C.V. master cylinder (centre valve)

5A 1a

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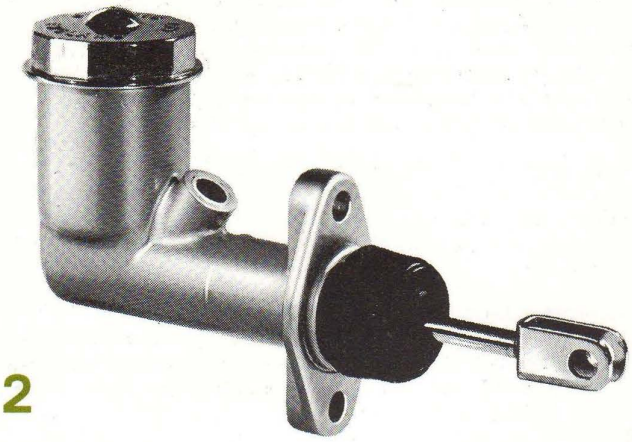

2

A 0484-5

Introduction

The Centre Valve (C.V.) Master Cylinder is made in a range of sizes and two distinct styles. With one the fluid reservoir is an integral part of the body (Fig. 1); whilst the other utilizes a supply tank which is remote from the cylinder (Fig. 2).

With emphasis on safety, more use is being made of transparent supply tanks, because the fluid level can be easily seen. The cylinder shown on Fig. 6 has a large direct supply tank, whilst the cylinder shown on Fig. 7 has a transparent extension fitted.

The operating principle is the same for all C.V. Master Cylinders. When pressure is applied to foot pedal the push rod contacts the plunger and pushes it up the bore of the cylinder. During the first 1/32 in. (0.8mm) of movement the spring washer fitted under the valve head is allowed to resume its natural 'bowed' shape and closes the port to the supply tank (Fig. 3). As the plunger continues to move up the bore, fluid is forced through the pipe lines to the wheel cylinders.

On the return stroke the plunger moves back with the return of the fluid and the final movement of the plunger compresses the spring washer, lifting the valve seal off its seat and opening the supply tank port (Fig. 3). The fluid can now move unrestricted between system and tank.

Servicing

Every 40,000 miles (64,000 km) or a period of three years, whichever occurs first, all hydraulic cylinders fitted to Private Cars and Light Commercial Vehicles should be replaced by new guaranteed units. However, provided the working surfaces of the master cylinder and plunger are in perfect condition, then new seals from a Girling Service Kit can be fitted. But if doubt exists regarding the condition of the cylinder or plunger then a new guaranteed master cylinder must be fitted.

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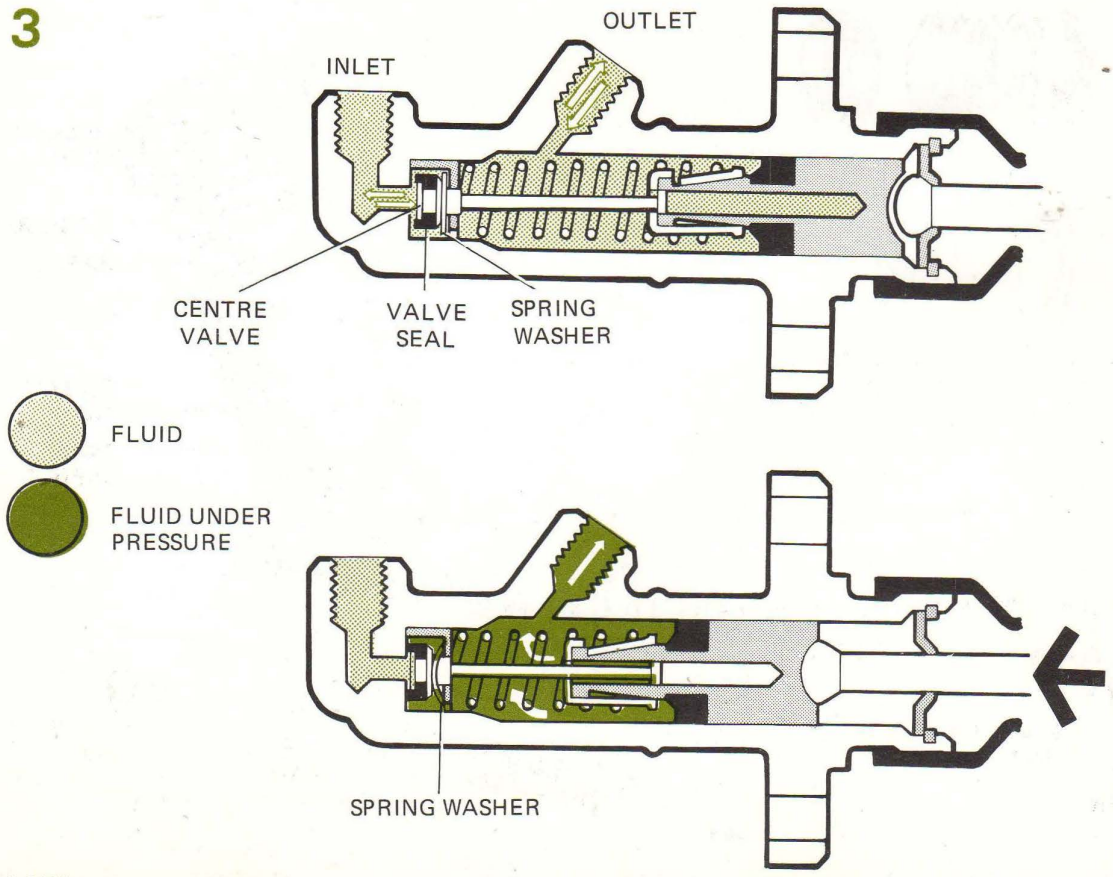

A 0483

C.V. master cylinder (centre valve)

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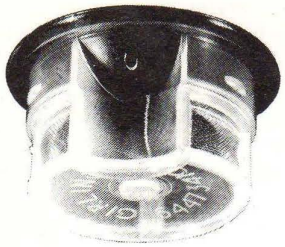

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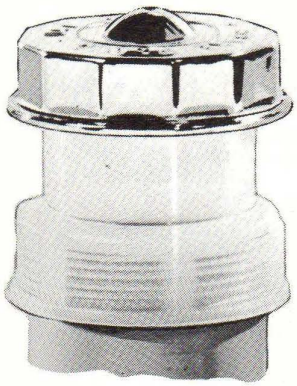

A 0486-7

General Information

Illustrated on Fig. 6 are the three types of dust cover in use. Fitted to the push rod is the small cup shaped cover and shown inset are the flat diaphragm type and the concertina type dust cover. The flat diaphragm type cover is held in position by a metal band secured by two or three indentations and sometimes the concertina type has a rubber band to seal it on the cylinder and a metal clip to seal it on the push rod.

Some cylinders of the type shown on Fig. 1 have a filter fitted (Fig. 4). The part number is 64473410 for cylinders with a cap diameter of 1¾ in. (44 mm). When correctly topped-up, the base of the filter should just be awash with brake fluid.

Transparent fluid level indicators (Fig. 5) are available for use on all C.V. Master Cylinders with integral fluid reservoirs. The part number is 64947008 for cylinders with a cap diameter of 1¾ in. (44mm) and 64947009 for cylinders with a cap diameter of 2½ in. (64 mm).

Dismantling (all types)

Drain the system of fluid by attaching a rubber tube to a wheel cylinder bleed screw, unscrew half a turn and pumping out the fluid by operating the foot pedal. Discard the fluid.

Disconnect the pipe, or pipes, from the cylinder. Unscrew the securing bolts, disconnect the push rod and remove the cylinder from its mounting. Drain out any surplus fluid by removing the filler cap.

Pull back the rubber dust cover and remove the circlip with a pair of long-nosed pliers. If a diaphragm type of dust cover is fitted, the metal retaining band should be carefully removed without damage. The plunger assembly can now be removed either by shaking the cylinder or by compressed air pressure.

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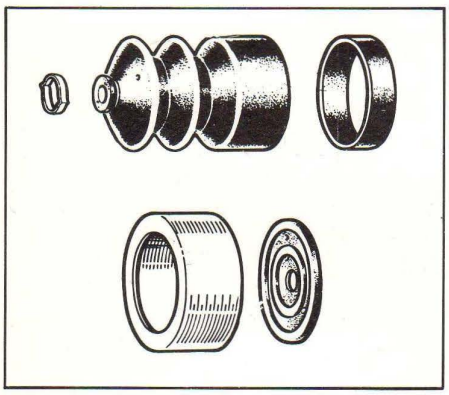

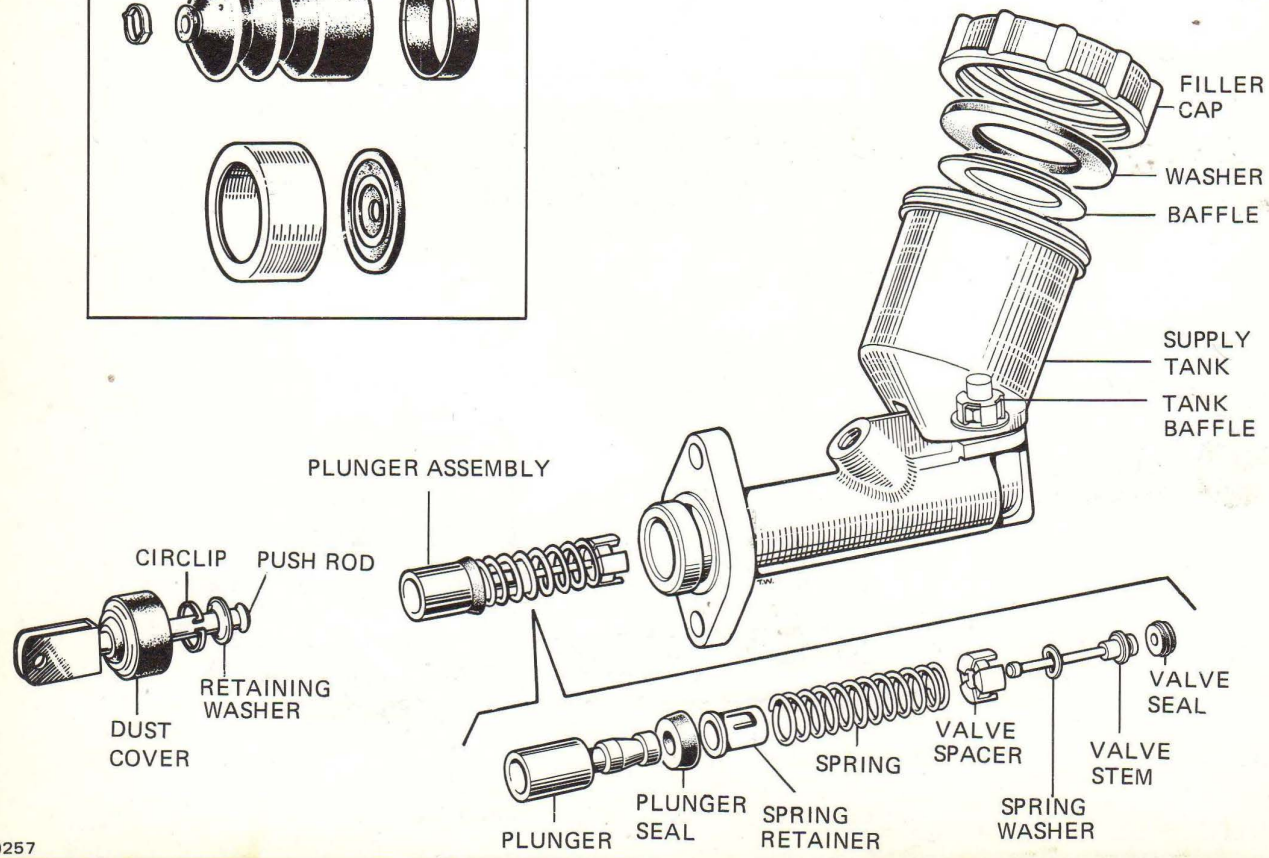

A 0257

C.V. master cylinder (centre valve)

If the seals are loose on the plunger and appear oversize, suspect contamination. Compare the old seals with new, but do not let them touch. If the old seals are appreciable larger, contamination is indicated and the system should be thoroughly flushed out with Girling Cleaning Fluid and all seals and hoses changed without delay.

Lift the leaf of the spring retainer (Fig. 8) and remove the spring assembly from the plunger. Compress the spring to free the valve stem from the keyhole of the spring retainer, thus releasing the tension of the spring. Remove the spring, valve spacer and spring washer from the valve stem and the valve seal from the valve head.

There are two types of plunger assembly as shown on the illustration (Fig. 8), and if the cylinder being serviced has the uppermost plunger fitted (type 'A'), remove the seal in the usual manner. But if the plunger is the type shown in the lower part of the illustration (type 'B'), with the seal at the push rod end of the plunger, the seal must be removed as follows:- Select a small screwdriver and round off and highly polish the end of the blade.

NOTE: This is most important for if the surface of the plunger is damaged in anyway, a new master cylinder must be fitted.

Refer to Fig. 9 and squeeze the seal until the polished blade of the screwdriver can be inserted then lever the seal as shown on Fig. 10 and remove from the plunger by pressing the seal off the plunger.

Remove the cap washer from the filler cap. If the cylinder is the type shown on Figs. 6 and 7, it is necessary to lever out the baffle before the washer can be removed.

Fig. 6 Type Master Cylinder

The translucent reservoir shown on Fig. 6 should not be removed under any circumstances. To all intent and purpose the reservoir is an integral part of the cylinder and the cylinder should be serviced as such. The reservoir, adaptor, gasket and seal are not serviceable.

Fig. 7 Type Master Cylinder

Unscrew the retaining collar and remove the reservoir extension together with the washer.

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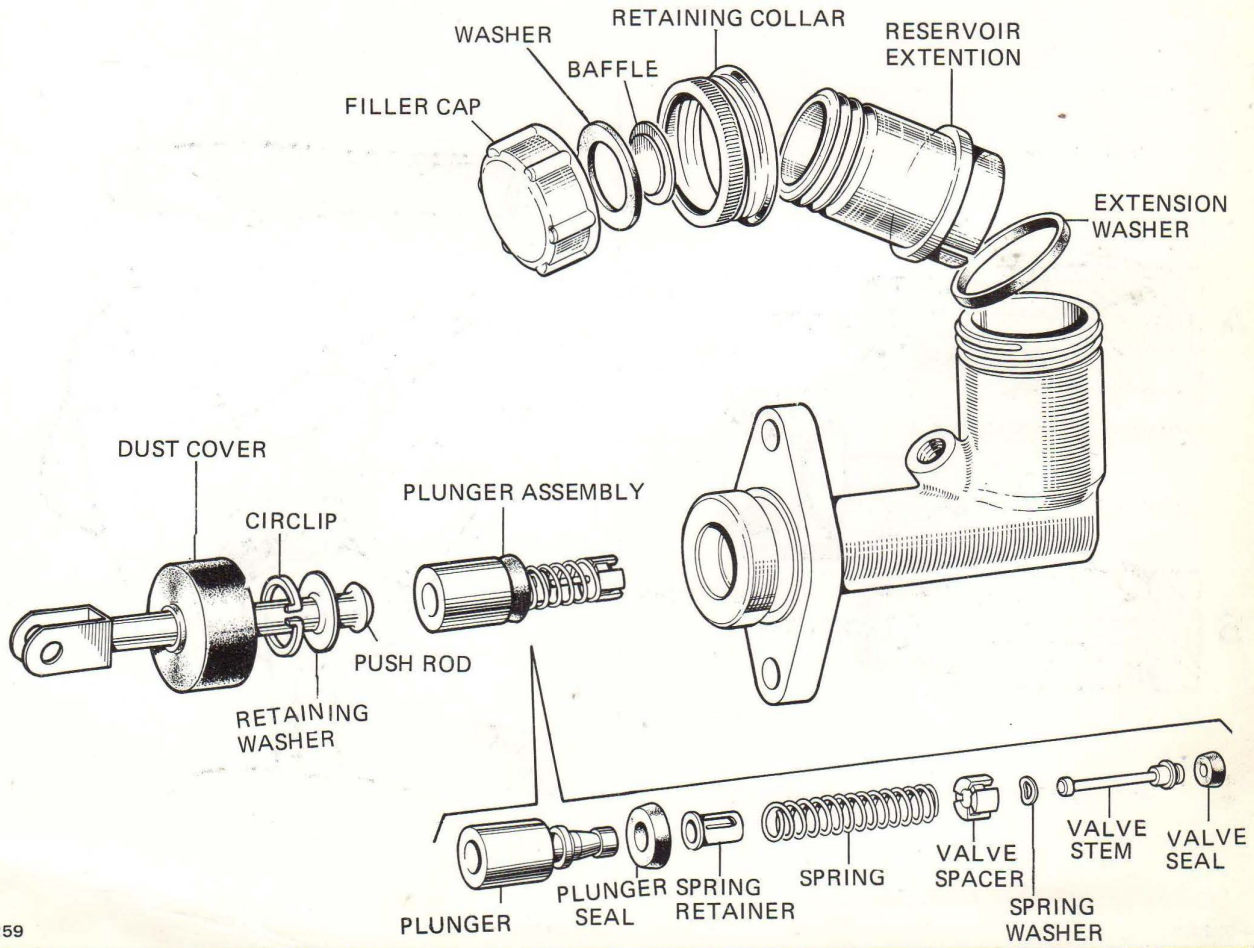

A0259

C.V. master cylinder (centre valve)

Cleaning

Comparison of the parts contained in the appropriate Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts throughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the plunger and cylinder bore for visible score marks, ridges and corrosion. Check the bore is smooth to the touch. If there is the slightest doubt as to the condition of the parts, then a new guaranteed master cylinder must be fitted. Inspect all other components to see that they are in good working order.

