



# SERVICE MANUAL

P 120

Part 7

BRAKES

*Service Department*

AKTIEBOLAGET

**VOLVO**

GÖTEBORG SWEDEN

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### ATTENTION

This Service Manual deals with wheel brake units of early and late production. In this connection, late production concerns wheel brake units of the Duo-servo type fitted at the factory on P 1200 with drum brakes with effect from chassis number 15329 and on chassis numbers 14986—14987, 15069—15072, 15075—15081, 15084, 15097—15105 and 15178—15185.

## DESCRIPTION

The P 120 is equipped with two brake systems which are completely independent of each other. One of these, the foot brake, is controlled by a brake pedal and operates on all four wheels through a hydraulic system. The other system, the handbrake, is controlled by a brake lever and operates mechanically on both the rear wheels.

When the brake pedal (6) is depressed, it influences the plunger in the master cylinder (4) by means of a push rod (5). The hydraulic pressure in the master cylinder then rises and this is transmitted through the brake fluid in the lines (2) to the wheel unit cylinders. The plungers in these are then pressed outwards and apply the brakes.

### Foot brake

This can either be of the drum type or of the disc type. The arrangement of the foot brake system is shown in Figs. 1 and 3 respectively.

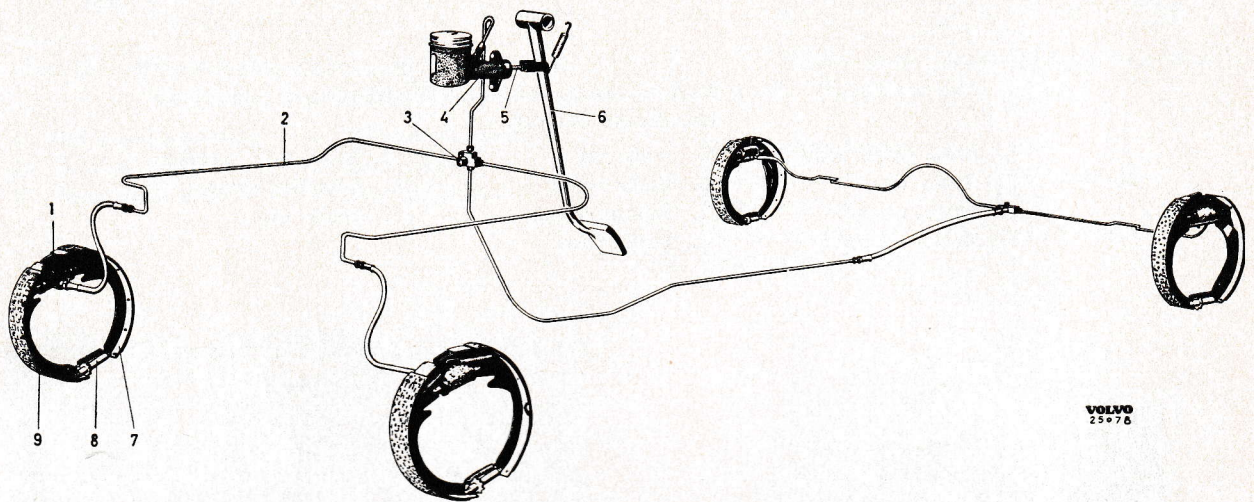
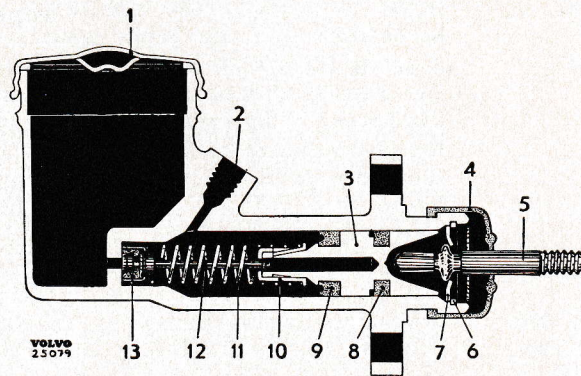


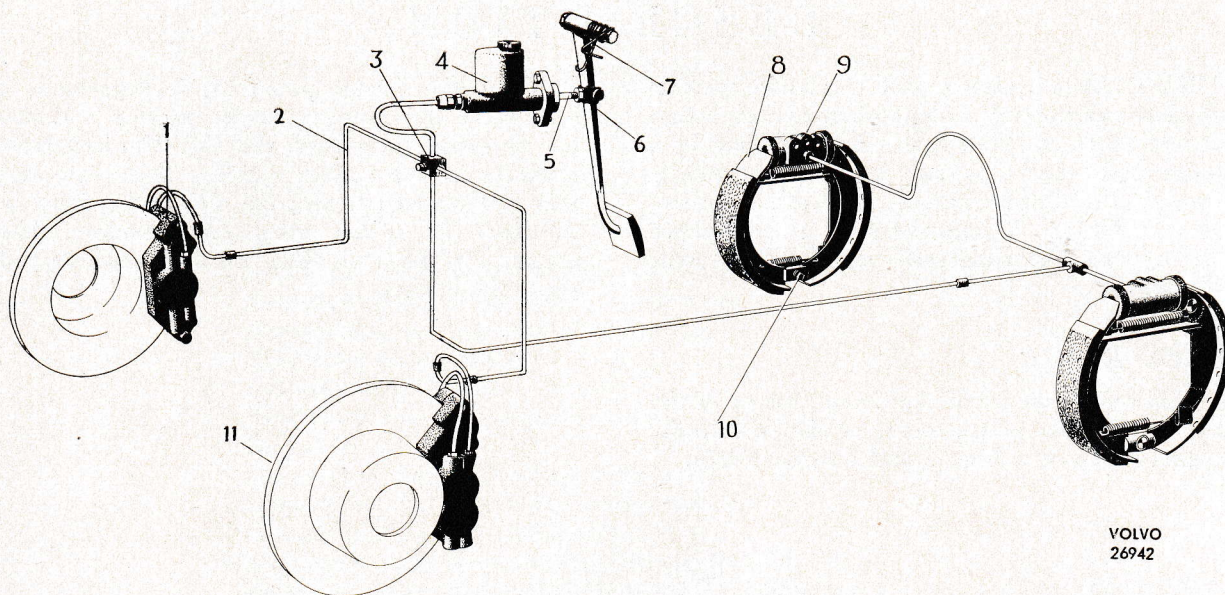
Fig. 1. Foot brake system, drum brakes.

- |                        |                    |                     |
|------------------------|--------------------|---------------------|
| 1. Wheel unit cylinder | 4. Master cylinder | 7. Rear brake shoe  |
| 2. Brake line          | 5. Push rod        | 8. Adjusting device |
| 3. Brake contact       | 6. Brake pedal     | 9. Front brake shoe |



- |                              |
|------------------------------|
| 1. Cap                       |
| 2. Connection for brake line |
| 3. Plunger                   |
| 4. Rubber cap                |
| 5. Push rod                  |
| 6. Locking ring              |
| 7. Washer                    |
| 8. Packing                   |
| 9. Packing                   |
| 10. Spring retainer          |
| 11. Spring                   |
| 12. Valve rod                |
| 13. Valve                    |

Fig. 2. Master cylinder, early production.



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Fig. 3. Foot brake system, vehicle with front wheel disc brakes.

- |                           |                  |                        |
|---------------------------|------------------|------------------------|
| 1. Front wheel brake unit | 5. Push rod      | 9. Wheel unit cylinder |
| 2. Brake line             | 6. Brake pedal   | 10. Adjusting device   |
| 3. Brake contact          | 7. Return spring | 11. Brake disc         |
| 4. Master cylinder        | 8. Brake shoe    |                        |

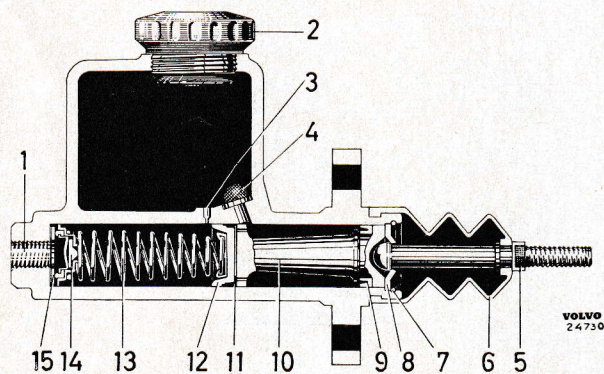


Fig. 4. Master cylinder, late production.

- |                              |                 |             |
|------------------------------|-----------------|-------------|
| 1. Connection for brake line | 6. Rubber cap   | 12. Packing |
| 2. Cap                       | 7. Locking ring | 13. Spring  |
| 3. Equalizing hole           | 8. Stop washer  | 14. Valve   |
| 4. Strainer                  | 9. Packing      | 15. Washer  |
| 5. Push rod                  | 10. Plunger     |             |
|                              | 11. Washer      |             |

### Wheel brake unit, drum brakes, early production

The front wheel brakes (Figs. 5 and 6) are of the "Two leading shoe" type, that is to say, each wheel has two brake cylinders with a plunger in each. By means of this arrangement

both the shoes function as primary shoes. Each shoe has a self-adjusting device.

The rear wheel brake units (Figs. 7 and 9) have a wheel unit cylinder with two plungers. At the bottom the shoes rest against a support attached to the brake backing plate. The front shoe is provided with a self-adjusting device and the rear shoe has a shorter lining.

Since the shoes can be displaced radially, they are self-centring. The clearance between the brake lining and drum can be adjusted by means of an eccentric which can be turned.

The self adjusting device (Fig. 8) functions as follows:

A contact plug (4) is fitted in a hole in the brake shoe. The outer end of this plug is held in contact with the brake drum by means of a spring (2). As the brake lining becomes worn, the contact plug moves inwards and influences the lever (7) by means of a stud (3), pressing the lever against the eccentric (6). This widens the distance between the guide lip (8) on the brake shoe and the lips (9) on the lever (7). The notched key (11), which is influenced by a spring (10), is then pulled in between the lips (8 and 9). The return movement of the brake shoe is thus limited so that the clearance between the brake lining and drum remains constant regardless of the wear on the brake lining.

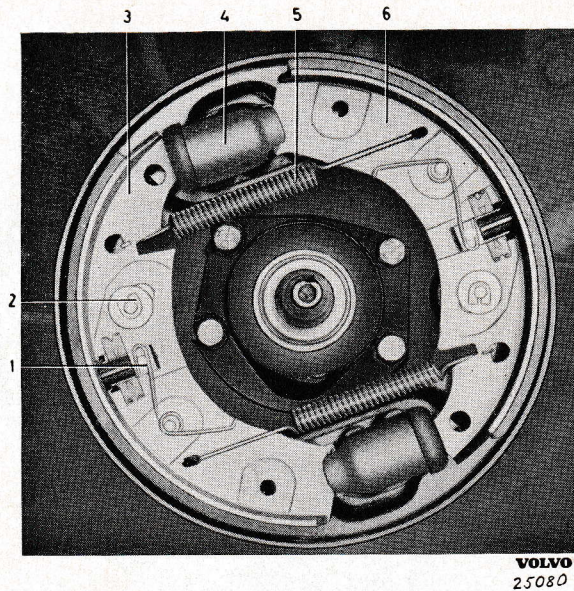


Fig. 5. Wheel brake unit, early production, left-hand front wheel.

- |                          |                        |
|--------------------------|------------------------|
| 1. Self adjusting device | 4. Wheel unit cylinder |
| 2. Locking washer        | 5. Return spring       |
| 3. Front brake shoe      | 6. Rear brake shoe     |

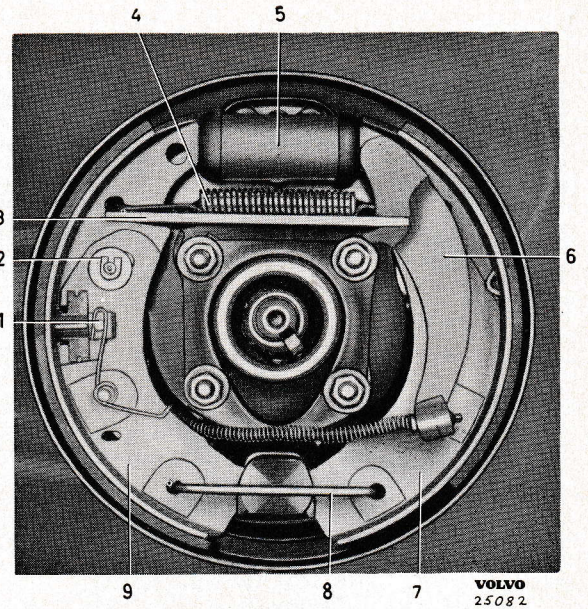


Fig. 7. Wheel brake unit, early production, left-hand rear wheel.

- |                          |                     |
|--------------------------|---------------------|
| 1. Self-adjusting device | 6. Lever            |
| 2. Locking washer        | 7. Rear brake shoe  |
| 3. Handbrake link        | 8. Spring           |
| 4. Return spring         | 9. Front brake shoe |
| 5. Wheel unit cylinder   |                     |

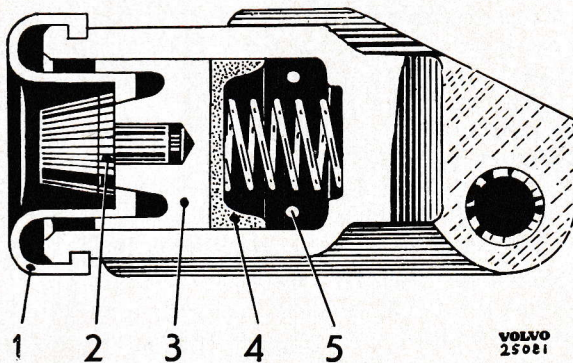


Fig. 6. Wheel unit cylinder, front wheel.

- |                |                              |
|----------------|------------------------------|
| 1. Rubber cap  | 4. Plunger packing           |
| 2. Plunger rod | 5. Connection for brake line |
| 3. Plunger     |                              |

When the contact plug reaches the web of the brake shoe as a result of brake lining wear, the self-adjusting function ceases. Further brake lining wear will then increase the clearance between the lining and drum. If the pedal stroke increases, that is to say, it can be pressed further down towards the floor, this means that the brake linings are worn and need replacing. In order to prevent vibration in the contact plug, a damping spring (5) is fitted between the brake shoe and contact plug.

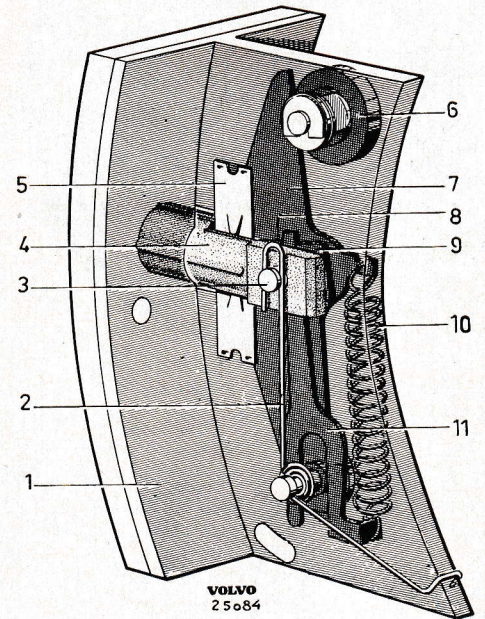
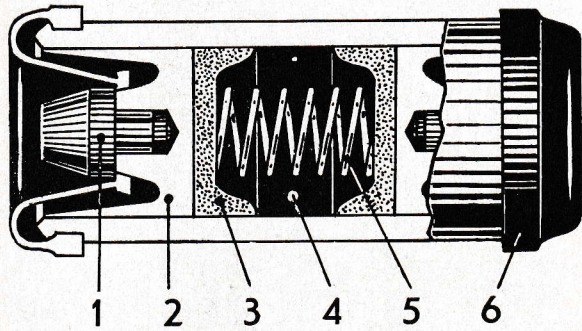


Fig. 8. Self-adjusting device.

