to damage the threads on the weld nut.
3. Fit the spring plate with the U-bolts. If you have any difficulty in centring the centre bolt on the rear spring, release the reaction rod. Tighten the nuts on the U-bolts.
4. Bolt tight the rear spring anchorage.
5. Make sure that all released spring bolts are not tightened up. Jack up the vehicle under the axle. Load the vehicle until there is an angle of 90° between the spring shackle and frame. Then tighten the spring shackle upper bolt. Load the vehicle further until the spring is flat and tighten up the remaining spring bolts.
6. Mount the wheel, tighten up the wheel studs and lower the vehicle.

Testing a spring

A spring can be tested in a hydraulic press. The press, however, must be provided with a sufficiently accu-

rate pressure gauge and it must have such a device that the spring cannot slide out sideways.

Invert the spring and place it in the press. Place supports at both ends. Apply pressure to the centre bolt, see Fig. 72-1. Check the spring test value against the data. If the pressure gauge indicates that the spring is faulty, straighten it or replace it.

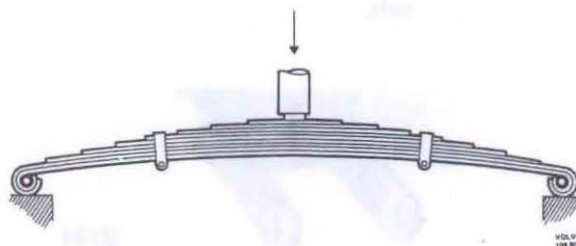


Fig. 72-1. Testing a spring

Fractured spring leaves

When one or several of the spring leaves are fractured, not only must they be replaced but the reason for the fracture should be looked into.

If the fracture is towards the middle of the spring, then the reason may be a faulty shock absorber. A fracture may also be due to a broken centre bolt or overloading.

Replacing spring bushings

Special tools:

- 6124 Press tool
- 6125 Drift
- 6138 Guide

Front springs

1. Jack up the vehicle.
2. Unbolt and remove the wheel covering the spring.

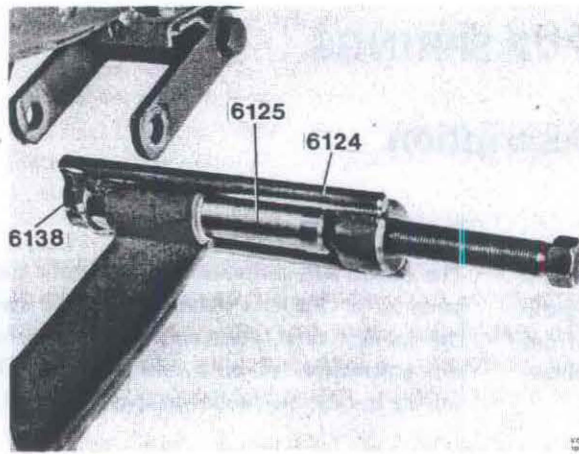


Fig. 72-2. Pressing out a spring bushing

3. Unscrew the spring bolt for the bushing to be replaced.
4. Fit press tool 6124, drift 6125 and guide 6138 according to Fig. 72-2 and press out the bushing.
5. Press in the new bushing using only press tool 6124, see Fig. 72-3, and screw in the spring bolt.



Fig. 72-3. Pressing in a spring bushing

6. Make sure that all spring bolts that were loosened are not tightened up. Jack up the vehicle under the axle. Load the vehicle to an angle of 90° between the spring shackle and frame. Then tighten up the spring shackle upper bolt. Load the vehicle further until the spring is straight and tighten up the remaining spring bolts.
7. Replace the upper bushing in the rear anchorage in the press with the drift 6125, see Fig. 72-4.
8. Mount and screw tight the wheel. Lower the vehicle.

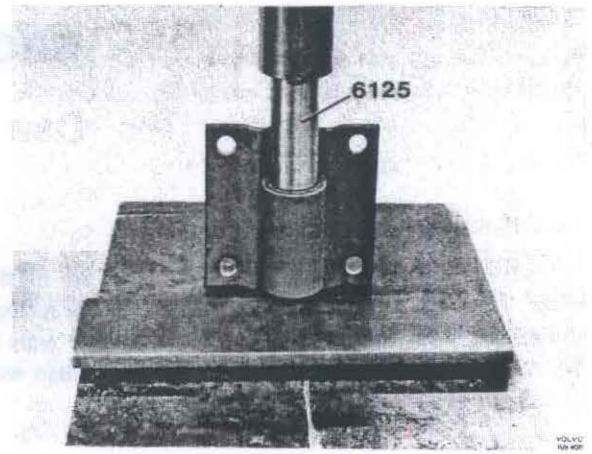


Fig. 72-4. Pressing bushing out of anchorage

Rear springs

1. Screw down the rear spring according to the instructions given under the heading "Removing a spring".
2. Press out the bushings in the spring with press tool 6124 and drift 6125, see Fig. 72-2.
3. Press in the bushings with only press tool 6124, see Fig. 72-3.
4. Replace the upper bushing in the rear anchorage in the press with drift 6125, see Fig. 72-4.
5. Bolt tight the spring according to the instructions given under the heading "Installing a spring".

3-axle vehicle, rear springs

Removing a rear spring

1. Jack up the vehicle and unbolt and remove the wheels.
2. Release the U-bolts and the lock bolts (4, Fig. 76-2). Lift out the spring.

Installing a rear spring

1. Place the spring and fit the U-bolts. Do not tighten up the U-bolts.
2. Torque the lock bolts to 230–280 Nm (23–28 kpm = 166–202 lbftf), and tighten up the lock nuts.
3. Torque the U-bolts to 230–280 Nm (23–28 kpm = 166–202 lbftf).
4. Mount the wheels, screw tight the wheel studs and lower the vehicle.

Testing a spring-fractured spring leaf

See under the heading "2-axle vehicle and 3-axle vehicle (front)".

GROUP 76 SHOCK ABSORBERS, STABILIZERS AND SUSPENSION COMPONENTS

Description

Shock absorbers

The shock absorbers are of the hydraulic, double-operating, telescopic type. They are maintenance-free but cannot be disassembled for repairs. If they leak or function poorly, the shock absorbers are replaced complete.

Design

The design of the shock absorbers can be seen from Fig. 76-1. The outer cylinder (1) protects against dust and dirt. The other two cylinders (2) and (4) are arranged concentrically with the one entirely pushed into the other. The inner cylinder (2) is the real working cylinder and has a valve (6) at its lower end. A piston (5) with channels regulated by valves run inside the inner cylinder. This piston is attached to a piston rod (3) at the opposite end of which there is a ring (9) for attaching the shock absorber to the frame. At the other end of the shock absorber there is a similar ring fixed to a cylinder (4). The intermediate space between the cylinders (2) and (4) serves as a reservoir and is only partly filled with fluid. The inner cylinder (2) is entirely filled with fluid on both sides of the piston (5). The cover (8) provides the sealing and guide for the piston rod (3). The ring (7) acts as a baffle for the fluid.

Function

When a shock absorber is compressed or extended according to the weight on the vehicle, the piston (5) moves in the inner cylinder (2). This causes fluid to flow through the valve-regulated channels in the piston. The speed at which the piston can move in the cylinder will depend on how fast the fluid flows through the channels from one side of the piston to the other side. Since the drilled channels are very narrow, the fluid can only pass through them slowly and this brakes the movement of the piston. It also has a damping effect on the movement of the spring. When a shock absorber is suddenly compressed or extended, further braking effect is caused by turbulence in the fluid passing through the channels in the piston. When the shock absorber is compressed or extended, this does not alter the volume equally on both sides of the piston due to the fact that the piston rod occupies a certain space. During compression of the absorber, some of the fluid flows through the valve (6) out into the reservoir, and when

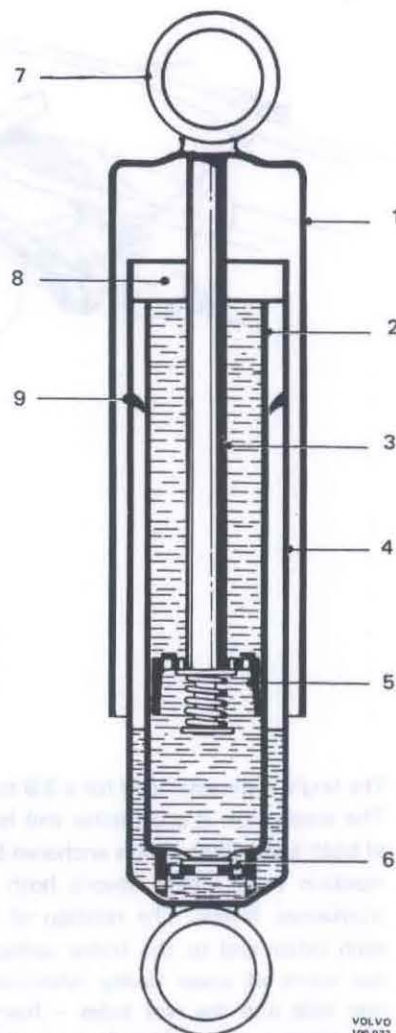


Fig. 76-1. Shock absorber

- | | |
|--------------------------|----------|
| 1. Outer cylinder | 6. Valve |
| 2. Inner cylinder | 7. Ring |
| 3. Piston rod | 8. Cover |
| 4. Intermediate cylinder | 9. Ring |
| 5. Piston | |

extension takes place, fluid is re-sucked into the cylinder (2) on the underside of the piston.

Reaction rods

2-axle vehicle

Two reaction rods have been fitted to the rear axle for more stable location.

The reaction rods are fixed at both ends with rubber bushings.

