CONTENTS 105A

GROUP 71

FRAME

DESCRIPTION

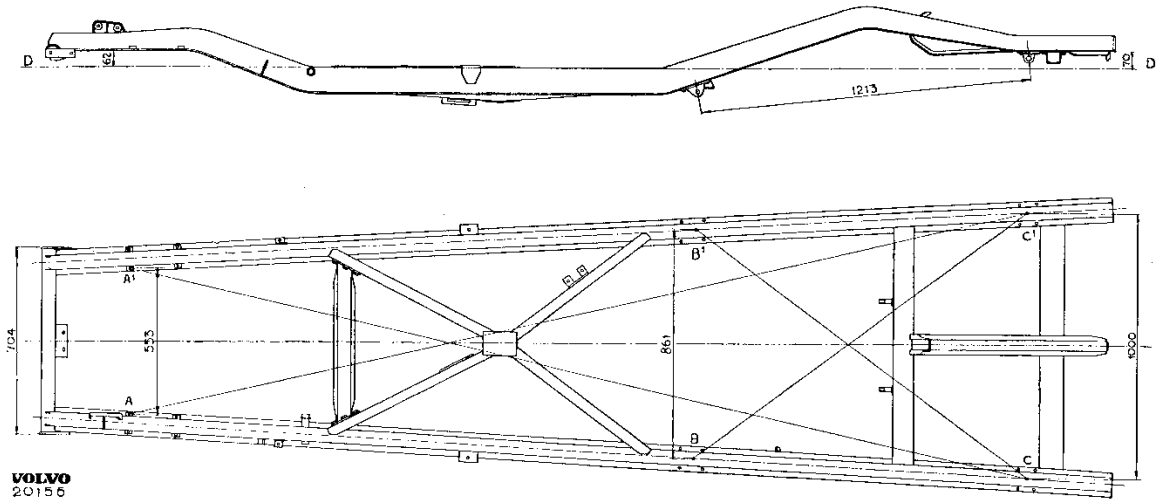

Fig. 1. Measuring the frame

A box-section frame is fitted on P 210 vehicles. The side members and all the cross-members with the exception of the gearbox support member are of the box type. In order to increase rigidity, the frame is X-braced. The rear cross-member is riveted to the side members. The gearbox support member is attached to the frame by means of bolts, three on each side, in order to facilitate removal of the gearbox. The front cross member, which carries the front wheel suspension, is attached to the frame by means of eight bolts. All the remaining cross-members are electrically welded. The attachments for the rear springs are riveted to the side members. The propeller shaft support bearing bracket is attached by means of two bolts to the upper side of the frame immediately behind the point of intersection of the X-bracing.

REPAIR INSTRUCTIONS

CHECKING FRAME ALIGNMENT

If the vehicle has been involved in a collision or run off the road, a check measurement should always done on the frame even if no damage has been noticed on the frame members. This check measurement is to prevent steering trouble occurring later, abnormally high tyre wear or noisiness in the form of squeaking and rattling. Measuring requires a level and clean floor and can be carried out without disassembling the body or chassi parts. The diagonal measuring method is used, this consisting of marking out symmetrical pairs of points on the frame, see Fig. 1, and transferring these to the floor where the actual measurement is carried out. The measuring points are transferred to the floor with the help of a plumb line, Fig. 2, and the vehicle should be held stationary by means of the handbrake or chocks under the wheels. Make a thick chalk mark on the floor and in this make a more accurate mark with a pencil exactly under the point of the plumb lead. Roll the vehicle out of the way and then connect the points diagonally by means of a chalked string, or other means. The intersection

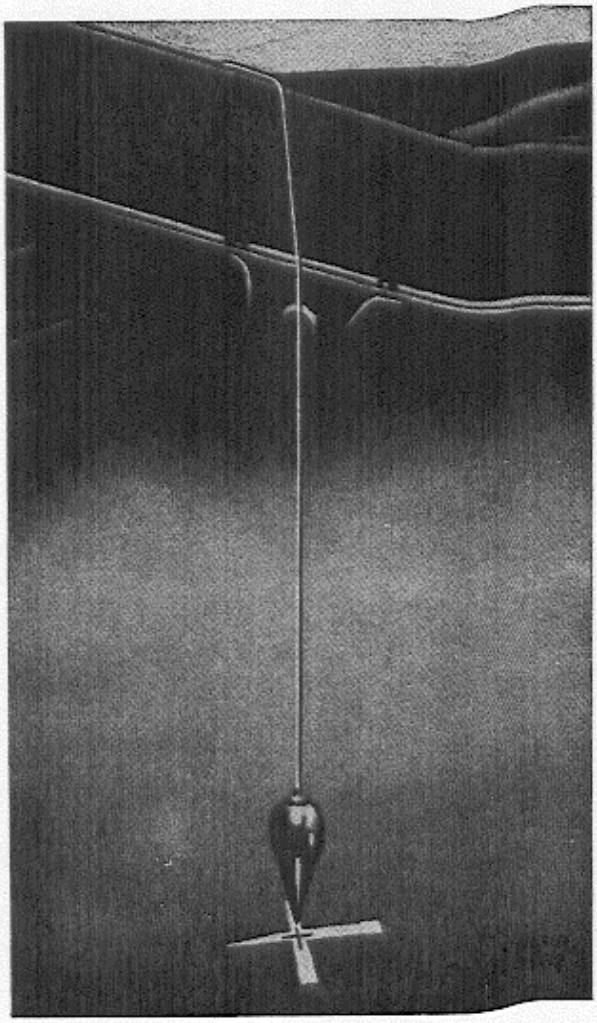

Fig. 2. Carrying out control measurement of the frame

points of these diagonals should lie on a common line, the centre line of the frame, see Fig. 1. If this is not the case then the frame is distorted. When measuring the distances between the points marked out by means of the plumb lead, ensure that the lengths of two intersecting diagonals are identical with a maximum deviation of 5 mm (0.2"). If the deviation exceeds this figure, the frame is distorted and must be straightened.