Assembling

Use the new parts from the Service Kit when re-assembling. Lubricate the inner diameter of the new plunger seal with unused Castrol-Girling Brake Fluid and fit the seal to the plunger. Refer to Fig. 8 and if the plunger is type 'A', then the seal fits over the reduced end of the piston; but if the plunger has the seal groove at the back as shown on 'B', then fit the seal as indicated on Fig. 11.

Fit the valve seal, smallest diameter leading, onto the valve head. Position the spring washer on the valve stem so that it 'flares' away from the valve stem shoulder as illustrated (Fig. 8). Follow with the valve spacer, legs first, and spring.

Fit the spring retainer to the spring and compress the spring until the valve stem passes through the keyhole in the spring retainer and engages in the centre. Fit the spring sub-assembly immediately to the plunger and press home the leaf of the spring retainer to secure (Fig. 8).

Liberally lubricate the plunger seal and the cylinder bore with unused Castrol-Girling Brake Fluid.

Insert the plunger assembly fully into the cylinder plunger bore, valve end leading, easing the entrance of the plunger seal. Position the push rod and retaining washer and fit the circlip. Smear the sealing areas of the rubber dust cover with Girling Rubber Grease and fit to the push rod; the remainder of the grease should be used to pack the dust cover. Position the dust cover on the cylinder body and, if applicable, fit the rubber band and the metal clip to the concertina-type dust cover.

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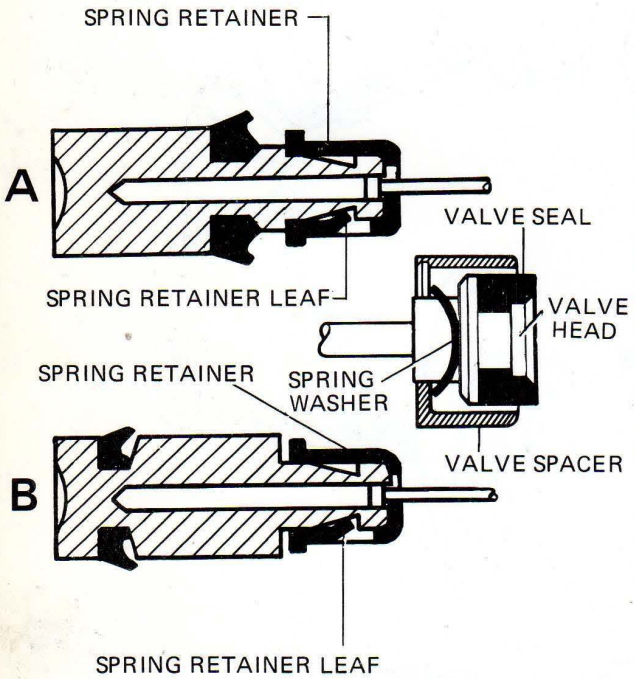

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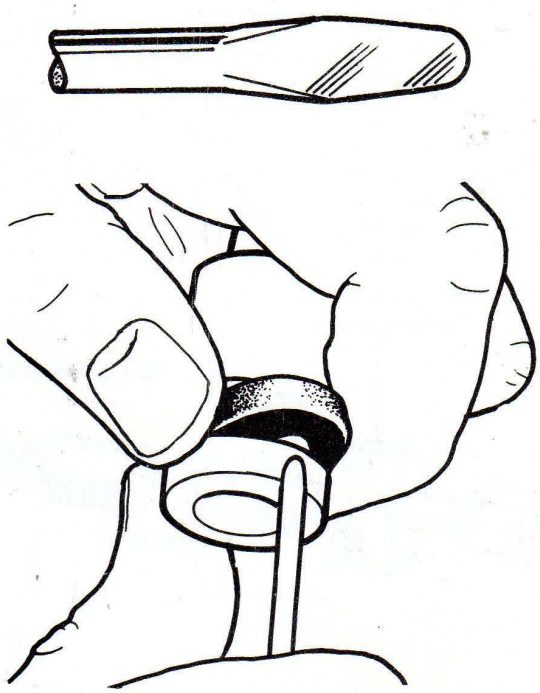

A 0296/5

A0296/1/2

Alternatively, if the dust cover is the diaphragm type. liberally smear the cover, the metal band and the plunger bore entrance with Girling Rubber Grease. Fit the dust cover to the push rod and position over the cylinder bore. Firmly press the retaining band against the cover and, whilst maintaining this position, crimp the metal band in three equally spaced places to secure, Fit the cap washer and baffle, if applicable, to the filler cap.

Fig. 7 Type Master Cylinder

Position the rubber washer and reservoir extension on the cylinder and screw on the retaining collar to secure.

Master Cylinders (All Types)

To prevent any foreign matter getting into the cylinder when the cylinder is being refitted to the vehicle, temporarily screw on the filler cap and cover all open bores.

When connecting the push rod it is essential to preserve the 1/32 in. (0.8 mm) gap between the push rod and the plunger when the push rod is fully returned. In these instances where the pedal returns until checked by the cylinder there is no danger, but where a separate pedal stop is fitted care must be taken.

Connect up the pipes and bleed the system as described in Section 1, Page 1D1

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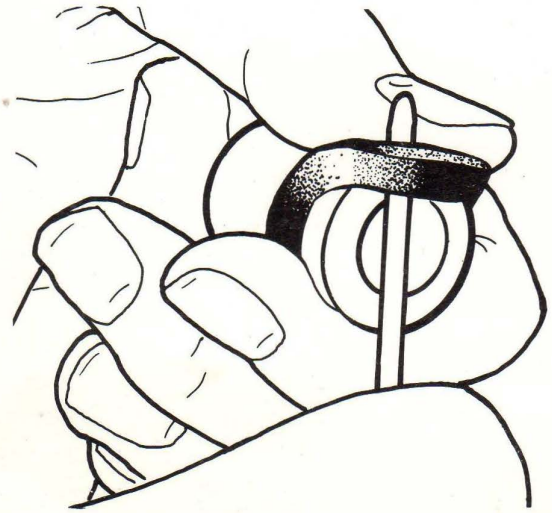

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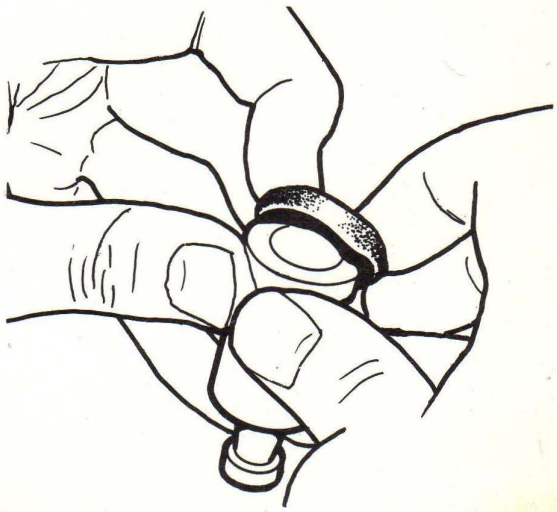

A0296/4

Introduction

This type of master cylinder is designed to be bolted to the chassis by side fixing lugs (Fig. 1) or by flange mounting (as shown on Figs. 2 and 3) and is made in a range of sizes. Those fitted to private cars, light commercial vehicles and clutch systems range from the smallest with a 5/8 in. (16 mm) diameter bore up to a 1 in. (25 mm) diameter bore. The larger types (Figs. 4, 5 and 6) with 1½ in. (38 mm), 1¾ in. (44 mm), and 2 in. (50 mm) diameter bores are fitted on the heavier commercial vehicles.

On all types the master cylinder is operated by a push rod connected through brake linkage, directly to the foot pedal, or by a vacuum servo unit or air cylinder. The push rod, on application, moves the piston in the cylinder bore and applies pressure to the fluid, which is displaced through the hydraulic pipe line to the wheel cylinders, expanding the wheel cylinder pistons and moving the shoes into contact with the drum.

With this cylinder, the main seal or recuperating seal is stationary in the body and the plunger moves through it to apply pressure to the fluid. There are four small holes in the plunger which bypass the recuperating seal to allow movement of fluid through the cylinder when the brake is off. On Fig. 7 the brakes are off and the fluid is permitted to flow between the reservoir and the wheel cylinders.

Fig. 8 shows the brakes being applied, the holes have passed the lip of the seal and pressure is being generated.

The recuperating seal shim allows the system to 'breath' between the cylinders and supply tank and also stops any extrustion of the seal through the recuperating drillings when under pressure.

The recuperating seal support keeps the seal in place and limits its travel when the pressure is released.

The end seal is a 'wiper' seal to stop any fluid seeping into the dust cover. The 1 in. (25 mm), 1½ in. (38 mm) and 2 in. (50 mm) diameter cylinders have a trapped line pressure valve fitted in the end cap, its purpose being to maintain residual line pressure of between 8 to 12 lb. per sq. in. which keeps the seals in the wheel cylinders under slight pressure, reduces seal travel and settlement, eliminates vacuum draw and assists in bleeding.

Where a master cylinder is coupled directly to the foot pedal linkage, always ensure that after adjusting the linkage and (with the pedal in the fully 'off' position) there is approximately 1/32 in. (0.8 mm) 'free play' between the push rod and master cylinder piston.

If the master cylinder is actuated by an air chamber always make sure that the correct amount of shims are fitted between the mating faces of the air chamber and the mounting flange. Never fit shims between the master cylinder and its flange. If this operation has to be attempted, offer up the air chamber to the mounting bracket WITHOUT SHIMS, then do the same with the master cylinder and measure the gap between the mating faces of the air chamber and the mounting bracket with feeler gauges; taking care not to depress the plunger in the master cylinder.

Obtain shims the thickness of the measured gap and then add one shim 0.030 in. thick and insert the total number between the the air chamber and bracket (refer to Fig. 9).

The hole in the shims and the vent hole in the end flange of the air chamber must line up with the hole in the mounting bracket.

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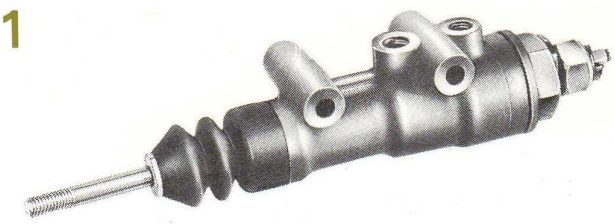

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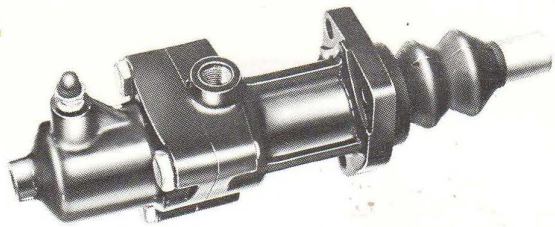

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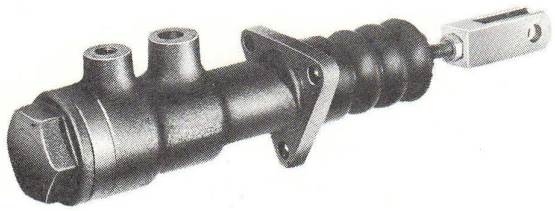

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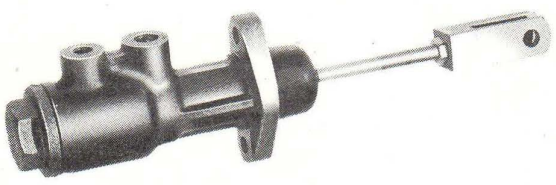

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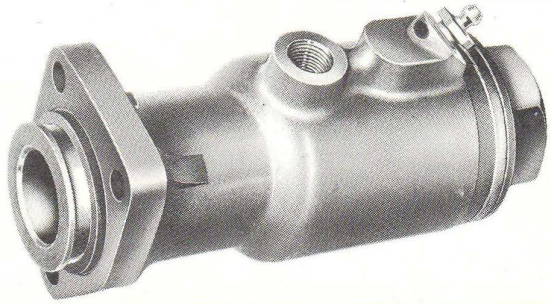

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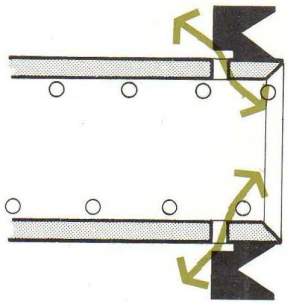

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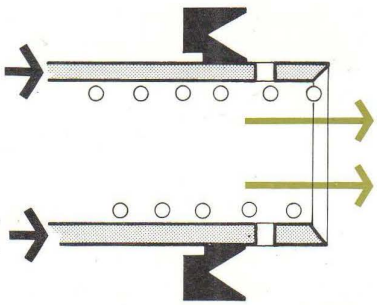

A 0470

Before removing the master cylinder from the vehicle it is always advisable to drain off the fluid. On the larger cylinders where a bleedscrew is fitted attach a bleed tube, lower the open end of the tube into a clean container, open the bleed-screw and pump the pedal until the system is clear of fluid. On the smaller cylinders without a bleedscrew connect the tube to a wheel cylinder bleedscrew.

Servicing

The servicing periods for hydraulic equipment fitted to Private Cars and Light Commercial Vehicles is 40,000 miles (64,000 km) or three years and for Medium and Heavy Commercial Vehicles it is 50,000 miles (80,000 km) or two years.

When the mileage is recorded or the time schedule expires, whichever is the sooner, the master cylinder should be replaced by a new guaranteed unit. However, provided the working surfaces of the cylinder and the plunger are in perfect condition, then new seals from a Girling Service Kit may be fitted. If doubt exists regarding the condition of the cylinder or the plunger then a new guaranteed master cylinder must be fitted.

