

SERVICE MANUAL

CARS AND VANS

PV 444

Part 9

SPRINGS AND SHOCK ABSORBERS

Export Service Department

AKTIEBOLAGET

VOLVO

GÖTEBORG, SWEDEN

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IMPORTANT

N.B. To avoid beforehand any possible confusion which may arise regarding the points and commas in the decimal figures in this book, we wish to point out that the *CONTINENTAL* system is used and not the English and American, i.e.

read 0,8 = $\frac{8}{10}$ 0,08 = $\frac{8}{100}$
 1,000 = one 1.000 = one thousand
However, with typical English measurements such as inches, the *ENGLISH* system is used, i.e. .004" and *not* 0,004"

SPRINGS

DESCRIPTION

The PV 444 is fitted with coil springs both front and rear. The front-wheel springing is independent.

The front springs extend from a housing on the front-axle member at the top to a control arm fitted to the front axle member and the lower end of the steering knuckle support.

The rear springs upper ends are fitted to the body with the aid of washers, bolts and rubber spacers. The lower ends are fitted to the rear axle support arms with washers and bolts.

REPAIR INSTRUCTIONS

Removing the front springs

1. Raise the front of the car until the wheels are about 15 mm (6") above floor level and block up the frame.
2. Disconnect the stabilizer.
3. Place a jack under the lower control arm and unscrew the four nuts on the front axle support member bracket. Fig. 1.
4. Lower the jack slowly and remove the spring when the lower control arm is sufficiently released.

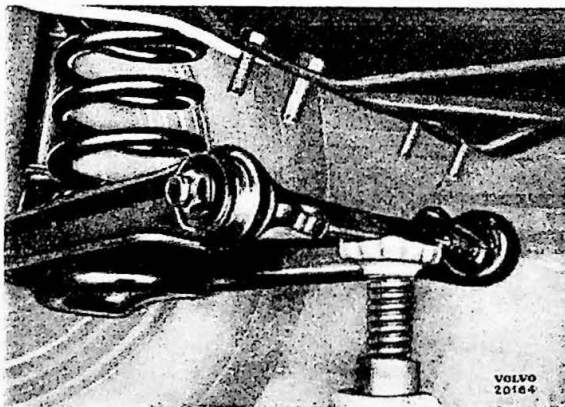


Fig. 1.

Checking the front springs

Springs must be checked before fitting. Measure the compressed and extended length of the springs. These measurements are listed in the Specifications. Check the general condition of the springs. "Tired" or damaged springs must be replaced.

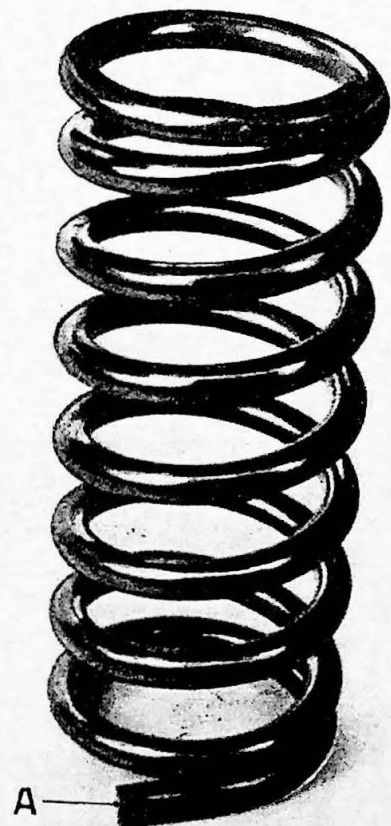


Fig. 2. Front spring.

Fitting the front springs

1. Place the spring in the attachment on the control arm. The straight end of the spring (A Fig. 2) must face downwards.

2. Lift up the control arm until the spring rests with the upper end in the seat on the front axle support member, and then place a jack under the control arm. Fig. 1.
3. Make sure that the spring is correctly in position. The straight end should rest in the recess in the lower spring attachment. Raise the lower control arm by means of the jack and tighten the four nuts on the bolts in the front axle support member. Lock the nuts with cotter pins. Connect the stabilizer.