The points indicated in Fig. 1, can be used for this indirect measuring method.

A and A_1 designate the forward inside attaching bolts for the frame front member.

B and B_1 designate the centres for the forward bolts on the rear springs.

C and C_1 designate the centres of the rearmost rear spring bolts in the frame.

A frame without a body can be checked directly by comparing with the measurements shown in Fig. 1 and then measuring the diagonals.

In order to determine whether the frame is distorted or bent, is should be laid on trestles with the centre straight upper surface of the side members (line D—D) parallel with the floor and with both sides at the same level. Measure the distance from the floor to the straight upper edge of the side members and then use these figures as a basis for the check measurement. See Fig. 1.

Be very accurate when marking and measuring.

STRAIGHTENING THE FRAME

A detailed description of how to straighten a frame cannot be given here. But, in general, it can be said that frame should preferably be straightened in a cold condition and, where possible, in a press. If heating is necessary it should not be taken to excess. Frame members should not be heated up more than to dark red heat (cherry red). Do not hammer or press directly onto the heated spot but around it, to prevent material stress. If the frame plate has been damaged at any point in the collision, it should be warmed up and worked back into position by hammering.

Before starting straightening work on a frame check to ensure that there are no cracks. If there are large cracks in any frame member, this member must be replaced. If there are only small cracks, a limiting hole should be drilled in at the end of the crack and the crack should then be welded.

Welding work on a frame requires great experience and must be done very accurately. No cracks must be left. The welds should be inspected carefully after they have cooled down.

When riveting a frame make sure that the rivets and holes are of the correct size and that the rivets pull sufficiently (check by knocking with a hammer). Out-of-round or worn holes should be reamed out and a thicker rivet used.

GROUPS 72 AND 73

SPRINGS

DESCRIPTION

The PV 544 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.

P 210 vehicles are fitted with two coil springs at the front and two longitudinal semi-elliptic springs at the rear. The rear springs each have eight leaves, both ends of each spring being fitted with threaded bushings. The leaves are held together by means of three tensioner bands. The rear springs have rubber inserts between the leaves.

REPAIR INSTRUCTIONS

FRONT SPRINGS

Removing the front springs

1. Raise the front end of the vehicle so that the front wheels are about 15 cm (6″) above the floor and block up the frame.
2. Disconnect the stabilizer on the front suspension.
3. Place a jack under the lower control arm and unscrew the four nuts on the front cross member attachments. Fig. 3.
4. Lower the jack slowly and remove the spring when the lower control arm is sufficiently far down.

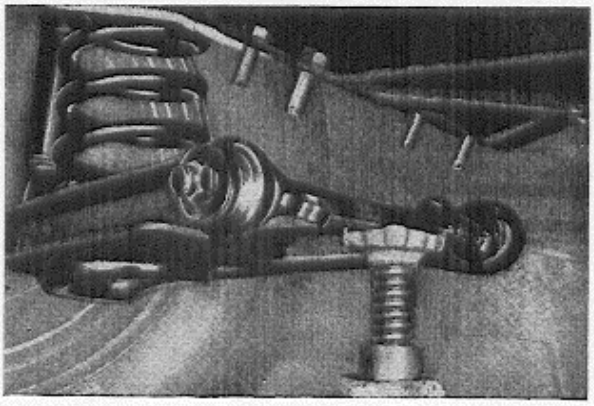

Fig. 3. Removing front springs

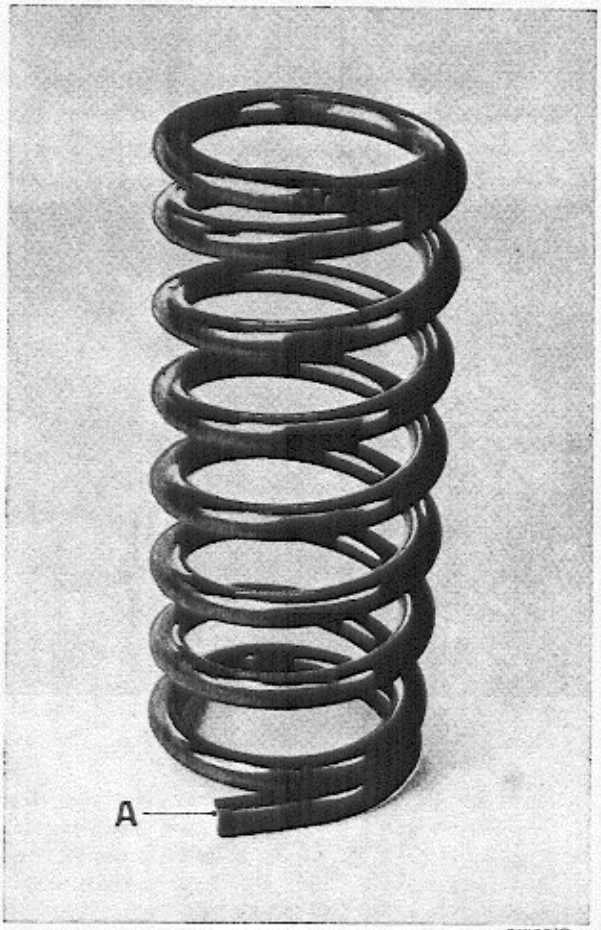

Fig. 4. Front spring

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. 4) 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. 3.
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.