3-axle vehicle

See under the heading "Bogie"

Bogie

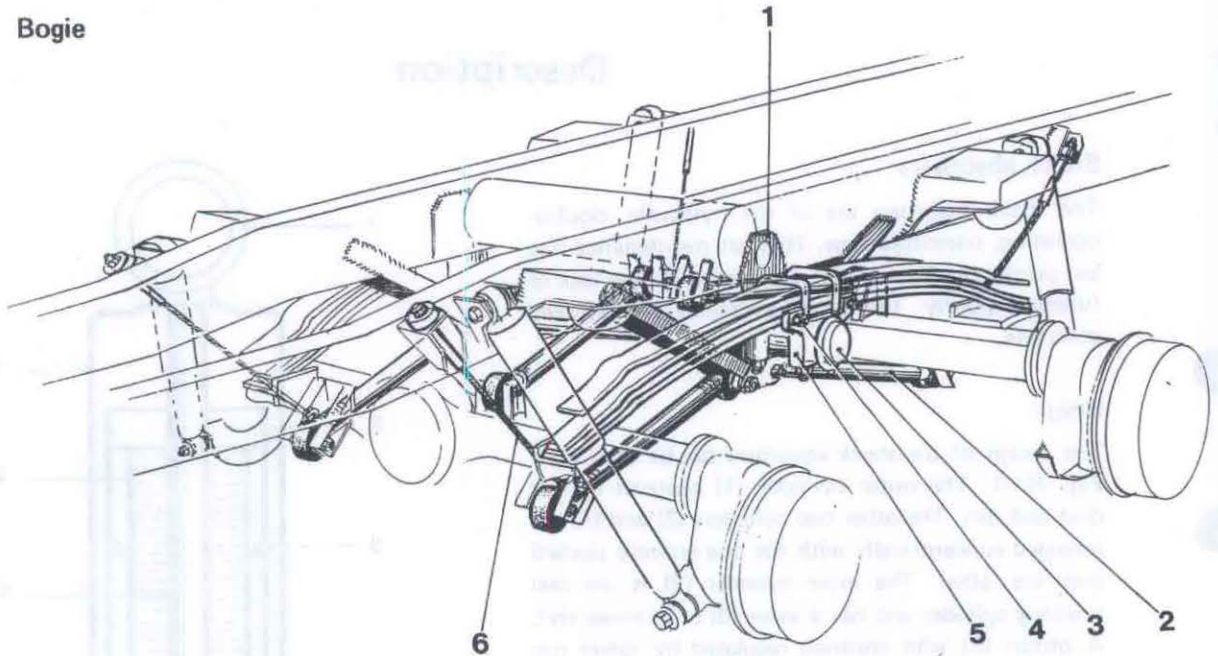


Fig. 76-2. Bogie

- | | |
|--------------------|--------------|
| 1. Bogie anchorage | 4. Lock bolt |
| 2. Reaction rod | 5. Cradle |
| 3. Cover | 6. Stop line |

The bogie is dimensioned for a 3.9 ton bogie pressure. The suspension is progressive and has slip suspension at both ends. Each axle is anchored by means of three reaction rods. These absorb both longitudinal and transversal forces. The relation of the rear axles to each other and to the frame cannot be adjusted. In the event of some faulty relationship between the rear axle and the rear axles - frame, examine what the defect is and replace the parts that are defective.

The cradle (5, Fig. 76-2) is journalled on the bogie attachment's (1) journal pin with needle bearings (4 and 8, Fig. 76-3) for radial forces and with synthetic thrust washers (3 and 9) for axial forces. Axial clearance is adjusted with the help of the nut (10).

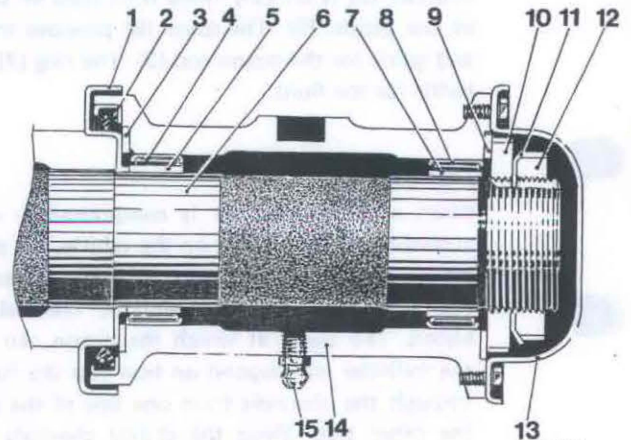


Fig. 76-3. Cradle journaling

- | | |
|--------------------------|------------------------|
| 1. Dust protective plate | 9. Outer thrust washer |
| 2. Sealing ring | 10. Inner nut |
| 3. Inner thrust washer | 11. Lock washer |
| 4. Inner needle bearing | 12. Outer nut |
| 5. Inner bearing race | 13. Cover |
| 6. Bogie axle | 14. Cradle |
| 7. Outer bearing race | 15. Lubricating nipple |
| 8. Outer needle bearing | |

Service Procedures

Shock absorbers

Removing

To remove a shock absorber, first remove the upper and lower anchorage bolts. A rear wheel must be removed in order to remove a rear shock absorber.

Installing

Before installing a shock absorber, bleed it by holding it in the vertical position with the protective cover upwards and pump 4–5 complete strokes or until you feel there is a certain amount of resistance in both directions. When installing a shock absorber, hold the dust protective cover upwards all the time.

Reaction rods

2-axle vehicle

Special tool:

6125 Drift

Replacing reaction rod rubber bushings

1. Unscrew the reaction rod.
2. Place the reaction rod in a press and press out the bushings with drift 6125, see Fig. 76-4.
3. Press in the bushings with the same drift used for pressing them out.
4. Screw tight the reaction rod with the vehicle loaded to a straight rear spring.

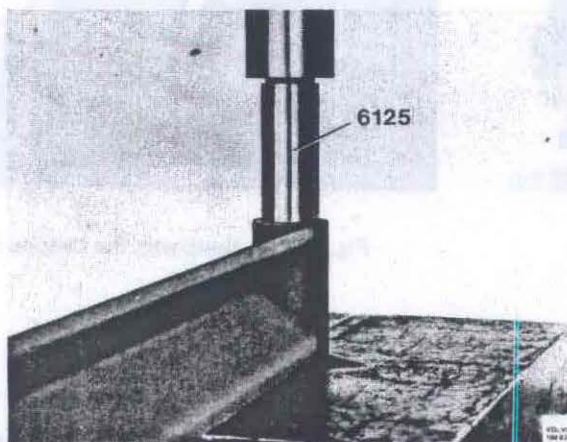


Fig. 76-4. Pressing out the bushing

3-axle vehicle

If any of the rod ends is loose, replace the rod complete.

Bogie

Special tools:

2952 Drift
1801 Standard handle
2494 Drift
2132 Sleeve
6142 Sleeve

Removing the cradle

1. Jack up the vehicle and remove the wheels.
2. Release the U-bolts and the lock bolts, see Fig. 76-5. Lift out the spring.
3. Screw off the cover (13, Fig. 76-3).
4. Knock up the lock washer (11) and screw off the outer nut (12) with a wrench, see Fig. 76-6.
5. Screw off the inner nut with a wrench and pull off the cradle. Remove the outer axial washer (9) and clean the cradle and bogie axle.

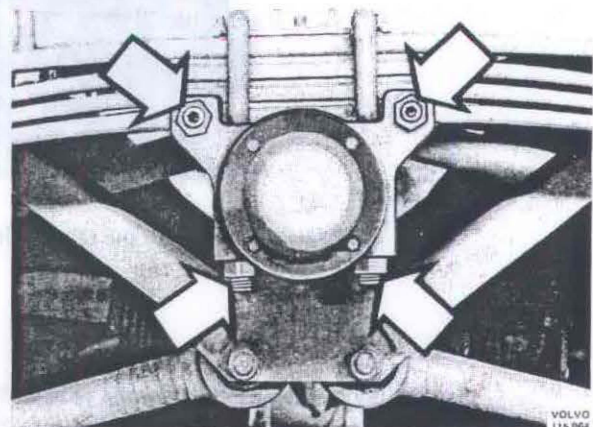


Fig. 76-5. Removing the spring

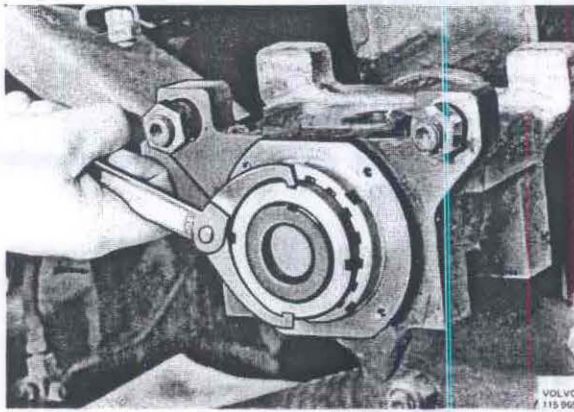


Fig. 76-6. Removing the outer nut

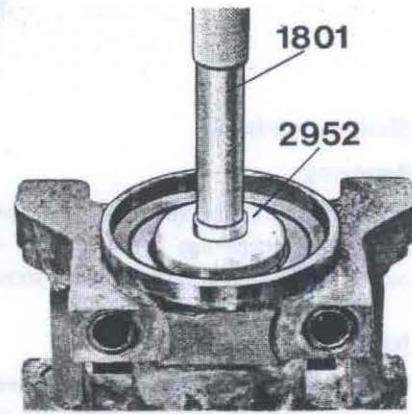


Fig. 76-8. Removing the needle bearing

Disassembling the cradle and removing the bearing races

1. Knock out the sealing ring with a chisel, see Fig. 76-7. If there is any burr underneath the sealing ring, remove it with a shaver.

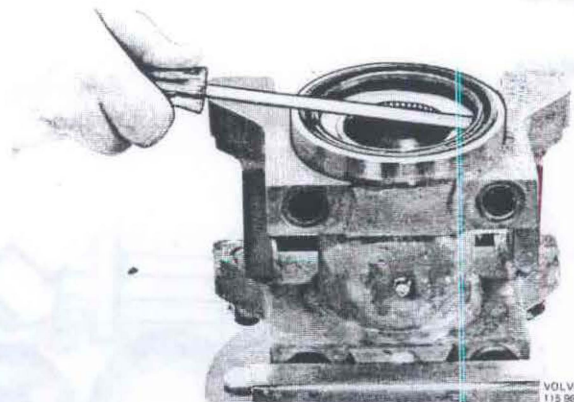


Fig. 76-7. Removing the sealing ring

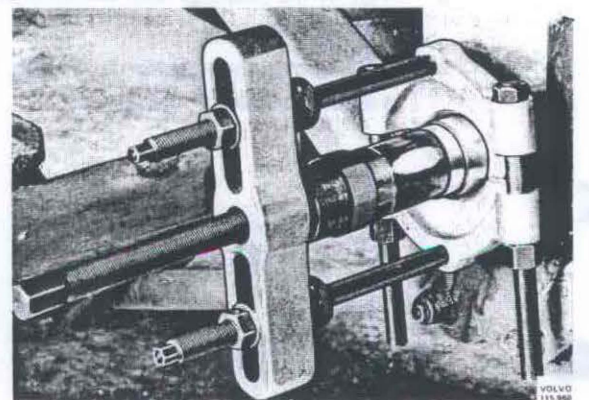


Fig. 76-9. Removing the bearing races

2. Press out the needle bearings with drift 2952 and standard handle 1801, see Fig. 76-8. Press out both the bearings at the same time. Pluck out the inner axial washer (3).
3. Pull off the bearing races (5 and 7) with a jackknife tool, see Fig. 76-9. Pull off both the races at the same time. Remove the dust protective plate by hand.

Inspection

Clean all the parts thoroughly. Check the bearings, bearing races, axial washers and bearing surfaces. Check the dust cover plate at the sealing surface for the sealing ring and the slide surface for the inner axial washer. The shaft pin where the dust cover plate sits must be properly cleaned.

Assembling and installing the cradle, also installing the bearing races

1. Press in the needle bearings with drift 2494 and standard handle 1801, see Fig. 76-10. Press in the bearings so that they are flush with the cradle.