N.B. Check, and if necessary, adjust the front wheel alignment as instructed in Part 6.

Removing the rear springs

1. Release the hand brake.
2. Raise the rear end of the car with a jack and block up the frame. Chocks must be placed under the front wheels.
3. Disconnect the shock absorbers (5 Fig. 3) from the attachment in the rear axle housing.
4. Disconnect the shock absorber band (11) from its attachment on the axle support arm (7).
5. Disconnect the spring from the axle support arm (screw 6).
6. Lower the rear axle housing sufficiently for the spring to hang freely.
7. Disconnect the spring from the frame (screw 1) and remove the spring.

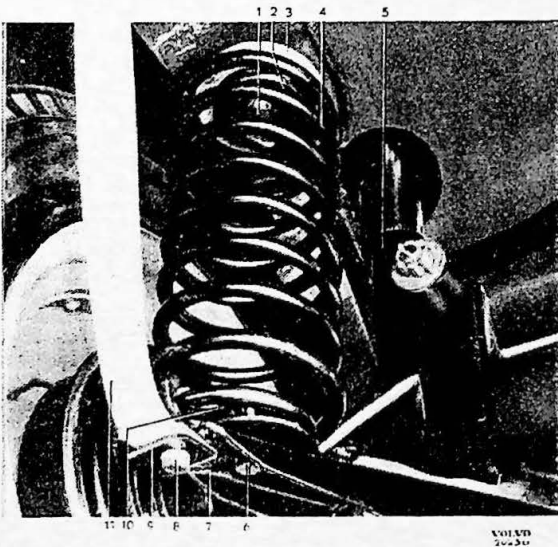


Fig. 3.

- | | |
|-------------------|-----------------------------------|
| 1. Screw | 7. Axle support arm |
| 2. Upper washer | 8. Screw |
| 3. Rubber spacer | 9. Washer for shock absorber band |
| 4. Rear spring | 10. Lower washer |
| 5. Shock absorber | 11. Shock absorber band |
| 6. Bolt | |

Checking the rear springs

The springs must be checked before fitting. Measure the compressed and extended length of the springs. These measurements are listed in the Specifications. Check the general condition of the springs. "Tired" or damaged springs must be replaced.

Fitting the rear springs

1. Place the spring and the rubber spacer (3) into position and attach the spring to the body. The straight part of the spring (A Fig. 4) must face diagonally inwards.
2. Raise the rear-axle housing with the jack and attach the spring to the support arm. Attach the shock absorber band (11) to the rear axle support arm.
3. Connect the shock absorber (5) to the rear axle housing.