- |                   |              |
|-------------------|--------------|
| 1. Brake shoe     | 7. Lever     |
| 2. Spring         | 8. Guide lip |
| 3. Stud           | 9. Lip       |
| 4. Contact plug   | 10. Spring   |
| 5. Damping spring | 11. Key      |
| 6. Cam            |              |



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Fig. 9. Wheel unit cylinder, rear wheel.

1. Plunger rod
2. Plunger
3. Packing
4. Connection for brake line
5. Spring
6. Rubber cap

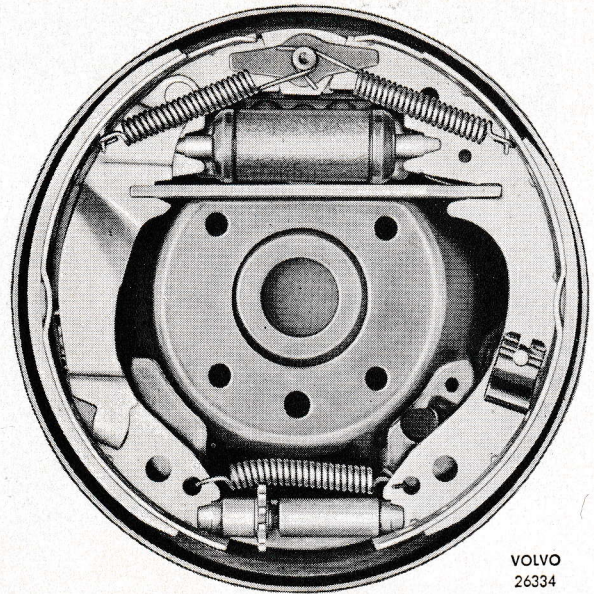


Fig. 11. Wheel brake unit, late production, right-hand rear wheel.

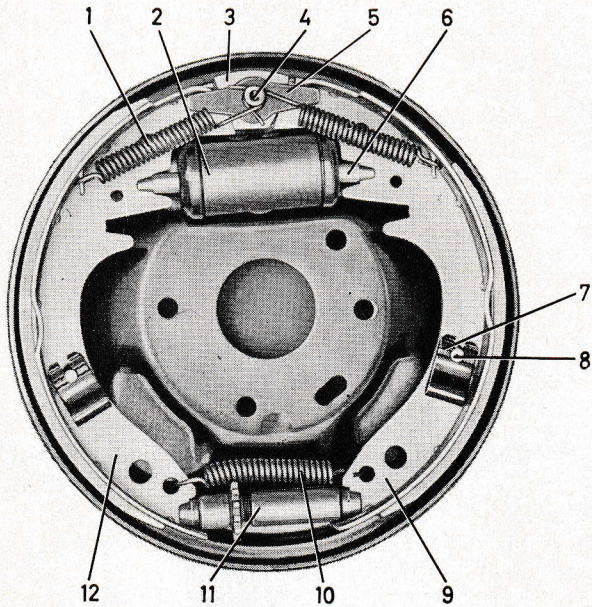


Fig. 10. Wheel brake unit, late production, right-hand front wheel.

1. Return spring
2. Wheel unit cylinder
3. Centring block
4. Anchor stud
5. Guide plate
6. Plunger rod
7. Clip
8. Guide pin
9. Front brake shoe
10. Locking spring
11. Adjusting device
12. Rear brake shoe

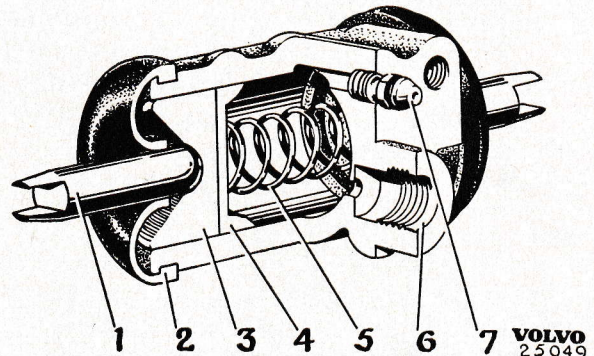


Fig. 12. Wheel unit cylinder, late production.

1. Plunger rod
2. Rubber cap
3. Plunger
4. Plunger packing
5. Return spring
6. Connection for brake line
7. Air-venting nipple

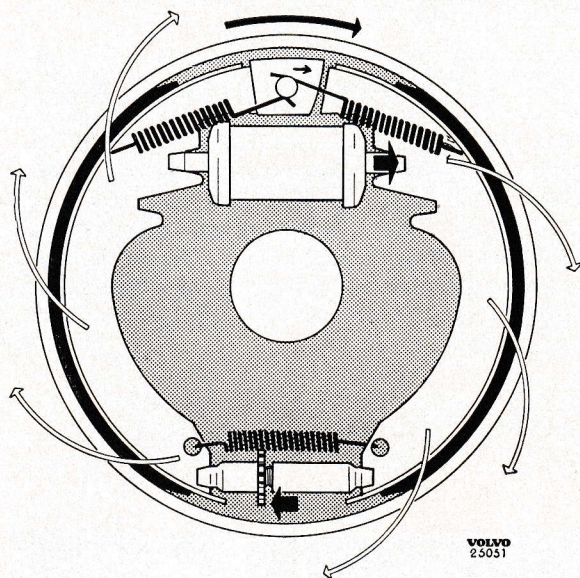


Fig. 13. Method of application of wheel brake unit.

When the brake is applied, the wheel unit cylinder plungers press out the shoes against the brake drum by means of the plunger rods (6, Fig. 10). Because of the friction between the drum and lining, the shoes will follow round in the direction of rotation of the drum. Due to the "floating" attachment of the shoes, the primary shoe (9) is pressed downwards and the secondary shoe (12) upwards until its upper end encounters the centring block (see Fig. 13). The end of the secondary shoe is then displaced by the block so that the shoe is centred in relation to the drum. Since the pivoting centre of the secondary shoe is at the anchor stud (4, Fig. 10) and that of the primary shoe at the adjusting device, friction between the drum and lining will assist with applying the brake, see Fig. 13. This action is also assisted by the fact that the primary shoe tends to follow round in the direction of rotation of the drum, which assists the application of the secondary shoe.

In order to give the brake linings as long life as possible, the rear shoes of the front wheel brake units (secondary shoes) are provided with thicker and eccentrically ground linings.

Wheel brake units of this type were at first provided with longer linings than those shown in Figs. 10 and 11.

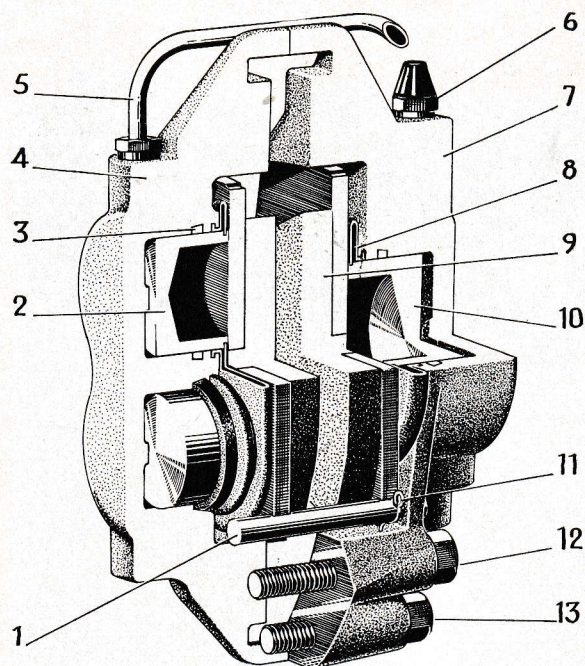


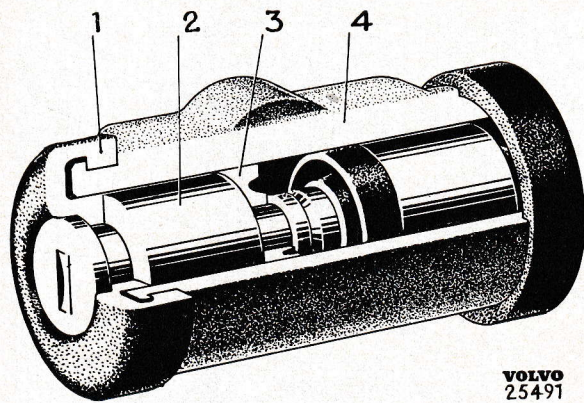
Fig. 14. Front wheel brake unit.

- |                    |                    |
|--------------------|--------------------|
| 1. Guide pin       | 8. Dust cover      |
| 2. Outer plunger   | 9. Pad assembly    |
| 3. Plunger packing | 10. Inner plunger  |
| 4. Outer housing   | 11. Locking spring |
| 5. Bridge pipe     | 12. Bolt           |
| 6. Brake line      | 13. Bolt           |
| 7. Inner housing   |                    |

## Wheel brake units on vehicles fitted with disc brakes at front

In this arrangement the front wheel brakes are of the disc type. The discs (11, Fig. 3) are made of steel and are attached to the hubs with which they rotate. At each steering knuckle there is a retainer for the wheel unit cylinders and brake pad assemblies, in future called the front wheel brake unit (1). In addition, protecting plates for the brake discs are attached to the steering knuckles. The brake pad assemblies (9, Fig. 14) are provided with moulded-in linings. During braking, one of the linings is pressed against the inner face of the brake disc by a large hydraulic plunger (10) and the other against the outer face of the disc by two smaller plungers (2). When braking ceases, the linings move back such an amount that they are always at a certain minimum distance from the brake disc, so that the front wheel brake units are self-adjusting.

The rear wheel brake units are of the drum type. The upper ends of the brake shoes (8, Fig. 3) rest against a double-acting wheel unit cylinder, and the lower ends against an adjusting device (10).



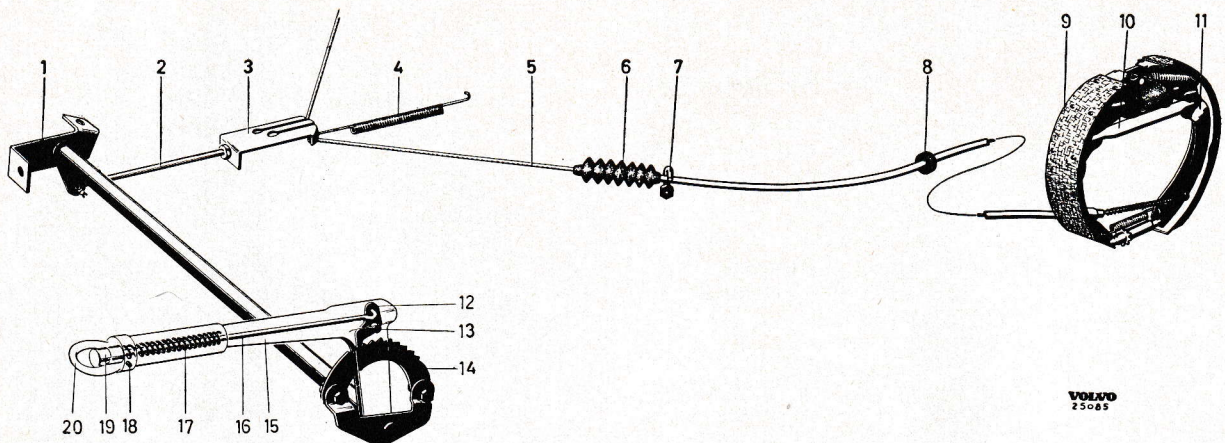
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Fig. 15. Rear wheel brake unit cylinder on vehicles fitted with disc brakes at front.

- |                |                    |
|----------------|--------------------|
| 1. Rubber seal | 3. Plunger packing |
| 2. Plunger     | 4. Housing         |

## Handbrake

The handbrake lever is floor-mounted on the outside of the driving seat. The movement of the lever is transmitted by means of a shaft, lever and pull rod to the clevis (3, Fig. 16). From there the movement is transmitted by means of cables (5) to the rear wheel brake unit levers (11). The upper end of this lever is attached to the rear brake shoe. When the lever is pulled forwards, the shoes are forced outwards by means of the links (10), causing the handbrake to be applied.



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Fig. 16. Handbrake system.

- |                                |                     |
|--------------------------------|---------------------|
| 1. Bearing support             | 11. Lever           |
| 2. Pull rod                    | 12. Pawl            |
| 3. Clevis, early production    | 13. Pin             |
| 4. Spring                      | 14. Ratchet segment |
| 5. Handbrake cable             | 15. Handbrake lever |
| 6. Bellows                     | 16. Push rod        |
| 7. Attachment for outer casing | 17. Spring          |
| 8. Bushing                     | 18. Screw           |
| 9. Brake shoe                  | 19. Button          |
| 10. Link                       | 20. Loop            |

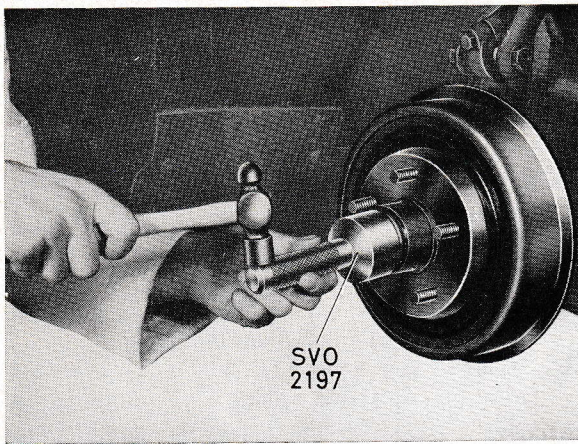
# REPAIR INSTRUCTIONS

## FOOT BRAKE

Wheel brake units, drum type,  
early production

Dismantling the front wheel  
brake unit

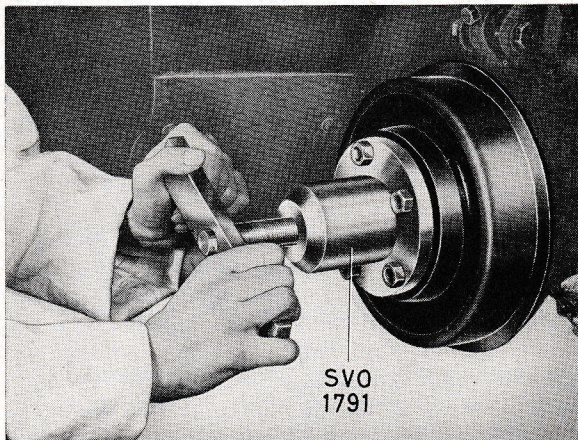
1. Remove the hub cap and slacken the wheel nuts slightly. Lift up the vehicle and block up under the lower control arm. Remove the wheel.



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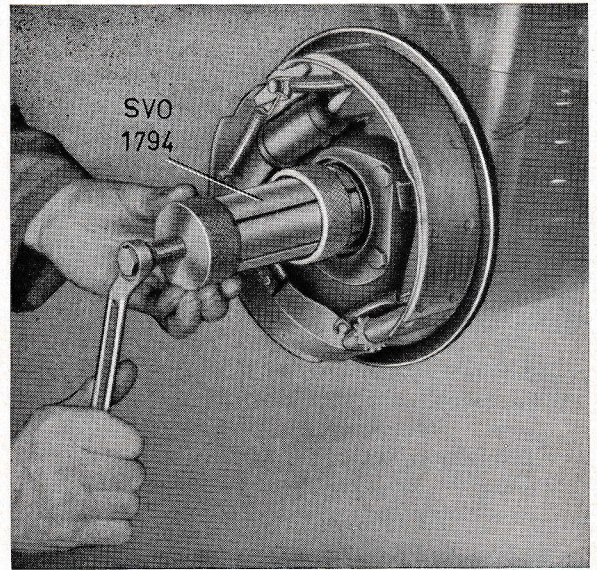
Fig. 17. Removing the grease cap.