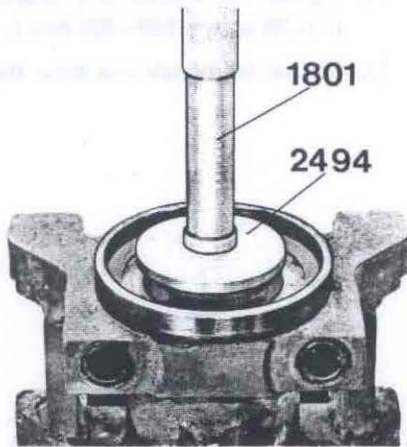


Fig. 76-10. Installing the needle bearing

2. Place the inner axial washer with a little grease on and press in the sealing ring with sleeve 2132, see Fig. 76-11.

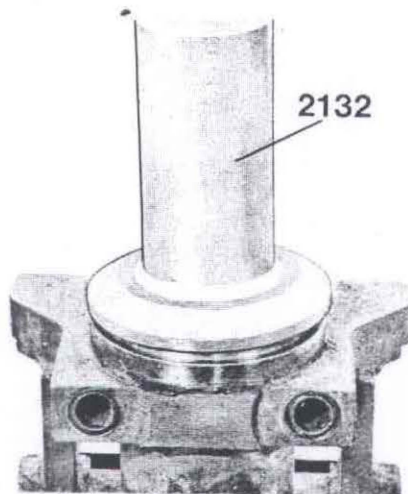


Fig. 76-11. Installing the sealing ring

3. Place the dust protective plate in position and fit the inner bearing race with sleeve 6142. Tap in the bearing race until it bottoms, see Fig. 76-12.

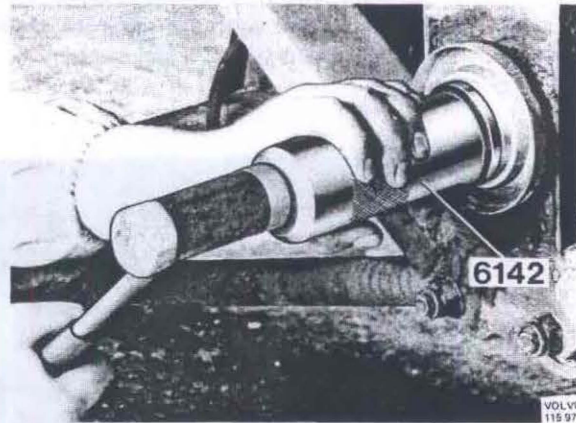


Fig. 76-12. Installing the inner bearing race

4. Tap in the outer bearing race halfway. Grease the lips of the sealing ring and the bearings with a little grease and place the cradle in position. Tap in the bearing race with sleeve 6142 until the sleeve goes against the cradle, see Fig. 76-13.

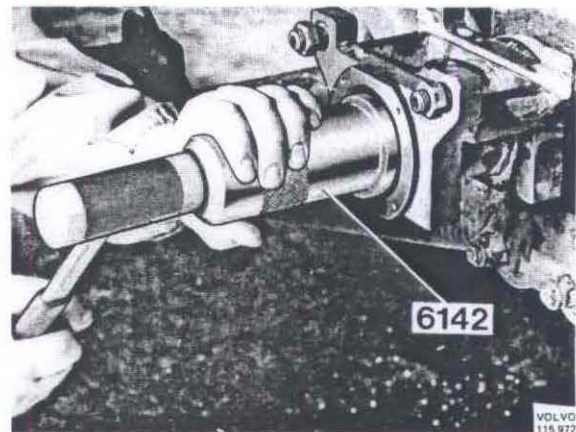


Fig. 76-13. Installing the outer bearing race

5. Grease the outer axial washer with a thin layer of grease and place it in position.
6. Screw on the inner nut and place the lock washer in position. Screw on the outer nut and tighten it against the inner nut when the hub has a little clearance. Do not lock the lock washer.
7. Position a dial indicator according to Fig. 76-14. Turn the cradle while pressing it inwards at the same time and zero-set the dial indicator. Turn the cradle and pull it outwards. Read off the clearance. The correct clearance should be 0.1 mm (0.0039"). If necessary, adjust the clearance. When correct clearance has been obtained, lock both the nuts with the lock washer.
8. Grease the cradle journalling through the lubricator underneath the cradle. Lubricate until grease squeezes out at one of the cradle ends.
9. Fill the cover halfway with grease and screw it into position.
10. Place the spring in position and fit the U-bolts. Do not tighten up the U-bolts. Tighten the lock bolts to a torque of 230–280 Nm (23–28 kpm = 166–202 lbftf) and tighten up the lock nuts.
11. Tighten the U-bolts to a torque of 230–280 Nm (23–28 kpm = 166–202 lbftf).
12. Bolt on the wheels and lower the vehicle.

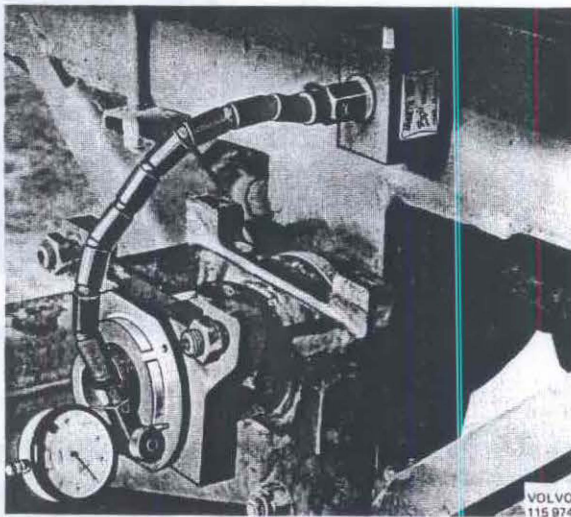


Fig. 76-14. Measuring the axial clearance

GROUP 77 WHEELS, HUBS

Description

Tyres

The tyres are balanced at the factory. The tyre tube should have its valve opposite (180°) the red centre of gravity marking on the tyre.

The front tyres should be fitted with the "points" on the tyre pattern facing opposite the direction of rotation, while they should be facing in the direction of rotation on the rear tyres.

Rims

The rims are of the disc type. They can be used for tyres with or without tubes.

Hubs

The front wheel and rear wheel hubs (Fig. 77-1) are of the same type. The stub axle (11) is journalled in the hub (10) by means of two tapered roller bearings (3 and 4). Oil sealing is provided by a sealing ring (1), which seals against a wear ring (2) and against the stub axle, as well as a sealing ring (9) which seals against the gear wheel (5).

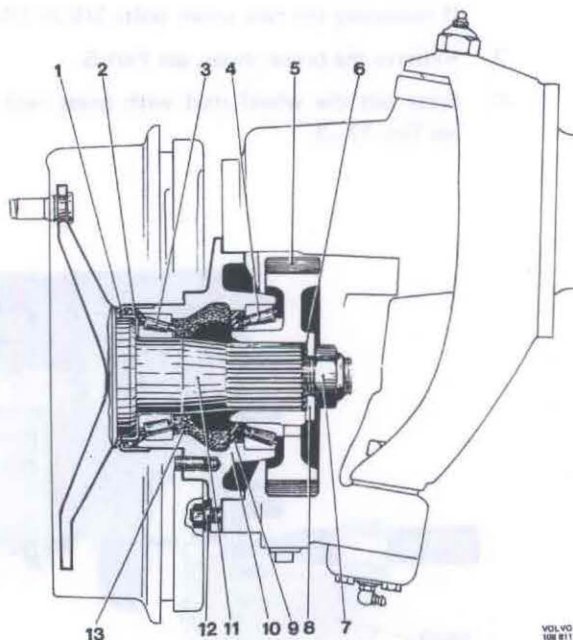


Fig. 77-1. Hub

- | | |
|------------------|-------------------|
| 1. Sealing ring | 8. Washer |
| 2. Wear ring | 9. Sealing ring |
| 3. Outer bearing | 10. Hub housing |
| 4. Inner bearing | 11. Stub axle |
| 5. Gear wheel | 12. Retaining nut |
| 6. O-ring | 13. Grease |
| 7. Nut | |

Service Procedures

Wheels

Removing a wheel

1. Slacken the wheel nuts several turns.
2. Jack up the front or rear end with a jack so high that the wheel to be removed comes off the ground.
3. Unscrew the wheel nuts and lift off the wheel.

Fitting a wheel

1. Clean thoroughly the contact surfaces on the rim and wheel nuts.
2. Lift the wheel in position and screw on the wheel nuts a couple of turns or so.
3. Lower the vehicle and tighten up the wheel nuts crosswise a little at a time until all are tightened to a torque of 160–210 Nm (16–21 kpm = 115–152 lbftf).

Replacing a wheel stud

Special tool:

2862 Press tool

1. Jack up the vehicle.
2. Remove the wheel, adjust down the brake shoes and remove the brake drum.

If necessary use two puller bolts 3/8-24 UNF.

3. Remove the brake shoes, see Part 5.
4. Press out the wheel stud with press tool 2862, see Fig. 77-2.

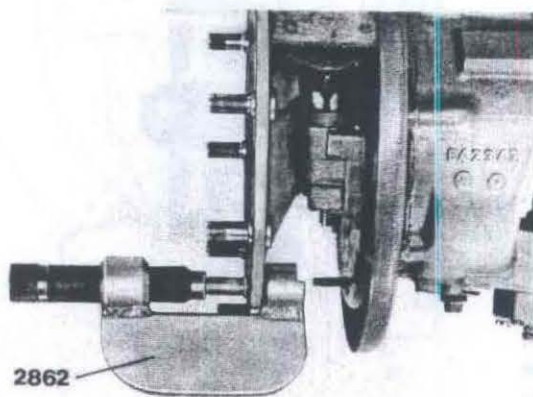


Fig. 77-2. Pressing out the wheel stud

5. Press in the new wheel stud with press tool 2862, see Fig. 77-3.

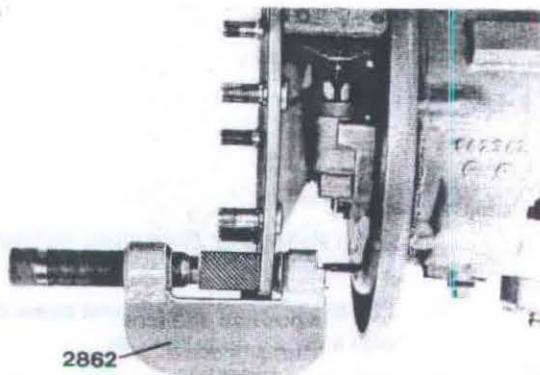


Fig. 77-3. Pressing in the wheel stud

6. Fit the brake shoes, see Part 5.
7. Fit the brake drum and adjust up the brake shoes.
8. Mount the wheel and tighten the wheel nuts crosswise to a torque of 160–210 Nm (16–21 kpm = 115–152 lbftf).
9. Lower the vehicle.