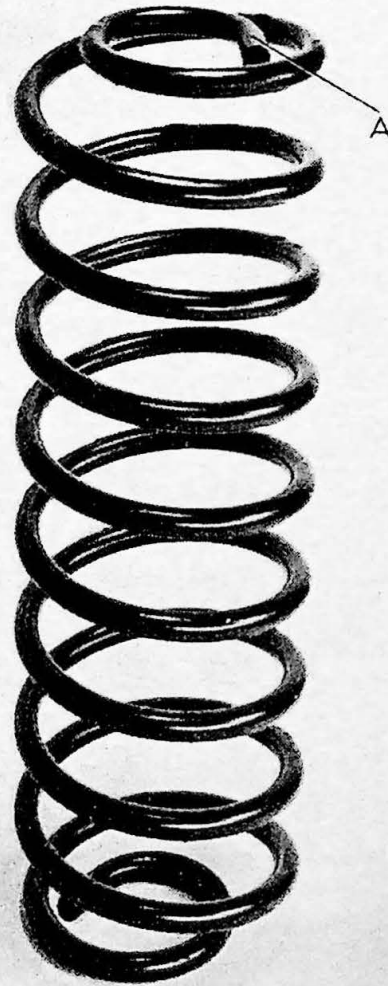


Fig. 4. Rear Spring. VOLVO 20237

SHOCK ABSORBERS

DESCRIPTION

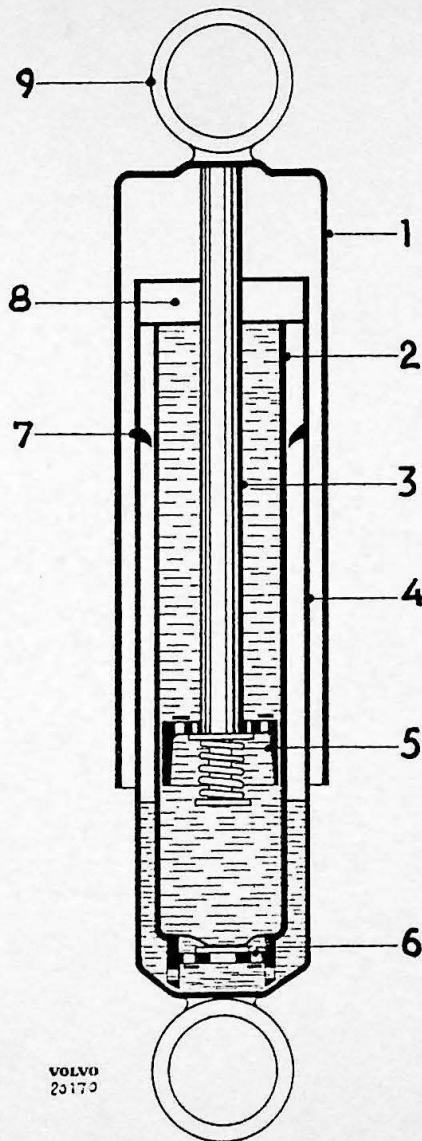
Design

The design of the shock absorbers is shown in Fig. 5. The outer cylinder (1) acts only as a guard against dust and dirt. The two remaining cylinders (2 and 4) are concentrically installed, with one pushed entirely in the other. The operating cylinder (2), or pressure tube, is fitted with a valve (6) at its lower end. A plunger (5) with valve operated channels slides in the pressure tube (see Fig. 6). The plunger is attached to a plunger rod (3), which is formed into an eye at its other end for attachment to the body. At the other of the shock absorber a similar eye is attached to the cylinder (4). The space between the cylinders (2 and 4) serves as a reservoir and is only partially filled with fluid. The pressure tube is completely filled with fluid on both sides of the plunger (5). The cap (8) functions as a plunger seal and guide. The ring (7) is designed to prevent splash in the fluid.

Operation

When the shock absorber is compressed or extended because of spring suspension, the plunger (5) slides in the pressure tube (2), forcing the fluid to flow through the valve operated channels in the plunger. The plunger sliding speed depends on how quickly the fluid passes from one side of the plunger to the other. As the channels are very narrow, the fluid can only pass through very slowly, and the plunger movement is braked and consequently the spring movement. With rapid compression or extension, the brake action on the plunger increases owing to the turbulence in the fluid passing through the channels in the plunger.

Volume does not change at the same degree on both sides of the plunger when the shock absorber is compressed or extended, as the plunger rod displaces a certain volume. Through this, some fluid will flow out through the valve (6) to the reservoir when compressed and the fluid will penetrate into the pressure tube (2) at the lower side of the plunger when the shock absorber is extended.



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Fig. 5.

Schematic view of shock absorber.

The shock absorbers on the PV 444 are hydraulic, double-acting and telescopic. The rear shock absorbers are tilted forward to prevent the shock absorbers extending further than the permitted limits, thus causing damage to the shock absorbers and/or excessive sway.

REPAIR INSTRUCTIONS

The PV 414 is fitted with two different types of shock absorbers. The one type, recognizable by the openings on the dust cover, can be disassembled for repair and oil filling, whilst the other is totally sealed and cannot be serviced. Shock absorbers of the latter type should be replaced if they do not operate satisfactorily. The sealed shock absorbers are fitted to chassis numbered 10001 onwards.

Disassembling the shock absorbers

1. When the shock absorber has been removed it must be thoroughly cleaned externally and then fastened into a vice, Fig. 7.
2. Extend the shock absorber as much as possible, unscrew the cap (8) with special tool SVO 1053 and remove the pressure tube.
3. Loosen the valve (6) by giving it several light blows with a soft hammer, with the shock absorber still in the extended position, Fig. 8. Drain the cylinder (see Fig. 9) and disconnect it from the cap (8).