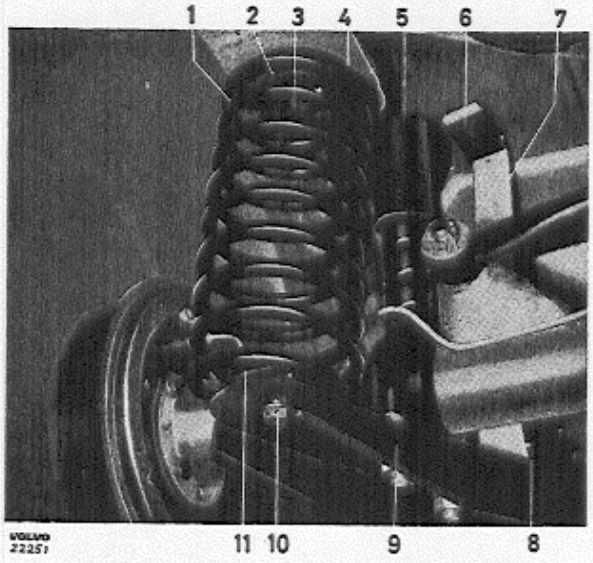

Fig. 5. Rear spring fitted, PV 544

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

REAR SPRINGS

Removing the rear springs, PV 544

1. Release the handbrake.
2. Raise the rear end of the car with a jack (placed under the rear axle housing) and block up the frame. Chocks must be placed under the front wheels.
3. Disconnect the shock absorbes (5, Fig. 5) 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 3) and remove the spring.

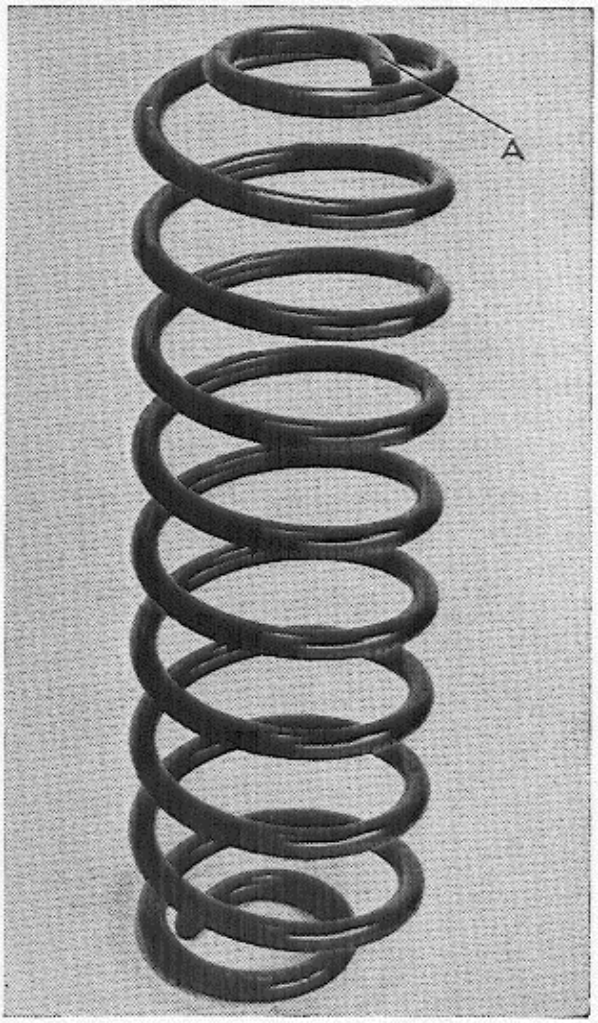

Fig. 6. Rear spring, PV 544

Checking the rear springs, PV 544

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, PV 544

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. 6) 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.

Removing the rear springs, P 210

1. Disconnect the lower end of the shock absorber.
2. Jack up the vehicle so that the rear wheels are about 10 mm (4") over the floor and block up the frame in front of the forward rear spring attachment.
3. Support the rear axle housing with a jack. Remove the four nuts on the spring U-bolts retaining the spring to the rear axle housing and remove the cap.
4. Screw out the forward spring bolt. Loosen the spring shackle by moving the bolts (4, Fig. 8), the sleeve (2) and the shackle side units (1). The spring can now be removed.

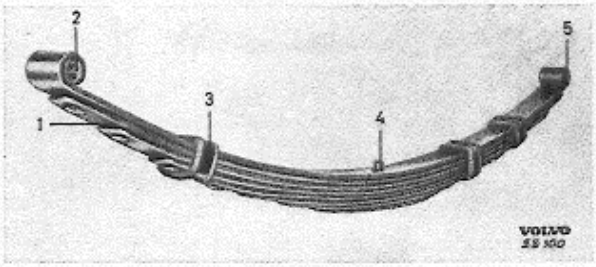

Fig. 7. Rear springs, P 210

1. Rubber insert
2. Rear spring bushing
3. Strap
4. Centre bolt
5. Forward spring bushing

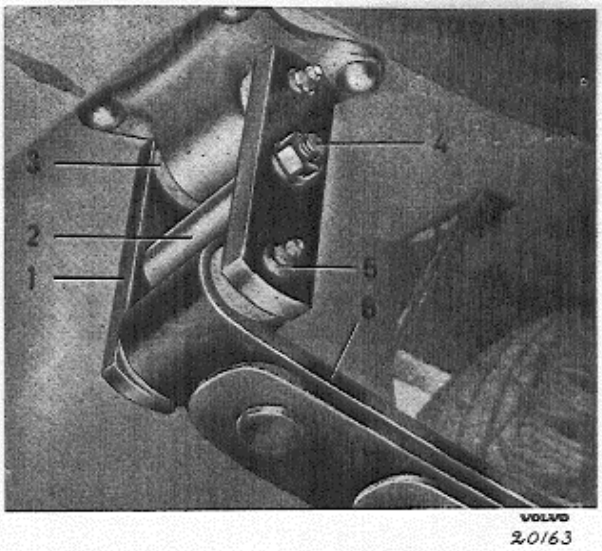

Fig. 8. Rear spring attachment

1. Spring shackle
2. Sleeve
3. Cork washer
4. Bolt
5. Spring bolt with lubricator
6. Spring

Checking the rear springs, P 210

Testing is carried out in a hydraulic press. One vital condition is that the press is fitted with a sufficiently accurate pressure gauge and also fitted with a device to prevent the spring from sliding out at the side.