2. Remove the grease cap with tool SVO 2197 (Fig. 17). Remove the split pin and castle nut. Pull off the hub with tool SVO 1791 (Fig. 18). If the inner bearing does not come out, pull it off the spindle with tool SVO 1794 (Fig. 19).



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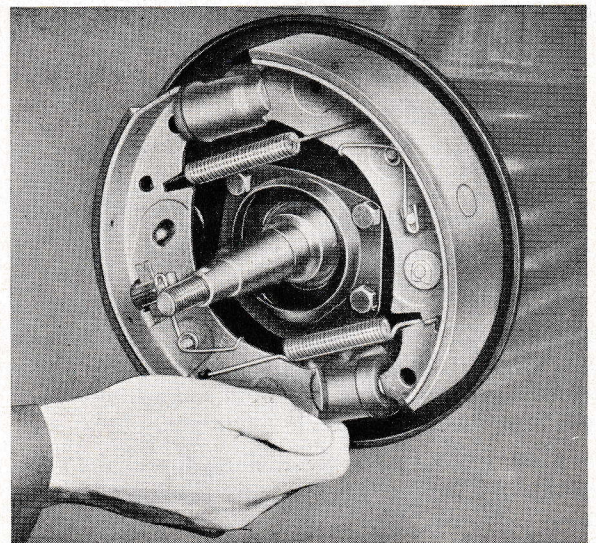
Fig. 18. Removing the hub.



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Fig. 19. Removing the inner bearing.

3. Remove the locking washer and other washers from the stud for the adjusting cam on the front brake shoe. Remove the shoe and springs as shown in Fig. 20. Remove the rear shoe in the same way.



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Fig. 20. Removing the brake shoe.

## Dismantling the rear wheel brake unit

1. Remove the hub cap and slacken the wheel nuts slightly. Lift up the vehicle and block up under the rear axle. Remove the wheel.
2. Release the handbrake. Remove the split pin and castle nut. Pull off the hub with tool SVO 1791 (Fig. 18).
3. Place clamp SVO 4074 on the wheel unit cylinder so that the plungers cannot be pressed outwards. Remove the lower spring with the help of pliers SVO 1221 (Fig. 21). Remove the locking washer and other washers from the front shoe. Then turn the shoe outwards so that the handbrake link can be removed. Lift off the front brake shoe and return spring. Disconnect the handbrake cable and remove the rear shoe.

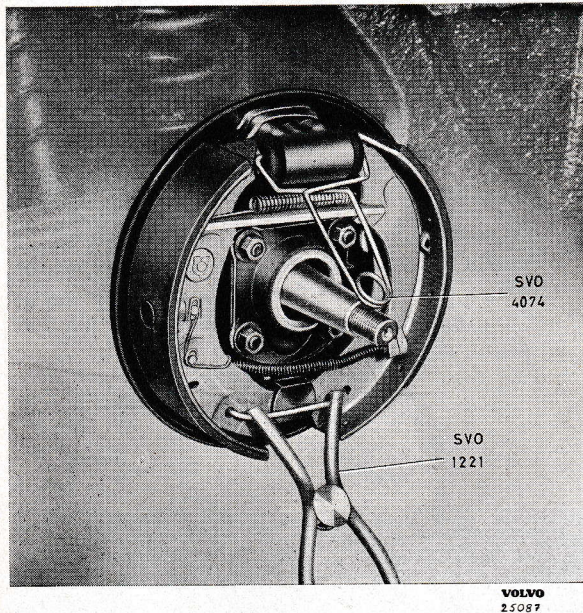


Fig. 21. Removing the lower spring.

## Replacing the brake linings

The old linings are removed in a band-type grinding machine. They can also be chiseled off, after which the brake shoe should be cleaned with emery cloth. In both cases, take care not to damage the shoe.

After having been cleaned up, the brake shoe should be washed in clean petrol or similar and then allowed to dry. If the linings are to be bonded on, the contact surface on the shoe must not be touched or made dirty after cleaning.

The dimensions of the new linings are given in the "Specifications". When fitting, make sure that the linings do not lie diagonally on the shoe and that the holes come opposite the contact plugs. The rear lining of the rear wheel brake unit is fitted on the upper part of the shoe.

When bonding, use only adhesive specially manufactured to withstand the high temperatures which arise during prolonged braking. The procedure for bonding varies with the different makes of adhesive and oven, so that a generally applicable description cannot be given. Follow the manufacturer's recommendations.

When riveting, begin at the centre of the lining. Use a rivet press and rivet punches corresponding to the size of the rivets. Check that the lining beds down properly along its whole length.

## Self-adjusting device

### Dismantling

1. Press in the contact plug (4, Fig. 8) and check that the key (11) is in its lower position.
2. Disconnect the spring (10) for the key and the spring (2) for the contact plug.
3. Remove the lever (7), key (11), contact plug (4), damping spring (5) and guide lip (8).

### Assembling

1. Fit the guide lip (8, Fig. 8). Replace the contact plug and fit the new one in position in the brake shoe. Place the key (11) in position with the smooth side towards the guide lip.
2. Press in the contact plug so that the hole in it comes opposite the hole in the brake shoe, and fit the lever (7) and spring (2) for the contact plug.
3. Hook on the spring (10) for the key and fit the damping spring.

### Testing

Testing is carried out as follows. While the contact plug is held pressed in, the key is moved to its outer end position, see Fig. 22, after which the pressure is taken off and the key released. When the contact plug is pressed in again, the spring should be able to pull the key inwards, see Fig. 23. While retaining pressure, the key is moved back to its outer position and the brake shoe is now ready for adjustment of the contact plug.

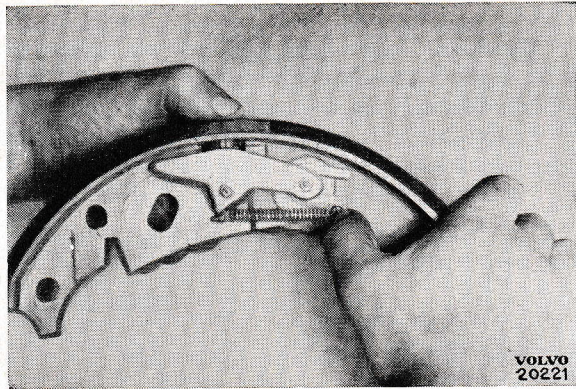


Fig. 22. Testing the self-adjusting device.

### Adjusting the contact plug

The contact plug is adjusted with the help of a file and an adjusting jig (part number 210030).

With the contact plug in the outer position, the brake shoe is secured in a vice. The lip of the lever (2, Fig. 24) should rest against one of the jaws in order to prevent the plug from being pressed in when adjusting, thus making the adjustment incorrect.

Place the adjusting jig (1) over the contact plug and file this off flush with the jig (see Fig. 24). The plug will then come 0.1 mm (0.039") above the surface of the brake lining.

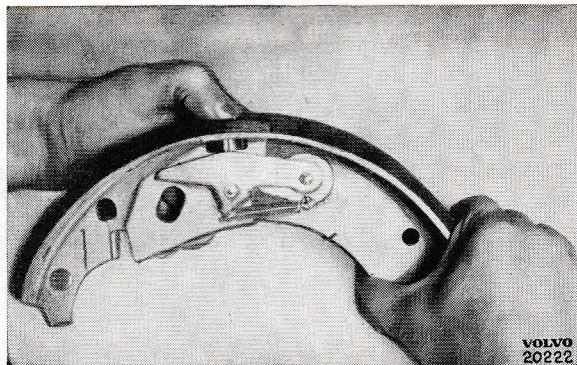


Fig. 23. Testing the self-adjusting device.

### Replacing stud for adjusting cam

The stud (5, Fig. 25) for the adjusting cam (4) which is fitted in the brake backing plate can be replaced by pressing out the old stud and staving in a new stud with the special staving tool SVO 2119.

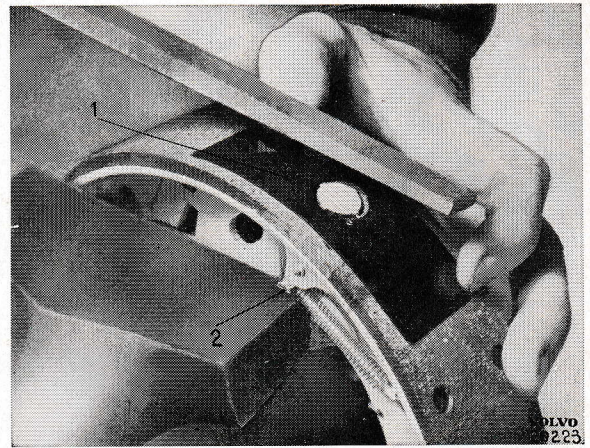


Fig. 24. Adjusting the contact plug.  
1. Adjusting jig 2. Lip

NOTE. On later type front shoes, the cam and stud are made in one piece, so that a larger cushioning sleeve which goes over the cam should be used.

The stud is replaced as follows:

1. Remove the brake backing plate. Place the cushioning sleeve belonging to the staving tool in a press as shown in Fig. 25 and press out the stud (5) with the help of a drift.
2. Turn the cushioning sleeve and place a new stud above it. Fit the adjusting cam (4), brake backing plate (1), spacing washer (3) and the internally toothed washer (2) over the stud. Press down the washers with the help of the staving tool, see Fig. 26.

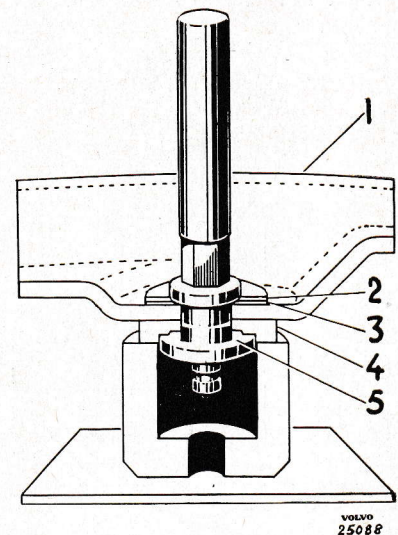


Fig. 25. Removing the stud.

1. Brake backing plate
2. Internally toothed washer
3. Spacing washer
4. Adjusting cam
5. Stud

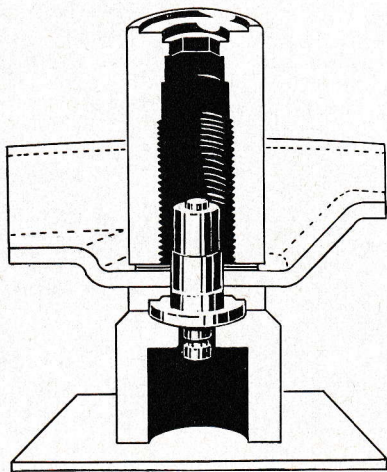


Fig. 26. Fitting the washers.

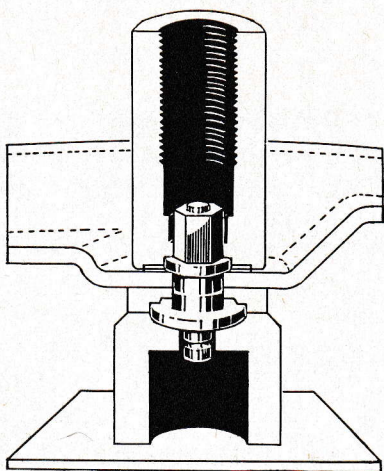


Fig. 27. Pressing together.

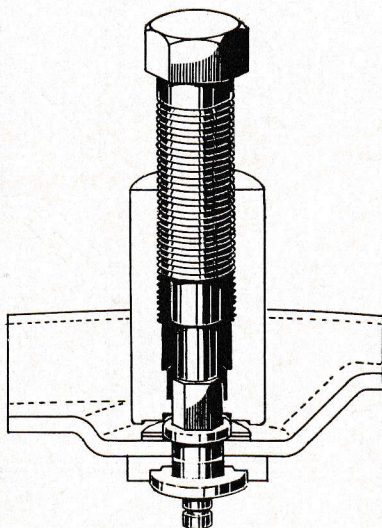


Fig. 28. Removing the tool.

3. Turn the tool round and centre it on the stud. Ensure that it is aligned with the stud. Press down the tool, see Fig. 27. Discontinue pressing at a maximum of 8 tons pressure. Turn the tool and check that the stud does not move too easily. If so, further pressure should be applied.
4. Screw in the bolt and pull the tool off the stud, see Fig. 28.

### Brake drum

The friction surface and radial throw of the brake drum should be checked. The radial throw must not exceed 0.15 mm (0.006"). If the friction surface is concave, scratched or cracked, the brake drum should be replaced. Rust spots and minor scratches can be polished or ground off in a machine.

### Assembling the front wheel brake unit

1. Check that the key in the self-adjusting device is in its outer position and that the eccentrics on the brake backing plate are turned to their lowest position. The self-adjusting devices must not be lubricated since this results in dust and dirt adhering to the parts, impairing the function of the device.
2. Place the rear shoe in position. Fit the flat washer, spring washer, flat washer and locking washer on the adjusting cam stud. Squeeze up the locking washer slightly after fitting.
3. Hook on the return springs to both shoes and fit the front shoe, see Fig. 20. Fit the locking arrangement as described above.
4. Check that the return springs and locking washers are properly in place and that the linings are free from burr, grease and dirt.
5. If the inner front wheel bearing has been removed, fit it in place in the hub. If necessary, pack it with wheel bearing grease. Press in the sealing ring with the help of drift SVO 1798 and standard handle SVO 1801.
6. Fit the hub and brake drum on the steering knuckle. Place on the outer bearing, washer and castle nut. Adjust the bearings by first tightening the nut to a torque of 7 kgm (50 lb.ft.). Then slacken the nut a third of a turn and lock it. Fill the grease cap with grease and fit it with drift SVO 2197.

7. Fit the wheel. Adjust the brake, see under "Adjusting the front wheel brake unit". Lower the vehicle. Tighten the wheel nuts to a torque of 10—14 kgm (70—100 lb.ft.). Fit on the hub cap.

### Assembling the rear wheel brake unit

1. Proceed in accordance with operations 1 and 2 under "Assembling the front wheel brake unit".
2. Hook the return spring onto the shoes, place the front shoe in position in the wheel unit cylinder, turn the shoe outwards, fit the handbrake link and place the shoe in position. Fit the locking arrangement.
3. Fit the lower spring with the help of pliers SVO 1221. Hook on the handbrake cable. Remove the clamp SVO 4074.
4. Check that the springs and locking washers are properly in position and that the linings are free from burr, grease and dirt.
5. Fit the hub, brake drum, washer and castle nut. Lock with a split pin after the nut has been tightened. Fit the wheel. Adjust the brake, see under "Adjusting the rear wheel brake unit". Lower the vehicle. Tighten the wheel nuts to a torque of 10—14 kgm (70—100 lb.ft.). Fit on the hub cap.