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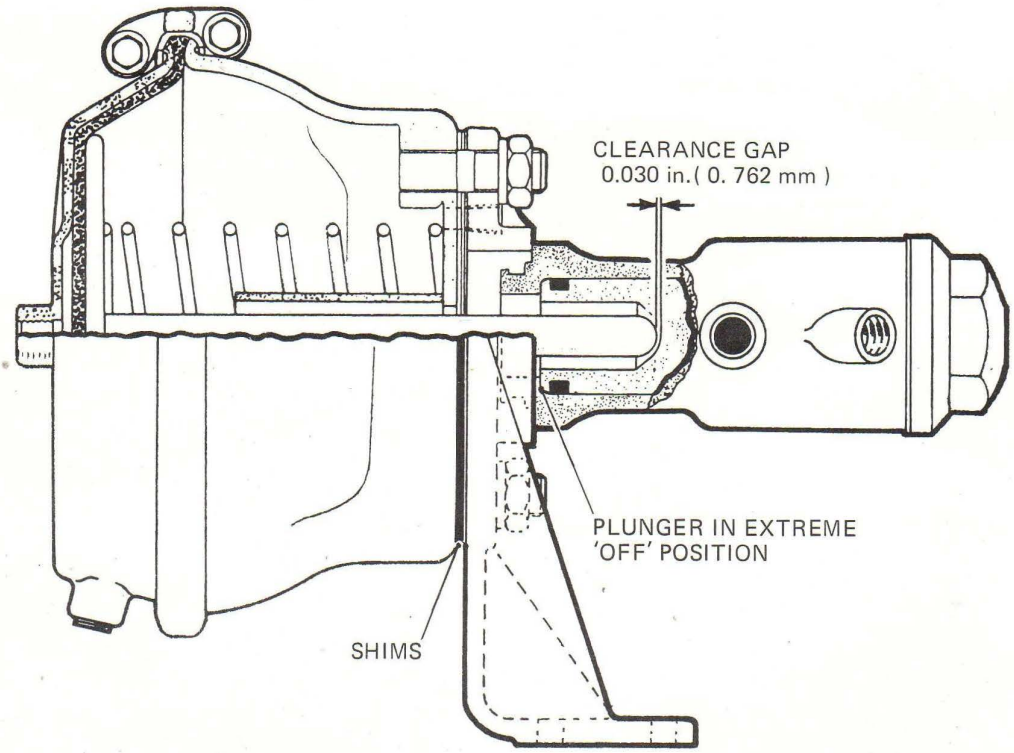

A 0471

compression barrel (C.B.) master cylinders (light commercial)

Dismantling (Fig. 10)

Drain the system of fluid as previously described (page 5A 2b), disconnect the pipe unions and the operating rod from its connection to the foot pedal. Withdraw the securing bolts and remove the cylinder from the chassis.

Clean the exterior of the master cylinder. Unscrew the end cap and remove complete with the gasket and the seal support. Remove the plunger return spring. Pull back the dust cover and extract the circlip, the push rod can then be removed. Push the plunger together with the end seal from the pressure end of the cylinder, then remove the recuperating seal, and the steel shim or the nylon backing ring (whichever is fitted).

Cleaning

Replace all seals and parts with those contained in the appropriate Girling Service Kit. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the plunger and the bore of the cylinder for visible score marks, ridges and corrosion and check they are smooth to the touch. If there is the slightest doubt about the condition of these parts, then a new guaranteed master cylinder should be used.

IMPORTANT:
The Service Kit will contain either a nylon backing ring or a steel shim (refer to Fig. 10). Discard the nylon backing ring or steel shim removed from the cylinder and fit the part supplied in the kit.

Assembling

The rubber seals and plunger should be smeared with unused Castrol-Girling Brake Fluid immediately before assembly. The two types of plunger and seal are shown on the illustration below (see inset 'A' and 'B').
Fit the end seal to the plunger and insert into the push rod end of the body, rotating the plunger to ease in the seal. Follow with the push rod assembly and secure with the circlip.

Place the nylon backing ring or steel shim over the plunger and settle in the recuperating seal with the back against the ring.

Place the seal support in position (if type 'C') or fit into the end cap (if type 'D'). Fit the gasket and screw on the end cap.

Liberally smear the sealing areas of the dust cover with the Rubber Grease supplied in the kit and fit the cover to the cylinder. Fit the rubber band (if applicable) to retain the dust cover on the body and ensure that the opposite end of the cover is located correctly on the push rod collar. If the dust cover fits on the push rod, tighten on the crimping band or bind with wire.

Refit the master cylinder to the chassis in reverse order to removal. When fitting the push rod to the linkage make quite sure that the master cylinder plunger is allowed to return fully, and a little 'play' can be felt between the push rod and plunger when the brake pedal is 'off'.

If the plunger is prevented from returning pressure builds up and the brakes bind on. The recuperating holes in the plunger are covered and the fluid cannot return.

Fill up the supply tank with Castrol-Girling Brake Fluid and bleed the system according to the instructions in Section 1, page 1D2.

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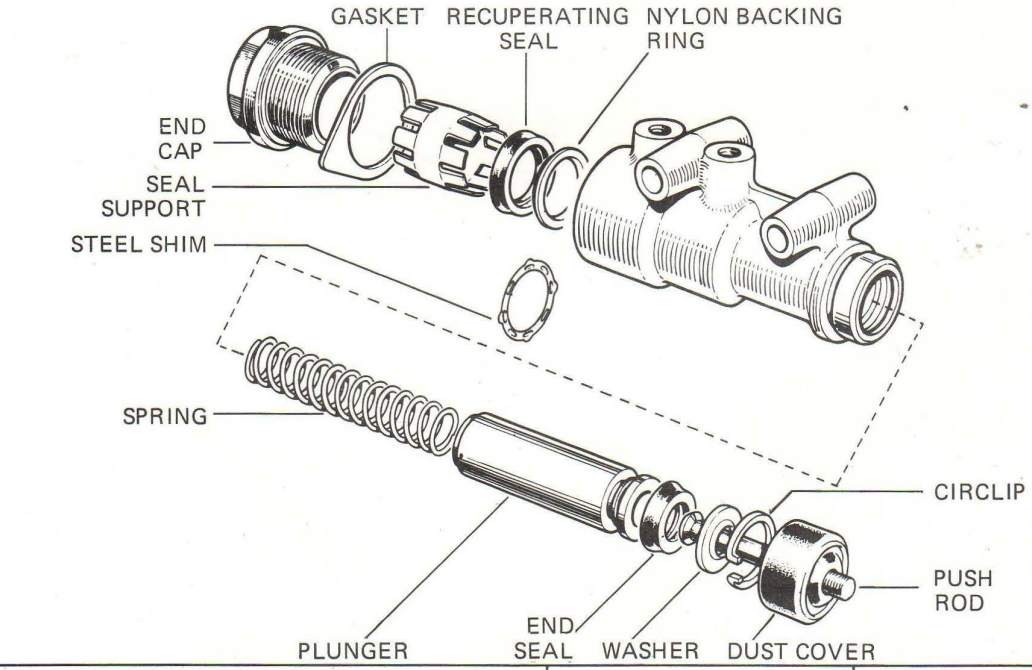

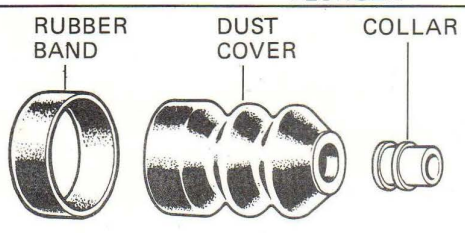

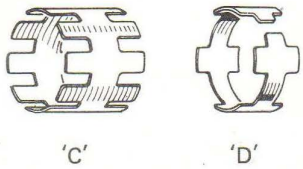

A 0148

5A 2d compression barrel (C.B.) master cylinders (medium commercial)

Dismantling (Fig. 11)

Drain the system of fluid as previously described (page 5A 2b), disconnect the pipe unions from the cylinder and unscrew the three bolts securing the cylinder to the servo unit or chassis.
Remove the dust cover and operating rod then clean the exterior of the cylinder, unscrew the three set bolts securing the two halves of the body and withdraw the plunger return spring. The steel shim, recuperating seal, seal support, trapped-line pressure valve and sealing ring can then be removed from the pressure end of the body. Release the circlip and extract the retaining washer. The plunger, complete with the end seal can then be pushed out from the jointing end face of the cylinder body and the end seal can be removed.

Cleaning

Replace all seals and parts with those contained in the appropriate Girling Service Kit. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the plunger and the bore of the cylinder for visible score marks, ridges and corrosion and check they are smooth to the touch. If there is the slightest doubt about the condition of these parts, then a new guaranteed master cylinder should be used.

Assembling

The rubber seals and plunger should be smeared with unused Castrol Girling Brake Fluid immediately before assembly.
Fit the end seal on to the plunger with the lips of the seal leading. Insert the plunger assembly into the reserve end of the body from the operating end and replace the washer and circlip. Position the sealing ring on the appropriate locating shoulder of the reverse end of the body. Into the pressure end of the body insert the trapped-line pressure valve and seal support.

Smear the recuperating seal with unused Castrol-Girling Brake Fluid and insert into the body with the lips of the seal facing the seal support, then position the shim on the seal. Insert the plunger return spring into the plunger and bolt the two halves of the body together, tightening the bolts securely. Liberally smear the sealing areas of the dust cover with Girling Rubber Grease. Refit the operating rod and fit the dust cover.

When refitting the master cylinder to the Servo housing, it is important to make sure the rod from the Servo unit is inserted into the end of the master cylinder operating rod.

Some of these cylinders are not provided with a trapped-line pressure valve but these are on special installations and are the exception to the rule.

Fill up the supply tank with Castrol-Girling Brake Fluid and bleed the system according to the instructions in Section 1, Page 1D2.

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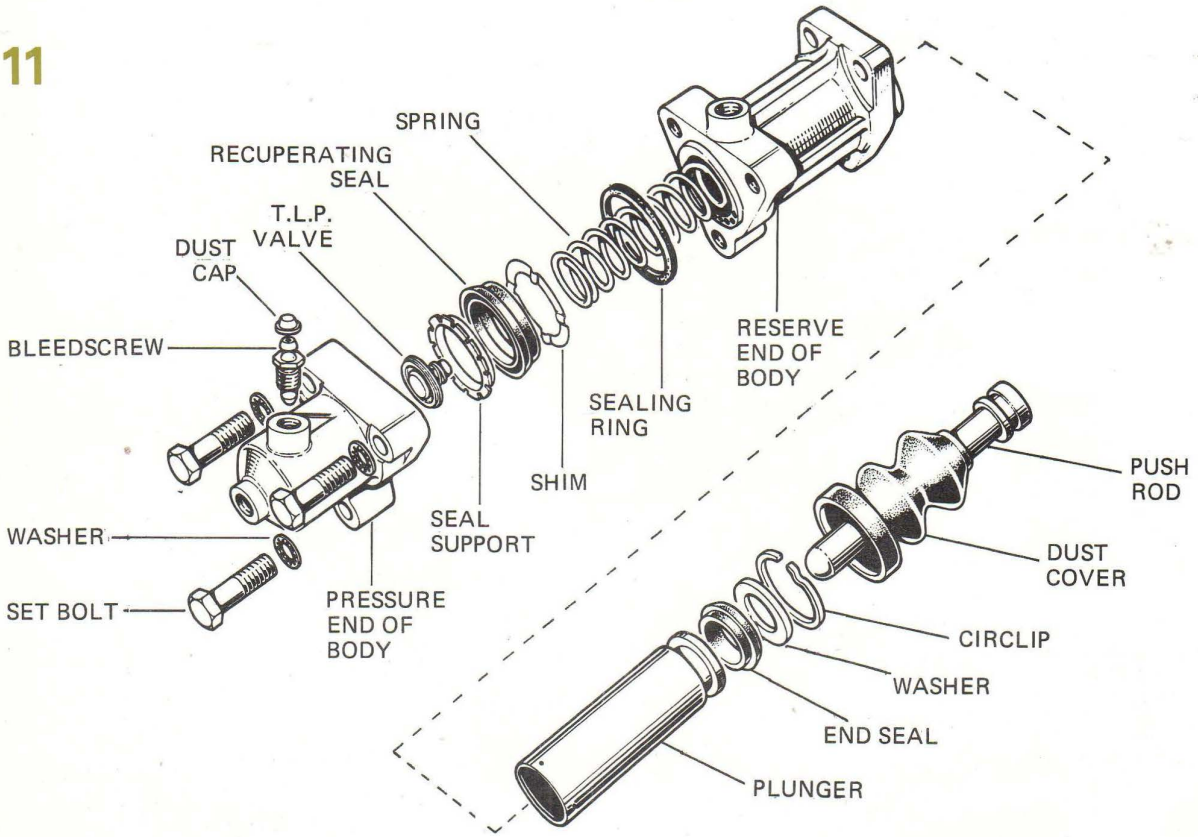


A 0155

compression barrel (C.B.) master cylinders (medium and heavy commercial)

Dismantling (Fig. 12)

Drain the system of fluid as previously described (page 5A 2b). Disconnect the pipe unions from the cylinder, unscrew the securing bolts and remove the cylinder from the vehicle.

Clean the exterior of the cylinder. Unscrew the end cap completed with lock washer, sealing ring and seal support and withdraw the plunger return spring and trapped-line pressure valve.

Remove the recuperating seal and shim from the cylinder bore, then detach the dust cover and push rod. Push the plunger out from the operating end of the cylinder and remove the end seal.

Cleaning

Replace all seals and parts with those contained in the appropriate Girling Service Kit. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the plunger and the bore of the cylinder for visible score marks, ridges and corrosion and check they are smooth to the touch. If there is the slightest doubt about the condition of these parts, then a new guaranteed master cylinder should be used.

Assembling

The rubber seals and plunger should be smeared with unused Castrol-Girling Brake Fluid immediately before assembly.

Fit the end seal to the plunger with the lip of the seal on first, facing towards the open end away from the operating rod. Push the plunger (end seal first) into the cylinder from the pressure end. On some cylinders a circlip and washer is fitted, as shown on the inset on Fig. 12. This type of cylinder should have the plunger inserted from the push rod end and the plunger rotated to ease in the seal.

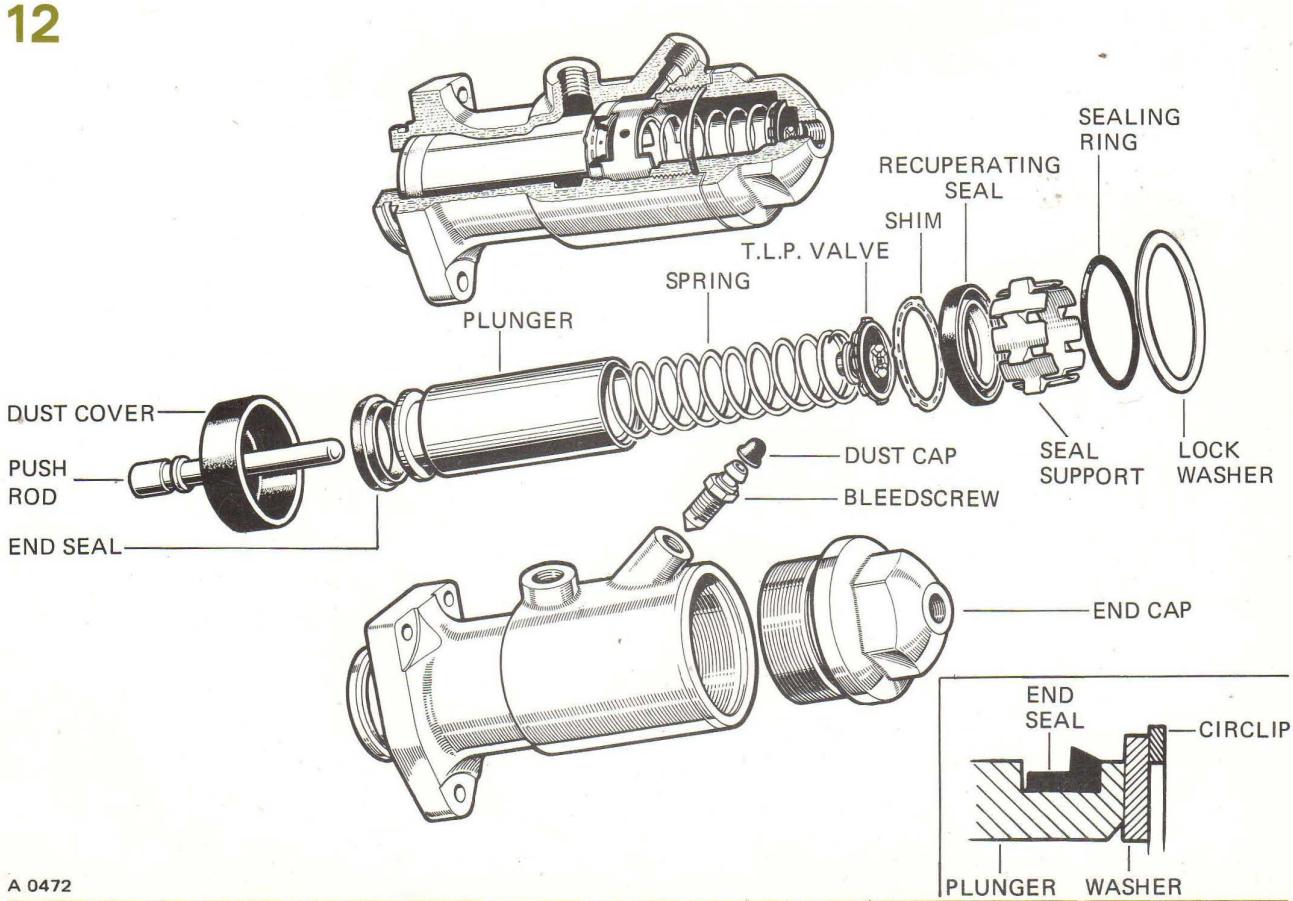
Insert the steel shim into the cylinder against the shoulder formed inside and fit the recuperating seal with the back of the seal towards the shim.

