

# SERVICE MANUAL

PV 444, 544

Part 9

SPRINGS AND SHOCK ABSORBERS

*Service Department*

AKTIEBOLAGET

# **VOLVO**

GÖTEBORG SWEDEN

## CONTENTS

Springs .....	1
Description .....	1
Repair instructions .....	1
Shock absorbers .....	3
Description .....	3
Tracing faults .....	5
Specifications .....	6

## SPRINGS DESCRIPTION

The PV 544, 444 is fitted with coil springs both front and rear. The front-wheel suspension is independent.

The front springs extend from a housing on the front-axle member at the top to a control arm fitted

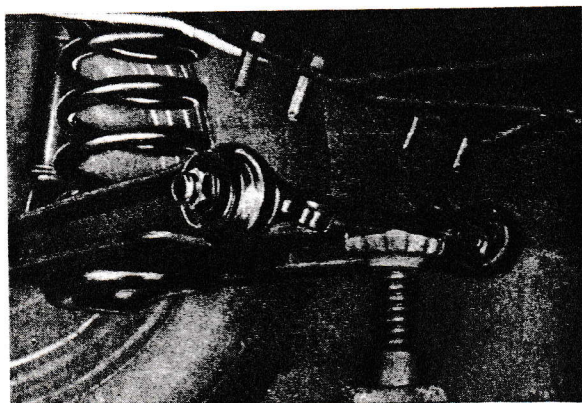
to the front axle member and the lower end of the steering knuckle support.

The rear spring 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 cm (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.

VOLVO  
20164

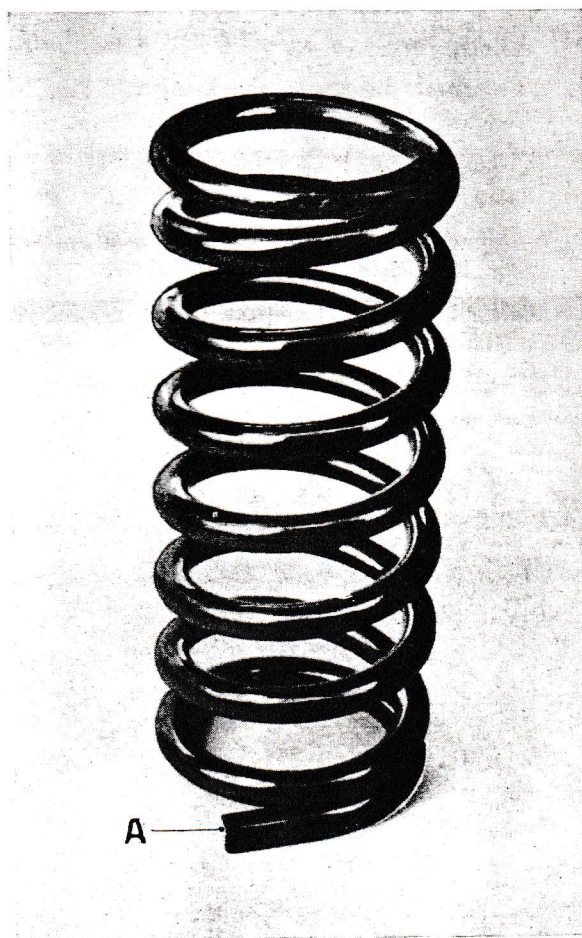
*Fig. 1. Removing front springs.*

### 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.

### 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, then place a jack under the control arm, see Fig. 1.

VOLVO  
20165

*Fig. 2. Front spring.*

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 handbrake.
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 (7) from its attachment on the axle support arm (9).
5. Disconnect the spring from the axle support arm (bolt 10).
6. Lower the rear axle housing sufficiently for the spring to be loosened.
7. Disconnect the spring from the body (bolt) and remove the spring.

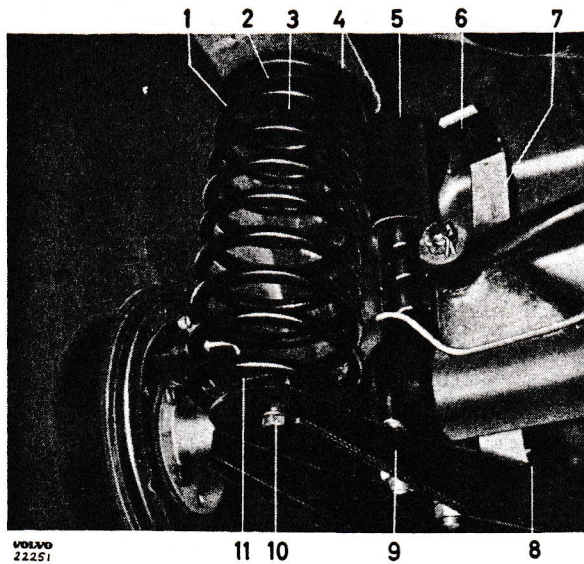


Fig. 3. Rear spring fitted.