The spring is placed in the press upside down and supported at both ends. After which pressure is applied on the centre bolt, see the principle in Fig. 9. The spring should have a negative deflection of 11 mm (0.43") (dimension B, Fig. 9) when subjected to a loading of 450 ± 15 kg (992 ± 33 lb.) The spring should first be pressed slightly past the position it should have during testing and released back to its correct position. Leaf friction is eliminated by striking cautiously on the spring, and then the pressure reading on the gauge should be read off. If the pressure gauge shows too low a value, the spring should be straightened or replaced.

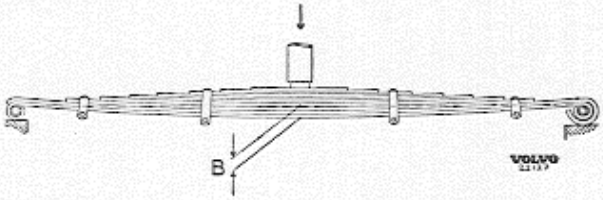

Fig. 9. Testing a leaf spring

Broken spring leaves

If one of more of the spring leaves is broken, it is not enough merely to replace them, but the cause of the breakage must also be determined.

If the main leaf is broken close to one of the attachments, examine to ensure that the spring bolt has neither jammed nor is binding in the bushing. If the spring breakage is in the centre of the spring, the reason for this can be a faulty shock absorber and this should be examined. Breakage can also depend on a faulty centre bolt or through overloading.

Assembly the rear springs, P 210

1. Turn the spring so that the half which has only one clip is to the rear. Make sure that the hand-brake cable is in its bracket (1, Fig. 10).
2. Lubricate the spring bushings and spring bolts. Lift up the spring and screw in the forward spring bolt and star washer.
3. Screw in the rear spring bolts so that their tapered ends project just as much on both sides. If the upper spring bolt has a right-angle lubricating nipple (early production) turn both nipples outwards. If the upper spring bolt has a staight lubricating nipple (late production) turn both nipples inwards, (Fig. 8).
4. Fit new cork washers (3, Fig. 8). Clean the tapered holes in the spring shackles and then fit the shackles (1). Fit the sleeve (2) and then the bolt (4) with its washer and nut. Strike the outer sides of the shackles a couple of times and then tighten the nut on the bolts.
5. Fit the U-bolts and caps retaining the spring to the rear axle housing and tighten these nuts properly. Re-connect the shock absorbers. Fit the lubricating nipples in the spring bolts and grease with chassis grease. Re-tighten the spring U-bolts and the spring shackle nuts after the vehicle has been run for some miles.

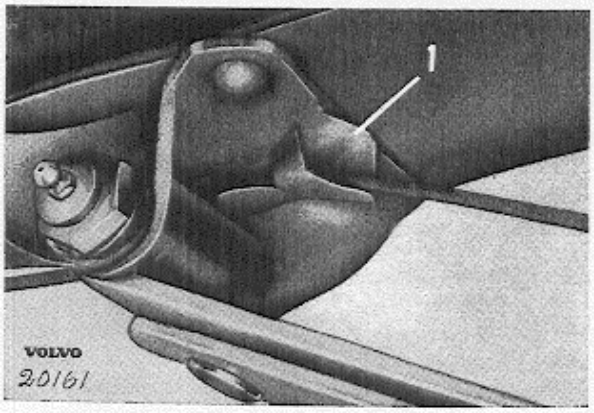

Fig. 10. Forward rear spring attachment

Replacing the bushings

It is not necessary to remove the spring from the vehicle to replace the bushings. The old bushings are pulled out and new ones pulled in with tool SVO 2382.

Removing

Fit the long sleeve on tool SVO 2382. Screw the tool into the bushing. Locate the sleeve so that the bevel is in its correct position, see Fig. 11. Then turn the spindle with the 25 mm sleeve and the ratchet handle. This will pull out the bushing.

Fitting

Fit the short sleeve on the tool. Place the tool in the attachment and screw on the bushing, see Fig. 12. The sleeve is located so that the bevel is in the correct position. Then turn the spindle with the 25 mm sleeve and ratchet handle. This will move the bushing into its correct position.

In all work with this tool, make sure that the bevel is as shown in Figs. 11 and 12, otherwise the sleeve will be crooked and the spindle distorted.

Replacing a rear spring attachment

When replacing spring attachments, make sure that the rivets and rivet holes have the correct dimensions and that the rivets tighten properly. Out-of-round holes should be reamed out and thicker rivets used. The forward rear spring attachment should be turned so that the bracket (1, Fig. 10) for the hand-brake cable is on the inside towards the centre of the frame.