4. Unscrew the nut (19 Fig. 6) and remove the plunger (5) complete with the integral parts and cap (8).

Assembling the shock absorbers

1. Protect the plunger threads with a covering (so that the seal is not damaged) and fit the cap (8 Fig. 6).
2. Remove the covering and fit the remaining parts as instructed below. See Fig. 6.

Valve washer (10) (flat side facing the cap [8"]), spacer (diameter 12,5 mm [$1/2$ "]), thickness 0,8 mm (.03") (11), star shaped washer (12) with the tops bent away from the spacer (11), inlet valve (13) and plunger (5).

Then, the following parts must be fitted into the plunger: notched washer (14), washer (15) (outer diameter 19 mm [$3/4$ "]), washer (16) (diameter 12,5 mm [$1/2$ "]), thickness 0,2 mm (.008"), valve seat attachment (17), valve spring (18), screw on the nut (19) and tighten it.

3. Attach the cylinder (2) on the cap (8).

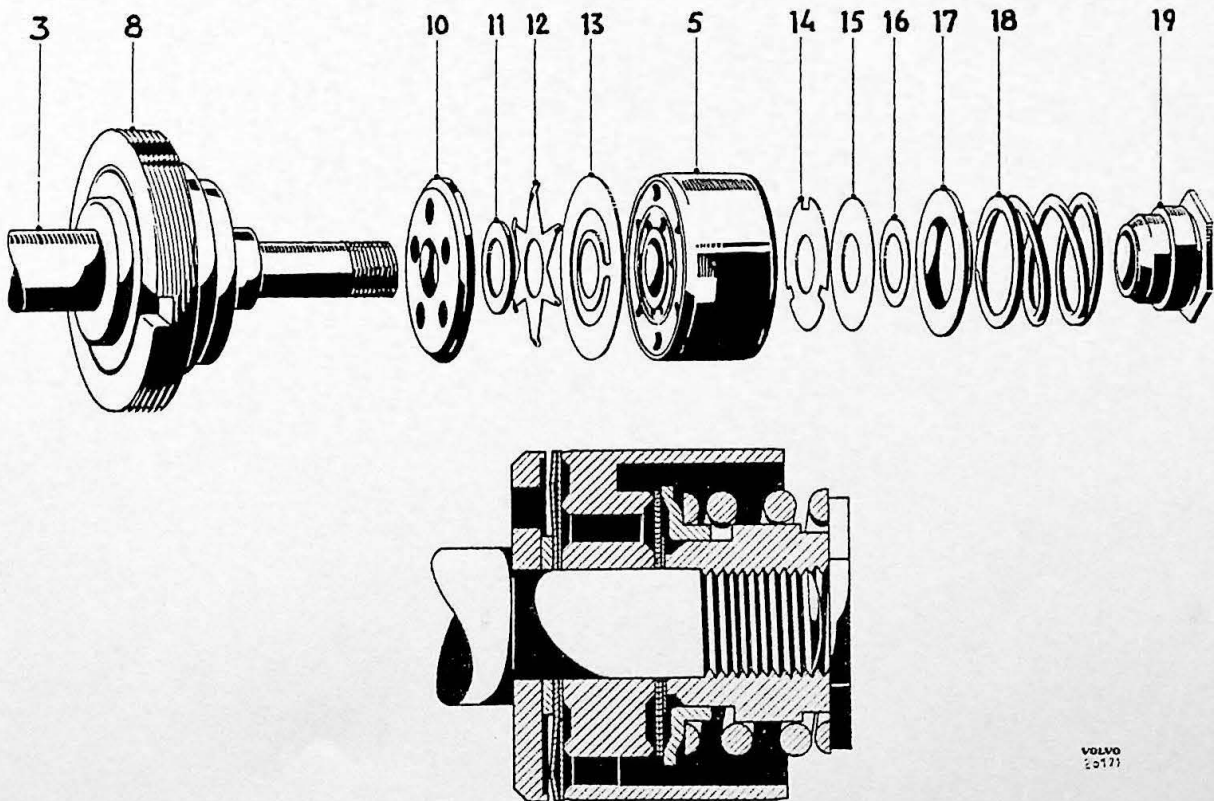


Fig. 6.