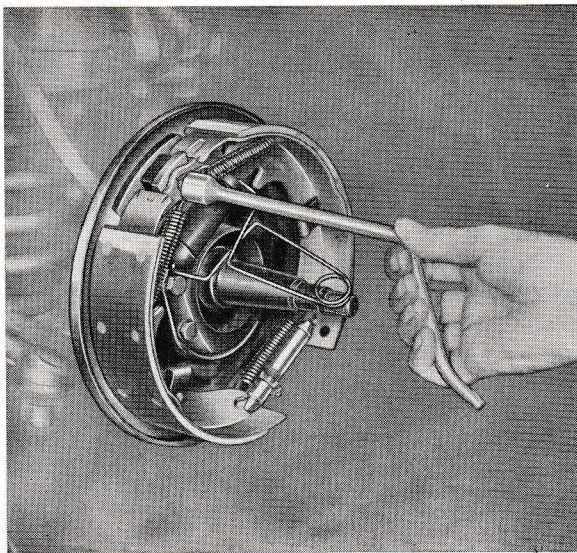


Fig. 29. Removing the return spring with brake spring tool (Snap-on BT 11 or corresponding).

### Adjusting the front wheel brake unit

Rotate the wheel backwards and turn the eccentric for the front brake shoe anti-clockwise on the right-hand wheel and clockwise on the left-hand wheel until the wheel is locked by the brake shoe. Then slacken the eccentric just sufficiently so that the wheel can rotate freely. Adjust the rear brake shoe in the same way.

### Adjusting the rear wheel brake unit

Check that the handbrake is released. Rotate the wheel backwards and turn the eccentric for the front brake shoe anti-clockwise on the right-hand wheel and clockwise on the left-hand wheel until the wheel is locked by the brake shoe. Then slacken the eccentric just sufficiently so that the wheel can rotate freely. Adjust the rear brake shoe by rotating the wheel forwards and applying the eccentric in the opposite direction to the front shoe.

### Wheel brake units, drum brakes, late production

#### Dismantling the front wheel brake unit

1. Remove the hub cap and slacken the wheel nuts slightly. Lift up the vehicle and block up under the lower control arm. Remove the wheel.
2. Remove the grease cap with tool SVO 2197 (Fig. 17). Remove the split pin and castle nut. Pull off the hub with tool SVO 1791 (Fig. 18). If the inner bearing does not come out with it, pull this off the spindle with tool SVO 1794 (Fig. 19).
3. Fit on the clamp SVO 4074 as shown in Fig. 30 so that the plungers in the wheel unit cylinder cannot be pressed outwards. The procedure for removing the shoes depends on which tool is used.

The two return springs are first disconnected with a brake spring tool as shown in Fig. 29, after which the locking clamps are removed and the shoes lifted off together with the adjusting device.

The locking spring is disconnected with the help of the brake spring pliers as shown in Fig. 30. Pull apart the shoes and remove the adjusting device. Hold against the guide pin on the rear side of the brake backing plate and remove the locking clamp. Turn the shoe outwards until the

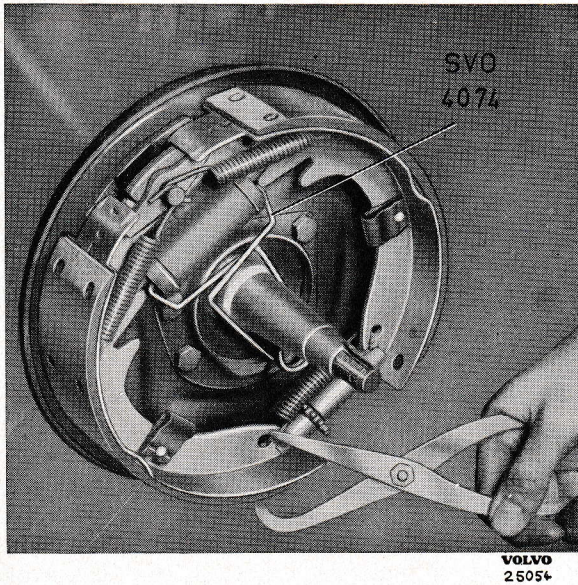


Fig. 30. Removing the locking spring.

push rod of the wheel unit cylinder is released, see Fig. 31. Then turn the shoe inwards until the return spring can be disconnected and the shoe lifted off. Remove the other shoe in the same way.

### Dismantling the rear wheel brake unit

1. Apply the handbrake. Remove the hub cap. Remove the split pin and slacken the castle nut and wheel nuts slightly. Lift up the vehicle and block up under the rear axle. Remove the wheel.
2. Release the handbrake. Remove the castle nut. Pull off the hub with tool SVO 1791 (Fig. 18).

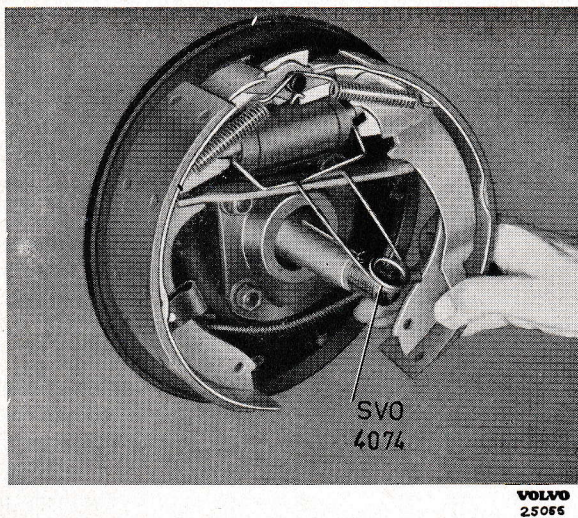


Fig. 31. Removing the brake shoe.

3. Place the clamp SVO 4074 over the wheel unit cylinder so that the plungers cannot be pressed outwards. Disconnect the handbrake cable from the lever. The procedure when removing the shoes depends on which tool is used. With a brake spring tool as shown in Fig. 29, the two return springs are first disconnected, after which the locking clamps are removed and the shoes lifted off together with the adjusting device.

With the help of brake spring pliers, the locking spring is disconnected as shown in Fig. 30. Pull apart the shoes and remove the locking clamp for the rear shoe. Turn the shoe outwards until the push rod from the wheel unit cylinder together with the handbrake link are released, see Fig. 31. Then turn the shoe inwards until the return spring can be disconnected and the shoe lifted off. Remove the other shoe in the same way.

### Replacing the brake linings

The vehicle can be equipped with different types of brake lining. The linings can be riveted or bonded onto the shoes, the primary shoes can have long or short linings and the linings can be of two different qualities. These can be differentiated since the earlier type is marked brown and green and stamped H 3142. *In order to avoid uneven braking effect, both wheels on the same shaft must have the same type of brake lining.*

The brake linings are replaced as follows.

#### Riveted brake linings

Remove the old linings by pressing out the rivets in a rivet press. Then wash the shoes clean and dry them.

Fit ready-made original linings. *When doing this, note that the thicker and eccentrically ground linings which are marked on the wearing side as shown in Fig. 32, should be fitted on the rear brake shoes (secondary shoes) of the front wheels. The thicker part (marked) should face upwards. On types with shorter primary linings, these are fitted as shown in Figs. 10 and 11 respectively.*

Use rivet sizes in accordance with those given in the specifications. Begin riveting at the middle of the lining and make sure that the lining beds down properly on the shoe along its whole length. Use a rivet press and rivet drifts corresponding to the rivet sizes.

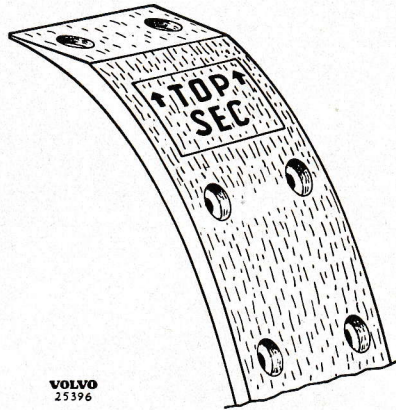


Fig. 32. Rear brake lining of front wheel.

### Bonded brake linings

The old linings should preferably be removed in a band-type grinding machine.

They can also be chiseled off, after which the brake shoe should be cleaned up with emery cloth. In both cases care should be taken to ensure that the shoe is not damaged. After cleaning up, the shoe should be washed in clean petrol or similar and then allowed to dry. After this, the contact surface for the lining must not be touched or made dirty.

For bonding purposes use only adhesives which are specially made to withstand the high temperatures arising during prolonged braking. Volvo original brake linings are ready-prepared with suitable quantities of such adhesive. The procedure when bonding varies with different makes of oven so that a generally applicable description cannot be given. Follow the manufacturer's instructions carefully.

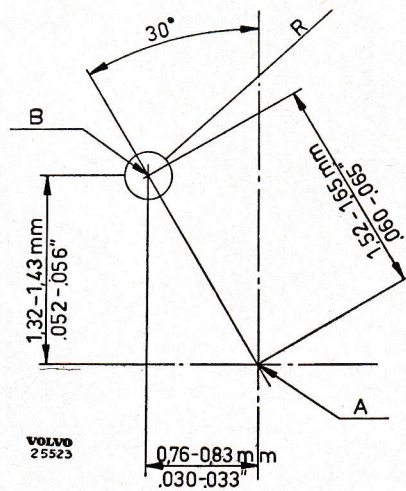


Fig. 33. Eccentricity for brake lining 661279.

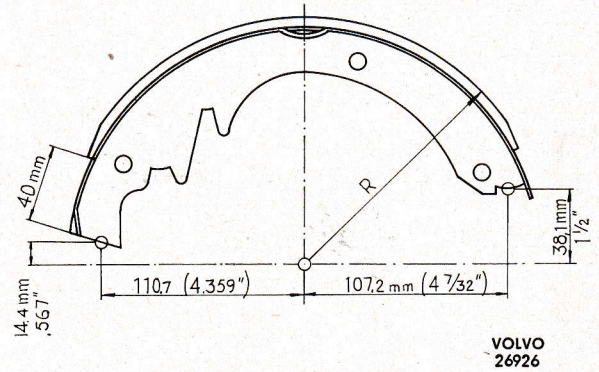


Fig. 34. Adjusting measurements for brake shoe, front wheel.

When fitting, make sure that the lining does not come diagonally on the shoe and that it is placed as shown in Figs. 34 and 35 respectively.  $\frac{1}{4}$ " linings (part number 661279) should be fitted on the rear brake shoes (secondary shoes) of the front wheels and  $\frac{3}{16}$ " linings on the others.

After bonding, the linings should be ground to the correct measurements. Since the rear brake linings of the front wheels must be ground eccentrically, this requires a grinding machine which can be specially adjusted for this type of lining. There are different types of these machines, so that the grinding procedure varies accordingly. Fig. 33, shows how much the pivoting centre should be displaced in relation to the brake shoe centre when grinding the eccentric lining (part number 661279). For other linings, the pivoting centre coincides with the brake shoe centre. The grinding radius (R) = half the diameter of the brake drum less 0.1—0.2 mm (0.004—0.008"). Machines which are graduated for the drum diameter should thus be set to a value which is 0.2—0.4 mm (0.008—0.016") less than the diameter of the brake drum. Before the linings are ground they should be chamfered.

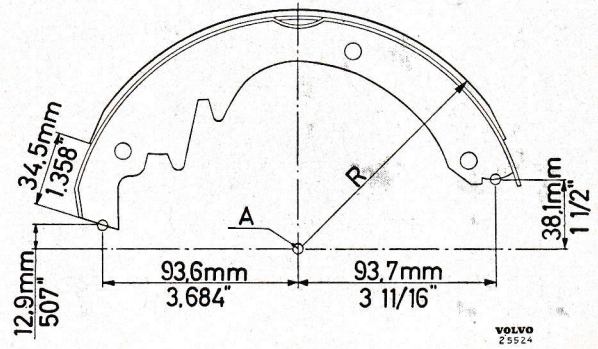


Fig. 35. Adjusting measurements for brake shoe, rear wheel.

## Brake drum

The friction surface and radial throw of the brake drums should be checked. The radial throw must not exceed 0.15 mm (0.006"). If the friction surface is concave, scored or cracked, the brake drum must be replaced. Rust spots and minor scratches can, however, be polished or ground off in a machine.

## Assembling the front wheel brake unit

1. Check, and if necessary, face the surface of the lips on the brake backing plate against which the shoes and centring block slide. Clean up the sliding surfaces on the shoes and centring block. Coat the surfaces with a very thin layer of heat-resistant grease. Place the centring block (3, Fig. 10) in position with the rounded side forwards *when the stamped-in arrow should point in the direction of rotation of the brake drum*. Place on the guide washer (5).
2. Hold the front shoe in place so that the return spring can be hooked on. Turn the shoe outwards so that the wheel unit cylinder push rod can be placed in position, see Fig. 36. Fit the guide pin (8) and clip (7).  
Fit the rear shoe in the same way. Remove the clamp SVO 4074. Fit the ad-

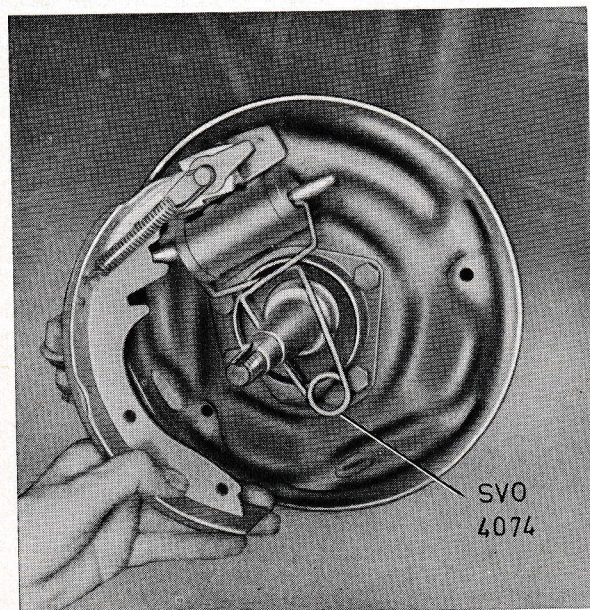


Fig. 36. Fitting brake shoe.

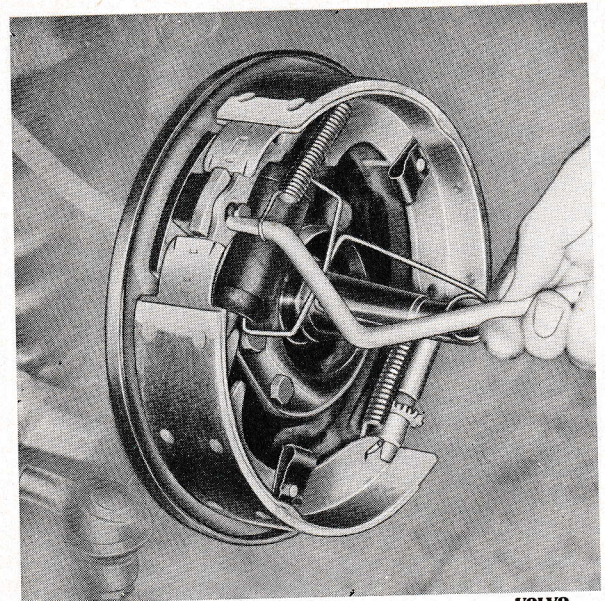


Fig. 37. Hooking on return spring.

justing device and its locking spring. If a brake spring tool as shown in Fig. 37 is available, it is possible to begin instead by fitting the adjusting device and locking spring, after which the shoes are placed in position. The locking clips are then fitted and the return springs hooked on with the pointed end of the tool, see Fig. 37.

3. Check that the springs and locking clamps are located properly, that the linings are free from burr, grease and dirt and that the thicker part of the lining on the rear shoe is turned upwards.
4. If the inner front wheel bearing has been removed it should be placed in position in the hub. If necessary, pack with wheel bearing grease. Press in the sealing ring with the help of drift SVO 1798 and standard handle SVO 1801.
5. Fit the hub with cleaned brake drum on the spindle. Place on the outer bearing, washer and castle nut. Adjust the bearings by first tightening the nut to a torque of 7 kgm (50 lb. ft.). Then slacken the nut a third of a turn and lock it. Fill the grease cap with grease and fit it with drift SVO 2197.
6. Fit the wheel. Adjust the brakes, see under "Adjusting the wheel brake unit". Lower the vehicle. Tighten the wheel nuts to a torque of 10–14 kgm (70–100 lb. ft.). Fit on the hub cap.