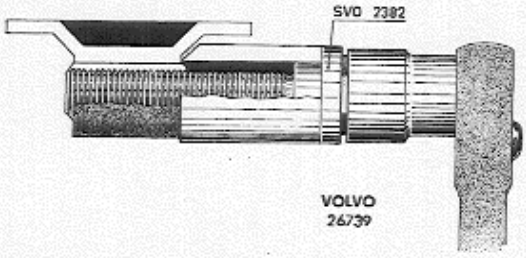

Fig. 11. Removing a spring bushing

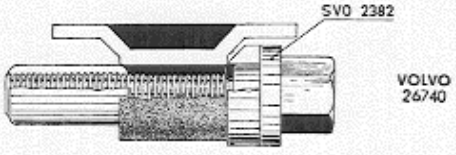

Fig. 12. Fitting a spring bushing

GROUP 76

SHOCK ABSORBERS

DESCRIPTION

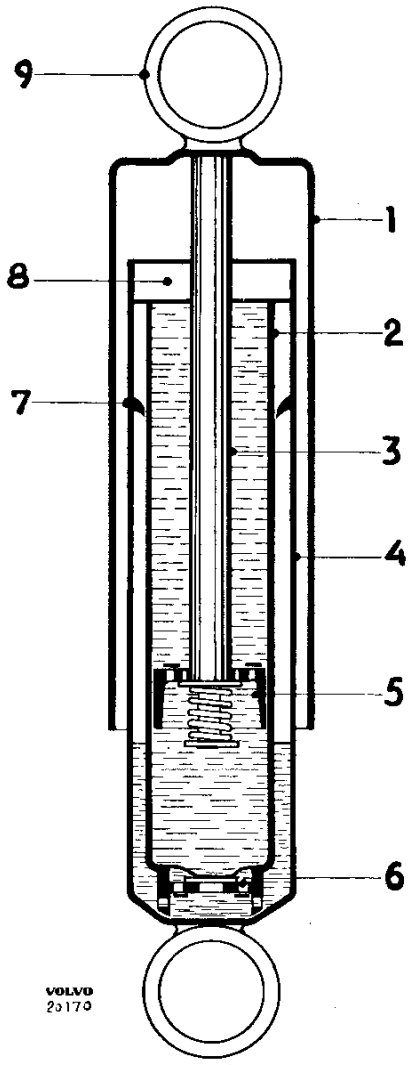

Fig. 13. Shock absorber

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

The shock absorbers on PV 544 and P 210 vehicles and hydraulic, double-acting units of the telescopic type. They require no maintenance and cannot be disassembled.

DESIGN

The design of the shock absorbers is shown in Fig. 13. The outer cylinder (1) acts only as a dust and dirt cover. The two other cylinders (2) and (4) are concentrically arranged with one slid into the other. The inner cylinder (2) is the actual working cylinder and has a valve (6) fitted in its lower end. A piston (5) with various channels controlled by valves operates inside the inner cylinder. The piston is attached to a piston rod (3), the opposite end of which is in the form af an eyelet (9) for attachment to the frame. A similar eyelet is attached to the cylinder (4) at the opposite end of the shock absorber. The space between the cylinders (2) and (4) serves as a reservoir and is only partially filled with liquid. The inner cylinder (2) is completely filled with liquid on both sides of the piston (5). The cover (8) functions as a seal and also as a guide for the piston rod (3). The ring (7) prevents splashing in the liquid.

OPERATION

When the shock absorber is compressed or extended by means of the spring on the vehicle, the piston (5) moves in the inner cylinder (2). Liquid then streams out through the valve-controlled channels in the piston. The speed with which the piston can move in the cylinder depends on the speed with which the liquid passes through the channels from one side of the piston to the other. Since the drilled channels are very small, the liquid can only pass through very slowly and this slows down the movements of the piston, and also the movements of the springs on the vehicle. In the case of sudden compression or extension, the slowing effect is further increased by turbulence in the liquid passing through the drilled channels in the piston.

When the shock absorber is compressed or extended, the volume on each side of the piston is not changed to the same extent since the piston rod displaces a certain volume. For this reason, when the shock absorber is compressed, some of the liquid flows out through the valve (6) into the reservoir and when the shock absorber is extended, fluid is sucked into the cylinder (2) again on the underside of the piston.

REPAIR INSTRUCTIONS

Removing

The shock absorber can be removed after the nuts (7, Figs. 14 and 15) and the washers (5 and 6) have been removed.

Fitting

Before being fitted, the shock absorber should be "vented" by holding it in a vertical position with the protective casing upwards and pumping four to five complete strokes or until resistance in both directions can be felt.

When assembling always keep the dust cover upwards the whole time.

Assembly is carried out in the reverse order to that used when disassembling. The shock absorber attachments are assembled as shown in Figs. 14 and 15. Since there are various models of attachment, make sure when replacing the bushings that the correct type is fitted. Late production bushings and bearing bolts result in rather more flexible attachment.

The rear shock absorbers are fitted so that the plate attached to the lower container is on the inside towards the centre of the body.

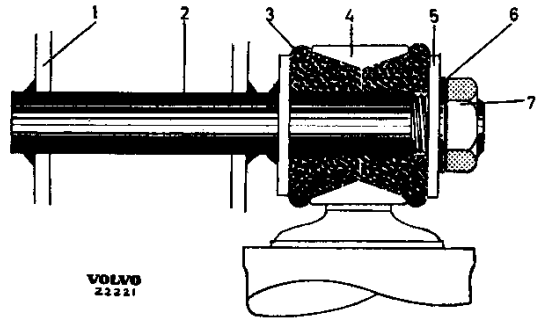

Fig. 14. Upper, rear shock absorber attachment

1. Frame
2. Bearing bolt
3. Rubber bushing
4. Shock absorber attaching eyelet
5. Washer
6. Lock washer
7. Nut

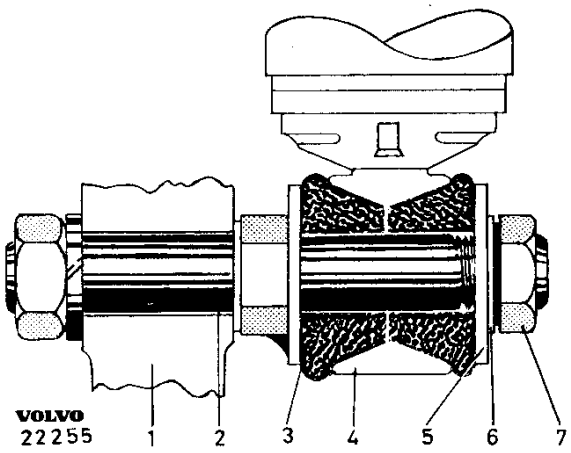

Fig. 15. Other shock absorber attachments

1. Bolt attachment
2. Bearing bolt
3. Rubber bushing
4. Shock absorber attaching eyelet
5. Washer
6. Lock washer
7. Nut

TRACING FAULTS

It is not possible to decide definitely the damping properties of a shock absorber without the help of special equipment. In most cases, however, the condition of the shock absorber can be determined with a fair amout of accuracy by means of the following test.

Extend and compress the shock absorber several times. There shold be equal resistance in both directions. During this test, the shock absorber should be held vertically with the protective casing upwards. If there is uneven resistance or no resistance at all, the shock absorbers should be replaced. Before the shock absorbers are removed, a preliminary test can be done by "rocking" the vehicle. The movements of the body should be rapidly damped by the shock absorbers.