Shock absorber plunger with valves.

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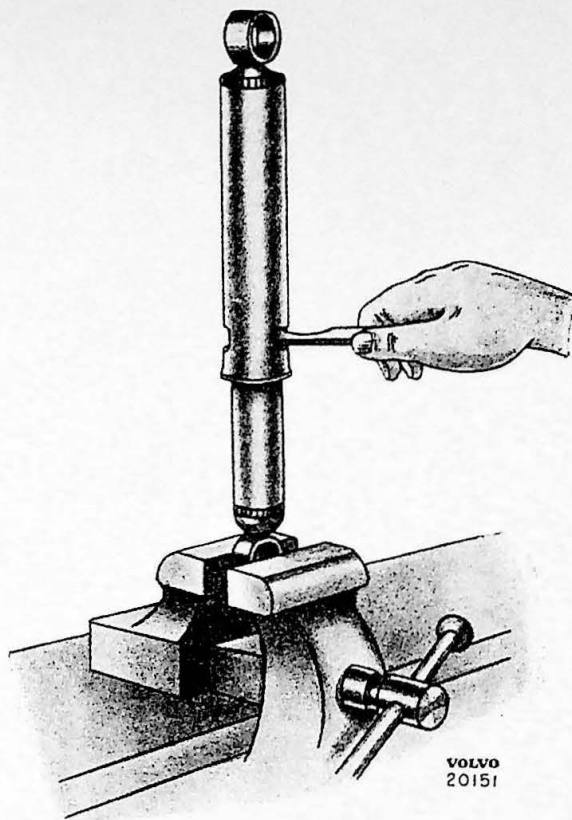


Fig. 7.

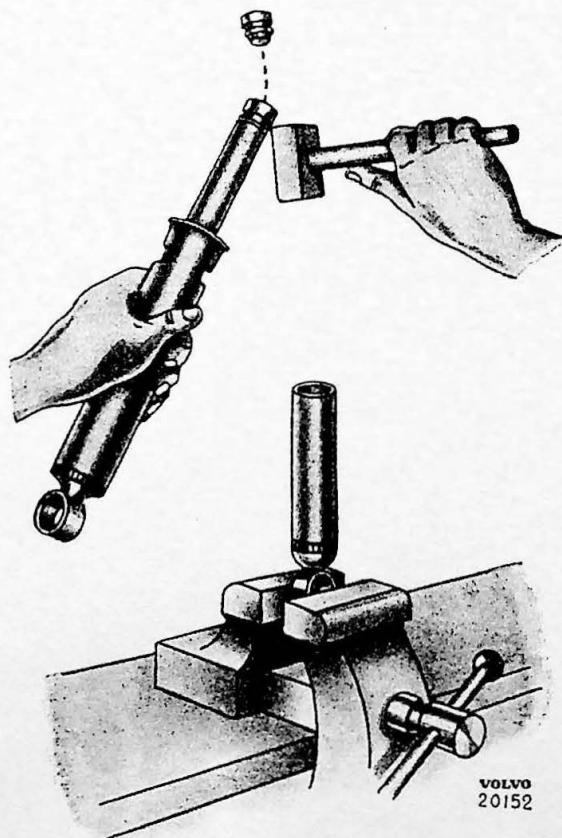


Fig. 8.

4. Fill fluid as instructed under the heading "Filling shock absorber fluid".
5. Fit the valve (6) on to the pressure tube (2). Place the pressure tube (2) into position in the cylinder (4) and tighten the cap (8) with tool SVO 1053.

Filling shock absorber fluid

1. Remove and disassemble the shock absorber as instructed in points 1—3 under the heading "Disassembling the shock absorbers". Do not disconnect the pressure tube (2) from the cap (8).

N.B. Shock absorbers should be extended during these operations. See Figs 7 and 8.