Insert the plunger return spring into the open end. Place the trapped-line pressure valve into the end cap, plain side first, i.e. with small spring torwards plunger return spring. Replace end cap complete with lock washer, rubber sealing ring and seal support, ensuring that the legs of the support are even in height when located in the end cap. Tighten the end cap firmly. Pack the dust cover with Girling Rubber Grease and refit together with push rod.

Refit the master cylinder in reverse order to removal. Top up the supply tank with Castrol-Girling Brake Fluid and bleed the system according to the instructions in Section 1, Page 1D2.

When in operation the plunger must NEVER be prevented from returning to its full 'off' position.

12



A 0472

A.S. master cylinder

Introduction

Designed to be bolted to the chassis in such a position that access to the reservoir tank is by a flap in the drivers compartment, the A.S. Master Cylinder (Figs. 1 and 2) is a compact plunger type master cylinder incorporating a trapped-line pressure valve and a cast iron body for optimum service life. A range of sizes is available suitable for most commercial vehicle applications. The piston is operated by a push rod which is connected through the brake linkage directly to the foot pedal and an air cylinder may be fitted in line to enable the input to the master cylinder to be raised.

Upon application of the foot pedal, initial movement of the push rod displaces the piston sufficiently for the cup seal to close the inlet supply port and further movement of the piston builds up pressure which is transmitted through the trapped-line valve to the wheel cylinders. When the foot pedal is released the rapid return of the piston causes the cup seal to momentarily collapse and allows a fast recuperation of the hydraulic fluid.

Residual line-pressure is maintained at between 3 to 12 lb. per square in. by the trapped-line pressure valve and the seals in the wheel cylinders are therefore kept under slight pressure. This prevents any tendency for the wheel cylinder seals to collapse and reduces the possibility of any ingress of air into the system.

Whether the master cylinder is connected direct to the foot pedal or to a servo unit, always ensure that after adjusting the linkage there is a 1/32 in. (0.8 mm) approximate clearance between the push rod and the master cylinder piston when the brake pedal is in the fully 'off' position.

Servicing

Every 50,000 miles (80,000 km) or two years whichever occurs first, all hydraulic cylinders fitted to Commercial Vehicles should be replaced by new guaranteed units. However, provided the working surfaces of the master cylinder and piston are in perfect condition, then new seals from a Girling Service Kit can be fitted. But if doubt exists regarding the condition of the cylinder or piston then a new guaranteed master cylinder must be fitted.

Dismantling

There are various sizes of A.S. master cylinders but basically they are all alike, the type of piston and trapped-line pressure valve fitted differentiates the two main types. The following dismantling and assembly procedure is applicable to both types of cylinder.

Drain the fluid from the system by attaching a bleed tube to a wheel cylinder bleedscrew, place the open end of the tube into a container, unscrew the bleedscrew half a turn and pump out the fluid by operating the foot pedal.

Remove the master cylinder from the vehicle.

Pull back the rubber dust cover and whilst holding the piston against the spring pressure, remove the retaining circlip. Remove the retaining washer, push rod (if fitted), together with the dust cover and identification washer. Pull out the piston and direct a blast of air pressure into the pressure outlet bore, to blow out the cup seal, invert the cylinder and catch the spring and valve assembly as they fall from the bore. Using a length of suitable copper wire bent at one end, hook out the rubber valve seat from the end of the bore ensuring that the bore surface is not damaged while so doing. Remove the seal from the piston and, if possible, from the valve assembly (dependent on the type of valve).

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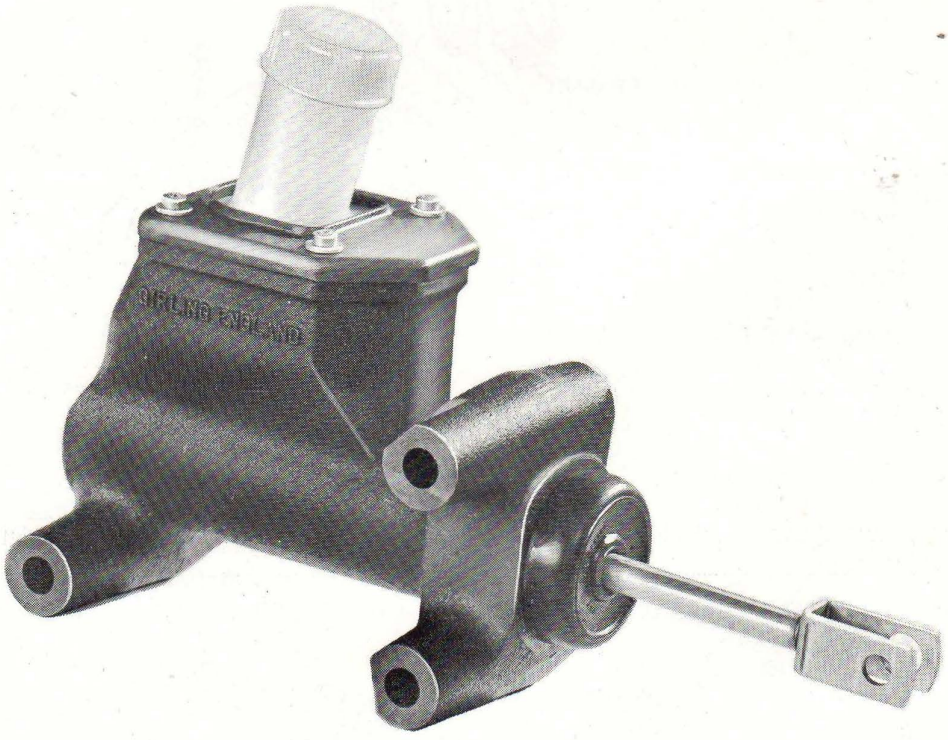

A 0422

A.S. master cylinder

Unscrew the filler cap and remove the cap, the baffle and rubber gasket. Unscrew the setscrews and remove the fluid reservoir cover plate assembly and remove the rubber gasket from the cover.

Cleaning

Replace all seals and parts with those contained in the appropriate Girling Service Kit. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the cylinder body piston bore for excessive wear and corrosion, visible scores and ridges and check that it is smooth to the touch. If in the slightest doubt as to the condition of the bore a new cylinder must be used. Examine all components for excessive wear and corrosion and fit new components if necessary.

Assembling

Use the parts from the Service Kit when re-assembling and lubricate all components with unused Castrol-Girling Brake Fluid before assembling.

Refer to the inset on Fig. 2 and fit the seal onto the piston.

If the trapped-line pressure valve is of the type that the seal can be renewed, fit the new seal ensuring that the seal is fitted correctly.

Locate the valve seat at the bottom of the piston bore. Fit the cup seal to the spring abutment washer with seal pip locating in the hole in the washer and to the opposite end of the spring fit the valve assembly, so that the convex part of the valve body sits inside the spring.

Ensure that the piston bore is well lubricated with unused Castrol-Girling Brake Fluid. Holding the cup seal end of the spring assembly and with the cylinder piston bore positioned vertically over the spring, push the spring, with valve end leading, up the piston bore until the valve contacts the valve seat at the end of the bore.

It is important to maintain the cylinder and spring upright, otherwise it is possible to displace the valve.

Invert the assembly and with the 'star' washer end of the piston leading, push the piston down the bore, easing the entrance of the piston seal. Fit the retaining washer (flat face foremost) and circlip whilst holding the piston against spring pressure. Position the identification washer against the mounting lug flange and smear the lips of the dust cover with Girling Rubber Grease and, if sufficient grease is available, fill the dust cover with the remaining grease and fit.

If the cylinder is not the type that is mounted directly on to a servo unit then the push rod is fitted with retaining washer and circlip.

Fit the rubber gasket to the fluid reservoir cover, position the cover on the body and secure with washers and setscrews.

Fit the rubber gasket to the filler cap, press home the filler cap baffle and screw the cap onto the reservoir cover.

Refit the cylinder to the vehicle ensuring that after adjusting the linkage there is a 1/32 in. (0.8 mm), approximate clearance between the push rod and the master cylinder piston when the brake pedal is in the fully 'off' position.

Fill up the supply tank with unused Castrol-Girling Brake Fluid and bleed the system as detailed in Section 1, Page 1D2.

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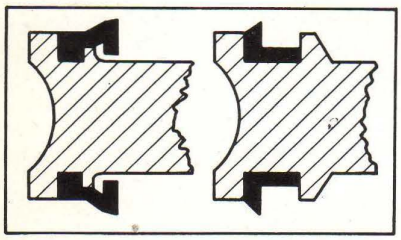
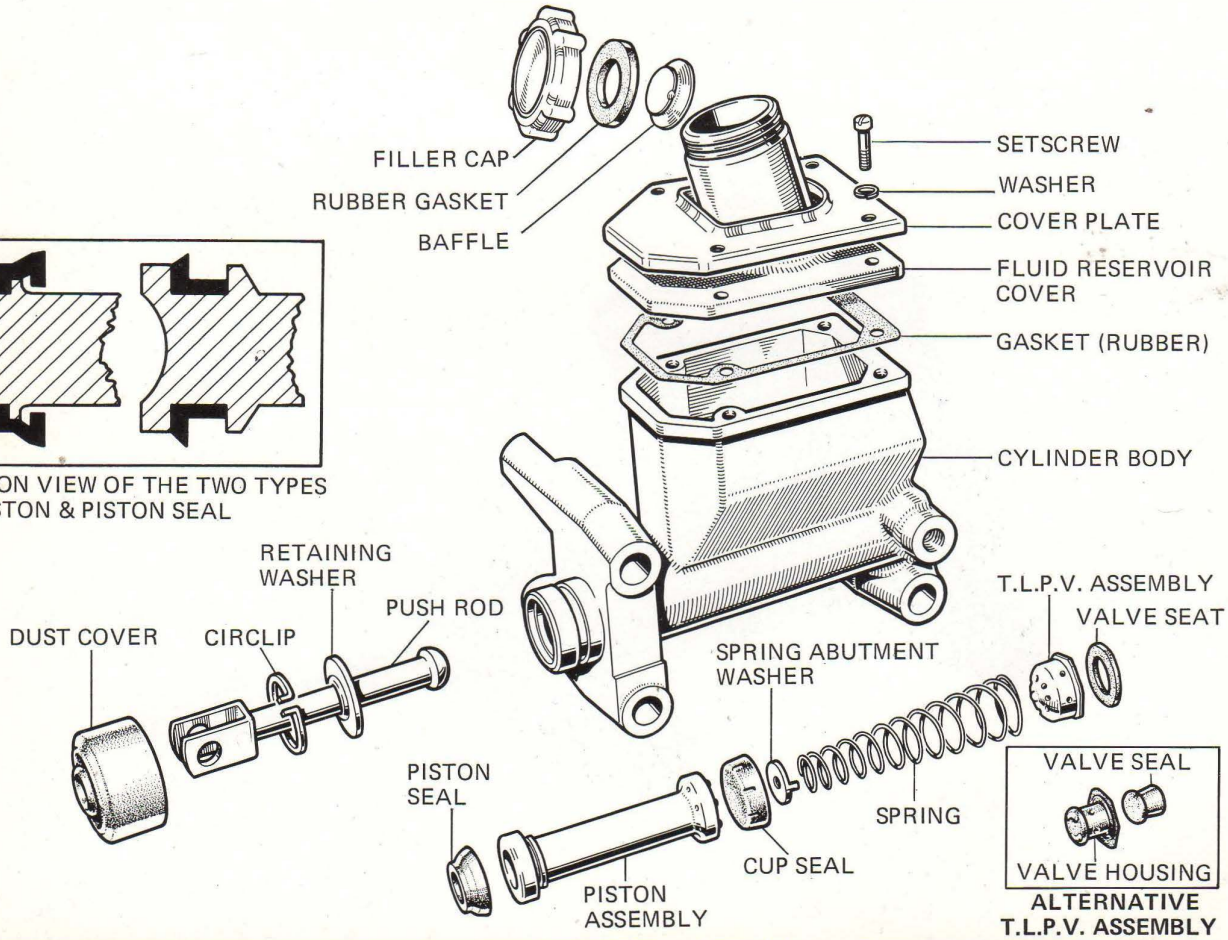


SECTION VIEW OF THE TWO TYPES OF PISTON & PISTON SEAL



A 0423

tandem (T.V.C.V.) master cylinder 5A 4a
(private cars & light commercial vehicles)

Introduction

The Tandem Master Cylinder (Fig. 1), is designed to operate dual-line hydraulic systems. It consists of two independent hydraulic cylinders and should one cylinder, or system, develop a fault the other remains operative.

The two independent cylinders are housed in a single cast-iron body (Fig. 2) and in the "Brake Off" position, the hydraulic fluid can move unrestricted between the dual line systems and the separate reservoirs in the supply tank. Fluid movement to the independent cylinders is controlled by two valves, a Tipping Valve and a Centre Valve; hence T.V.C.V. Tandem Master Cylinder.

When the brake is applied (Fig. 3), a push rod moves the primary plunger up the cylinder bore which allows the spring loaded tipping valve to return to centre. The primary port is closed by the valve and further movement of the primary plunger results in hydraulic pressure being transmitted to the front brakes. At the same time, the pressure created acts in conjunction with the increasing force of the intermediate spring to overcome the stronger secondary spring, thus actuating the secondary plunger. Initial movement of the secondary plunger allows the spring washer under the valve head to resume its natural "bowed" shape and close off the centre valve supply port; hydraulic pressure is then transmitted to the rear brakes.

On the return stroke the plungers move back with the return of the fluid and the final movement results in the two valves being lifted off their seats.

Servicing (Fig. 3)

After every 64,000 km (40,000 miles) or a period of three years, whichever occurs first, all master cylinders fitted to Private Cars and Light Commercial Vehicles should be replaced by new guaranteed units. However, the cylinders may be serviced at this period when new seals from the appropriate Girling Kit should be fitted, but only if the plunger bore is in perfect condition.