Leakage

A leaking shock absorber should be replaced.

Noisiness

Noisiness can depend on worn rubber bushings in the shock absorber attachment and these should be changed. It can also depend on an excessively low liquid level or damaged units inside the shock absorber. In this case the entire shock absorber should be replaced.

GROUP 77

WHEEL AND HUB

CHANGING WHEELS

When fitting wheels it is important that all grit and dirt and any surplus paint is cleaned off from the contact surfaces between the wheel and hub.

REPLACING AND ADJUSTING THE FRONT WHEEL BEARINGS

When adjusting the front wheel bearings, first remove the wheel hub to inspect the bearing races and rollers. If these are scored or worn they must be replaced. Below is described the procedure for complete replacement of bearings. For ordinary inspection and adjustment, disregard the points not applying.

1. Remove the hub cap and slacken the wheel nuts slightly.
2. Jack up the front part of the vehicle and place trestles under the lower control arms, remove the wheel nuts and lift off the wheel.
3. Remove the grease cap with tool SVO 2197 (Fig. 16). Remove the split pin and castle nut. Pull off the hub with puller SVO 1791 as shown in Fig. 17.
4. Drive out the bearing races. For the inner race use drift SVO 1799 and for the outer race drift SVO 1800, together with standard handle SVO 1801.

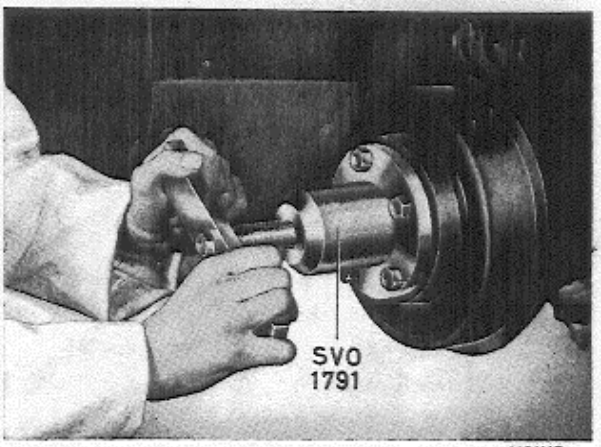

Fig. 17. Removing hub

5. Pull of the inner bearing with puller SVO 1794 if necessary (see Fig. 18).
6. Clean the hub, brake drum and grease cap.
7. Press in the new bearing races. Use standard handle SVO 1801 together with drift SVO 1798 for the inner race and SVO 1797 for the outer race.
8. Pack the bearings with multipurpose, first-class, lithium-based grease with the help of a lubricating device. If one of these is not available, pack the bearings by hand with sufficient grease that will find room between the roller retainer and

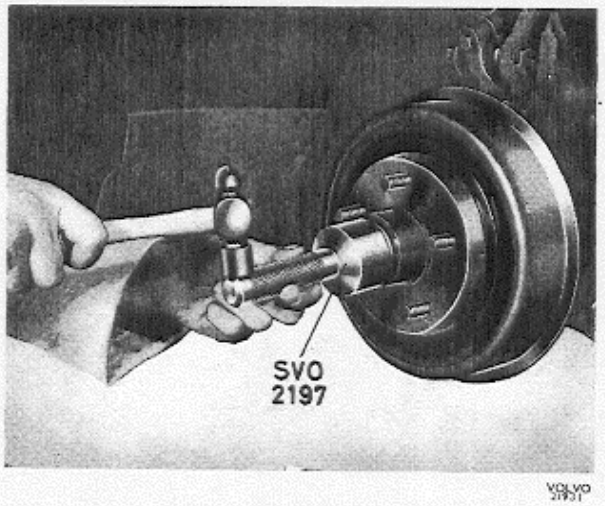

Fig. 16. Removing grease cap

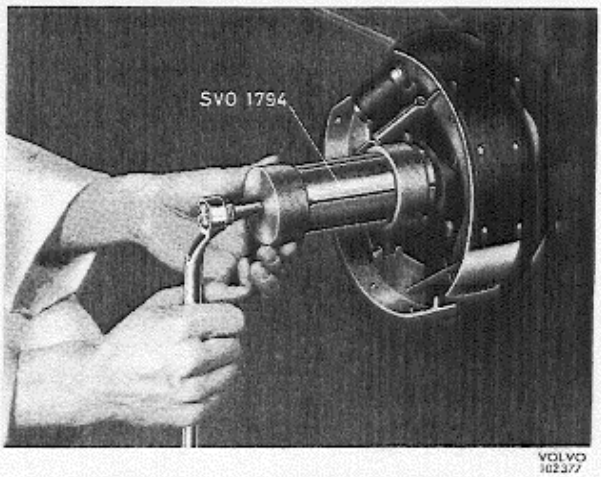

Fig. 18. Removing inner bearing

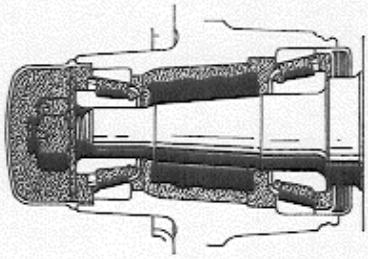

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Fig. 19. Lubricating the front wheel bearing

the inner ring. Also coat grease on the outer sides of the bearings and on the outer rings pressed into the hub. The recess in the hub should be filled up with grease all round to the smallets diameter of the outer ring for the outer bearing, see Fig. 19.

Place the inner bearing in position in the hub. Press in the sealing ring with drift SVO 1798 together with standard handle SVO 1801 (see Fig. 20).