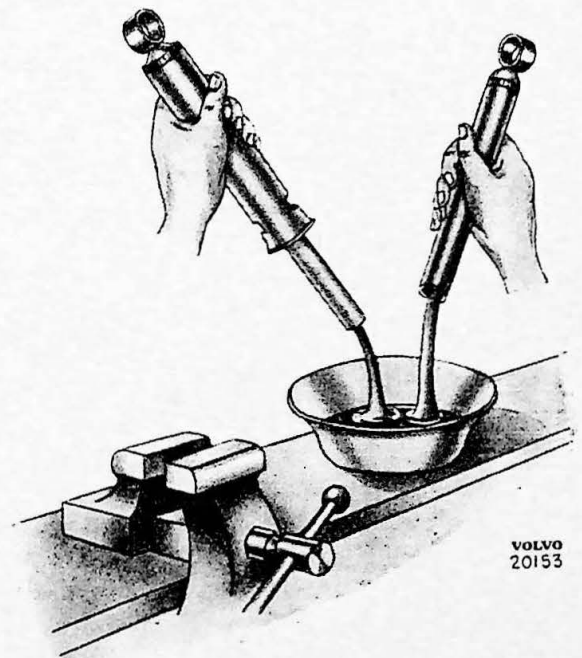


Fig. 9.

2. Completely drain both of the cylinders, Fig. 9.
3. Place the dust cover in a vice with the pressure tube turned upwards and fully extended, Fig. 10. Measure the required amounts of shock absorber fluid accurately (front 97 cm³, rear 178 cm³), and pour it into the pressure tube until it is wholly filled. Replace the valve (6).
4. Place the cylinder (4) in the vice in an upright position. Fill it with the remaining quantity of fluid, Fig. 11, and assemble the shock absorber as instructed in point 5 under the

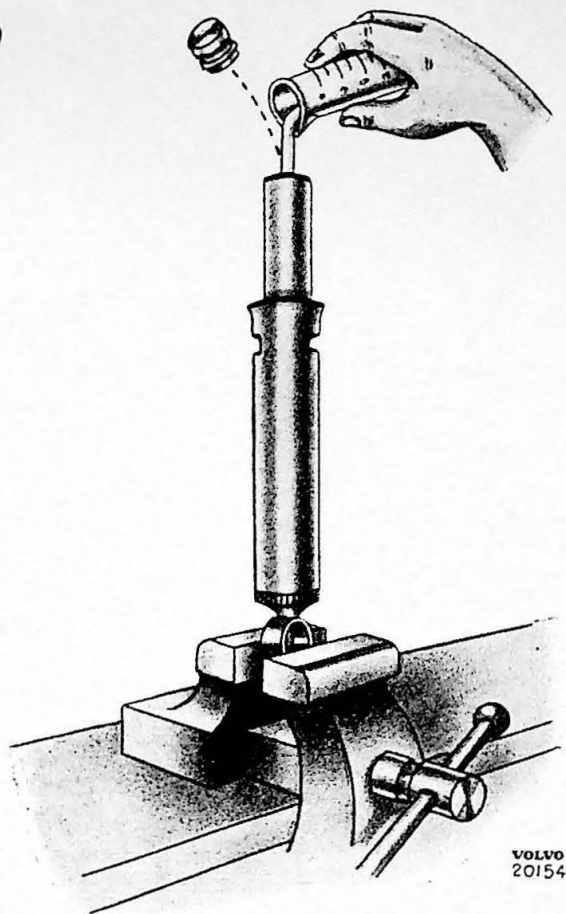


Fig. 10.

heading "Assembling the shock absorbers".

Use a new cover seal. As the seal comes in contact with the cylinder (4), it should be soaked in shock absorber fluid and stretched before fitting. Tighten the cap with tool SVO 1053.