Hubs

Special tools:

- 6132 Press washer
- 2564 Drift
- 1801 Standard handle
- 2490 Drift
- 2337 Drift
- 6134 Puller
- 6107 Drift
- 6106 Sleeve
- 6130 Drift
- 2910 Sleeve
- 2022 Sleeve

Checking, adjusting the wheel bearings

1. Jack up the vehicle.
2. Remove the wheel for the hub or hubs to be checked.
3. Apply a dial indicator as shown in Fig. 77-4. Press in and rotate the hub, zero-set the dial indicator. Pull out and rotate the hub, read off any clearance in the bearings. If clearance exceeds 0.08 mm (0.0032"), adjust the wheel bearings as follows:

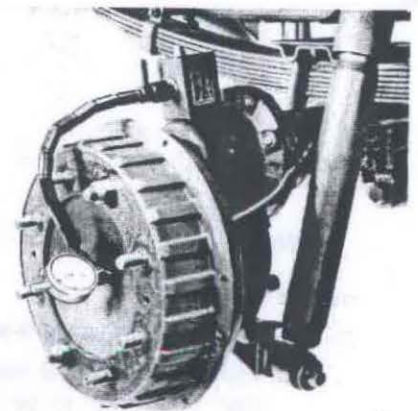


Fig. 77-4. Checking wheel bearing clearance

4. Remove the hub according to the instructions given under the heading "Removing a hub".
 5. Disassemble the hub according to the instructions given under the heading "Disassembling a hub".
 6. Check the wheel bearings. If damaged, replace the bearings according to the instructions given under the heading "Replacing wheel bearings".
 7. Assembling, which also includes adjusting, is to be carried out according to the instructions given under the heading "Assembling a hub".
 8. Installing is according to the instructions given under the heading "Installing a hub".
2. Pull off the gear wheel (5) with the Kukko standard jackknife 20-2, see Fig. 77-6. Lift off the hub (10) together with the brake backing plate.

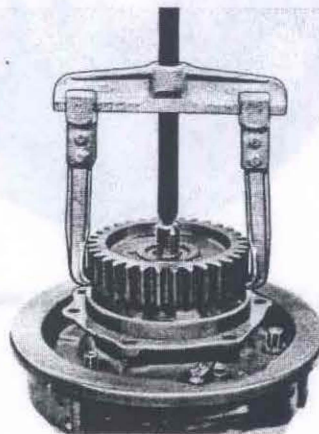


Fig. 77-6. Removing the gear wheel

Removing a hub

1. Jack up the vehicle.
2. Remove the wheel for the hub concerned.
3. Drain the oil in the wheel carrier housing.
4. Disconnect the brake lines and plug them.
5. Unscrew the nuts between hub and wheel carrier housing.
6. Remove the plug on the reverse side of the wheel carrier housing and screw in a M10 bolt with thread length minimum 50 mm (2"), see Fig. 77-5. Screw in the bolt so that the hub releases fully.

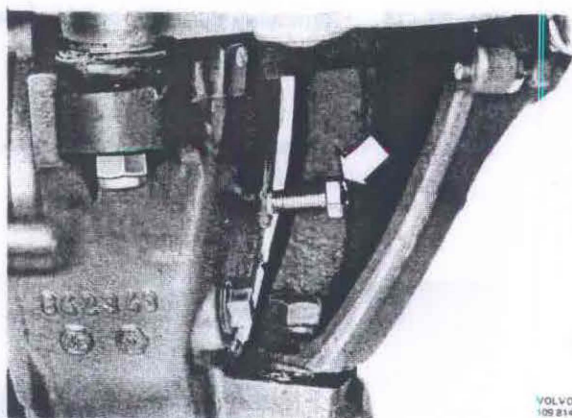


Fig. 77-5. Pressing out the hub

3. Clean all the parts thoroughly. Clean the surface between the hub and the wheel carrier housing well so that no old sealing agent remains.

Replacing wheel bearings

1. Press out the inner bearing outer ring and inner sealing ring with two 6132, drift 2564 and standard handle 1801, see Fig. 77-7. Place tool 6132 as shown in Fig. 77-8.

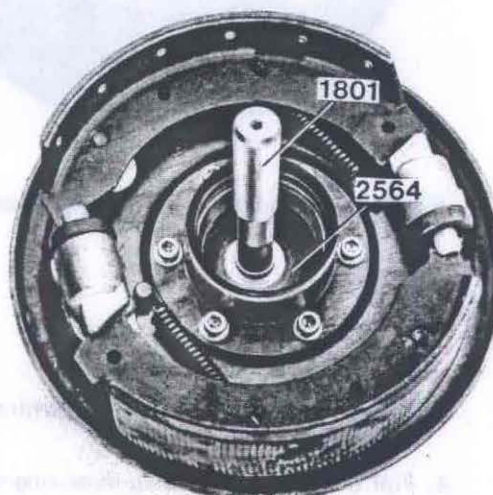


Fig. 77-7. Removing the inner bearing outer ring and inner sealing ring

Disassembling a hub

1. Knock up the lock ring on the nut (7, Fig. 77-1) with a hammer and drift and unscrew the nut. Remove the washer (8) and the O-ring (6).

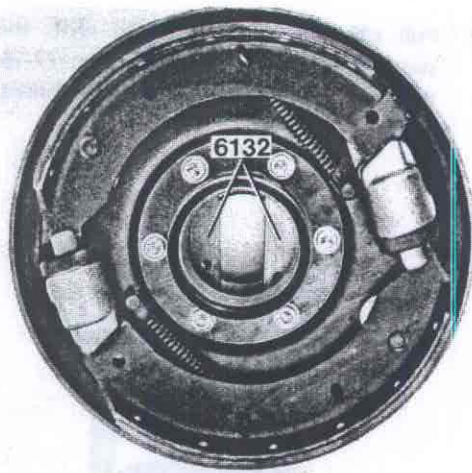


Fig. 77-8. Location of thrust washers 6132

2. Press out the outer bearing outer ring with drift 2490 and standard handle 1801, see Fig. 77-9.

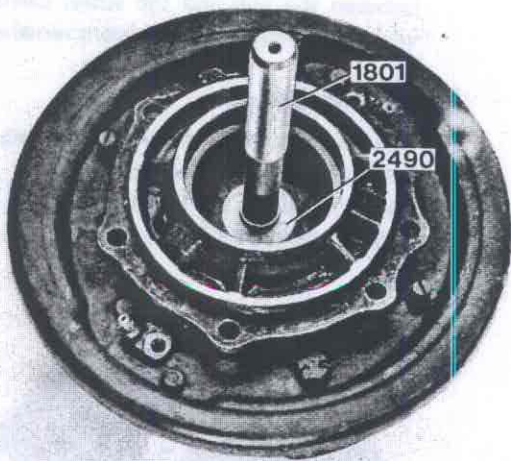


Fig. 77-9. Removing the outer bearing outer ring

3. Knock out the outer sealing ring with drift 2337, see Fig. 77-10.
4. Pull off the outer bearing inner ring with puller 6134, see Fig. 77-11.
IMPORTANT! Knock down the ring on the puller well.

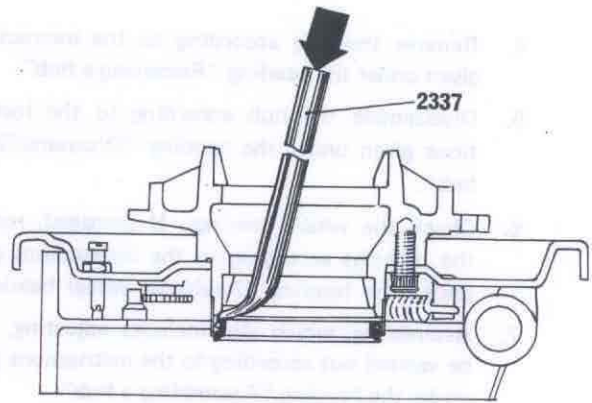


Fig. 77-10. Removing the outer sealing ring

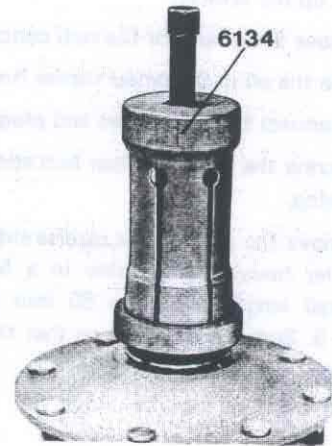


Fig. 77-11. Removing the outer bearing inner ring

5. Tap off the inner bearing inner ring with a 6 mm (1/4") drift, see Fig. 77-12.

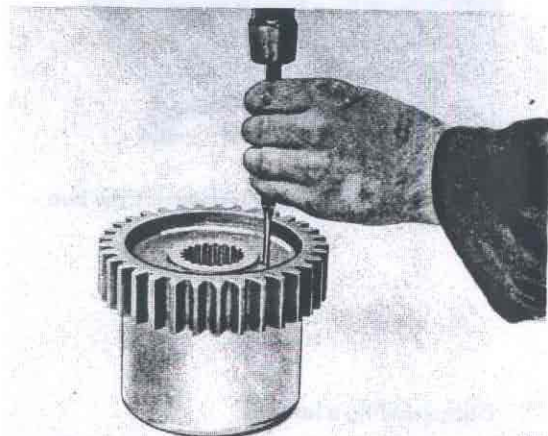


Fig. 77-12. Removing the inner bearing inner ring

6. Check the contact surfaces of the sealing rings according to the instructions given under the heading "Replacing sealing rings".
7. Press on the outer bearing inner ring with sleeve 6106, see Fig. 77-13.

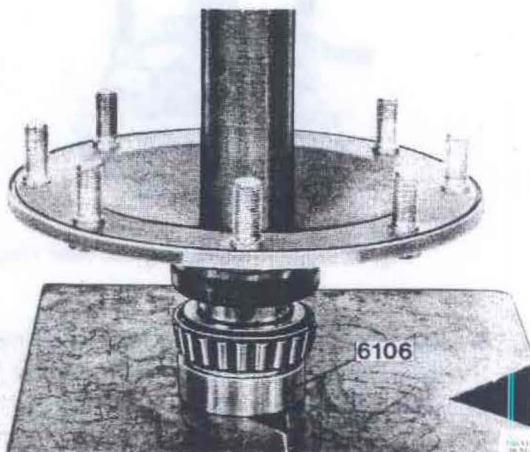


Fig. 77-13. Installing the outer bearing inner ring

8. Press on the inner bearing inner ring with sleeve 6106, drift 2490, and standard handle 1801, see Fig. 77-14.

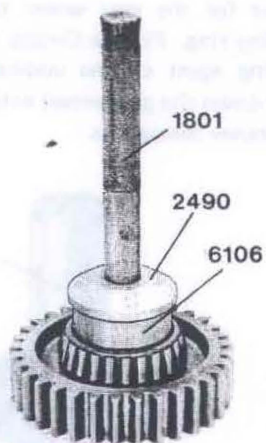


Fig. 77-14. Installing the inner bearing inner ring

9. Tap in the inner sealing ring with drift 6130, see Fig. 77-15. The sealing ring should be 2 mm (5/64") under the outer ring. Press in the inner bearing outer ring with drift 6107 and standard handle 1801, see Fig. 77-16.