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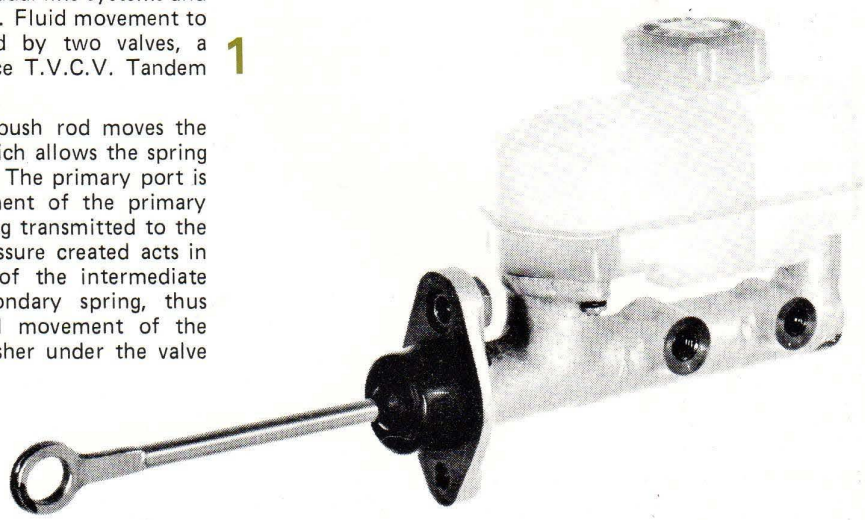
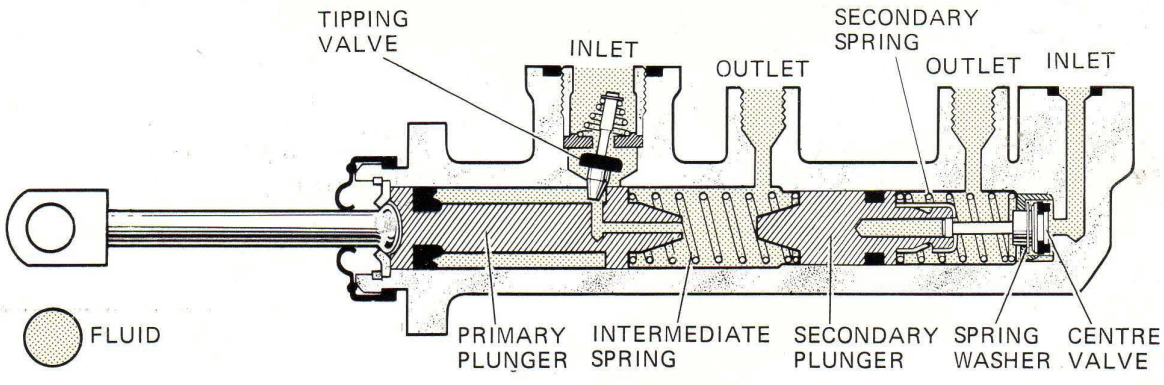
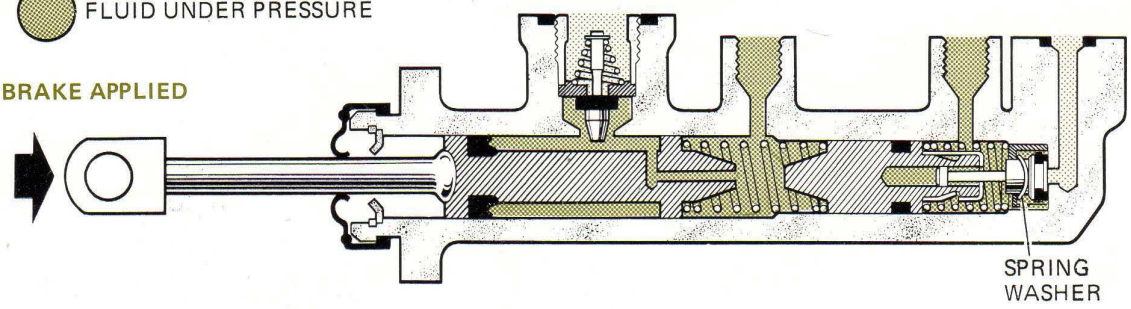


A0874

2 BRAKE OFF



3 BRAKE APPLIED



A0291

5A 4b tandem (T.V.C.V.) master cylinder (private cars & light commercial vehicles)

General Information

There are three distinct types of Tandem Master Cylinders fitted to Private Cars and Light Commercial Vehicles. With one the fluid supply tank is remote from the cylinder (Fig. 4); the second has a supply tank retained by screws at both ends (Fig. 5); the third and most popular type utilizes a supply tank retained at one end by an internal circlip and two screws at the other (Fig. 6).

NOTE: Unless damaged, no attempt should be made to remove the supply tank from the master cylinder illustrated on Fig. 6. Access to the tipping valve is gained by removing the two screws and pivoting the tank from the end retained by the internal circlip.

If a Tandem Master Cylinder does not incorporate a push rod (Fig. 6), then it is fitted onto a direct acting Mechanical Servo Unit. If a push rod is fitted (Figs. 4 and 5) power assistance can be added to the vehicle, if required, but two Girling "Powerstops" must be fitted, one to each of the dual-line systems and expert advice should be sought.

NOTE: Because of the variation in bore sizes, volume ratio and stroke, it is essential when replacing or servicing Tandem Master Cylinders that the correct parts are used.

Dismantling (Figs 4, 5 & 6)

Drain the system of fluid by attaching a rubber tube to a bleedscrew, unscrew half a turn and pump out the fluid by operating the foot pedal.

NOTE: Discard the fluid.

Disconnect the pipes from the master cylinder. Unscrew the securing nuts, disconnect the push rod, or remove from the Mechanical Servo Unit as applicable, and remove the cylinder from its mounting. Unscrew the filler cap and drain out surplus fluid from the supply tank.

If a push rod is fitted, pull back the rubber dust cover and remove the circlip with a pair of long nosed pliers. If a diaphragm type of dust cover is fitted (Fig. 4), the metal retaining band should be removed without damage.

If the cylinder being serviced is similar to the one shown on Fig. 6, the fluid supply tank should not be removed during normal servicing and access to the tipping valve is gained by removing the two retaining screws and pivoting the tank at the retained end as illustrated.

NOTE: If damaged, the retained tank should be renewed as described on page 5A 4d.

If, however, the cylinder being serviced is similar to the one shown on Fig. 5, then access to the tipping valve is gained by unscrewing the two retaining screws at each end of the cylinder and removing the tank completely.

Remove the face seals and unscrew the tipping valve securing nut.

Depress the primary plunger and remove the tipping valve. The internal parts can now be removed, either by shaking the cylinder body or by compressed air pressure.

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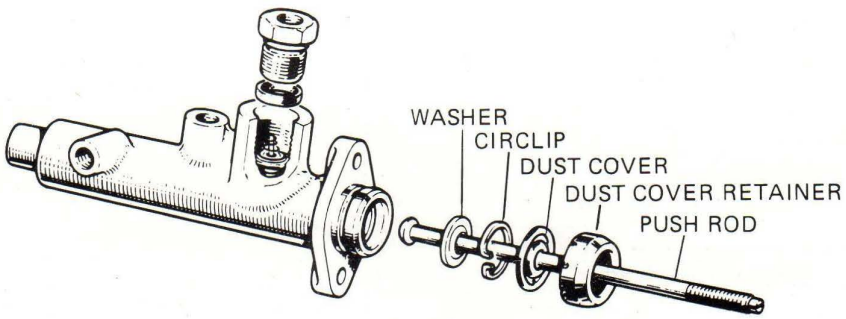

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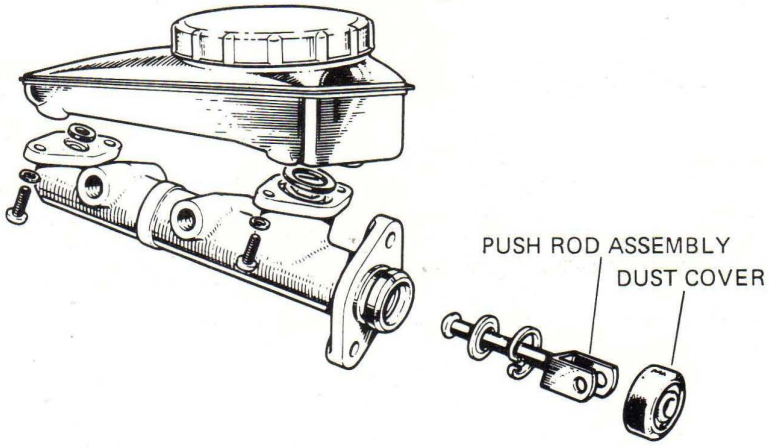

A0228

tandem (T.V.C.V.) master cylinder 5A 4c
(private cars & light commercial vehicles)

NOTE: Care must be taken to keep each plunger and its spring together at all times. Whilst both springs look alike, the secondary spring is stronger than the intermediate spring.

Separate the plungers and the intermediate spring.

To dismantle the secondary plunger assembly (Fig. 7); lift the leaf of the spring retainer and remove the spring and centre valve sub-assembly from the secondary plunger. Remove the spring, valve spacer and spring washer from the valve stem and the valve seal from the valve head.

Remove the seals from the primary and secondary plungers. Lever out the baffle and remove the cap washer from the filler cap.

Cleaning

Comparison of the parts contained in the appropriate Girling Service Kit will indicate which parts should be discarded. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid.

Examine the plungers and the bore of the cylinder for visible score marks, ridges and corrosion; check the bore is smooth to the touch. If there is the slightest doubt regarding the condition of the bore, then a new guaranteed master cylinder must be fitted.

Assembling

Lubricate the gland and ring seals with unused Castrol-Girling Brake Fluid. Fit the gland seal to the primary plunger and the ring seal to the secondary plunger.

Refer to Fig. 7 and fit the valve seal, smallest diameter leading, onto the valve head. Position the spring washer on the valve stem so that it flares away from the valve shoulder and follow with the valve spacer, legs first. Attach the spring retainer to the valve stem, keyhole first. Slide the secondary spring over the retainer and position the sub-assembly on the secondary plunger.

The spring must be compressed whilst the leaf of the spring retainer is pressed down behind the head of the plunger. To do this a bench vice is necessary and to prevent possible contamination two small pieces of clean paper are also required to protect the hydraulic parts. Refer to Fig. 8 and position the sub-assembly between the jaws of a bench vice with a clean piece of paper interposed between each end of the sub-assembly and the jaws of the vice. Close the vice to compress the spring until it is almost coil bound. Use a suitable small screwdriver to press the spring retainer back against the secondary plunger as illustrated (Fig. 8).

NOTE: It is important that the spring retainer is pressed right back against the secondary plunger.

Refer to Fig. 9 and using a pair of pointed nosed pliers, depress the leaf of the spring retainer behind the head of the plunger.

NOTE: It is essential to ensure that the retainer leaf is straight and firmly located behind the plunger head as shown on Fig. 7.

Liberally lubricate the cylinder bore and plunger seals with Castrol-Girling Brake Fluid.

Fit the intermediate spring into position between the primary and secondary plungers and, with centre valve end leading, insert into the cylinder bore easing the entrance of the plunger seals. Press the primary plunger down the bore to fit the tipping valve assembly. Fit the face seal and screw in the tipping valve securing nut; tighten to a torque of 47 to 54 Nm (35 to 40 lbf. ft.).

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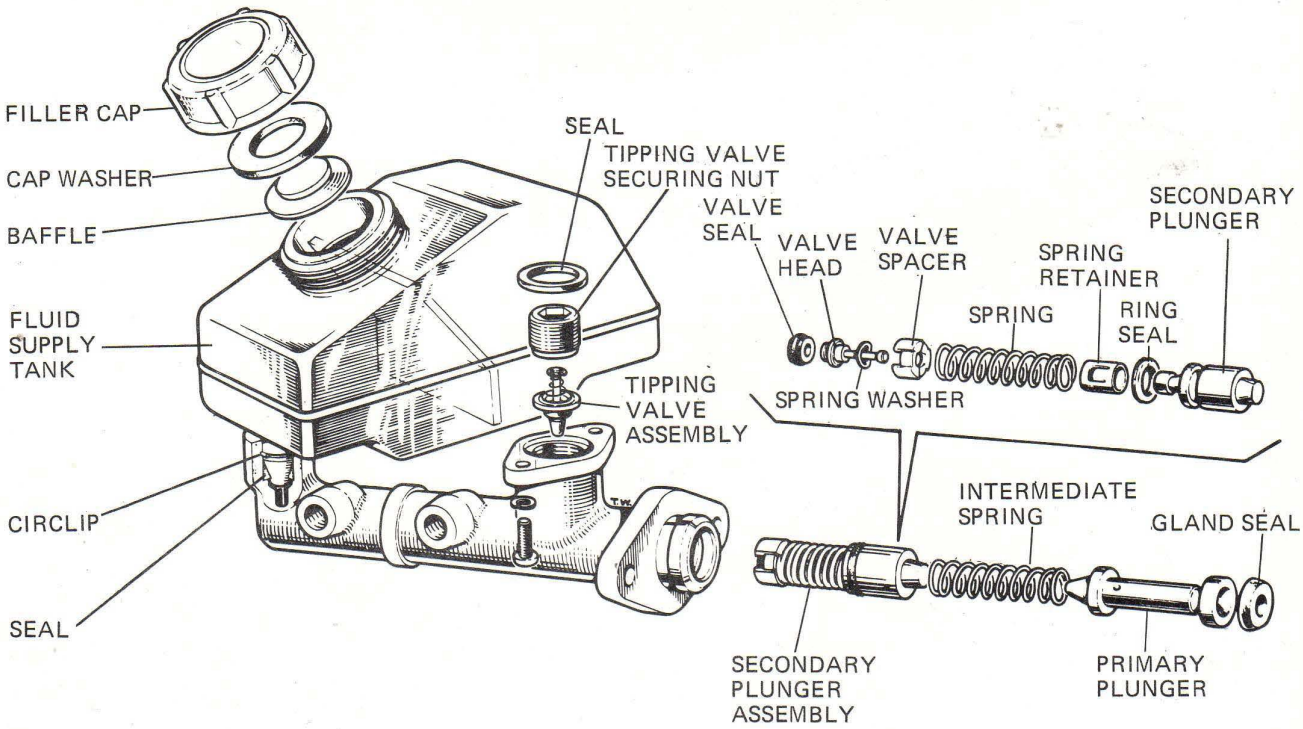

A0875

If a push rod is fitted, smear the sealing areas of the rubber dust cover with Girling Rubber Grease and fit to the push rod. If the push rod has a clevis (Fig. 5), fit the dust cover from the opposite end and ease it over the washer. Use the remainder of the Girling Rubber Grease to pack the dust cover and fit the push rod, circlip and dust cover to the cylinder.

Alternatively, if the dust cover is the diaphragm type; liberally smear the cover, the metal band and the plunger bore entrance with Girling Rubber Grease. Fit the dust cover to the push rod and position over the cylinder bore. Firmly press the metal retaining band against the dust cover and, whilst maintaining this position, crimp the metal band in three equally spaced places to secure. Fit the cap washer and baffle to the filler cap and screw the cap onto the fluid supply tank. Check the face seals are in position and offer the supply tank to the cylinder; secure with the screws and washers.

When refitting the cylinder to the vehicle, temporarily cover all open bores to prevent foreign matter entering the cylinder.

NOTE: When connecting the push rod it is essential to preserve the 0.8 mm (1/32 in.) gap between the push rod and the primary plunger when the push rod is fully returned. With installations where the pedal returns until checked by the cylinder there is no danger, but where a separate pedal stop or stop light switch is fitted care must be taken.

Connect up the brake pipes and bleed the system in the recommended manner.

If the master cylinder does not incorporate a push rod and fits directly onto a Girling Mechanical Servo Unit, there is no necessity to alter the height of the push rod fitted to the Servo Unit.

Supply Tank Replacement (Fig. 6)

If damaged, the supply tank retained by an internal circlip may be renewed, and kits containing the necessary parts are available, but the master cylinder must first be removed from the vehicle and then dismantled.