Fitting the shock absorbers

Before fitting, air-vent the shock absorber by holding it in an upright position with the dust

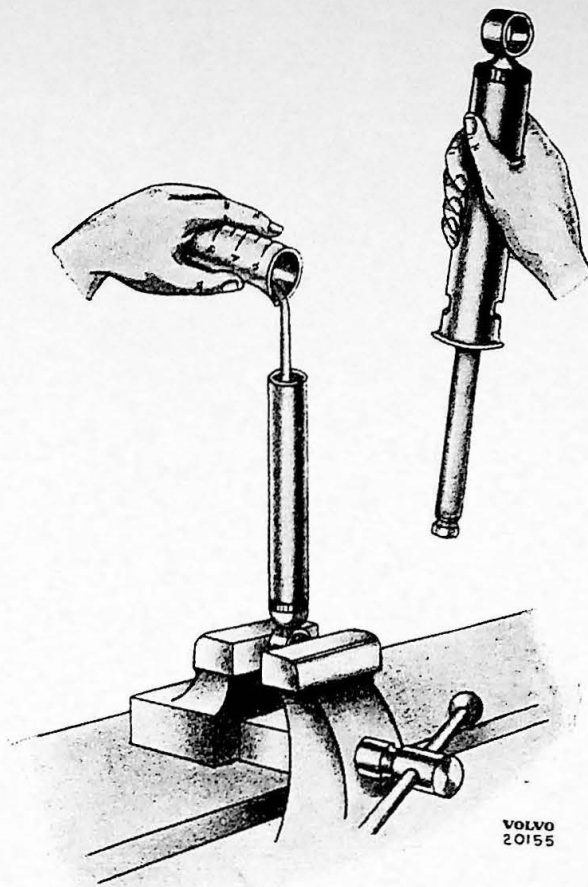


Fig. 11.

cover uppermost and work the unit up and down four or five complete strokes or until one feels the shock absorber resisting in both directions.

Fit the shock absorber on to the car, keeping the dust cover uppermost all the time.

The rear shock absorbers should be fitted with their respective plates on the lower parts facing inwards towards the frame centre line.

TRACING FAULTS

Test the shock absorber by working it up and down several times. There should be equal resistance in both directions. The shock absorber should be in an upright position with the dust cover uppermost when testing. Fill with fluid if there should be any uneven resistance. Follow the instructions given under the heading "Filling shock absorber fluid". If there should be excessive resistance or no resistance what-so-ever, the shock absorber must be disassembled and repaired (if of the later model), or replaced.

A preliminary investigation can be carried out by swaying the car before removing the shock absorbers. A strong braking effect should be noticeable.

Leakage

In the event of leakage, it is not sufficient to just add more fluid. The shock absorber must be removed and repaired or replaced.

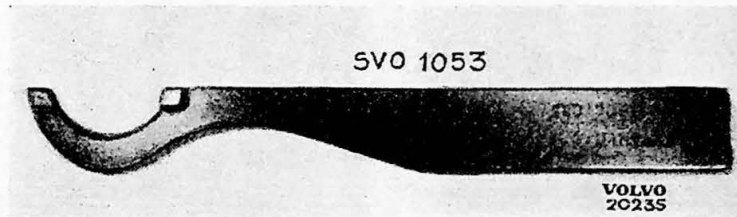
Noise

Noise may be caused by worn rubber bushings on the shock absorber eyes, insufficient fluid or damaged integral parts. Worn or damaged parts must be replaced with new.

Add fluid as instructed under the heading "Filling shock absorber fluid".

TOOLS

The following special tool is necessary when repairing shock absorbers:



SVO 1053. Shock absorber spanner.

SPECIFICATIONS

Springs

Front	Coil springs
Length loaded with 435 ± 12 kg (960 ± 26 lb.)	177 mm (6 ³¹ / ₃₂ ")
Material thickness	13.6 ± 0.1 mm
Rear	Coil springs
PV 444 TL:	
Length loaded with 300 ± 10 kg (661 ± 22 lb.)	255 mm (10")
Material thickness	13 ± 0.1 mm
Other models:	
Length loaded with 215 ± 8 kg (475 ± 18 lb.)	242 mm (9 ¹⁷ / ₃₂ ")
Material thickness	11.8 ± 0.1 mm

Shock absorbers

Shock absorbers on chassis up to and including No. 10000 may be dismantled.

Fluid capacity:

Front	97 cm ³
Rear	178 cm ³