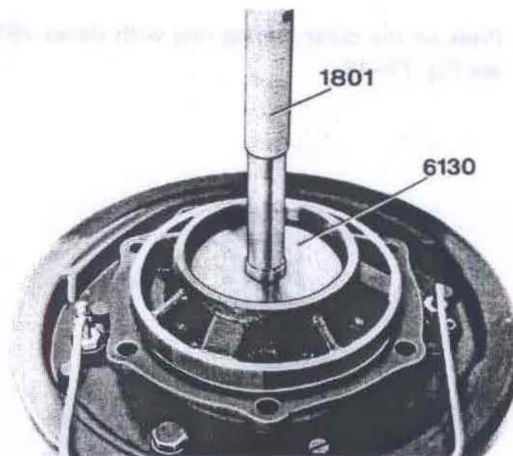


Fig. 77-15. Installing the inner sealing ring

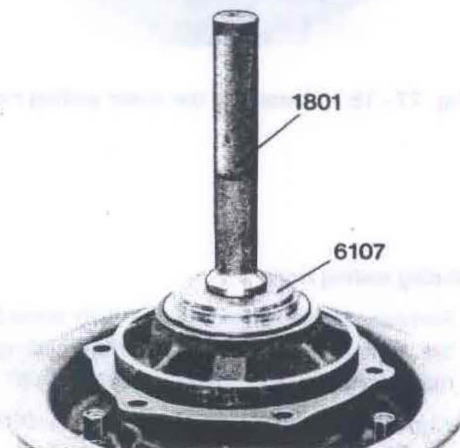


Fig. 77-16. Installing the inner bearing outer ring

10. Press on the outer bearing outer ring with drift 6107 and standrad handle 1801, see Fig. 77-17.

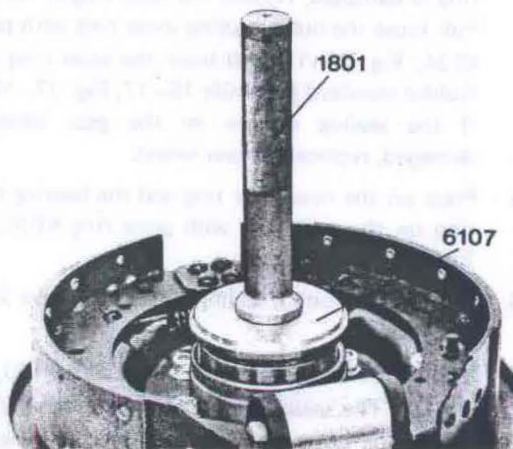


Fig. 77-17. Installing the outer bearing outer ring

11. Press on the outer sealing ring with sleeve 2910, see Fig. 77-18.

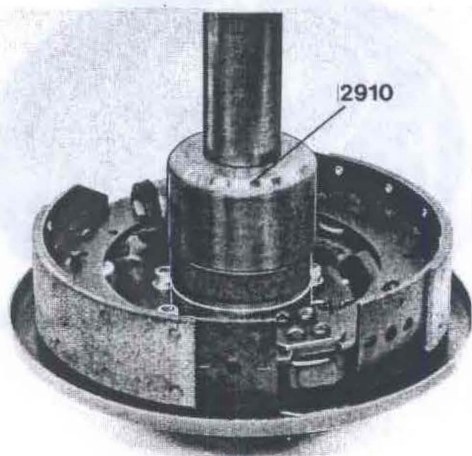


Fig. 77-18. Installing the outer sealing ring

Replacing sealing rings

1. Remove and disassemble the hub according to the instructions given under the headings "Removing a hub" and "Disassembling a hub".
2. Knock out the outer sealing ring with drift 2337, see Fig. 77-10.
3. Press out the inner sealing ring and inner outer ring with two 6132, drift 2564 and standard handle 1801, see Fig. 77-7. Place 6132 as shown in Fig. 77-8.
4. Check the sealing surfaces of the sealing rings. If the sealing surface on the stub axle is damaged, replace the stub axle. If the surface on the wear ring is damaged, replace the wear ring as follows: Pull loose the outer bearing inner ring with puller 6134, Fig. 77-11. Pull loose the wear ring with Kukko standard jackknife 15-17, Fig. 77-19. If the sealing surface on the gear wheel is damaged, replace the gear wheel.
5. Press on the new wear ring and the bearing inner ring on the stub axle with press ring 6106, Fig. 77-13.
6. Press on the outer sealing ring with sleeve 2910, Fig. 77-18.
7. Tap in the inner sealing ring with drift 6130, Fig. 77-15. The sealing ring should lie 2 mm ($5/64$ "') below the outer ring. Press in the inner bearing outer ring with drift 6107 and standard handle 1801, Fig. 77-16.

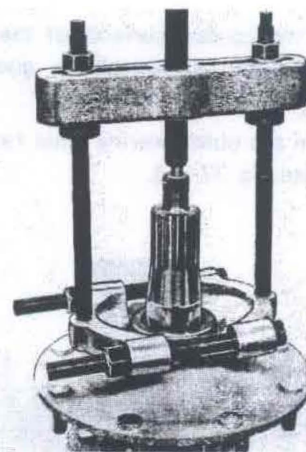


Fig. 77-19. Removing the wear ring

8. Assemble and install the hub according to the instructions given under the headings "Assembling a hub" and "Installing a hub".

Assembling a hub

1. Grease all bearings and sealing rings. Fill half the space in the hub with wheel bearing grease according to 13, Fig. 77-1. Grease the splines on the stub axle.
2. Place the hub with brake backing plate on the stub axle.
3. Press down the gear wheel with sleeve 2022 so far that the hub has a clearance of a small fraction of an inch, Fig. 77-20, while rotating the hub at the same time in order to make it easier for the gear wheel to fit into the inner sealing ring. Fit the O-ring, the washer with the sealing agent on the underside and a new nut. Pull down the gear wheel with the nut so that the clearance disappears.

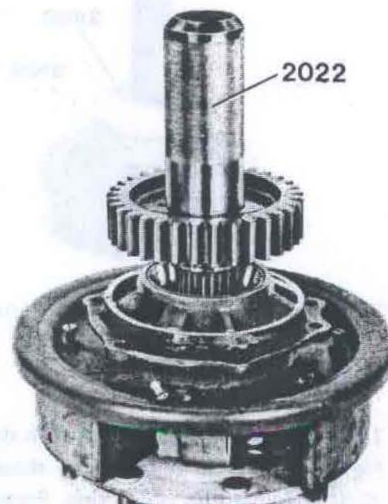


Fig. 77-20. Installing the gear wheel

4. Fit a spring balance like the one shown in Fig. 77-21. Note the reading on the balance. This shows the friction of the sealing rings.

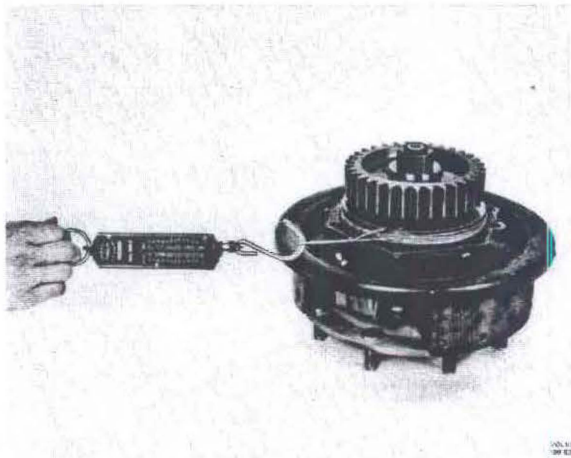


Fig. 77-21. Measuring the pre-load on hub

5. Tighten the nut so that the clearance disappears and changes to pre-loading. Check the pre-loading with the spring balance according to Fig. 77-21. Correct load on the spring balance should be the value obtained in point 4 plus 42-48 N (4.2-4.8 kp = 9.2-10.5 lbf) for new bearings. For run-in bearings, the load should be that obtained in point 4 plus 24-28 N (2.4-2.8 kp = 5.3-6.2 lbf).
6. When correct pre-load has been obtained, lock the nut by peening the edge in the shaft recess.

Installing a hub

1. Coat the sealing surfaces on the hub and wheel carrier housing with sealing agent.

2. Fit the hub and tighten up all retaining nuts.
3. Disconnect and plug the brake lines and bleed the wheel cylinders. Remove the contact for the pressure difference, see Fig. 77-22, during the bleeding. If a bleeder apparatus is used, the working pressure should be 0.2 MPa (2 kp/cm² = 28 lbf/in²). For more detailed instructions concerning bleeding, see Part 5.

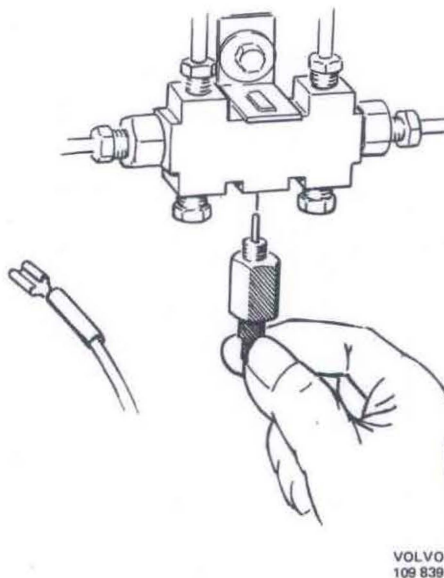


Fig. 77-22. Contact for pressure difference

4. Screw in the plug on the reverse side of the wheel carrier housing and fill with oil.
5. Mount the wheel, tighten up the nuts crosswise and lower the vehicle.

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Figure 1:

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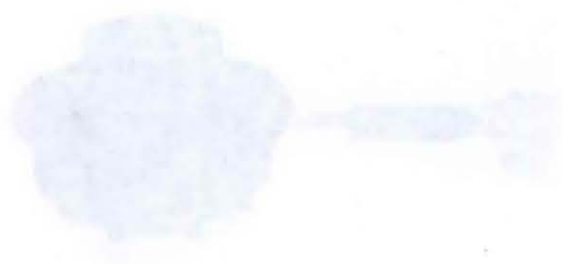


Figure 2:

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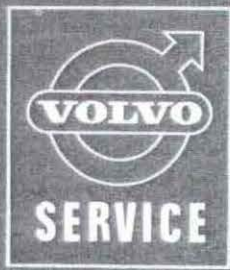
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PART 8

BODY

C3-series

SERVICE MANUAL

Contents

Group 83 Doors and roof hatch

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Replacing door stops	2
Replacing doors	2

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GROUP 83 DOORS AND ROOF HATCH

Description

The doors are constructed of an outer plate provided with powerful edge reinforcements. Each door has a replaceable upper section and a lower section with retainers and bolts. The doors have also insulation and interior panelling. Hinges are bolted to the lower section of the door and body.

The door lock is shown on Figs. 83-1 and 83-3 and the door stop on Fig. 83-4.

The roof hatch is shown on Fig. 83-2.