9. Place the hub on the spindle. Fit the outer bearing, washer and castle nut.
10. The front wheel bearings are adjusted by first tightening the nut with a torque wrench to a torque of 7 kgm (50 lb.ft.). Then slacken the nut a third of a turn. If the slot in the nut does not correspond with the split pin hole, slacken the nut further to enable the split pin to be fitted. Check that the wheel rotates easily but without any play.
11. Fill the grease cap half-full with the type of grease mentioned in point 8 and fit the cap with drift SVO 2197 (see Fig. 21).
12. Lift on the wheel after having cleaned the contact surfaces between wheel and hub free from sand and dirt, and tighten the nut sufficiently so that the wheel cannot be displaced on the hub. Lower the vehicle and tighten the wheel nut. Tighten every other nut a little at a time until all are tightened to a torque of 10—14 kgm (72—101 lb.ft.). Fit the hub cap.

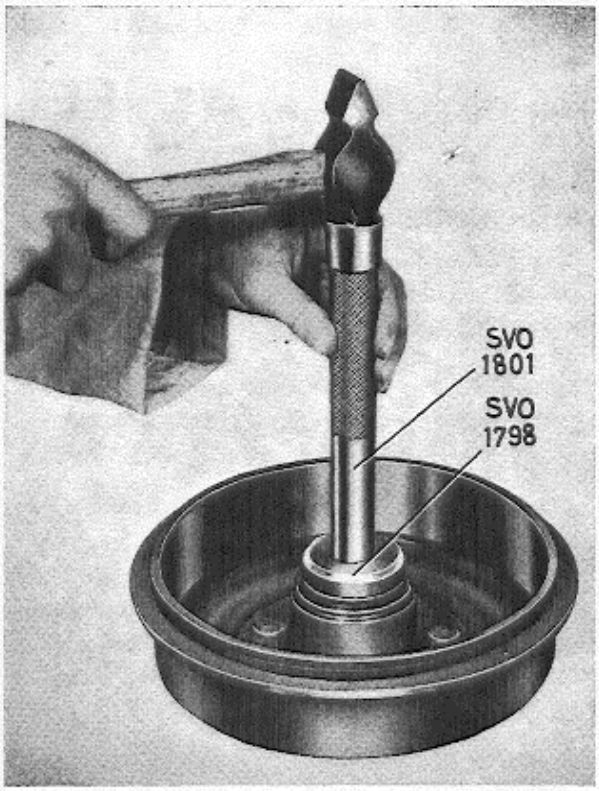

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Fig. 20. Fitting sealing ring

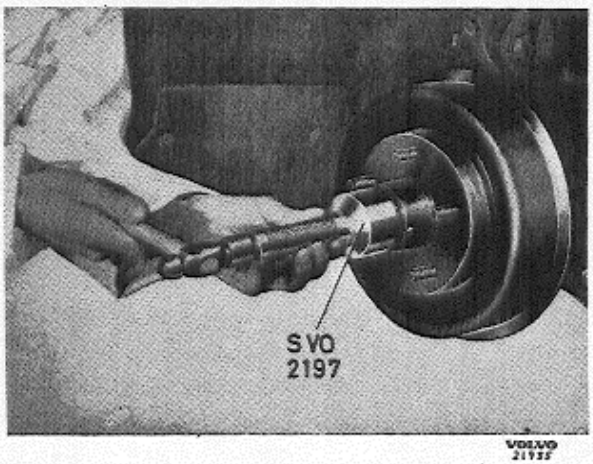

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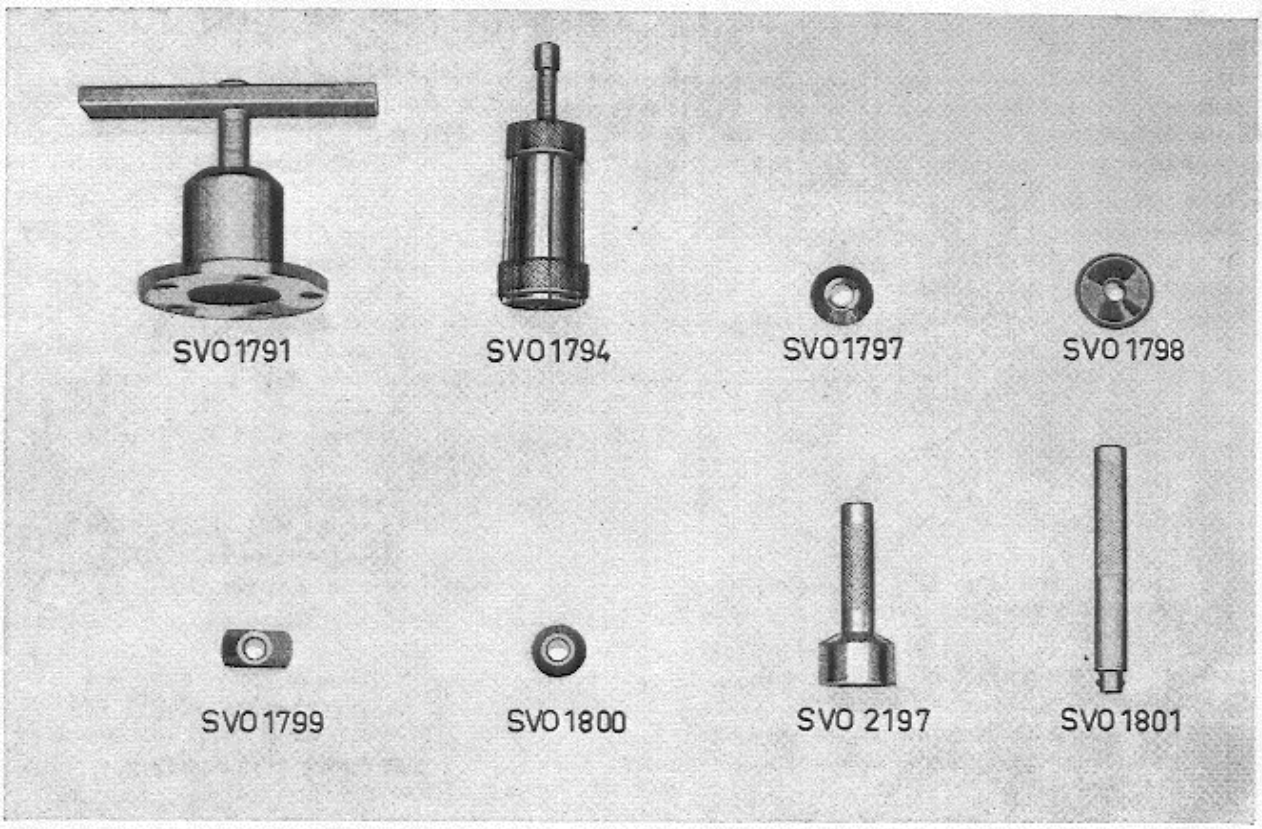
Fig. 21. Fitting grease cap

TOOLS

Special tools for work on the hub.