The procedure for renewing the supply tank is as follows:—

1. Remove the master cylinder from the vehicle and dismantle as previously described.
2. Lever the supply tank from the cylinder body and remove the circlip and seal.
3. Ensure the cylinder body is undamaged and clean.
4. Fit the new seal and circlip into the cylinder body, lubricate applicable parts with unused Castrol-Girling Brake Fluid, then press the supply tank into position on the cylinder body.
5. Re-assembly the master cylinder as described previously and test for leaks as follows:— Blank off both outlet connections and top up the supply tank with Castrol-Girling Brake Fluid. Apply an air pressure of 30 to 35 p.s.i. to the filler cap connection. If satisfactory, refit the master cylinder to the vehicle and bleed the system as detailed in Section 1, Page 1D1.

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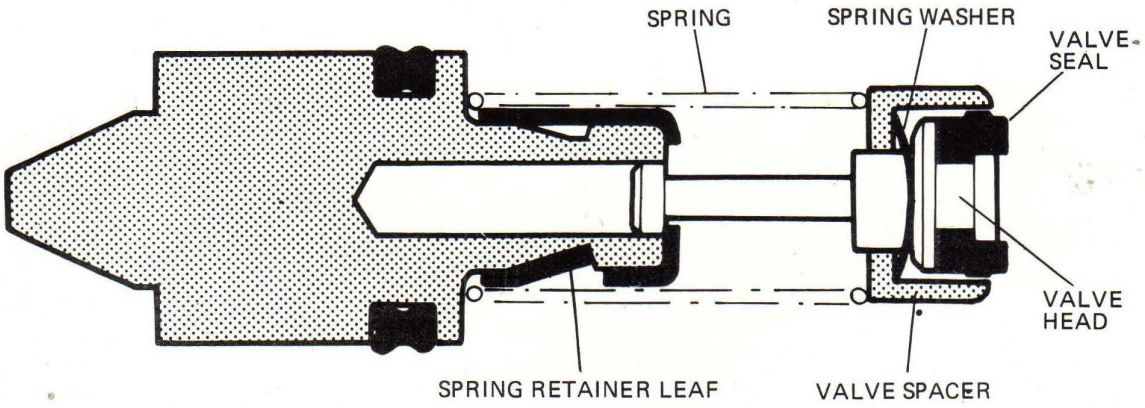

A0304

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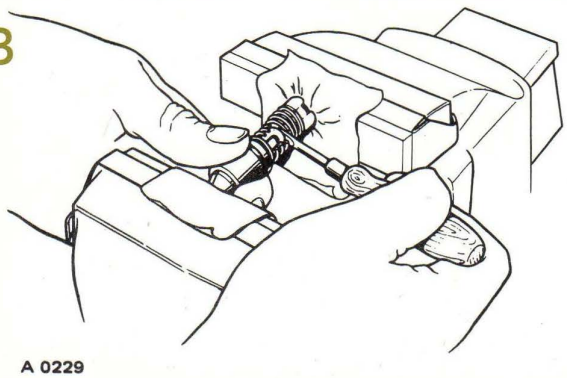

A 0229

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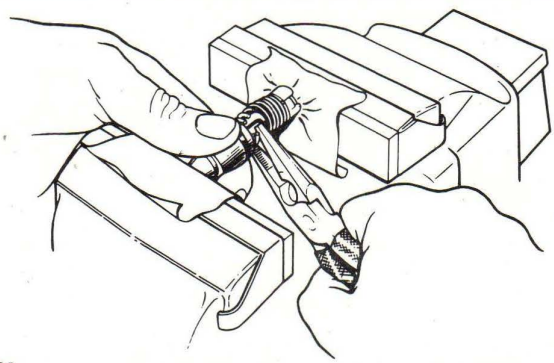

A 0230

tandem (T.V.C.V.) master cylinder (commercial vehicles) 5A 5a

Introduction

This type of master cylinder (Fig. 1), consists of two independent and complete hydraulic cylinders in series, one operating on the front brakes and the other on the rear, so that in the unlikely event of one system failing, the other system will provide an effective brake.

Upon application of brake pedal pressure, the push rod moves the primary plunger up the cylinder bore and allows a spring loaded tipping valve to return to centre. The primary supply port is closed by the valve and further movement of the primary plunger results in hydraulic pressure being transmitted via a trapped-line pressure valve, to the wheel cylinders of the rear brakes. At the same time the pressure created acts in conjunction with the increasing force of the primary spring to overcome the stronger secondary spring, thus actuating the secondary plunger.
Initial movement of the secondary plunger closes off the centre valve supply port and the hydraulic pressure is transmitted, via a second trapped-line pressure valve, to the wheel cylinders of the front brakes.

In case of a failure in either chamber, or circuit, mechanical contact takes place within the cylinder and the remaining chamber builds up the normal pressure to operate the brakes, front or rear, which it controls.

Servicing

Every 50,000 miles (80,000 km) or two years, whichever occurs first, all hydraulic cylinders fitted to Commercial Vehicles should be replaced by new guaranteed units. However, provided the working surfaces of the master cylinder and plungers are in perfect condition, then new seals from a Girling Service Kit can be fitted. But if doubt exists regarding the condition of the cylinder bore or plungers then a new guaranteed master cylinder must be fitted.

Dismantling

Drain both front and rear systems of fluid by attaching a bleed tube to one front and one rear wheel cylinder bleedscrew, then place the open end of each tube into a container, unscrew the bleedscrew half a turn and pump out the fluid by operating the foot pedal.

Disconnect the pipe nuts at the inlet and outlet ports, unscrew the flange fixing bolts and remove the cylinder from the vehicle.

Unscrew the supply adaptor then depress the primary plunger to withdraw the tipping valve assembly.

Unscrew the outlet adaptors and withdraw the valve assemblies and seals. Extract the secondary plunger retaining pin from the primary outlet bore by shaking the body until the pin can be withdrawn.

Shake out the primary plunger and spring and the secondary plunger assembly.

Lift the spring retainer leaf and remove the spring from the secondary plunger. Compress the spring to disengage the valve stem from the keyhole of the spring retainer, thus releasing the tension of the spring. Remove the spring, valve spacer and spring washer from the valve stem and the valve seal from the valve head.

As shown in the inset (Fig. 2) with the early type cylinders the primary spring was retained in a similar manner to the secondary spring, but with the present type the primary spring located on

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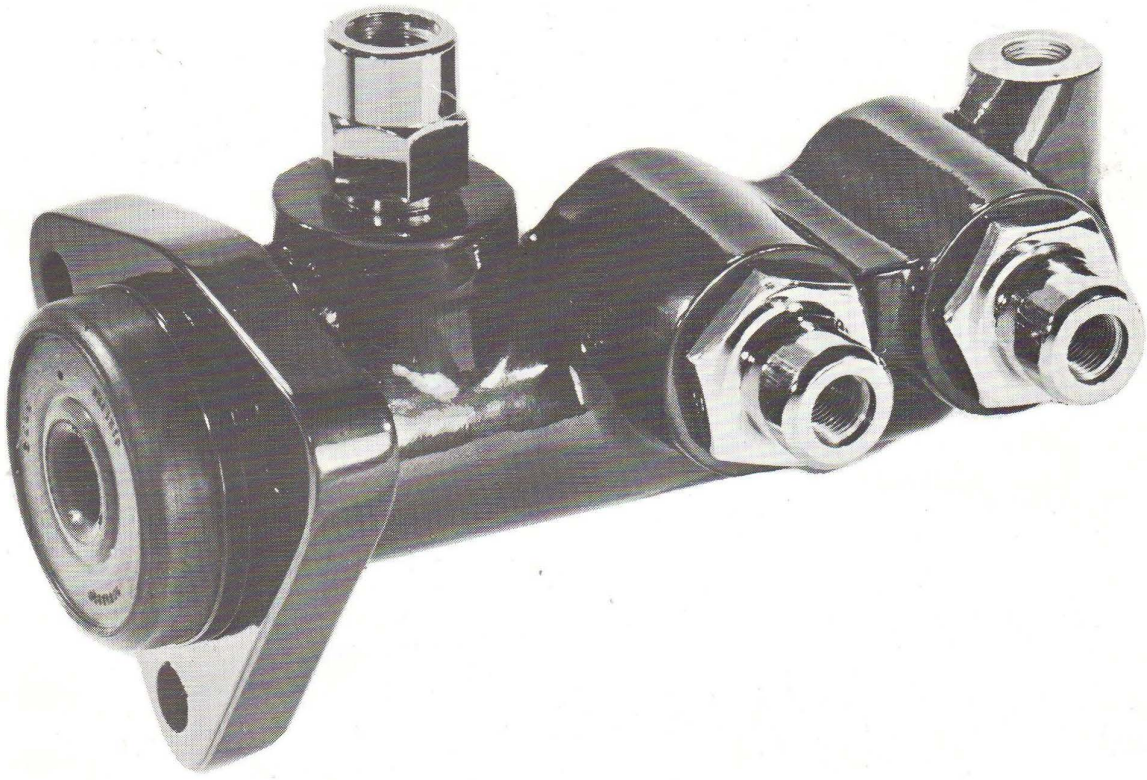

A 0488

tandem (T.V.C.V.) master cylinder (commercial vehicles)

the spigots of the primary and secondary plungers. Remove or dismantle as applicable.

Remove the seals from the primary and secondary plungers. Compress the primary spring to disengage the stem from the keyhole slot of one of the spring retainers and separate these components.

Cleaning

Comparison of the parts contained in the appropriate Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place the cleaned parts onto a clean sheet of paper.

Examine the plungers and cylinder bore for visible score marks ridges and corrosion. Check the bore is smooth to the touch. If there is the slightest doubt as to the condition of the parts then a new guranteed master cylinder must be fitted. Inspect all other components to see they are in good working order.

Assembly

Use the new parts from the Girling Service Kit when re-assembling. Refer to the inset on Fig. 2 and fit the valve seal, smallest diameter leading, to the valve head. Position the spring washer on the valve stem so that it 'flares' away from the valve stem shoulder (as illustrated) and follow with the valve spacer, legs first, and (longer) secondary spring.

Fit the spring retainer to the spring and compress the spring until the valve stem passes through the keyhole slot and engages in the centre. Fit the spring sub-assembly immediately to the secondary plunger and press home the leaf of the spring retainer to secure.

Early type cylinders only: Fit the large and small spring retainer to the primary spring and pass the stem through the slot in the large spring retainer locating the stem head in the slot. Compress the spring until the opposite end of the stem passes through the keyhole and is engaged in the centre; fit the sub-assembly to the primary plunger and press home the spring retainer leaf to secure.

Fit the seals to the primary and secondary plungers and liberally lubricate the seals and the cylinder plunger bore with unused Castrol-Girling Brake Fluid. Insert the secondary plunger assembly into the plunger bore and follow with the primary spring and primary plunger, or the primary plunger assembly (as applicable).

Position the tipping valve above the primary supply bore and depress the primary plunger to locate the valve stem behind the plunger flange. Refit the secondary plunger retaining pin. Fit the copper gasket, position the identification washer and screw the supply adaptor into the body.

Fit seals to the valve housings, fit the housings to the springs and position in the body, Fit the face sealing rings and fit the valve seats to the outlet adaptors, screw the adaptors into the body.

Lubricate the sealing areas of the dust cover with Castrol-Girling Rubber Grease and use the rest of the grease to pack the cover. Fit the dust cover to the cylinder body.

Refit the cylinder assembly to the vehicle and ensure there is a clearance between the push rod and the primary plunger. Connect up the hydraulic pipes, fill up the supply tanks described with unused Castrol-Girling Brake Fluid and bleed the system as in Section 1 Page 1D2.

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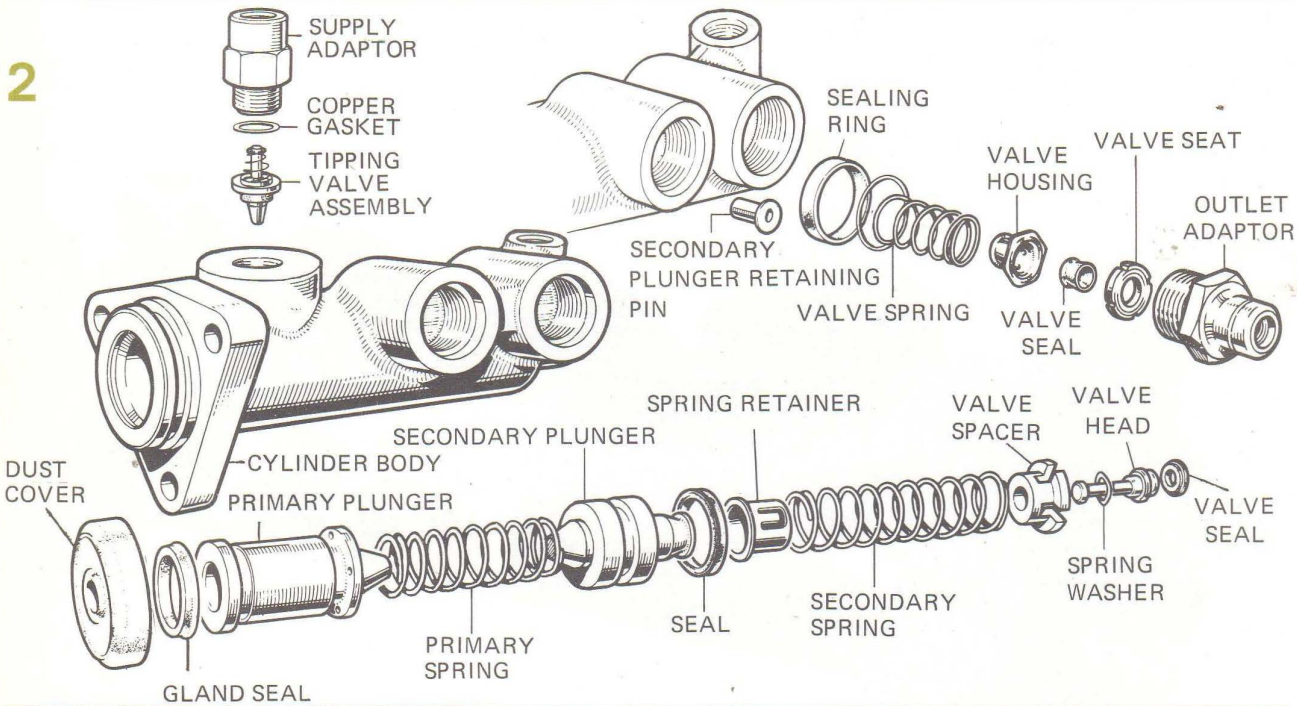