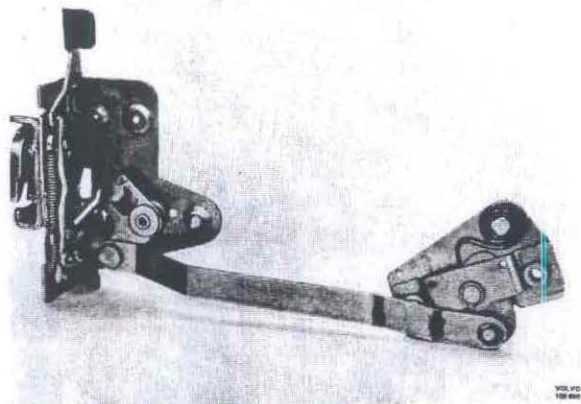


Fig. 83-1. Door lock (right-hand)

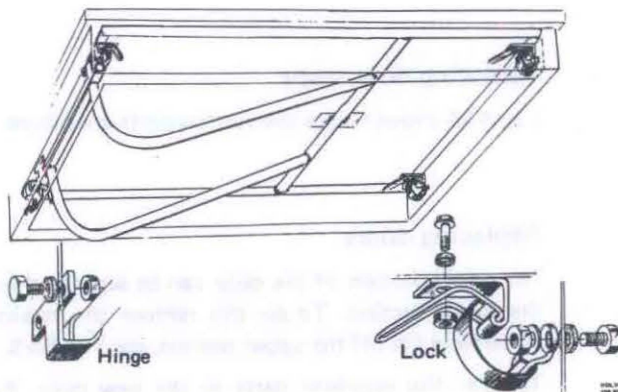


Fig. 83-2. Roof hatch

Service Procedures

Replacing door locks

1. Remove the handle and the lower door panel with strips.
2. Set the lock to the locked position, see Fig. 83-3.
3. Remove the five retaining screws and pull forward the lock.
4. Fit the new lock in the "locked position". Check the function after having tightened up the retaining screws.
5. Re-install the panel and the strips.

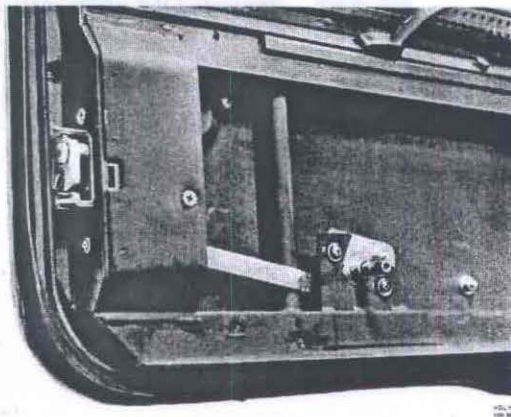


Fig. 83-3. Door lock (left-hand)

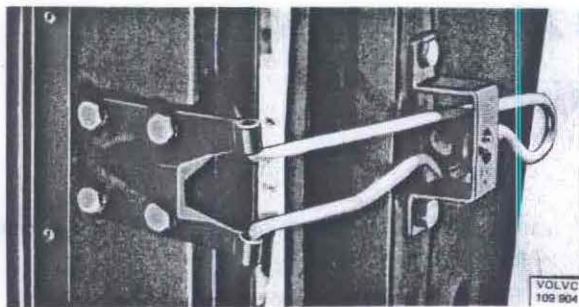


Fig. 83-4. Door stop

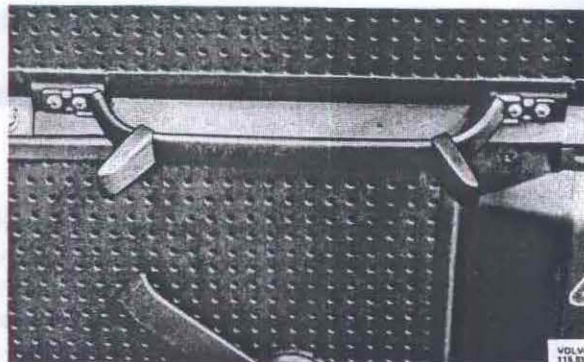


Fig. 83-6. Handle parts

Replacing door stops

Fig. 83-4 shows where the various parts are placed.

Replacing doors

The upper section of the door can be separated from the lower section. To do this remove the retaining screws and lift off the upper section, see Fig. 83-5.

Transfer the requisite parts to the new door. Figs. 83-6 and 83-7 show some of the parts.

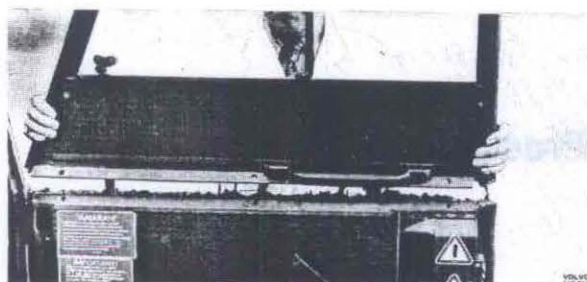


Fig. 83-5. Removing the upper section

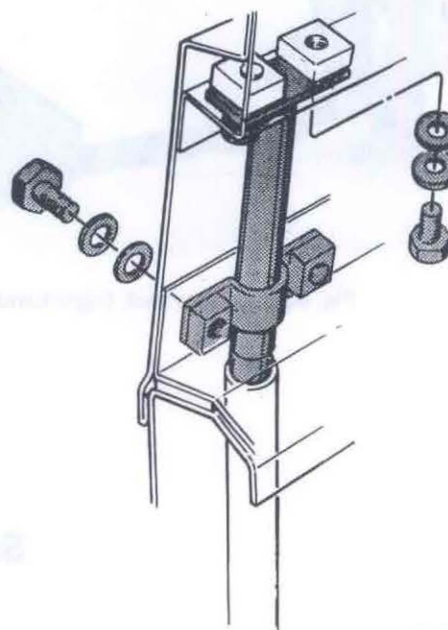


Fig. 83-7. Door parts

GROUP 84 WINDOWS AND WEATHERSTRIPS

Service Procedures

DOOR WINDOWS

Replacing a window

Remove the retaining screws for the upper slide rail. Carefully pull out the rail and windows. Install the rail and new windows. Tighten up the rail retaining screws.

Replacing the front pawl

The design of the front pawl is shown on Fig. 84-1. To replace lock the pawl in the lifted-up position.

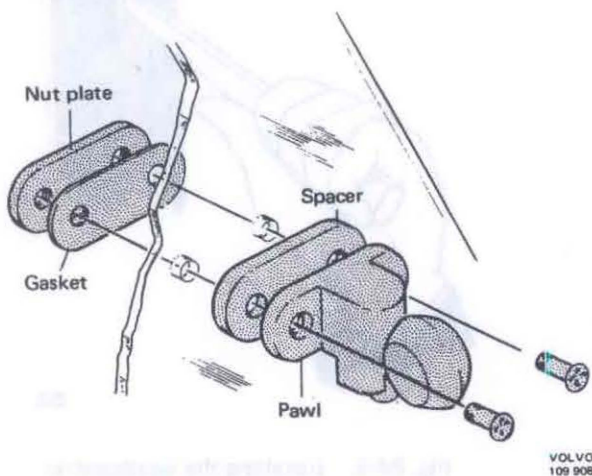


Fig. 84-1. Front pawl

Replacing the rear pawl

1. Remove the retaining screws for the slide rail.
2. Carefully pull out the rail and windows.
3. Drill out the rivets.
4. With new rivets secure the pawl firmly in position.
5. Re-install the windows and rail in position and tighten up the screws.

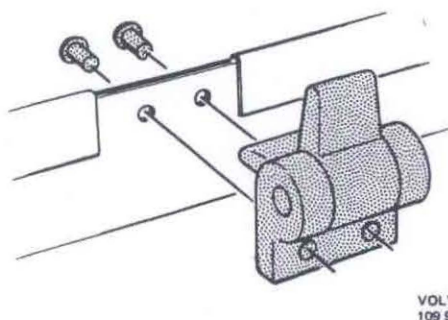


Fig. 84-2. Rear pawl

REAR WINDOW AND WINDSCREENS

Replacing

1. Remove the rubber seal adhesion from the plate.
2. Use force and press the glass outwards at the corner until the rubber seal releases from the guide edge on the body.
3. Remove the rubber seal and clean the seal and plate from sealing compound. Replace damaged or hard sealing.
4. Check to make sure the guide edge is not warped. Straighten it if necessary.
5. Place the glass in the rubber seal. Place a cord (suitably of terylene) in the seal groove for the plate edge, see Fig. 84-3.
6. Hold the glass pressed against the window opening and carefully pull out the cord from the inside. The rubber seal should thereby fit into position, see Fig. 83-4. It may sometimes be necessary to adjust the position of the glass with the palm of the hand. If the cord is stiff to pull, then there is risk of damaging the sealing.
7. If necessary adjust the location of the rubber seal. For windscreens and rear window seal round with sealing cement. Make sure that the cement fills the joints at the glass and plating.

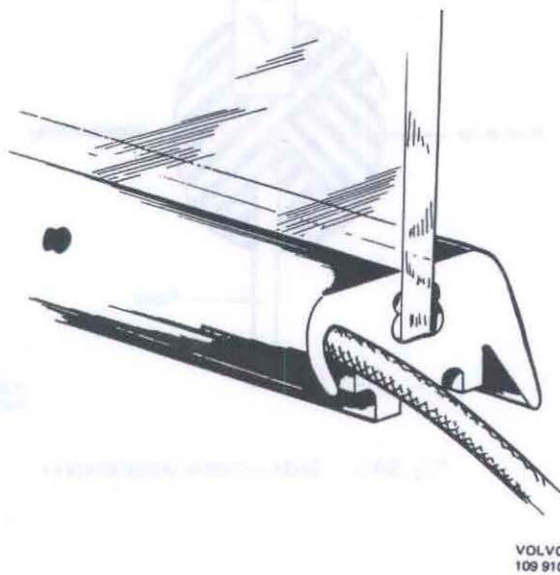


Fig. 84-3. Installing the cord

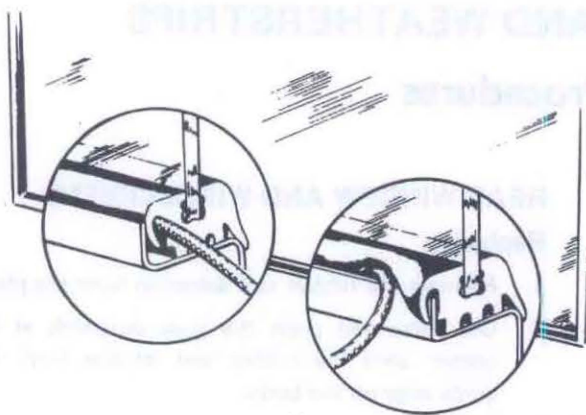
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Fig. 84-4. Installing the strip

SIDE WINDOWS**Replacing**

Pull out the key strip. Press out the window but let the sealing strip remain in the plate.

Fit the new window in the sealing strip groove. Re-fit the key strip. Usually a special tool is used for this purpose, but the glass can also be fitted with screwdrivers after the key strip has been coated with soap solution.

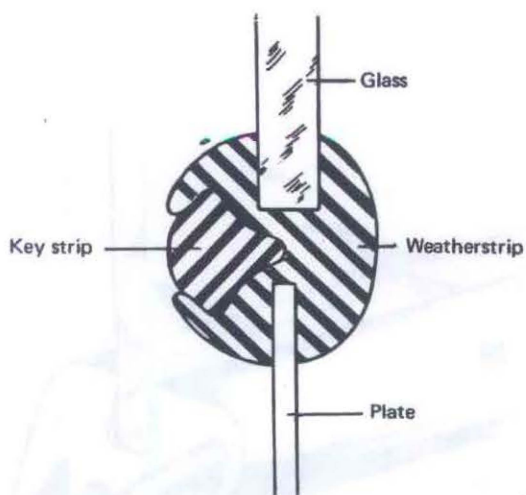
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Fig. 84-5. Side window weatherstrip

WEATHERSTRIPS**Replacing**

Remove the weatherstrip by pulling it outwards so that it releases from the rail.