## Assembling the rear wheel brake unit

1. Proceed in accordance with operations 1 and 2 under "Assembling the front wheel brake unit". Place the handbrake link with spring in position in the front shoe before fitting the rear shoe. Connect on the handbrake cable.
2. Check that the springs and locking clips are properly located and that the linings are free from burr, grease and dirt.
3. Fit the hub with cleaned brake drum, washer and castle nut. Fit the wheel. Adjust the brakes, see under "Adjusting the wheel brake units". Lower the vehicle. Lock the castle nut with a split pin after the nut has been tightened properly. Tighten the wheel nuts to a torque of 10—14 kgm (70—100 lb. ft.). Fit on the hub cap.

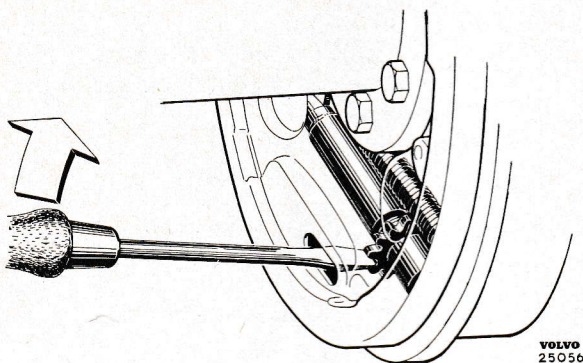


Fig. 38. Adjusting the wheel brake unit.

## Adjusting the wheel brake units

The brakes should be checked and if necessary adjusted every 5,000 km (3,000 miles).

If it is suspected that the linings are worn out, remove the brake drum for checking this. The adjusting device permits adjustment to be carried out even when the linings are worn down to the rivets. Such wear can cause the rivets to damage the drums. Regular examination of the linings should be carried out every 20,000 km (12,500 miles), and more frequently in the case of hard driving.

Adjusting is carried out as follows.

1. Lift up the vehicle and block up under the control arms or rear axle. Release the hand brake.
2. Remove the rubber seal, insert a screwdriver into the recess and apply the brake shoes by moving the screwdriver upwards as shown in Fig. 38. Turn the notched wheel of the adjusting screw until the brake drum is locked.

3. Turn back the adjusting screw 8 notches. Then check that the drum can rotate freely. If not, depress the brake pedal in order to centre the shoes. If this does not help, turn the adjusting screw back a further 2 notches. Repeat the procedure until the drum can rotate freely. Fit the rubber seal.

## Front wheel brake unit, disc brakes

### Replacing the pad assemblies

The pad assemblies should be replaced when there is about 3 mm ( $1/8''$ ) left of the lining thickness. In no circumstances may the linings be worn down to under 1.5 mm ( $1/16''$ ).

1. Remove the hub cap and slacken the wheel nuts slightly.
2. Lift up the front end and block up under the lower control arms. Screw off the wheel nut and lift down the wheel.
3. Remove the hairpin-shaped locking clips and guide pins for the pads. Pull out the pads as shown in Fig. 39.
4. Press in the plungers of the wheel unit cylinders carefully and fit the new pads. When doing this, note that the brake fluid level in the master cylinder rises and may run over. Re-fit the guide pins and locking clips.
5. Operate the brake pedal repeatedly and check that the movement feels normal. It is not generally necessary to carry out air-venting after replacing the pads.
6. Lift on the wheel after having cleaned the contact surfaces between the wheel and hub free from grit and dirt, and then

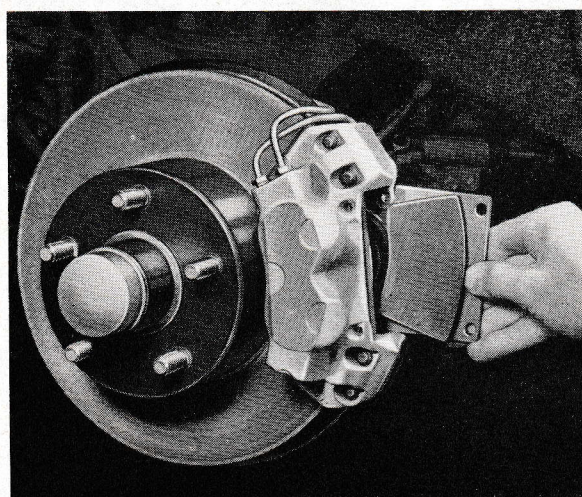


Fig. 39. Removing the pads.

screw up the nuts so that the wheel cannot be disturbed on the hub. Lower the vehicle and tighten the wheel nuts. Tighten every other nut a little at a time until all of them are tightened to a torque of 10—14 kgm (70—100 lb. ft.). Fit the hub cap.

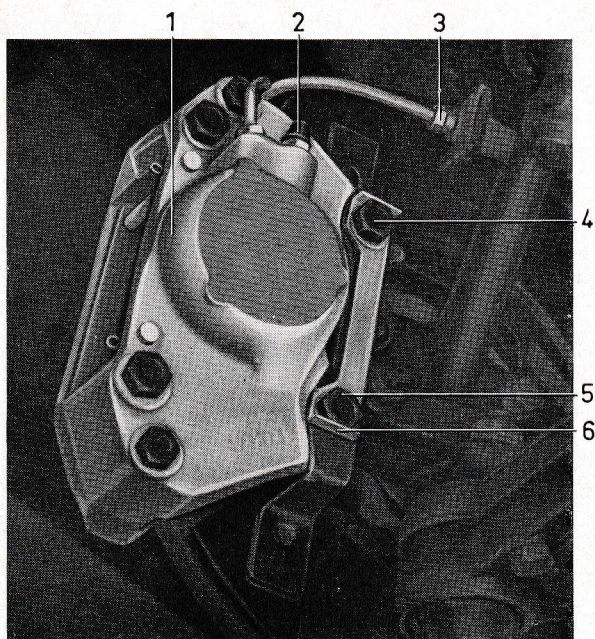
## Reconditioning the wheel unit cylinders

### Removing

1. Remove the wheel, see operations 1—2 under "Replacing the pad assemblies".
2. Clean the front wheel brake unit externally.
3. Unscrew the brake line (3, Fig. 40) and plug the connection. Brake fluid must not be allowed to get onto the brake disc or pads. Bend up the locking washer (6) and screw out the attaching bolts (4 and 5). Lift off the brake unit complete, see Fig. 41.

### Dismantling

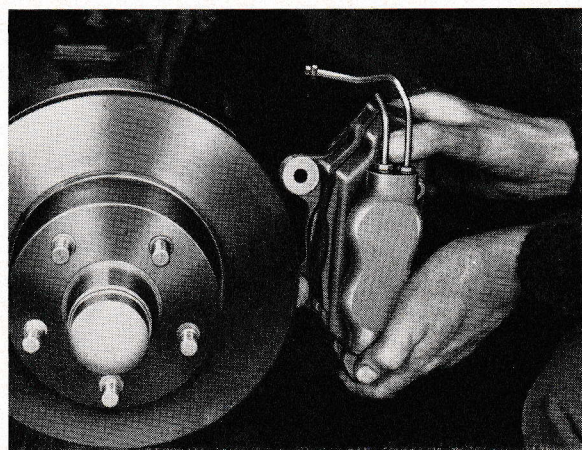
1. Remove the hairpin-shaped locking clips, (11, Fig. 14) and guide pins (1). Pull out the pads (9).



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Fig. 40. Front wheel brake unit.

- |                       |                   |
|-----------------------|-------------------|
| 1. Housing            | 4. Attaching bolt |
| 2. Air-venting nipple | 5. Attaching bolt |
| 3. Brake line         | 6. Locking washer |



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Fig. 41. Removing the front wheel brake unit.

2. Remove the plungers and pull off the rubber dust covers (8).
3. Take out the packings (3) from the cylinders with the help of a blunt tool. Be careful to avoid damaging the edges of the grooves.

### Inspecting

Before inspecting, all parts should be washed in methylated spirits. The plungers and cylinders should be inspected carefully. There must be no scoring, scratches or rust spots on the polished surface. Damaged plungers must be replaced. Minor damage in the cylinders can generally be put right by honing. When doing this, the two halves of the brake are taken apart. The procedure varies with different types of machine, so that no general description can be given. Follow the manufacturer's instructions carefully. Clean the cylinders thoroughly after honing and check that the channels are clear.

### Assembling

1. Coat the working surfaces of the plungers and cylinders with brake fluid.
2. Fit new packings (3, Fig. 14) into the cylinders. Place the rubber dust covers (8) in position and make sure that they enter the cylinder grooves.
3. Fit the plunger with the closed end first. Press the plungers right in and make sure that the rubber dust covers enter the plunger grooves.

- Place the pads (9) in position. If the two halves of the brake unit have been taken apart, fit these together. Tighten the inner, larger attaching bolts (12) to a torque of 6.2—7 kgm (45—50 lb. ft.) and the outer, smaller bolts (13) to a torque of 3.5—5.2 kgm (25—30 lb. ft.). Fit the guide pins and locking clips.

### Fitting

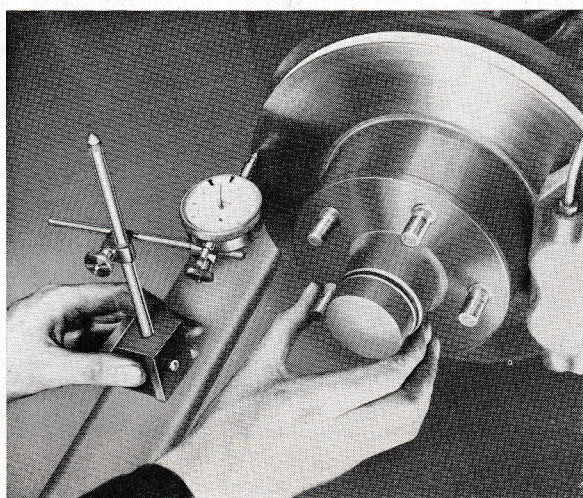
Check that the contact surfaces on the front wheel brake unit and retainer are clean and undamaged since it is vital that the brake unit is located correctly in relation to the brake disc. Fit the brake unit, see Fig. 40.

Check that the brake disc runs freely between the pads. Place on the locking washer (6) and tighten the attaching bolts (4 and 5) and lock them. Connect the brake line (3) and air-vent the wheel unit cylinders. Fit the wheel, see operation 6 under "Replacing the pad assemblies".

### Brake disc

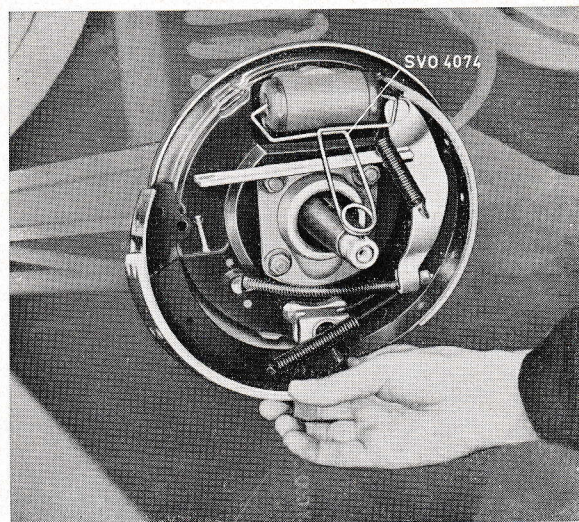
The brake disc should be examined as regards the friction surface, run-out and thickness. There must be no rust spots or scoring on the friction surface. The run-out must not exceed 0.1 mm (0.004") and should be measured as shown in Fig. 42. First check that the wheel bearings are correctly adjusted and that the disc fits securely on the hub. The thickness should not vary more than 0.03 mm (0.0012") when the disc is rotated one turn, since this can cause a vibrating brake pedal.

The brake disc can be reconditioned by fine turning or fine grinding. Machining should be done together with the hub. After machining, the thickness of the disc must not be less than



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Fig. 42. Checking run-out.



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Fig. 43. Removing the brake shoe.

12.2 mm (0.4803") and the surface texture should be max. 3  $\mu$  measured on a random diameter, and max. 5  $\mu$  measured radially. After reconditioning, the disc must not have a run-out exceeding 0.10 mm (0.004") and its thickness must not vary more than 0.03 mm (0.0012").

If the brake disc cannot be put in order in accordance with the above, or if there are cracks or similar damage, the disc together with the hub should be replaced. Concerning the procedure for this, see under "Replacing or adjusting the front wheel bearings", Part 6.

When replacing the wheel studs, the old stud is pressed out after which an oversize stud is fitted. Before the stud can be pressed through the hole in the brake disc, this must be drilled out to 16.6—16.8 mm (0.653—0.661").

### Rear wheel brake unit, on vehicles fitted with disc brakes at front

#### Dismantling

- Remove the hub cap and the split pin in the drive shaft. Slacken the castle nut and wheel nuts slightly. Lift up the vehicle and block up underneath the rear axle. Remove the wheel.
- Release the handbrake. Pull off the hub with tool SVO 1791, see Fig. 18.
- Place clamp SVO 4074 over the wheel unit cylinder so that the plungers cannot be pressed outwards. Remove the upper return spring with the help of brake pliers. Pull down the front shoe into the groove on the brake backing plate, hold

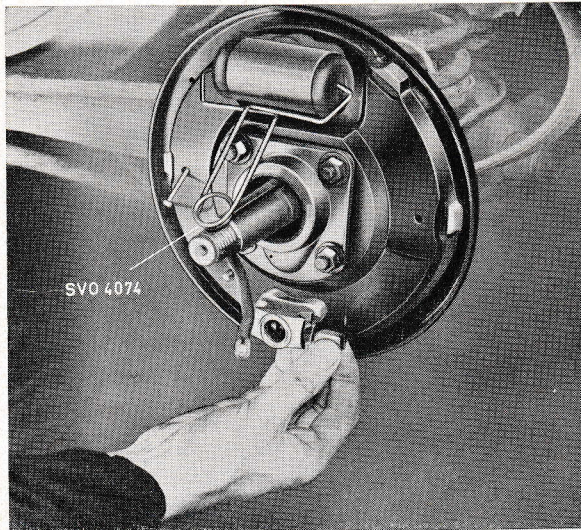


Fig. 44. Removing the adjusting plunger.

against the guide pin on the back of the plate and turn and remove the locking washer. Lift off the shoe, see Fig. 43.

4. Remove the rear shoe in a similar manner and disconnect the handbrake cable. Unhook the return springs and if necessary the handbrake link.
5. Screw in the adjusting screw slightly. Remove the adjusting plungers, see Fig. 44.

### Replacing brake linings

The brake linings should be replaced at the latest when they are worn down level with the rivet heads.

1. Press out the rivets with the special drift in a rivet press. Then wash the shoes clean and dry them.
2. Rivet on the ready-manufactured original linings. The front lining is placed at the bottom of the shoe and the rear one on top, see Fig. 45. Use rivets in accordance with the specifications and a rivet press with suitable drifts. Begin to rivet at the centre and continue outwards towards the ends. Check after riveting that the brake lining beds down properly along its whole length.
3. In order to obtain best results, the linings should be ground in a special grinding machine. When doing this, make sure that the linings have a radius 0.2—0.4 mm (0.008—0.016") smaller than that of the brake drum.

### Brake drum

The friction surface and radial throw of the brake drums should be checked. The radial throw must not exceed 0.15 mm (0.006"). If

the friction surface is concave, scored or cracked, the brake drum must be replaced. Rust spots and minor scratches, can, however, be cleaned up in a machine.