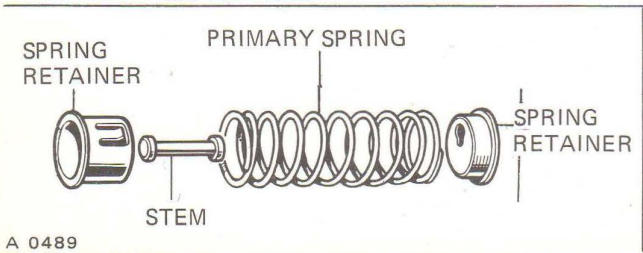

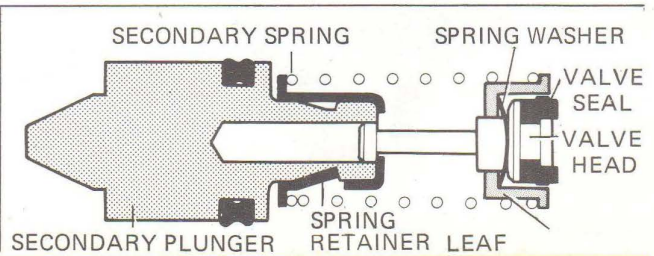

A 0489

tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

5A 6a

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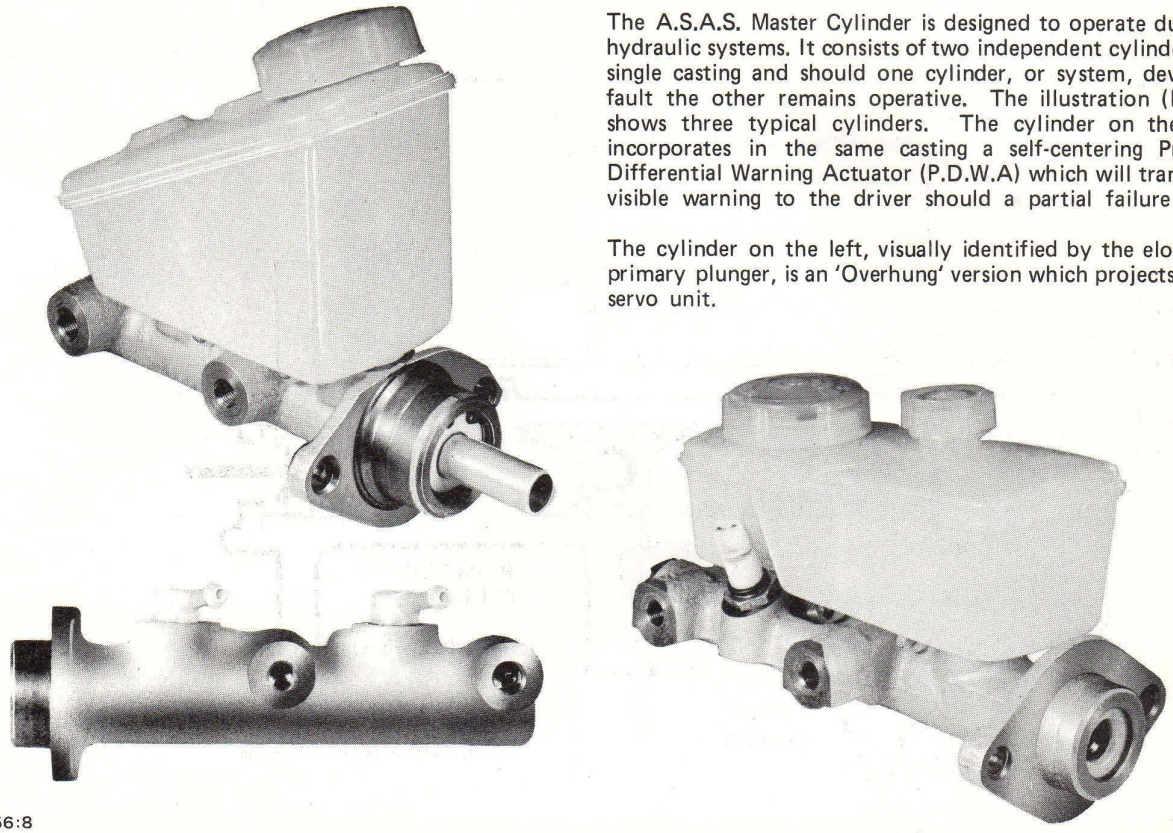


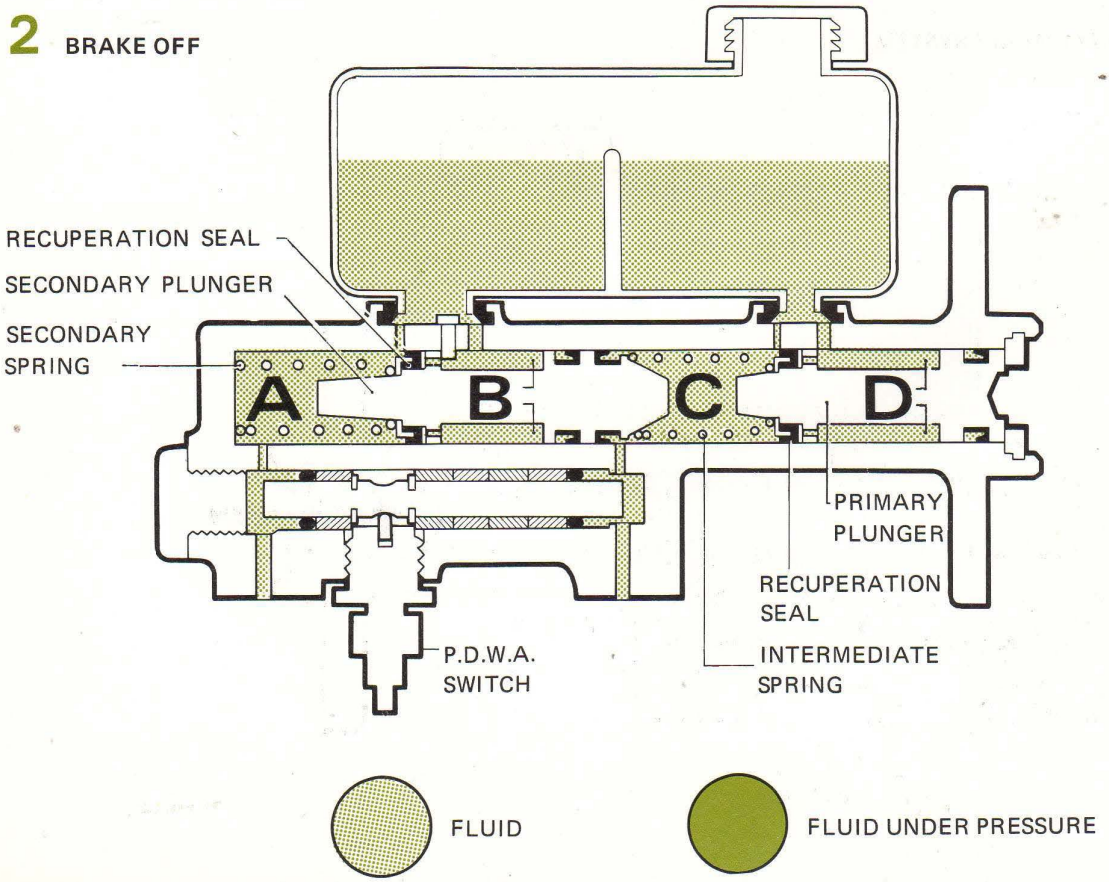
A0756:8

Introduction

The A.S.A.S. Master Cylinder is designed to operate dual-line hydraulic systems. It consists of two independent cylinders in a single casting and should one cylinder, or system, develop a fault the other remains operative. The illustration (Fig. 1) shows three typical cylinders. The cylinder on the right incorporates in the same casting a self-centering Pressure Differential Warning Actuator (P.D.W.A) which will transmit a visible warning to the driver should a partial failure occur.

The cylinder on the left, visually identified by the elongated primary plunger, is an 'Overhung' version which projects into a servo unit.

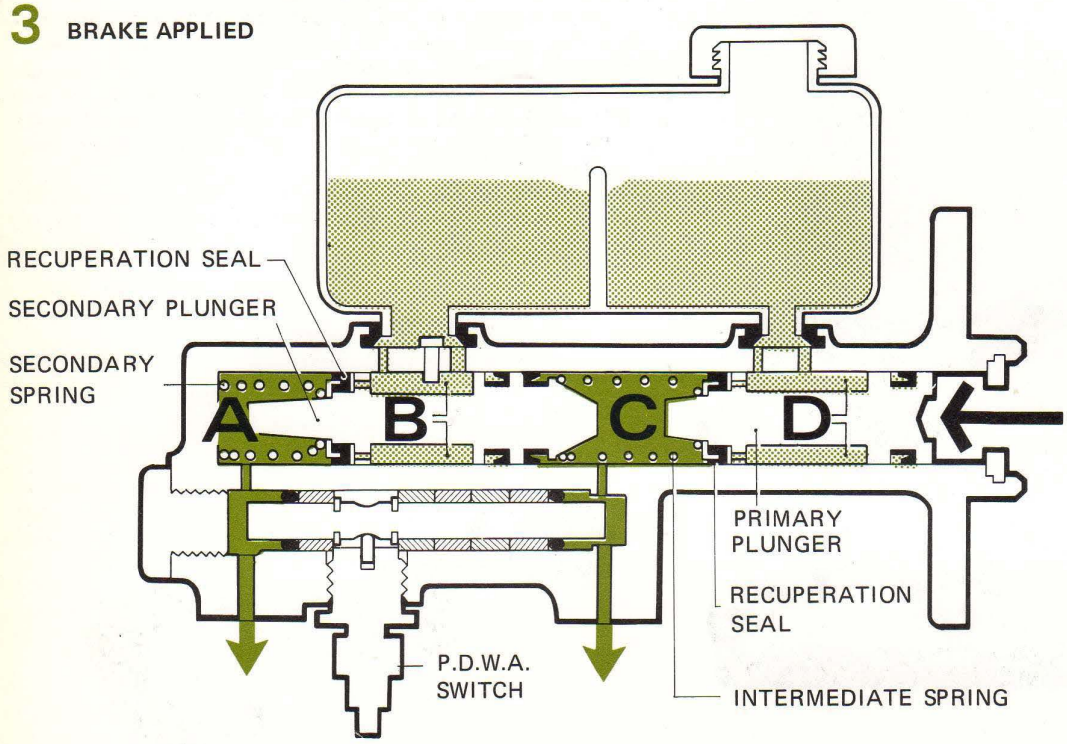
2 BRAKE OFF



A0649/1

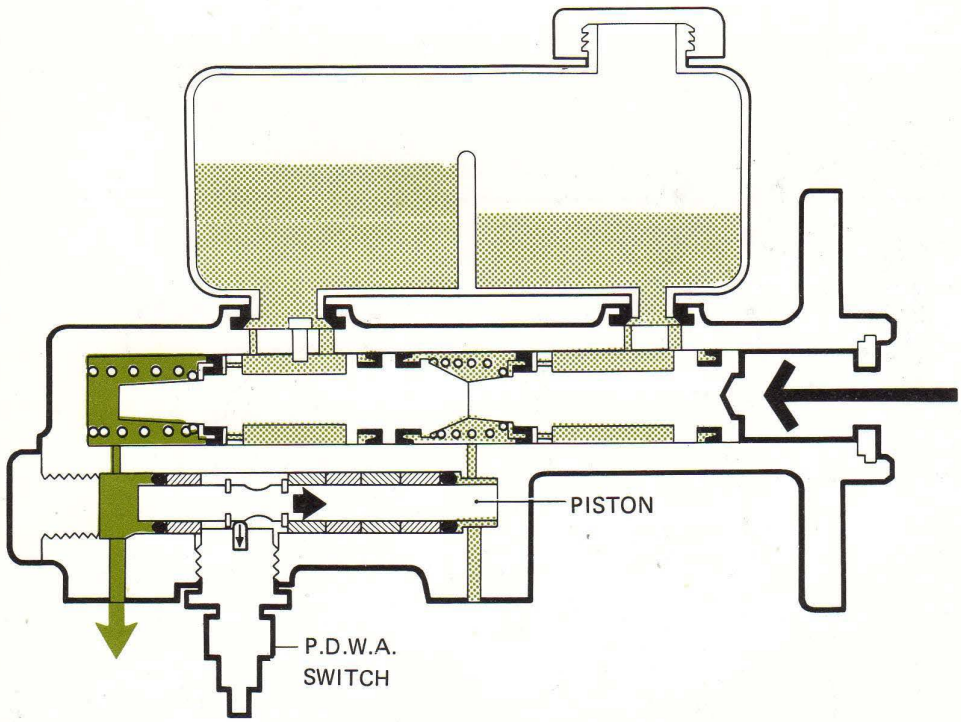
5A 6b tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

3 BRAKE APPLIED



A0649/2

4 FAILURE IN PRIMARY SYSTEM



A0650/1

tandem (A.S.A.S.) master cylinder 5A 6c
(private cars & light commercial vehicles)

When the brakes are off (Fig. 2), the hydraulic fluid can move unrestricted between the dual-line system and the separate reservoirs in the fluid supply tank. When the foot brake is applied (Fig.3), the primary plunger moves up the cylinder bore and the pressure created acts in conjunction with the increasing force of the intermediate spring to overcome the stronger secondary spring, thus moving the secondary plunger up the bore at the same time. Initial movement of both plungers takes the recuperating seals past the bypass holes in chambers 'A' and 'C' and this action applies pressure to the fluid in those chambers, which is directed via the P.D.W.A. to the respective cylinders of each of the separate systems. The fluid in chambers 'B' and 'D' is unaffected by movement of the plungers and can move unrestricted between the separate chambers and respective reservoirs in the fluid supply tank, both before and during brake application.

When the brakes are released, the plungers, aided by the return springs, are retracted faster than the fluid and this creates a vacuum between the fluid in chambers 'A' and 'C' and the recuperation seals. The recuperation seals momenterally collapse, thus allowing fluid in chambers 'B' and 'D', which was unaffected by the movement of the plungers, to flow through the holes in the plungers, over the collapsed seals and into chambers 'A' and 'C' respectfully. The movement of fluid from the one set of chambers to the other, is compensated for by fluid from the separate reservoirs in the supply tank moving through the feed holes in the cylinder. Conversely, the final return movement of the plungers causes the extra fluid in chambers 'A' and 'C' to move through the bypass holes and into the fluid reservoirs.

Should a failure occur in one system, brake pedal travel will increase and the resultant imbalance of pressures would cause the P.D.W.A. piston to move towards the system in which the failure and loss of pressure had occured (Figs. 4 and 5). As the plunger of the electrical switch assembly seats in a groove in the piston, movement of the piston pushes the plunger into the body of the electrical switch and completes the electrical circuit to a warning light on the dashboard.

The remaining system will still operate effectively and once the fault is traced and rectified, the P.D.W.A. piston automatically returns to its neutral position and this would be indicated by the light going out on the dashboard.

Servicing

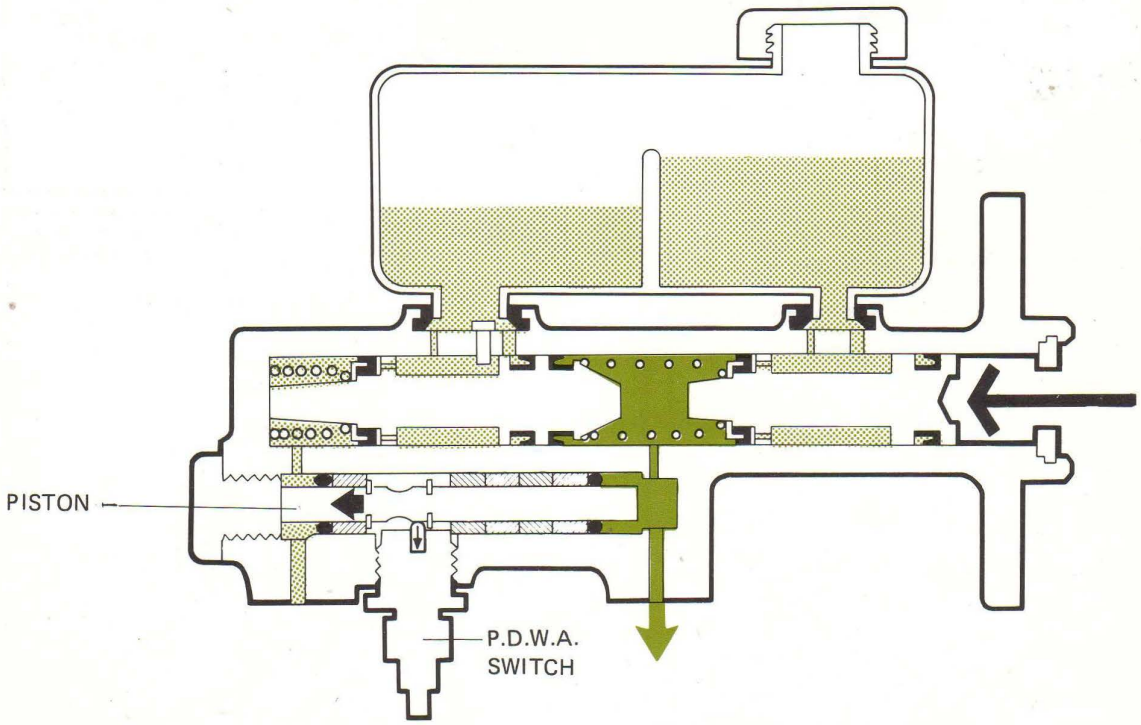
Every 64,000 km (40,000 miles) or a period of three years, whichever occurs first, master cylinders fitted to Private Cars and Light Commercial Vehicles should be replaced by new guaranteed units. However, the cylinders can be overhauled at this juncture and new seals fitted, from the appropriate Girling Service Kit, but only if the plunger bore is in perfect condition.