When installing, place one of the edges in position in the rail and press the other down into the rail with a putty knife. The putty knife is moved along the rail as shown in Fig. 84-6:

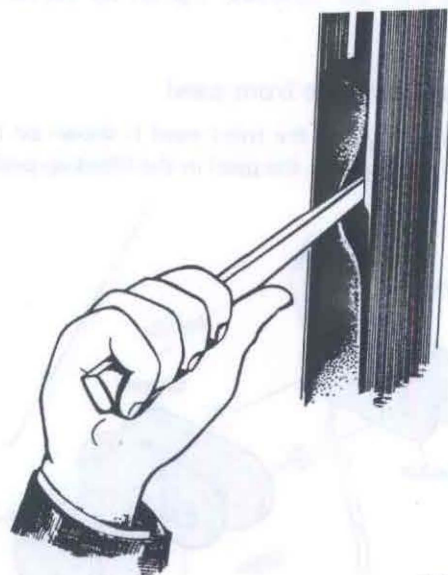
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Fig. 84-6. Installing the weatherstrip

GROUP 85 SEATS AND VENTILATION SYSTEM

Description

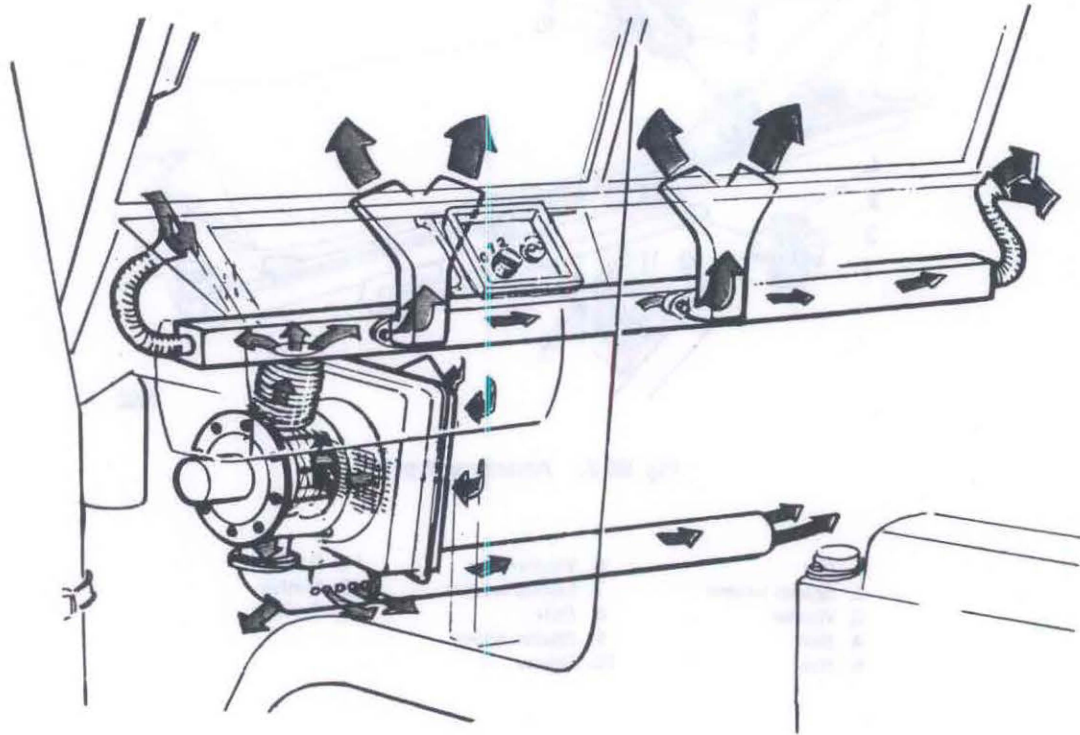


Fig. 85-1. Ventilation system

VENTILATION SYSTEM

See Fig. 85-1 for the lay-out of the system.

The air intake is placed between the radiator grille and the radiator. Air is sucked into the fan housing by means of the fan. It is then discharged to the defroster nozzles and the floor vents.

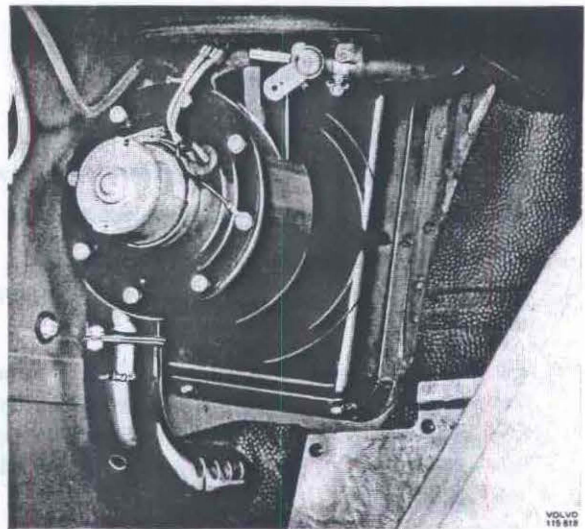


Fig. 85-2. Fan motor installed

Service Procedures

SEATS

The seat attachments are shown on Fig. 85-3.

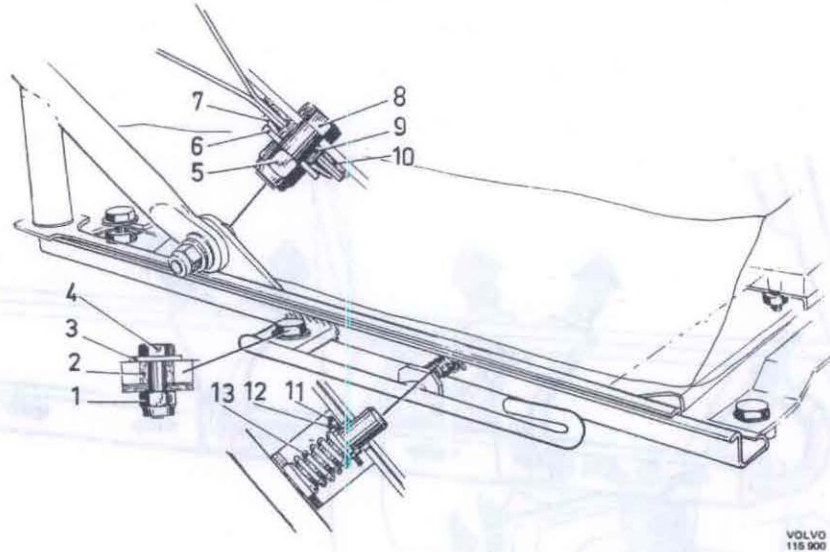


Fig. 85-3. Attachment parts

- | | | |
|------------------|------------------|---------------|
| 1. Nut | 6. Washer | 11. Split pin |
| 2. Spacer sleeve | 7. Spring washer | 12. Washer |
| 3. Washer | 8. Bolt | 13. Spring |
| 4. Bolt | 9. Spacer sleeve | |
| 5. Nut | 10. Spacer | |

VENTILATION SYSTEM

Replacing motor and fan

1. Disconnect the electric cables from the motor.
2. Remove the screws for the fan cover.
3. Lift off the cover with fan and motor.
4. Release the clamp and remove the motor from the cover.
5. Fit the rubber ring and cover on the motor. Connect up the cable harness according to Fig. 85-4. Tighten the clamp when the adjustment has been made to the measurement 86 mm (3.5"), see Fig. 85-5.
6. Fit the cover with motor. Connect up the electric cables.

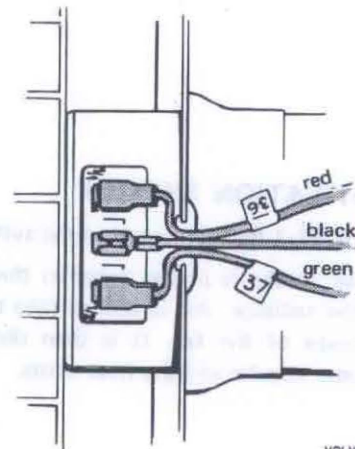


Fig. 85-4. Electrical connections

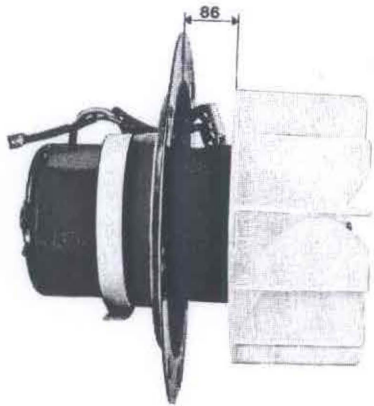
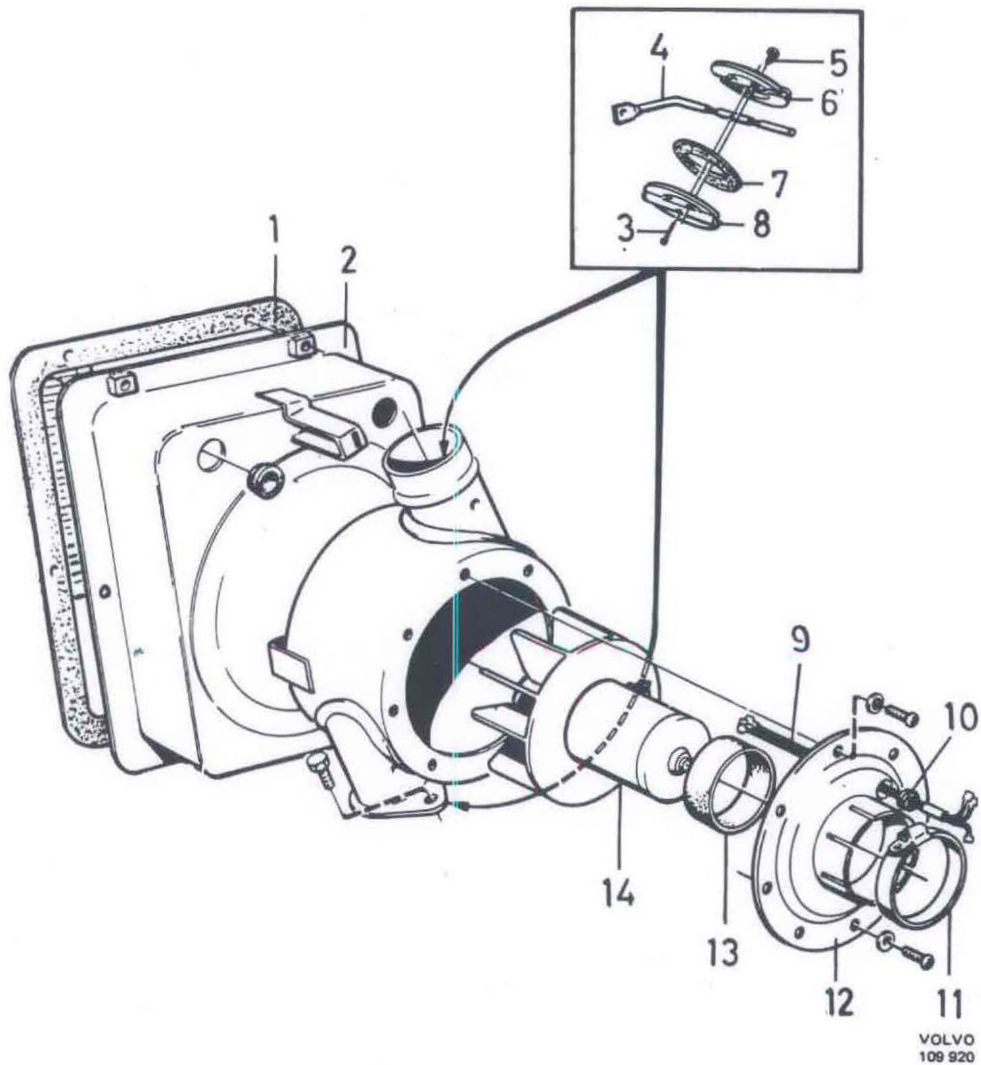