### Assembling

1. Screw back the adjusting screw and fit the cleaned adjusting plungers after having coated them lightly with heat-resistant grease. Check that the plungers move easily.
2. Fit the lever onto the rear brake shoe. Hook on the handbrake cable and return springs. Place the shoe in position and fit the guide pin and locking clip. Make sure that the head of the guide pin enters the recess in the clip.
3. Place the handbrake link in position and make sure that it is turned the right way round. Hook on the lower return spring and fit the front brake shoe with guide pin and locking clip. Hook on the upper return spring with brake pliers. Remove SVO 4074. Fit the spring clip (5, Fig. 45).
4. Check that the springs and locking washers are properly in position and that the linings are free from burr, grease and dirt.

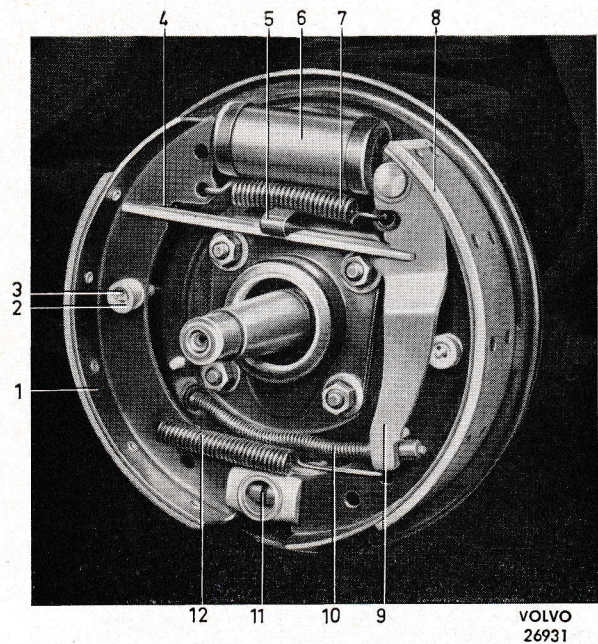


Fig. 45. Rear wheel brake unit.

- |                        |                                |
|------------------------|--------------------------------|
| 1. Front brake shoe    | 7. Upper return spring         |
| 2. Locking washer      | 8. Rear brake shoe             |
| 3. Guide pin           | 9. Lever                       |
| 4. Link                | 10. Return spring for lever    |
| 5. Spring clip         | 11. Adjusting spring for lever |
| 6. Wheel unit cylinder | 12. Lower return spring        |

5. Check that the key is fitted in the drive shaft and fit the hub with brake drum. Place on the washer and tighten the castle nut. If the wheel unit cylinder has been removed, this should be air-vented, see under "Air-venting the hydraulic system". Lift on the wheel after having cleaned the contact surfaces between the wheel and hub free from dirt and grit, and tighten the nuts sufficiently so that the wheel cannot be disturbed on the hub. Adjust the brakes, see under "Adjusting the wheel brake units". Lower the vehicle and tighten the wheel nuts. Tighten every other nut a little at a time till all are tightened to a torque of 10—14 kgm (70—100 lb.ft.). Tighten the castle nut finally and lock with a split pin. Fit the hub cap.

### Adjusting the wheel brake units

The front wheel disc brakes are so designed that the linings always stand at a certain minimum distance from the brake disc regardless of wear. The front wheel brake units are therefore self-adjusting and it is not necessary to carry out any manual adjustment of the pad assemblies.

If the brake pedal goes too far down towards the floorboard when braking, this generally means that the brake linings on the rear wheel are worn and that the brake shoes require adjusting. If it is suspected that the linings are worn out, the brake drum should be removed for checking this. The adjusting device permits further adjustment even if the linings are worn down to the rivets, and this situation can lead to the rivets damaging the drum. The linings should be inspected regularly at least every

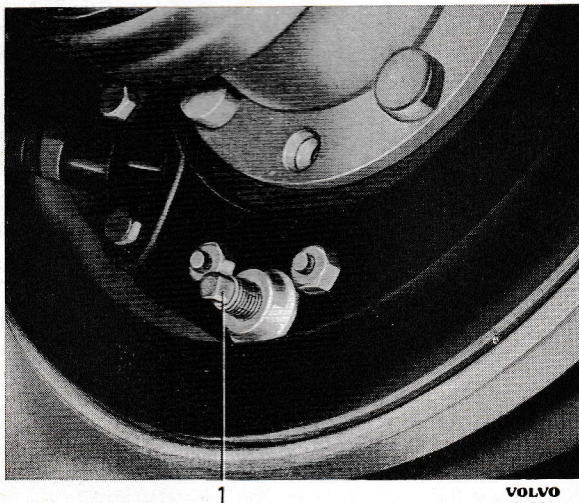
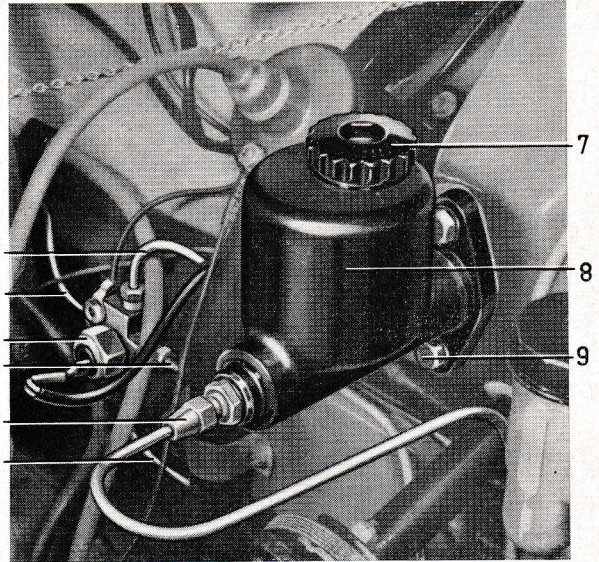


Fig. 46. Adjusting device for rear wheel brake unit.

1. Adjusting screw



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Fig. 47. Brake parts.

1. Brake line, rear wheels
2. Connection
3. Brake line, left front wheel
4. Brake contact
5. Brake line, right front wheel
6. Brake line, master cylinder
7. Filling cap
8. Master cylinder
9. Attaching bolt

20,000 km (12,500 miles), and more frequently in the case of hard driving. Adjusting is carried out as follows:

1. Lift up the rear end and block up under the rear axle. Release the handbrake.
2. Turn the adjusting screw (1, Fig. 46) clockwise until the brake drum locks. Then slacken the screw until the drum can rotate freely.
3. Adjust the other rear wheel in the same way. Lower the vehicle.

### Hydraulic system

Observe the utmost cleanliness when working on the hydraulic system. Wash the hands with soap and water before cleaning the internal parts. These should be cleaned with methylated spirits. Petrol, paraffin or spirit containing benzol must not be used.

Use only first-class brake fluid which fulfills the requirements of SAE 70 R3 (HD quality). Avoid spilling brake fluid on the paintwork as this can cause damage.

### Master cylinder, early production

#### Removing

1. Remove the split pin and stud for the brake pedal. Disconnect the return spring. Remove the rubber cover.

2. Slacken the connection for the brake line. Collect up the brake fluid which runs out. Remove the two attaching bolts for the master cylinder. Take out the master cylinder carefully. Avoid spilling brake fluid onto the paintwork since this can cause damage.

### Dismantling

1. Remove the cap and empty out the brake fluid.
2. Bend back the rubber cover (4, Fig. 2) and remove the locking ring (6), washer and push rod (5). Shake out the parts from the cylinder. Bend up the locking ring on the spring retainer (10) which is placed on the plunger (3) and separate the parts. Remember that the spring (11) is under tension.

### Inspecting

Before inspecting, all the parts of the master cylinder should be washed in methylated spirits.

The cylinder should be inspected thoroughly internally. There must be no scoring, scratches or rust spots on the polished surface.

The clearance between the plunger and cylinder must not exceed 0.15 mm (0.006") and this can be measured as shown in Fig. 48. If the clearance exceeds 0.15 mm (0.006"), test with a new plunger. If this does not help, the master cylinder must be replaced.

Examine packings and other parts for wear and damage. Damaged or worn parts must be replaced.

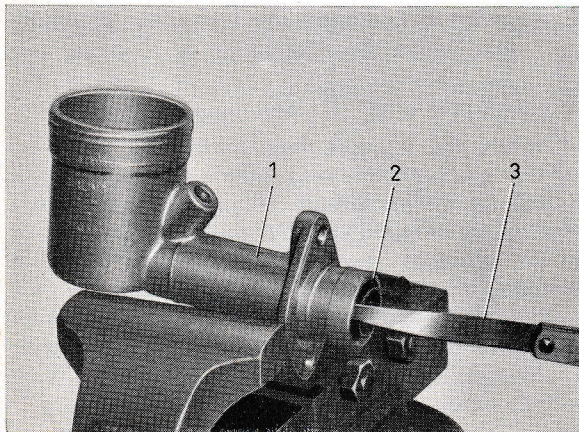


Fig. 48. Checking the clearance.

1. Master cylinder
2. Plunger
3. Feeler gauge

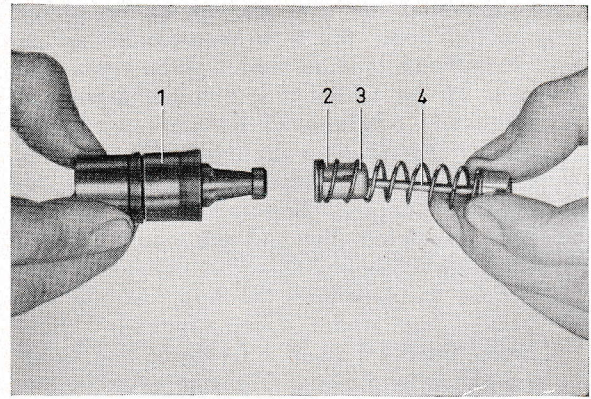


Fig. 49. Assembling the plunger.

1. Plunger
2. Locking piece
3. Spring retainer
4. Push rod

### Assembling

1. Fit the packings onto the plunger (3, Fig. 2) and valve (13).
2. Assemble the valve. Turn the convex part of the spring washer to face the packing.
3. Fit the spring and spring retainer (3, Fig. 49) onto the push rod (4) and assemble these parts to the plunger, see Fig. 49. Then press down the locking piece (2) on the spring retainer so that the parts are held in position.
4. Dip the packing and plunger in brake fluid and fit them into the cylinder. Fit the push rod, (5, Fig. 2), washer and locking ring (6).

### Fitting

Fitting is done in the reverse order to removing. Do not forget the split pin in the pedal stud. Fill up with brake fluid and air-vent the system in accordance with the instructions under "Air-venting the brake system".

## Master cylinder, late production

### Removing

See under "Master cylinder, early production".

### Dismantling

1. Unscrew the cap (2, Figs. 4 and 50) and empty out the brake fluid.
2. Bend back the rubber cover (6) and remove the locking ring (7), washer (8) and push rod (5). Shake all the parts out of the cylinder, see Fig. 50.

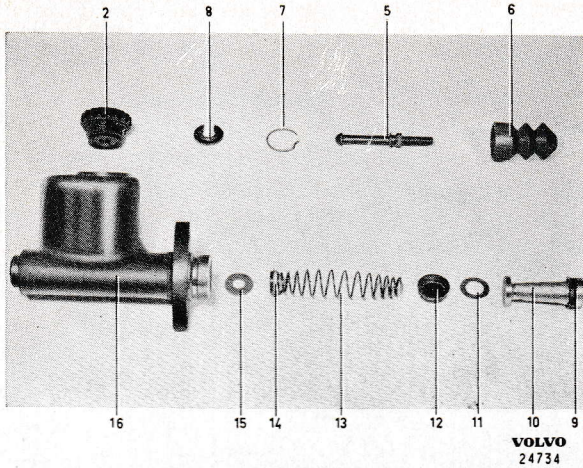


Fig. 50. Master cylinder, late production.

- |                 |                      |
|-----------------|----------------------|
| 2. Cap          | 11. Washer           |
| 5. Push rod     | 12. Packing          |
| 6. Rubber cover | 13. Spring           |
| 7. Locking ring | 14. Valve            |
| 8. Stop washer  | 15. Washer           |
| 9. Packing      | 16. Cylinder housing |
| 10. Plunger     |                      |

### Inspecting

Before inspecting, all the master cylinder parts should be washed in methylated spirits. The cylinder must be examined thoroughly internally. There must be no scoring, scratches or rust spots on the polished surface. Such damage can as a rule be eliminated by honing the cylinder. The procedure for this varies with

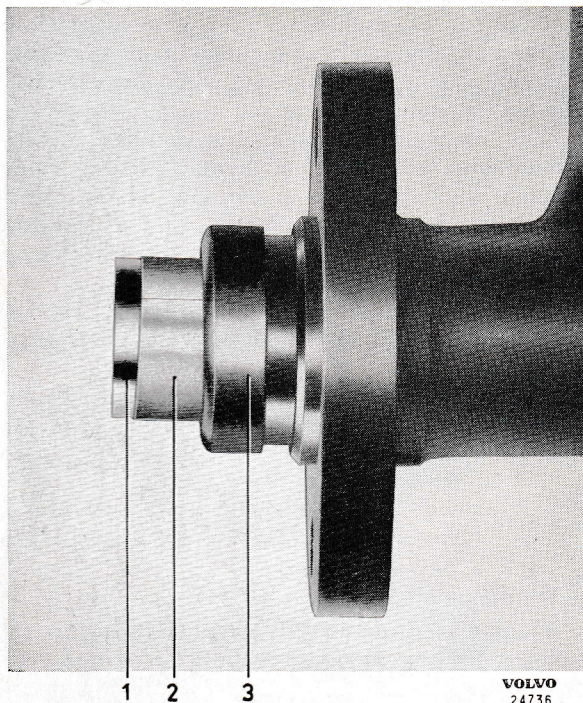


Fig. 51. Fitting the plunger.

1. Plunger    2. Brass foil    3. Master cylinder

different machines so that no general description can be given. Therefore follow the manufacturer's instructions. Clean the cylinder thoroughly after honing and check that the holes are clear.

The clearance between the plunger and cylinder must not exceed 0.20 mm (0.008") which can be measured with a feeler gauge as shown in Fig. 48. If the clearance exceeds 0.20 mm (0.008"), test with a new plunger. If this does not help, the master cylinder must be replaced.

Examine the packings, valves and other parts for wear and damage. Damaged or worn parts must be replaced.

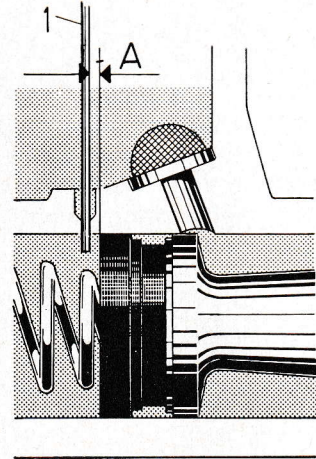


Fig. 52. Checking the equalizing hole.

1. 0.5 mm (25 gauge) wire    A = approx. 0.5 mm (0.02")

### Assembling

1. Fit the washer (15, Fig. 50), in the bottom of the cylinder.
2. Place the packing (12) on the spring guide. Dip the packing in brake fluid and fit it together with the spring and valve. Place the washer (11) into the cylinder.
3. Pull the packing (9) onto the plunger and turn it as shown in the figure. Dip the plunger in brake fluid and fit it. Take care to see that the packing (9) is not damaged. It is best to use a piece of brass foil formed into a ring to act as a guide for the packing, see Fig. 51. Compress the spring and fit the push rod (5), washer (8) and locking ring (7).  
Check that the equalizing hole is clear by inserting a piece of 0.5 mm (25 gauge) wire through the hole, see Fig. 52. It should then be possible to press the plunger in approx. 0.5 mm (0.02") before the wire is gripped. Take care not to damage the packing. Also check that there is clearance for the push rod (5).
5. Fit the rubber cover (6).