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

### 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 spring. "Tired" or damaged springs must be replaced.

### Fitting the rear springs

1. Place the spring and the rubber spacer (4) 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 (7) to the rear axle support arm.
3. Connect the shock absorber (5) to the rear axle housing.

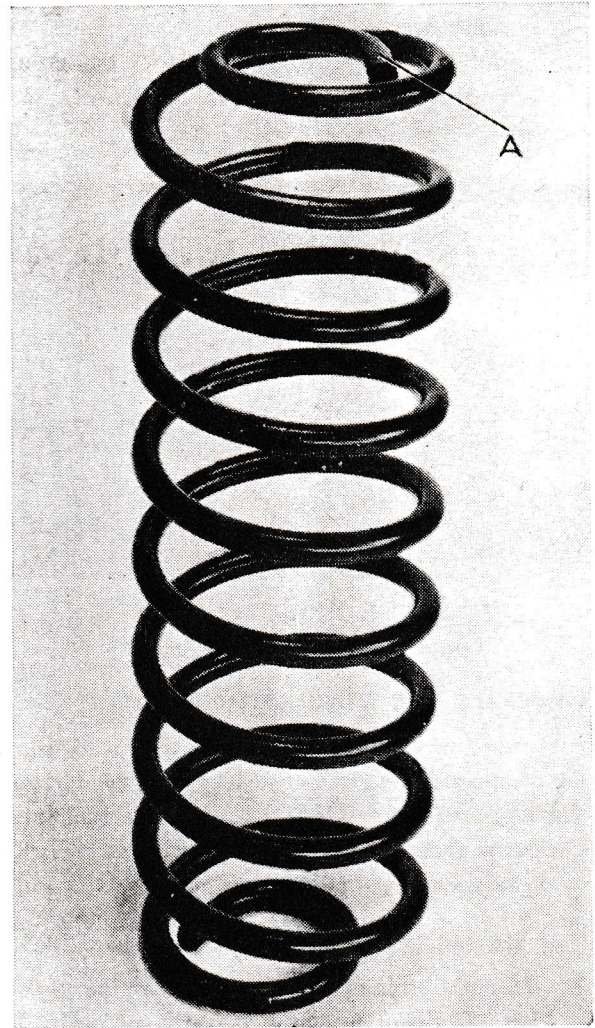
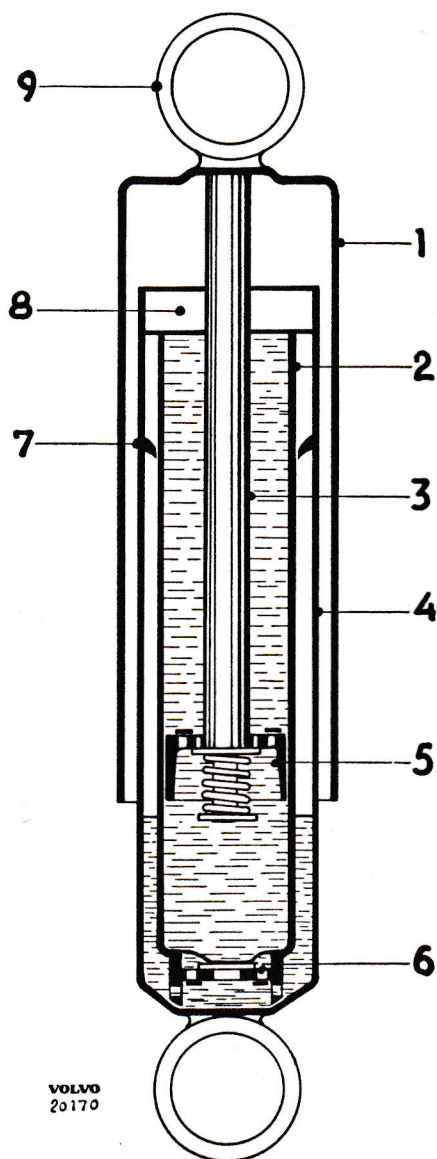


Fig. 4. Rear spring. VOLVO 20257

# SHOCK ABSORBERS

## DESCRIPTION



VOLVO  
20170

Fig. 5. Schematic view of shock absorber.