Fig. 85-5. Motor with cover



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Fig. 85-6. Ventilation system parts

- | | | |
|------------------|------------------|---------------------|
| 1. Sealing strip | 6. Disc half | 11. Clamp |
| 2. Fan housing | 7. Gasket | 12. Cover |
| 3. Pin | 8. Disc half | 13. Rubber ring fan |
| 4. Disc spindle | 9. Cable harness | 14. Motor with fan |
| 5. Screw | 10. Bushing | |



FIGURE 10-10

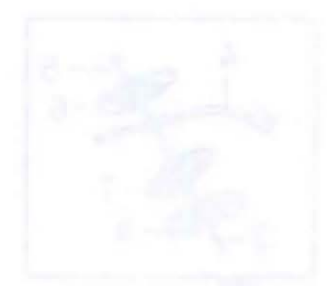


FIGURE 10-11

- | | | |
|-------------------|-------------------|------------------|
| 1. Piston | 11. Crankshaft | 21. Oil Pan |
| 2. Connecting Rod | 12. Main Bearings | 22. Oil Pump |
| 3. Crankshaft | 13. Piston Rings | 23. Water Pump |
| 4. Main Bearings | 14. Piston Pins | 24. Timing Belt |
| 5. Piston Pins | 15. Piston Skirt | 25. Timing Chain |
| 6. Piston Skirt | 16. Piston Rings | 26. Timing Cover |
| 7. Piston Rings | 17. Piston Skirt | 27. Timing Chain |
| 8. Piston Skirt | 18. Piston Rings | 28. Timing Cover |
| 9. Piston Rings | 19. Piston Skirt | 29. Timing Chain |
| 10. Piston Skirt | 20. Piston Rings | 30. Timing Cover |

GROUP 87 CAP AND PLATFORM

Description

The cab can be said to be made up of two main sections, a floor section and hardtop, made up of a number of form-pressed steel plates.

Among other things, the floor section consists of the following sections which are welded together: front floor, wheel housing, engine casing, firewall, side plates and front end with dashboard.

The hardtop forms an integral unit made up of roof, sides and windscreen frame welded together.

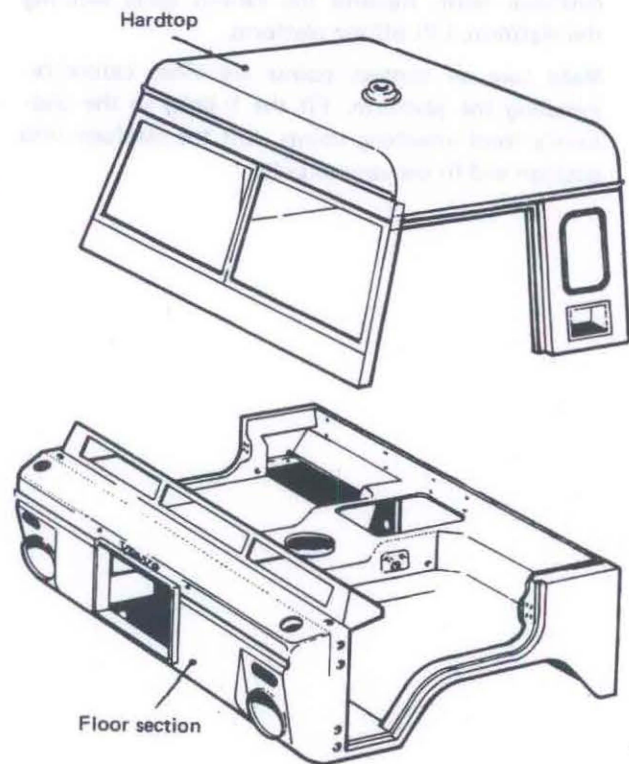


Fig. 87-1. Cab

Service Procedures

The procedure for repairing the cab (or body) will depend on the nature of the damage as well as the availability of tools and parts. The following general instructions apply:

Welding

When about to carry out any electric welding, first disconnect both battery cables. Also disconnect the cable from the charging regulator, see Fig. 87-2. Connect up the welding unit as near the welding point as possible.

Sealing

Use sealing agent Bostik Silikon or corresponding for the bolting.

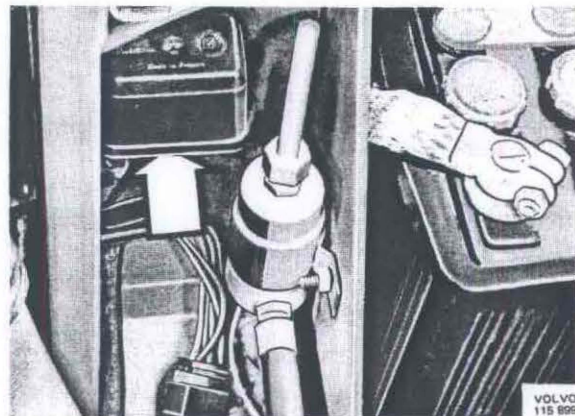


Fig. 87-2. Charging regulator connection

Platform

To remove the platform, fix one end of the hoist straps to the platform lift eyelets, see Fig. 87-3. Then fix the other end of the straps to the hooks on the overhead hoist. Remove the various bolts securing the platform. Lift off the platform.

Make sure all contact points are clean before re-installing the platform. Fit the U-bolts in the platform's front attaching points. Lift the platform into position and fit the various bolts.

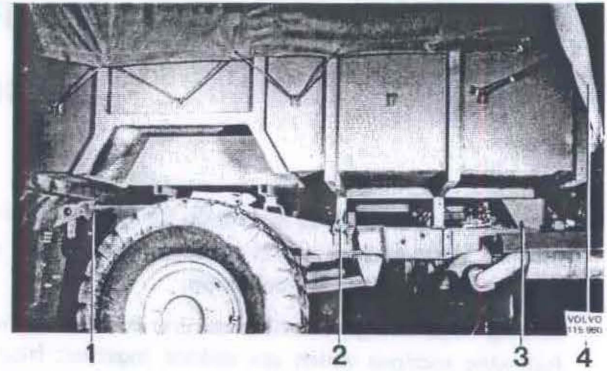
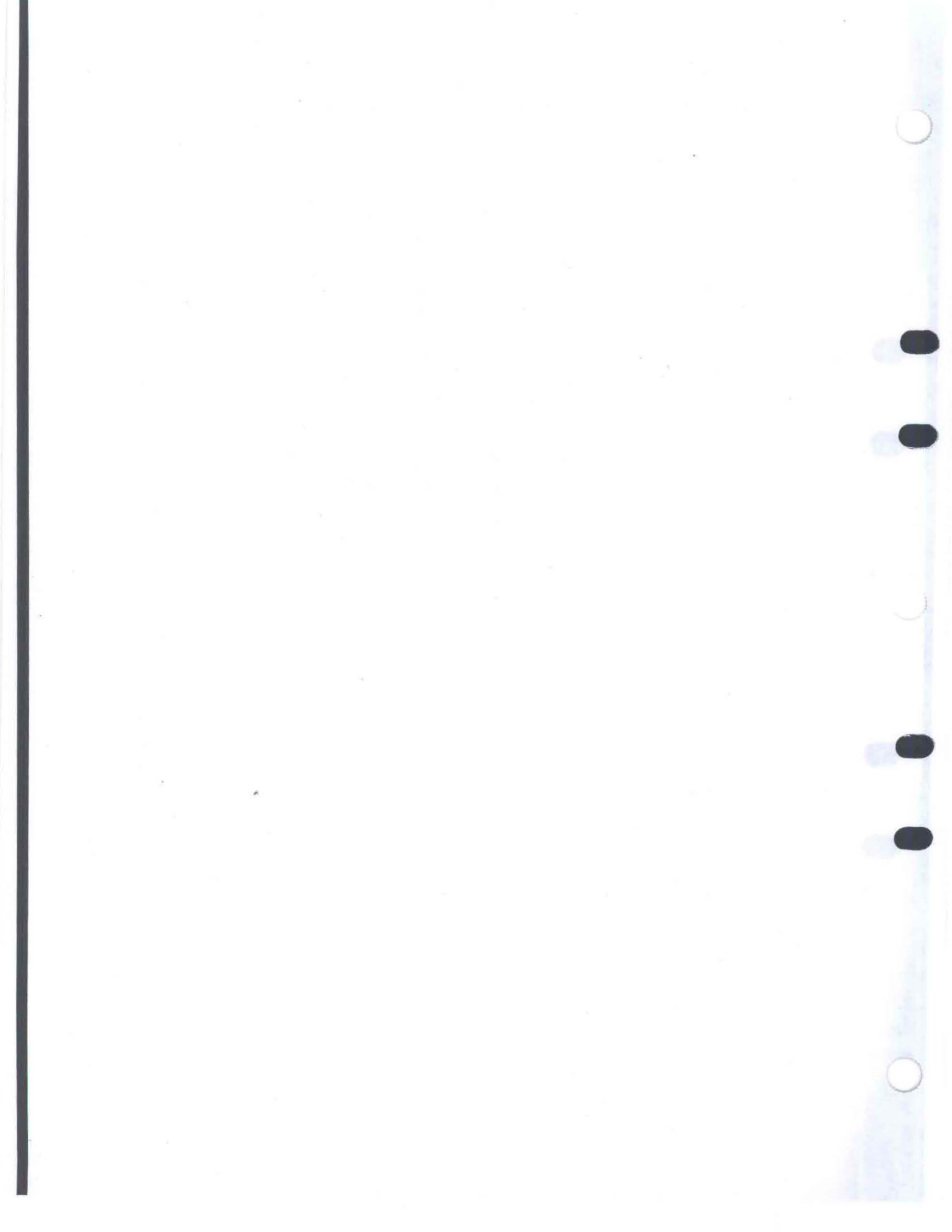


Fig. 87-3. Removing the platform

- | | |
|------------|-----------------|
| 1. Bolting | 3. U-bolts |
| 2. Bolting | 4. Hoist straps |









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