## Fitting

Fitting is done in the reverse order to removing. Do not forget the split pin in the pedal stud. Fill up with brake fluid and air-vent in accordance with the instructions under "Air-venting the brake system".

## Wheel unit cylinder

Concerning the wheel unit cylinders of the disc brakes, see under "Front wheel brake unit, disc brakes".

### Removing, drum brakes, late production

1. Remove the hub, see under "Dismantling the wheel brake unit".
2. Place clamp SVO 4047 over the wheel unit cylinder. Move the brake shoes to one side with the help of a screwdriver in order to release the push rods from the shoes, see Fig. 53.
3. Disconnect the brake lines and unscrew the wheel unit cylinder attaching bolts. Lift off the wheel unit cylinder but make sure that no brake fluid gets onto the linings.

### Removing, remainder

1. Remove the hub and brake shoes, see under "Dismantling the wheel brake unit".
2. Disconnect the brake line and unscrew the wheel unit cylinder attaching bolts. Lift off the wheel unit cylinder.

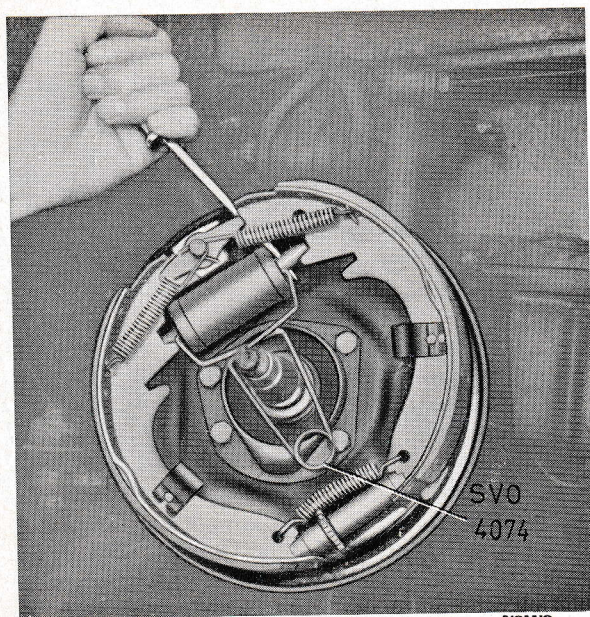


Fig. 53. Removing the wheel unit cylinder.

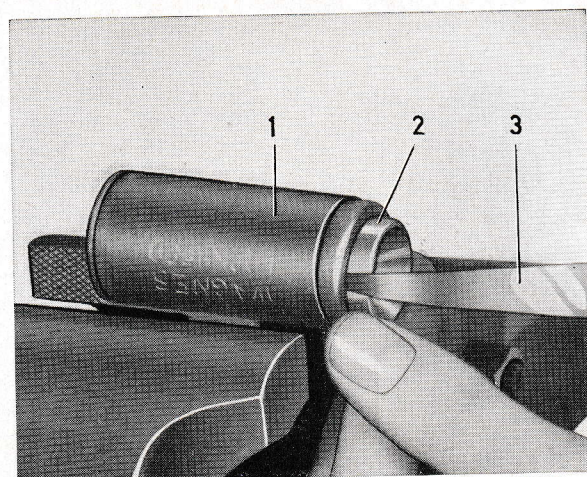


Fig. 54. Checking the clearance.

1. Wheel unit cylinder 2. Plunger 3. Feeler gauge

## Reconditioning

Remove the clip, pull off the rubber seals and take out plungers, packings and springs. Wash all parts in clean spirit.

The cylinder must be examined thoroughly internally. There must be no scoring, scratches, or rust spots on the polished surface. Such damage can as a rule be eliminated by honing the cylinder. Since the procedure for this varies with different machines, follow the instructions of the manufacturer concerned. Clean the cylinder thoroughly after honing, when the air-venting nipple should be removed.

The clearance between the plunger and cylinder must not exceed 0.25 mm (0.010") which is measured as shown in Fig. 54. If the clearance exceeds 0.25 mm (0.010"), test with a new plunger. If this does not help, the wheel unit cylinder must be replaced.

Examine the packings and other parts for wear and damage. Damaged or worn parts must be replaced.

Assemble the parts in the reverse order to dismantling. When doing this, dip the plungers and packings in brake fluid.

## Fitting

Fitting is done in the reverse order to removing. When working on both front and rear wheel unit cylinders of late production, remember that the front cylinder has a diameter of 1" and the rear of  $\frac{13}{16}$ ". Air-vent the wheel unit cylinder.

## Brake lines

The brake lines should be flushed through in connection with full reconditioning of the hydraulic system.

The lines are disconnected at the wheel unit cylinders one by one and flushed through with brake fluid or spirit. Flushing is preferably done by filling the master cylinder and then carrying out repeated braking movements with the pedal.

After having been flushed through with spirit, all leads must be blown clean with water-free, filtered compressed-air, since the spirit can cause gas bubbles in the system, giving rise to a "spongy pedal".

In the case of leakage or where the lines have been subjected to damage so that leakage is suspected, the damaged lines should be replaced. This is done as follows:

1. Remove the damaged brake line.
2. Take a new original brake line, blow it clean internally with water-free, filtered compressed-air, and fit it. Make sure that the brake line is in such a position that it cannot be chafed during driving. Particularly important points are those where the pipes pass the rear spring attachments on the rear axle, where the pipe must not be closer than 10 mm ( $\frac{3}{8}$ " ), and where the pipes pass the support arms. If the pipe is not bent correctly, it should be adjusted by hand before fitting. If bending is done after the pipe has been fitted, this often results in deformation at the connections. On vehicles with disc brakes, note that the line between the front wheel brake unit and hose does not have the same type of cone in both ends.

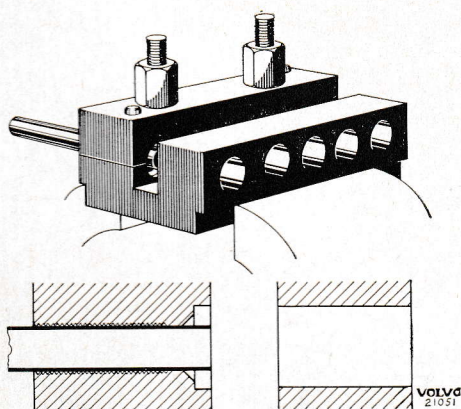


Fig. 55. Flanging a brake pipe.

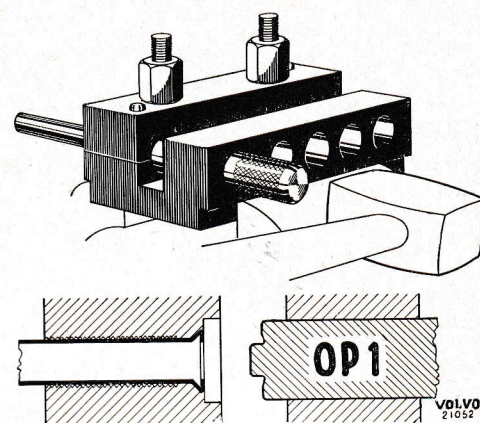


Fig. 56. Flanging a brake pipe.

If for any reason the brake line is not available ready-made, it can be manufactured as follows. This description does not apply, however, to lines for the front wheel brakes on vehicles with disc brakes.

1. Cut the new pipe to the length required. The pipe should be cut at right angles, after which all burr should be removed.
2. Place tool SVO 2049 in a vice. Insert the pipe so far that its end comes flush with the vice jaw as shown in Fig. 55. Tighten the nuts.
3. Place the drift OP 1 in the tool. Strike the drift with a copper mallet until it goes right in. The edge of the pipe is thus bent out as shown in Fig. 56.
4. Replace the drift with OP 2 (Fig. 57) and knock this right in.
5. Place on the keeper nuts and repeat operations 3—5 at the other end of the pipe.
6. Bend the new brake line using the old one as a pattern. Bending should be done round an object having the same radius as the bend required.

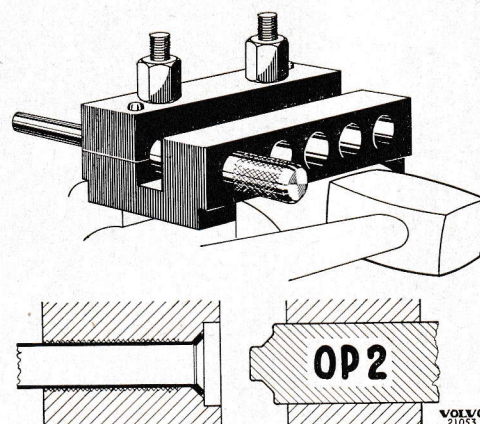


Fig. 57. Flanging a brake pipe.

## Air-venting the hydraulic system

An indication that there is air in the system is that the brake pedal can be depressed with very little resistance or that it feels "spongy". After any part of the system has been removed for repairs, air-venting must be carried out. Air can also enter the system if there is insufficient brake fluid in the container. If, for example, only one wheel unit cylinder has been removed, it is usually sufficient just to air-vent this. If, on the other hand, the master cylinder or lines from this have been removed, then the whole system must be air-vented.

Air-venting the whole brake system is carried out as follows:

1. Clean around the filling cap on the master cylinder. Screw off the cap and top up with brake fluid if necessary.
2. Clean the air-venting nipple. Place the air-venting key with hose on the air-venting nipple and let the other end of the hose hang down in the fluid in a collecting vessel, see Fig. 58. For front wheel brake units of early production, key SVO 2280 is used, for disc brakes SVO 2381, and for other brakes SVO 1431.

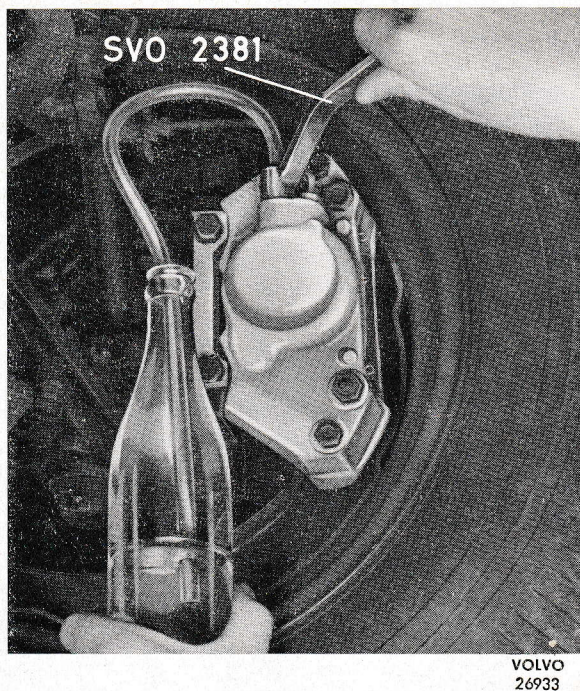


Fig. 58. Air-venting the disc brakes.

3. Open the nipple and have someone depress the brake pedal gradually. Close the nipple before the pedal is released, otherwise air can be sucked in if there is no non-return valve between the master cylinder and lines. Repeat this procedure as long as there are air bubbles in the fluid running out.
4. Air-vent the other wheels in the same way. Check between every wheel that there is sufficient brake fluid in the container.

A special air-venting apparatus can also be used which maintains the fluid in the system under a certain pressure. In this case it is not necessary for the brake pedal to be operated, so that one man can carry out air-venting.

## Leakage test

Once or twice a year, and when any hydraulic part has been removed, it is a good idea to check the system for leaks. This can be done by placing the system under pressure by means of a pedal jack, after which all the hydraulic parts can be examined for leakage. It is even better if the test is done with a special pressure tester. This is connected to the hydraulic system and the pressure raised to a maximum of 100 kg/cm<sup>2</sup> (1420 lb.sq.in.).

After 10 minutes the pressure set on the gauge must not fall more than 10% of the first reading and should then remain constant. If there is the slightest leakage in the system, the pressure will drop.

If there is any leakage, the fault should be remedied before the vehicle is taken into use.

## Brake pedal

### Adjusting the pedal position

When the brake pedal is released, it should take up the same position as the clutch pedal. The position is adjusted by slackening the locknut and turning the push rod for the master cylinder. Do not forget to tighten the locknut.

### Replacing the pedal and bushings

See under "Reconditioning pedal shaft", Service Manual, Part 2.

## HANDBRAKE

### Replacing the handbrake cable

#### Removing

1. Apply the handbrake, remove the hub cap, slacken the wheel nuts and castle nut.
2. Lift up the rear end, block up under the rear axle and remove the wheel. Release the handbrake.
3. Pull off the brake drum and hub with puller SVO 1791, see Fig. 18. Disconnect the cable from the brake shoe lever.
4. Remove the bolts of the cable casing attachment on the brake backing plate or the locking spring if the brakes are of early production. Remove the cable casing front attachment with rubber sleeve. Disconnect the cable from the clevis and pull out the cable forwards. In the case of older type cables (up to chassis number 534), this is pulled first backwards so that the locking washer can be removed. If the guide sleeve and locking washer do not come out with the cable, knock the guide sleeve to the rear with a narrow drift.

#### Fitting

1. Fit the rubber sleeve over the cable casing and connect the cable to the clevis.
2. Thread the sealing ring over the cable spring (does not apply to cables with locking springs). Insert the cable through the brake backing plate. On older type cables the guide sleeve and locking washer are then fitted. Connect the cable to the brake shoe lever.
3. Place on the locking spring or tighten the bolts, whichever the case may be. Fit the cable casing front attachment and make sure that the clamp enters the groove on the sleeve. If necessary, slacken the adjusting nuts. Fit the rubber sleeve in its bracket.
4. Fit on the hub with brake drum and wheel. Tighten the castle nut and wheel nuts sufficiently for the drum and wheel to come into the correct position.
5. Adjust the handbrake. Lower the vehicle and tighten the wheel nuts to a torque of 10—14 kgm (70—100 lb.ft.). Tighten and lock the castle nut. Fit on the hub cap.

### Replacing the rubber cover

If the handbrake cable rubber cover has been damaged for any reason, it must be replaced, otherwise water and dirt can penetrate, causing rusting.

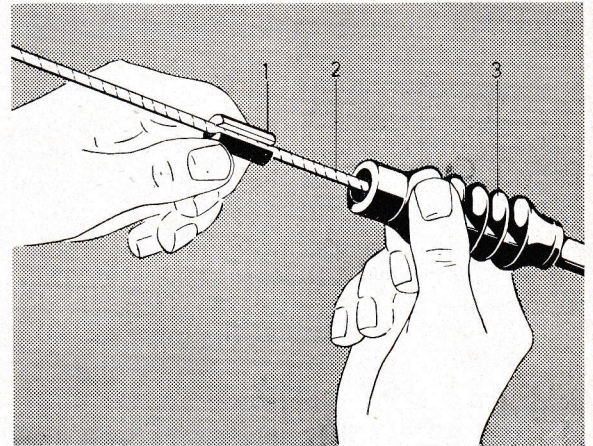
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Fig. 59. Fitting the rubber cover.

1. Sealing plug
2. Cable
3. Rubber cover

For this purpose there is a special rubber cover with sealing plug (part numbers 86850 and 86851 respectively). When replacing, the pull rod is disconnected from the lever and the cable disconnected from the clevis. Cut off the old cover and thread on the new one. Connect the cable to the clevis and re-fit the pull rod. Place the slotted sealing plug (1, Fig. 59) onto the cable (2) and press it into the rubber casing (3).