The shock absorbers on the PV 544, 444 are hydraulic, double-acting and telescopic. Bands are fitted between the support arms and body. These prevent damage to the shock absorbers by limiting wheel travel downwards. Wheel travel upwards is limited by rubber blocks. On early production cars, the bands were fitted behind the springs while on late production cars, they are fitted in front of the springs (7, Fig. 3).

### 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 end 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 during travel, 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 to 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.

# REPAIR INSTRUCTIONS

## Fitting the shock absorbers

Before fitting, airvent the shock absorber by holding it in an upright position with the dust cover

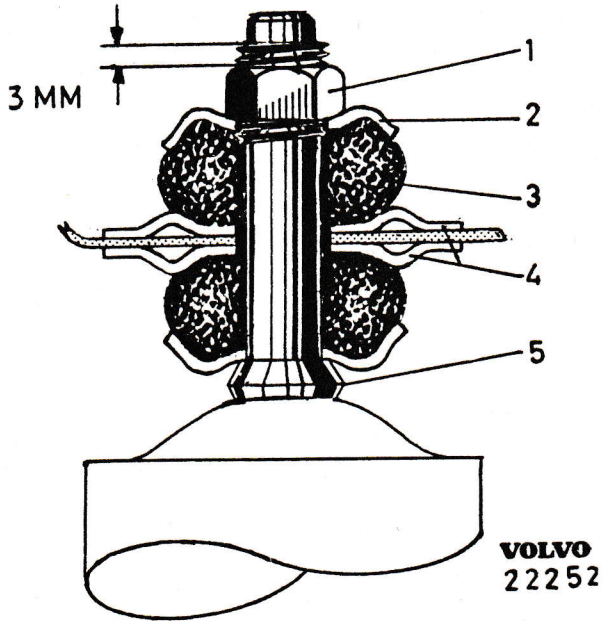


Fig. 6. Upper, rear shock absorber attachment.

- |                   |                                  |
|-------------------|----------------------------------|
| 1. Nut            | 4. Washers welded in body plate  |
| 2. Washer         | 5. Shock absorber attaching bolt |
| 3. Rubber bushing |                                  |

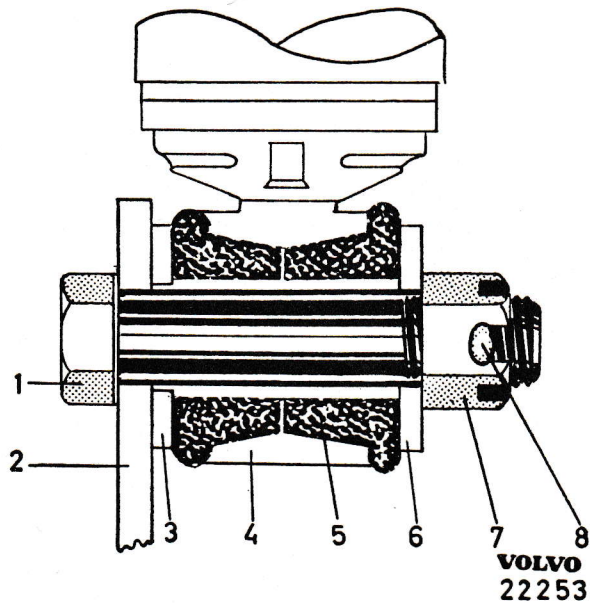


Fig. 7. Lower, rear shock absorber attachment.  
(Late production).

- |                                    |                   |
|------------------------------------|-------------------|
| 1. Bearing bolt                    | 5. Rubber bushing |
| 2. Bracket                         | 6. Washer         |
| 3. Washer with spacer sleeve       | 7. Nut            |
| 4. Shock absorber attaching eyelet | 8. Cotter pin     |

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 in the reverse order to that used when removing. The shock absorber attachments are assembled as shown in Figs. 6—9.