VOLVO 100 664

SVO 1791 Puller for wheel hub.

SVO 1794 Puller for inner ring, inner wheel bearing.

SVO 1797 Drift for fitting outer bearing ring.

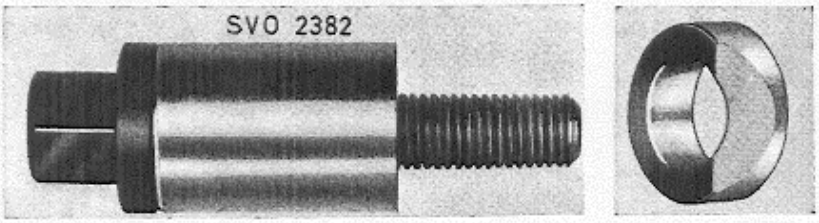
SVO 1798 Drift for fitting inner bearing ring and seal in hub.

SVO 1799 Drift for removing inner bearing ring.

SVO 1800 Drift for removing outer bearing ring.

SVO 1801 Standard handle 18×200.

SVO 2197 Drift for fitting and removing grease cap.



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SVO 2382. Tool for springs bushings

SPECIFICATIONS

FRAME, P 210

Overall length	3915 mm (154″)
Width:	
Front	704 mm (27.72″)
Rear	1120 mm (44.10″)
Number of cross-members (including X-members)	6
Frame height (side-members) max	90 mm (3.54″)
Material thickness:	
Side-members	2 mm (5/64″)
Front cross-member (tubular)	50.8 mm (2″) ext.
Support member for gearbox	2 mm (5/64″)
X-members	2 mm (5/64″)
Cross-member no. 3	2 mm (5/64″)
Rear cross-member	1.5 mm (1/16″)

FRONT SPRINGS

Type	Coil springs
Material thickness	13.6 ± 0.1 mm (0.53″ ± 0.004″)
Outer diameter	110 ± 1 mm (4.33″ ± 0.04″)
Length, unloaded (new spring)	approx. 255 mm (10″)
Number of turns, total	8
Test values:	
Length with loading 435 ± 12 kg (960 ± 26 lb.)	177 mm (6.97″)
Length, fully compressed	max. 113 mm (4.45″)
Loading required for compression of 1 cm (0.40″) (measured within spring length range 155—200 mm = 6—8″)	59 ± 2 kg (130 ± 4 1/2 lb.)

REAR SPRINGS, PV 544

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 ± 8 kg (474 = 17 ½ lb.)	242 mm (9.52″)
Length, totally compressed	max. 114 mm (4.49″)
Loading required to compress spring 1 cm (25/64″): Measured within spring length limits 190—290 mm (74.8″—11.4″)	14.5 ± 0.5 kg (32 ± 1 lb.)

REAR SPRINGS, P 210

Type	Semi-elliptic leaf springs
Length	1240 ± 3 mm (48.88 ± 0.11″)
Width	45 mm (1.77″)
Number of leaves	8
Thickness of leaves	
Leaves 1—4	7 mm (0.28″)
,, 5—8	6 mm (0.24″)
Test values:	
The springs should have a negative deflection of 11 mm = 0.43″ (dimension B, Fig. 9) with a loading on the centre bolt of	450 ± 15 kg (992 ± 33 lb.)
Loading for deflection of 1 cm (0.04″) (measured under such a loading the springs has a negative deflection of 11 ± 25 mm = 0.43 ± 1.00″)	34 ± 2 kg (75 ± 4 1/2 lb.)

SHOCK ABSORBERS

Type	Double-acting, hydraulic telescopic shock absorbers
Length measured between lug centres:	
Front shock absorber, compressed	approx. 200 mm (7 7/8″)
extended	approx. 290 mm (11 3/8″)
Rear shock absorber, PV 544, compressed	approx. 300 mm (11 7/8″)
extended	approx. 485 mm (19″)
Rear shock absorber, P 210, compressed	approx. 330 mm (13″)
extended	approx. 545 mm (21″)

WHEEL

Rims

Size	4.00×15″
Number of wheel nuts	5
Radial throw	Max. 2.5 mm (0.10″)
Run-out	Max. 2.5 mm (0.10″)
Tightening torque for wheel nuts	10—14 kgm (70—100 lb. ft.)

Tyres

PV 544

Type	Tubeless
Size, early prod.	5.90—15″
late prod.	6.00—15″
Number of plies	4
Tyre pressure (cold tyres) 5.90—15″, front	1.4 kg/cm² (20 lb/sq. in.)
rear	1.6 kg/cm² (23 lb/sq. in.)
for continuous driving between 140—160 km.p.h. (90—100 m.p.h.), front	1.8 kg/cm² (26 lb/sq. in.)
rear	2.0 kg/cm² (28 lb/sq.. in.)
6.00—15″, front	1.4 kg/cm² (20 lb/sq. in.)
rear,, 1—2 persons	1.6 kg/cm² (23 lb/sq. in.)
5 persons with luggage	1.8 kg/cm² (26 lb/sq. in.)

P 210

Type	Tubeless
Size	6.40—15″
Number of plies	4
Tyre pressure (cold tyres) front	1.4 kg/cm² (20 lb/sq. in.)
rear, 1—2 persons	1.7 kg/cm² (24 lb/sq. in.)
5 persons with luggage	2.1 kg/cm² (30 lb/sq. in.)