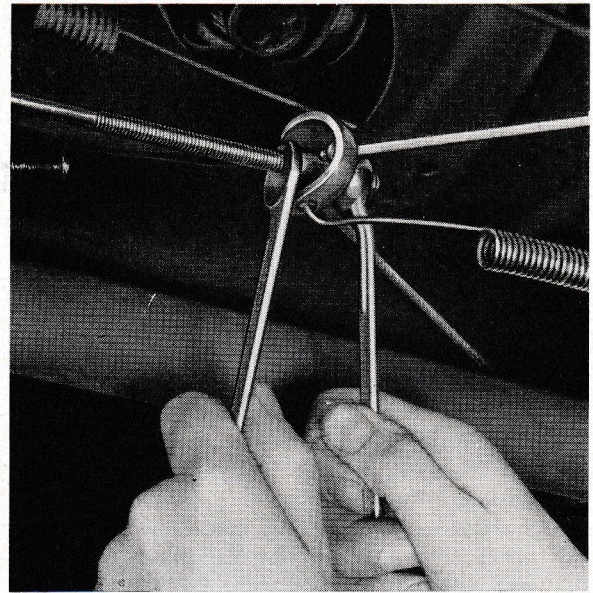
### Replacing the handbrake lever or catch parts

1. Lift up the rear end and block up under the rear axle.
2. Remove the split pin and pull the cables so that the pull rod (2, Fig. 16) can be removed from the lever. Remove the bearing support (1).

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Fig. 60. Removing the handbrake lever.

3. Turn back the floor mat and remove the rubber cover over the ratchet segment. Remove the ratchet segment.
4. Move the brake lever (15) towards the centre of the vehicle until it releases at the outer bearing. Remove the rubber seal and pull out the handbrake lever forwards with shaft and lever, see Fig. 60.
5. Screw out the locking screw (18) and remove the loop (20) and button (19). Take the spring out of the lever. Remove the pin (13) and take out the push rod (16) and pawl (12).
6. Fit the new parts in the reverse order. Make sure that the pin is properly secured without the movement of the pawl being affected. Lubricate the bushings with a thin layer of ball bearing grease. Do not forget to lock the pull rod and ensure that the rubber on the shaft seals properly.



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Fig. 61. Adjusting handbrake.

### Adjusting the handbrake

The handbrake should give full effect at the 4th—5th ratchet notch. If not, the handbrake should be adjusted. Before adjusting, make sure that the fault is not in the wheel brake units. On vehicles with late production wheel brake

units (without self-adjusting), the rear wheel brakes should therefore be adjusted first.

The handbrake is adjusted by moving the clevis on the pull rod, see Fig. 61. Tighten the nuts properly after adjusting.

## FAULT TRACING

FAULT
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REASON	REMEDY
--------	--------

### No or poor braking effect

Insufficient brake fluid in the system.

Air in the hydraulic system.

Leakage in the hydraulic system.

Defective master cylinder.

Incorrectly adjusted brakes.

Unsuitable brake linings.

Grease or oil on the brake linings.

Top up with brake fluid. Check for leakage.

Air-vent.

Air-vent the system.

Check and repair the leakage. Air-vent.

Recondition the master cylinder.

Adjust the brakes.

Change over to original brake linings.

Replace the brake linings. Check the sealing ring.

## Vehicle pulls to one side when braking

Grease or oil on one of the brake linings.

Different types of brake lining.  
Brakes unevenly adjusted.  
Oval or uneven brake drum.  
Defective wheel unit cylinder.  
Excessive play in wheel bearings, or faulty wheel alignment.  
Uneven tyre pressure.  
Tyres unevenly worn.

Replace the brake lining. Check the sealing ring.

Replace with the same type.  
Adjust the brakes.  
Replace or grind the drum.  
Recondition the wheel unit cylinder.  
Adjust the front end.

Adjust the tyre pressure.  
See Part 8.

## The brakes grab

Brakes badly adjusted.  
Moisture on the brake linings.

Excessive play in wheel bearings.  
Brake linings worn out.  
Brake linings glazed.  
Damaged or loose brake linings.  
Loose brake backing plate or retainer.  
Oval brake drum.  
Broken return spring.  
Wheel brake unit centring block damaged.  
Uneven sliding surfaces on brake shoes and centring block.

Adjust the brakes.

Apply the brakes several times, when the trouble will disappear.  
Adjust the bearings.  
Replace the linings.  
Replace the linings and repair the leakage.  
Replace the linings.  
Tighten the brake backing plate.  
Replace or grind the drum.  
Replace the spring.  
Replace the centring block.  
Clean up the sliding surfaces.

## Brakes bind on one of the wheels

Brakes incorrectly adjusted.  
Broken return spring.  
Handbrake cable binds.  
Brake line to the wheel blocked up or damaged.  
Excessive play in wheel bearings.

Adjust the brakes.  
Replace the spring.  
Lubricate or replace the cable.  
Clean or replace the line.  
Adjust the bearings.

## Brakes bind on all wheels

Brakes incorrectly adjusted.  
During very cold weather: poor quality brake fluid.  
Equalizing hole in late production master cylinder blocked up.

Adjust the brakes.  
Change the brake fluid.  
Recondition the master cylinder.

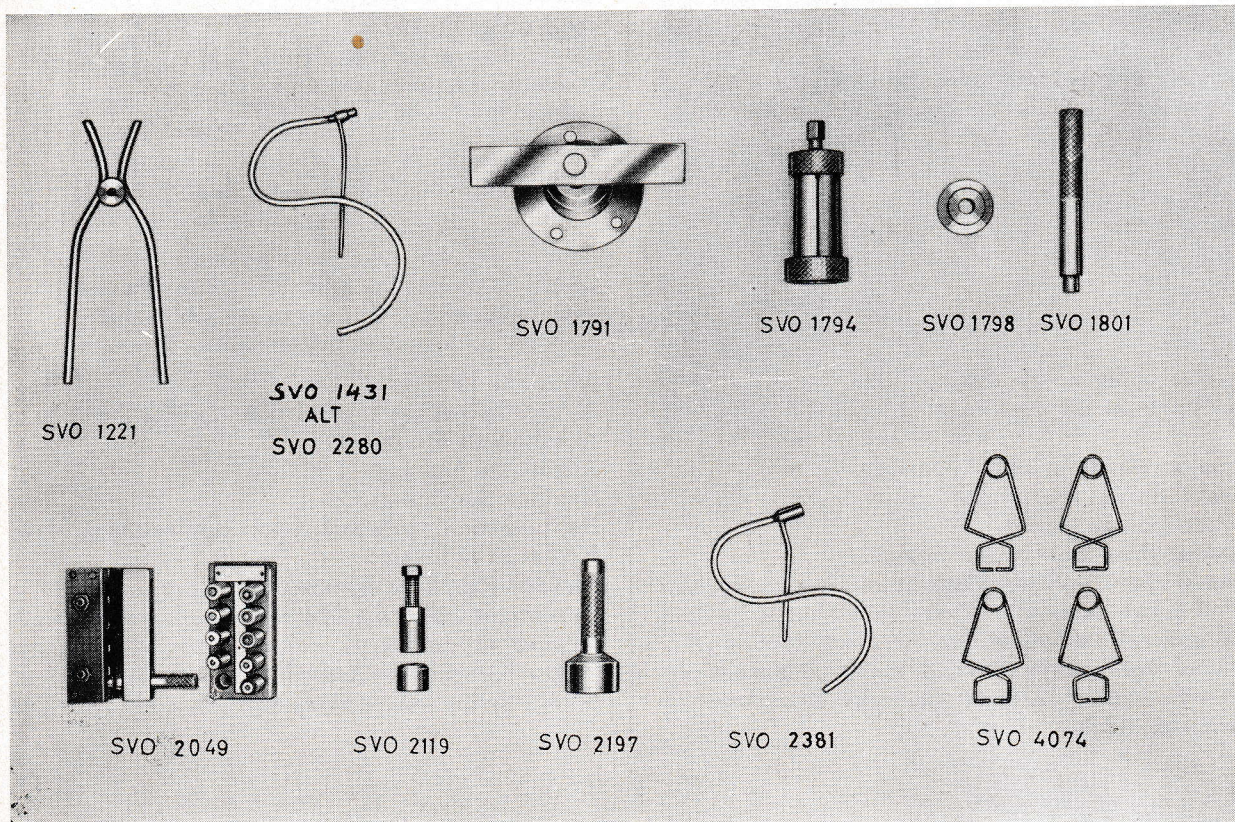
## The brakes squeal

Brake linings worn out.  
Dirt in the brake drums.  
Vibrating brake drums.

Replace the linings.  
Clean the drums and linings.  
Fit damping springs on the outside of the drums.

## TOOLS

The following special tools are required for repairs to the brake system.



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Fig. 62. Special tools.

- |          |   |          |   |
|----------|---|----------|---|
| SVO 1221 | Pliers for lower spring, rear wheel brake unit, early production. | SVO 2119 | Staving tool for eccentric stud, early production.                    |
| SVO 1431 | Key for air-venting nipple.                                       | SVO 2197 | Drift for removing and fitting grease cap for front wheel hub.        |
| SVO 1791 | Puller for hub and brake drum.                                    | SVO 2280 | Key for air-venting nipple, front wheel brake unit, early production. |
| SVO 1794 | Puller for inner bearing on steering knuckle.                     | SVO 2381 | Key for air-venting nipple, vehicles with disc brakes.                |
| SVO 1798 | Drift for fitting sealing ring in front wheel hub.                | SVO 4074 | Spring clip for wheel unit cylinder.                                  |
| SVO 1801 | Standard handle.  |          |   |
| SVO 2049 | Tool for flanging brake pipe.                                     |          |   |

# SPECIFICATIONS

## Wheel brake units, drum brakes

### Early production

Brake drums, diameter .....	9" (228.6 mm)
radial throw, max. ....	0.15 mm (0.006")
Brake linings:	
Width .....	2"
Thickness .....	3/16"
Length, front wheel .....	260 mm (10 <sup>1</sup> / <sub>4</sub> ")
rear wheel, front shoe .....	260 mm (10 <sup>1</sup> / <sub>4</sub> ")
rear shoe .....	200 mm (7 <sup>7</sup> / <sub>8</sub> ")
Effective area, front wheel .....	520 cm <sup>2</sup> (80.6 sq.in.)
rear wheel .....	465 cm <sup>2</sup> (72.1 sq.in.)
total .....	985 cm <sup>2</sup> (152.7 sq.in.)
Return spring for brake shoe:	
Applied force necessary for a total length of	
154 mm (6.06"), front wheel .....	13.5—20.5 kg (29.7—45.1 lb.)
rear wheel .....	15.5—20.5 kg (34.1—45.1 lb.)
Clearance between brake lining and drum .....	0.1 mm (0.004")
Rivets for brake linings, size .....	9/64 × 5/16" (3.5 × 8 mm)

### Late production

Brake drum, diameter, front wheel .....	10" (254 mm)
rear wheel .....	9" (228.6 mm)
Width .....	0.15 mm (0.006")
Brake linings, early production:	
radial throw, max. ....	2"
Thickness, rear lining, front wheel .....	1/4—3/16" (ground)
others .....	3/16"
Length, front wheel .....	275 mm (10 <sup>53</sup> / <sub>64</sub> ")
rear wheel .....	250 mm (9 <sup>27</sup> / <sub>32</sub> ")
Effective area, front wheel .....	560 cm <sup>2</sup> (86.8 sq.in.)
rear wheel .....	508 cm <sup>2</sup> (78.7 sq.in.)
total .....	1068 cm <sup>2</sup> (165.5 sq.in.)
Brake linings, late production:	
Width .....	2"
Thickness, rear lining, front wheel .....	1/4—3/16" (ground)
others .....	3/16"
Length, front wheel, front shoe .....	192 mm (7 <sup>9</sup> / <sub>16</sub> ")
rear shoe .....	250 mm (9 <sup>27</sup> / <sub>32</sub> ")
rear wheel, front shoe .....	212 mm (8 <sup>11</sup> / <sub>32</sub> ")
rear shoe .....	250 mm (9 <sup>27</sup> / <sub>32</sub> ")
Effective area, front wheel .....	497 cm <sup>2</sup> (77 sq.in.)
rear wheel .....	451 cm <sup>2</sup> (70 sq.in.)
total .....	948 cm <sup>2</sup> (147 sq.in.)
Rivets for brake linings, size .....	9/64 × 5/16" (3.5 × 8 mm)

## Wheel brake units on vehicles fitted with disc brakes at front

### Front wheel brake unit

Type .....	Disc
Brake disc:	
External diameter .....	276.5 mm (10.88")

Thickness, new .....	12.7—12.8 mm (0.500—0.504")
reconditioned .....	min. 12.2 mm (0.480")
Run-out .....	max. 0.1 mm (0.004")
<b>Brake linings:</b>	
Number per wheel .....	2
Thickness .....	10.7 mm (0.422")
Effective area per wheel .....	92.5 cm <sup>2</sup> (14.3 sq.in.)

### Rear wheel brake unit

Type .....	Drum
Brake drum, diameter .....	9" (228.6 mm)
Brake drum, radial throw .....	max. 0.15 mm (0.006")
<b>Brake linings:</b>	
Width .....	2"
Thickness .....	<sup>3</sup> / <sub>16</sub> "
Length .....	210 mm (8 <sup>1</sup> / <sub>4</sub> ")
Effective area per wheel .....	210 cm <sup>2</sup> (32.5 sq.in.)
Rivets for brake linings, size .....	<sup>11</sup> / <sub>64</sub> × <sup>17</sup> / <sub>64</sub> " (6.7 × 4.4 mm)
<b>Return spring for brake shoe:</b>	
Applied force necessary for a total (outer) length of	
for upper spring, 95 mm (3.74") .....	7—9.5 kg (15.4—21 lb.)
for lower spring, 132 mm (5.20") .....	5.5—8 kg (12.1—17.6 lb.)

### Hydraulic system

#### Master cylinder

Inner diameter, early production .....	<sup>7</sup> / <sub>8</sub> " (22.23 mm)
late production .....	<sup>7</sup> / <sub>8</sub> " (22.23 mm)
Clearance between plunger and cylinder, early production .....	max. 0.15 mm (0.006")
late production .....	max. 0.20 mm (0.008")
Tightening torque for adjusting nuts for master cylinder push rod	1.1—1.2 kgm (8—9 lb.ft.)

#### Wheel unit cylinder, drum brakes

Internal diameter, front wheel, early production .....	<sup>7</sup> / <sub>8</sub> " (22.23 mm)
late production .....	1" (25.4 mm)
rear wheel, early production .....	<sup>7</sup> / <sub>8</sub> " (22.23 mm)
late production I .....	<sup>13</sup> / <sub>16</sub> " (20.64 mm)
late production II .....	<sup>7</sup> / <sub>8</sub> " (22.23 mm)
Clearance between plunger and cylinder .....	max. 0.25 mm (0.010")

#### Wheel unit cylinder, on vehicles fitted with disc brakes at front

<b>Front wheel:</b>	
Number per wheel .....	3
Diameter, inner cylinder .....	2 <sup>1</sup> / <sub>8</sub> " (53.98 mm)
outer cylinders .....	1 <sup>1</sup> / <sub>2</sub> " (38.1 mm)
Tightening torque, inner bolts .....	6.2—7.0 kgm (40—50 lb.ft.)
outer bolts .....	3.5—4.2 kgm (25—30 lb.ft.)
<b>Rear wheels:</b>	
Internal cylinder diameter .....	1" (25.4 mm)
Clearance between plunger and cylinder .....	max. 0.25 mm (0.010")

#### Brake lines

External diameter .....	<sup>3</sup> / <sub>16</sub> "
-------------------------	--------------------------------