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

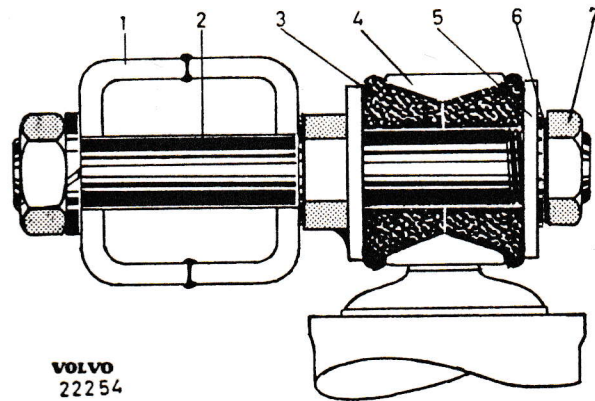


Fig. 8. Upper, front shock absorber attachment.

- |                                    |                |
|------------------------------------|----------------|
| 1. Upper control arm               | 5. Washer      |
| 2. Bearing bolt                    | 6. Lock washer |
| 3. Rubber bushing                  | 7. Nut         |
| 4. Shock absorber attaching eyelet |                |

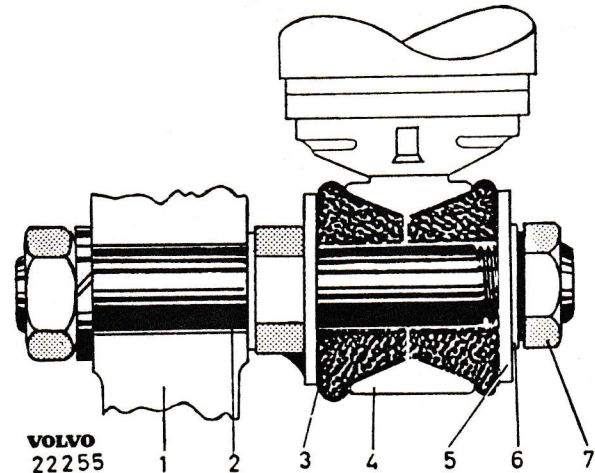


Fig. 9. Lower, front shock absorber attachment.

- |                                    |                |
|------------------------------------|----------------|
| 1. Steering knuckle support        | 5. Washer      |
| 2. Bearing bolt                    | 6. Lock washer |
| 3. Rubber bushing                  | 7. Nut         |
| 4. Shock absorber attaching eyelet |                |

## TRACING FAULTS

The damping properties of a shock absorber cannot definitely be determined without using special instruments. In most cases, however, a fairly accurate idea of the state of the shock absorbers can be determined in the following way.

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.

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

### Noise

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

## SPECIFICATIONS

### Front springs

Type .....	Coil springs
Material thickness .....	13.5—13.7 mm (0.531"—0.539")
Outer diameter .....	109—111 mm (4.29"—4.37")
Unloaded length (new spring) .....	approx. 255 mm (10")
Total number of turns .....	8

Test values:

Length, loaded with $435 \pm 12$ kg ( $959 \pm 26 \frac{1}{2}$ lb) .....	177 mm (6.97")
Length, totally compressed .....	max. 113 mm (4.45")
Loading required to compress spring 1 cm ( $\frac{25}{64}$ "):	
Measured within spring length limits 155—200 mm (6.1"—7.87") .....	$59 \pm 2$ kg ( $130 \pm 4 \frac{1}{2}$ lb)

### Rear springs

Type .....	Coil springs
Material thickness .....	11.7—11.9 mm (0.460"—0.468")
Outer diameter .....	125.5—127.5 mm (4.94"—5.02")
Unloaded length (new spring) .....	approx. 390 mm (15.3")
Total number of turns .....	9

Test values:

Length loaded with $215 \pm 8$ kg ( $474 \pm 17 \frac{1}{2}$ lb) .....	242 mm (9.52")
Length, totally compressed .....	max. 114 mm (4.49")
Loading required to compress spring 1 cm ( $\frac{25}{64}$ "):	
Measured within spring length limits 190—290 mm (74.8"—11.4") .....	$14.5 \pm 0.5$ kg ( $32 \pm 1$ lb)

### Shock absorbers

Length between eyelet centres:

Front shock absorbers, compressed .....	approx. 200 mm (8")
"    "    "    extended .....	approx. 290 mm (11 $\frac{1}{2}$ ")
Rear shock absorbers, compressed .....	approx. 300 mm (11 $\frac{3}{4}$ ")
"    "    "    extended .....	approx. 485 mm (19")