A modification to the secondary plunger affected the number of seals fitted to the plungers. Original cylinders (Figs.2,3,4 & 5) included five seals, two on the primary plunger and three on the secondary plunger; whereas all current production units include only four seals, two on each plunger. Interchangeability is not affected in that a four seal Mk2 cylinder can replace a five seal Mk1 unit, but not vice-versa.

IMPORTANT: WHEN OVERHAULING A FIVE SEAL UNIT ALL FIVE SEALS MUST BE FITTED

If a breather hole (Fig. 26) is incorporated in the 'Overhung' type master cylinder, periodically check to see it is clear. Under normal circumstances, there should be no danger of blockage and the only checks necessary should be at the recommended overhaul period. If blocked, refer to 'Cleaning'

5 FAILURE IN SECONDARY SYSTEM



A0650/2

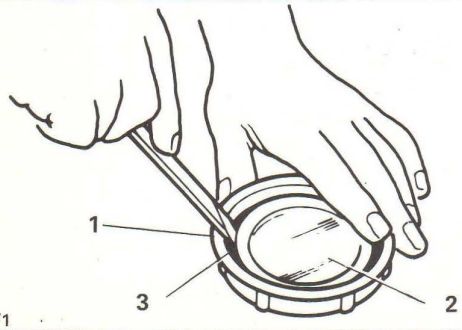
5A 6d tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

Dismantling

A small screwdriver with the end rounded and polished is required to remove the seals. Before proceeding, make sure the cylinder, work area, all tools and the hands are clean. Care must also be taken to keep each plunger and its spring together at all times; whilst both springs may look alike, the secondary plunger spring is stronger and has a thicker coil.

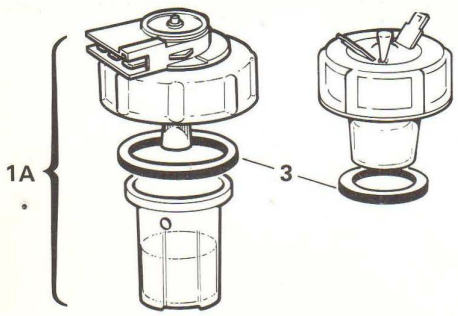
Whilst details may vary from those shown, the general procedure should be followed.

6 Unscrew filler cap (1) and drain off surplus brake fluid. Lever out plastic baffle (2) and remove rubber washer (3). Some cylinders have two filler caps.



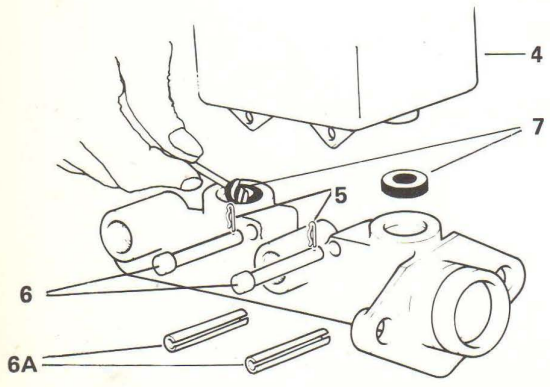
A0653/1

7 Some filler caps incorporate a fluid level indicator (1A); remove only the rubber washer (3).



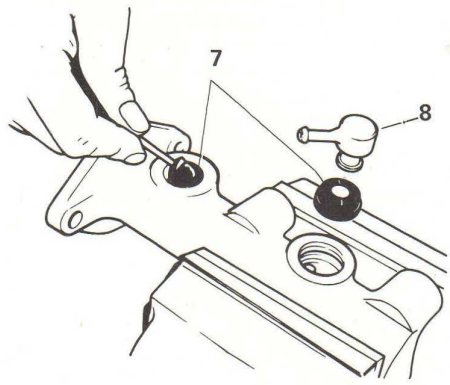
A0929/1

8 To remove fluid reservoir (4); Remove the pin retaining clips (5) and withdraw the fluid reservoir fixing pins (6); alternatively remove roll pins (6A). Pull the reservoir off the master cylinder and lever out the seals (7).



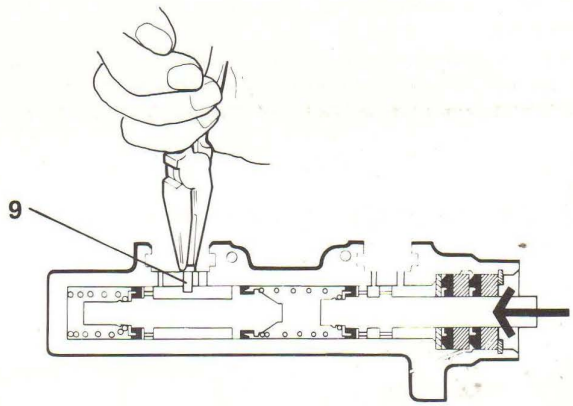
A1132

9 If adaptors are fitted, instead of a fluid reservoir; clamp cylinder in bench vice, pull off adaptors (8) and lever out seals (7).
Some reservoirs are 'self retaining', in a similar style to the adaptors; pull off the reservoir and remove the seals.



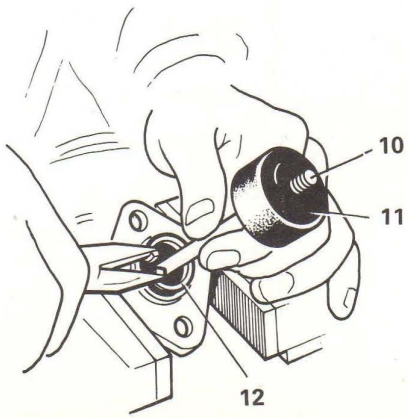
A0735/1

10 Push plunger fully down cylinder bore and withdraw secondary plunger stop pin (9).



A1082

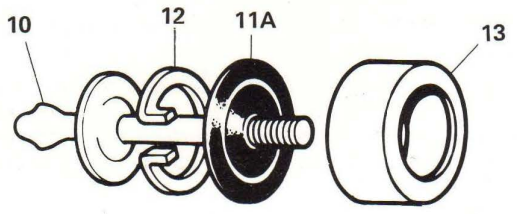
11 If a push rod is fitted (10); clamp cylinder in bench vice as shown, pull back rubber dust cover (11), press on push rod and remove circlip (12) with long nosed pliers.



A0735/3

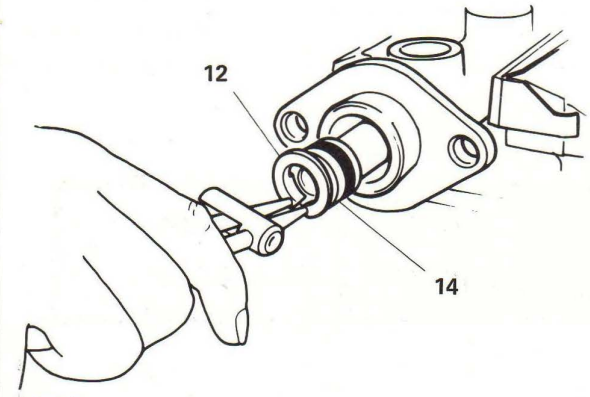
tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

12 Some cylinders may have a flat dust cover (11A) and as the metal retaining band (13) must be used again on reassembly, carefully prise back the indentations in the edge to remove it from the cylinder. The push rod (10) can then be removed by removing the circlip (12).



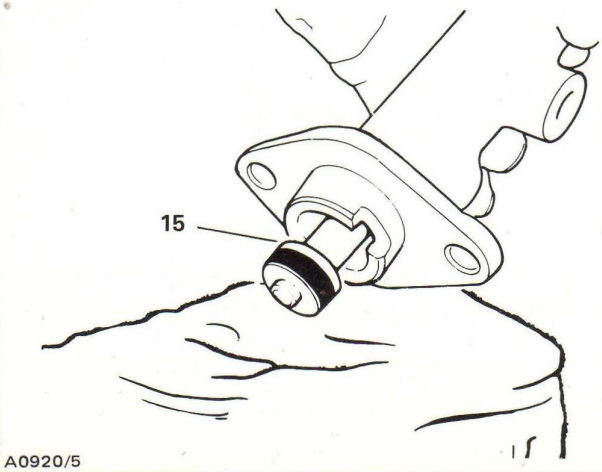
A0736/2

13 Remove circlip (12) and withdraw primary plunger assembly (14).



A0653/5

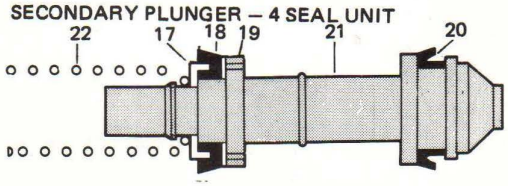
14 Tap cylinder on soft or wooden surface to remove secondary plunger assembly (15). If necessary, lubricate cylinder bore with unused Castrol-Girling Brake Fluid to ease removal.



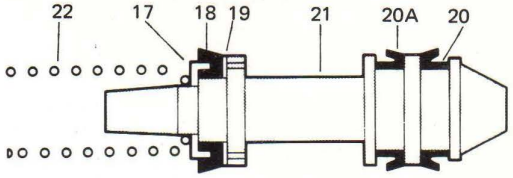
A0920/5

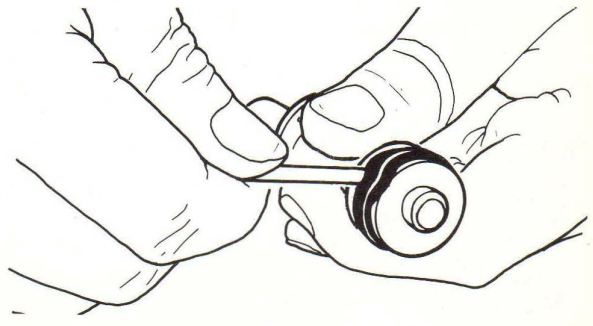
15 Remove secondary plunger spring (22), seal retainer (17), recuperating seal (18) and washer (19). Taking care not to damage the plunger (21), remove seal (20) on four seal units or seals (20) and (20A) on five seal units. Keep the plunger and its spring together at all times.

SECONDARY PLUNGER – 4 SEAL UNIT



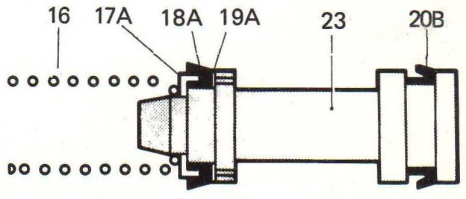
SECONDARY PLUNGER – 5 SEAL UNIT





A0920/1

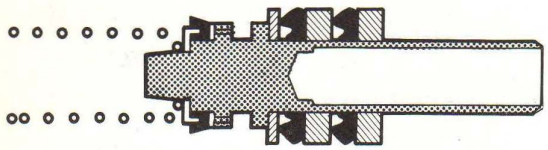
16 Remove primary plunger spring (16), seal retainer (17A) recuperating seal (18A) and washer (19A). Taking care not to damage the plunger (23), remove the seal (20B). Keep the plunger and its spring together at all times.



A0920/2

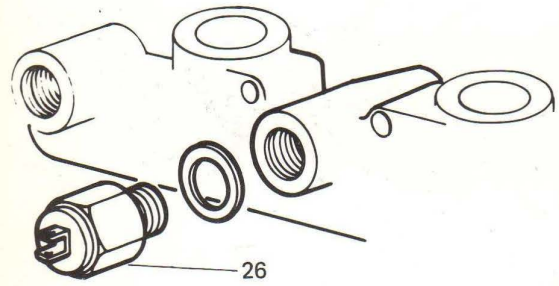
5A 6f tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

17 On 'Overhung' cylinders the primary plunger looks like this but the same procedure should be followed.



A0735/4

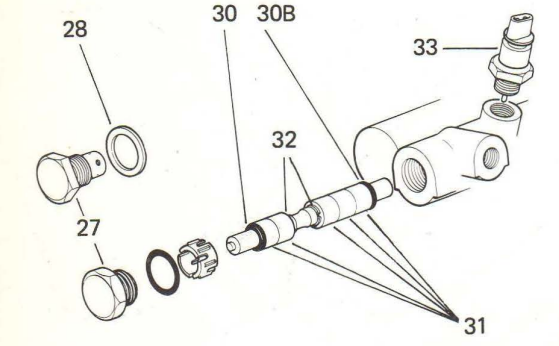
18 If fitted, unscrew the stop-light switch (26).



A0736/1

Dismantling the P.D.W.A.

19 Unscrew the switch assembly (33). Unscrew the end plug (27) and remove the gasket (28), or 'O' ring and spacer. Tap the cylinder on a soft or wooden surface to remove the internal parts; note the position and number of sleeves (31) for reassembly. If necessary, hook out the 'O' ring (30B) at the bottom of the bore, but care must be taken to prevent damaging the surface of the cylinder. Replace circlips (32) only if damaged; care must be taken not to damage the piston if the circlips are removed.



A0930

Cleaning

The cylinder is now completely dismantled. The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the cylinder bores, the plungers and P.D.W.A. piston for visible score marks, ridges and corrosion. The cylinder bores should be smooth to the touch. Unless in perfect condition, fit a new guaranteed master cylinder. Ensure the threads of the P.D.W.A. switch, end plug and unit body are undamaged; check the switch and end plug screw easily into the body.

Examine the 'Overhung' type master cylinder to ensure that the breather hole (Fig. 26) is clear and free from dirt and grease. If the breather hole is blocked clean by washing the cylinder body with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid.

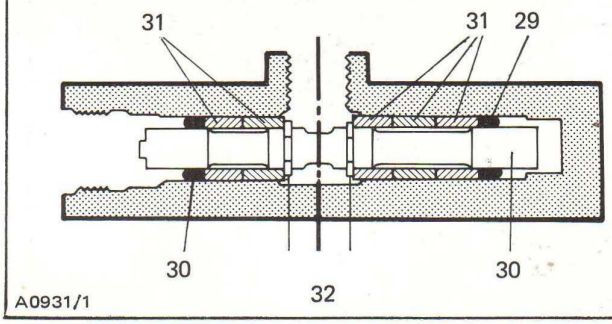
Reassembly

TO HELP PREVENT DAMAGE, IT IS ESSENTIAL THAT GENEROUS AMOUNTS OF UNUSED CASTROL-GIRLING BRAKE FLUID ARE USED AT ALL STAGES OF SEAL ASSEMBLY.

If an integral P.W.D.A. is not incorporated, proceed to Fig. 23.

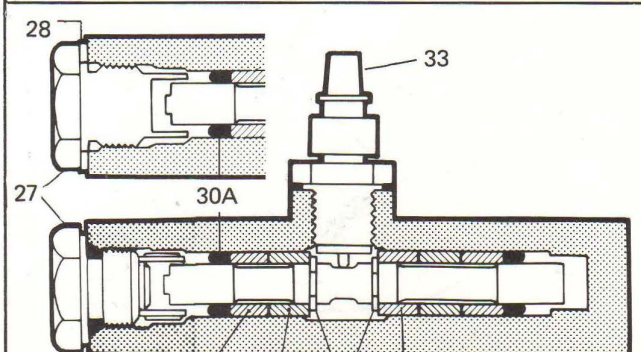
Assembling the P.D.W.A.

20 Fit circlips (32) to the piston (29). Follow with sleeves (31) and new 'O' rings (30). Lubricate parts and cylinder bore with unused Castrol-Girling Brake Fluid and insert the piston until the radiused groove in the piston is centrally opposite the switch aperture.
Ensure the sleeves are positioned on the piston in the same order as noted when dismantling.



A0931/1

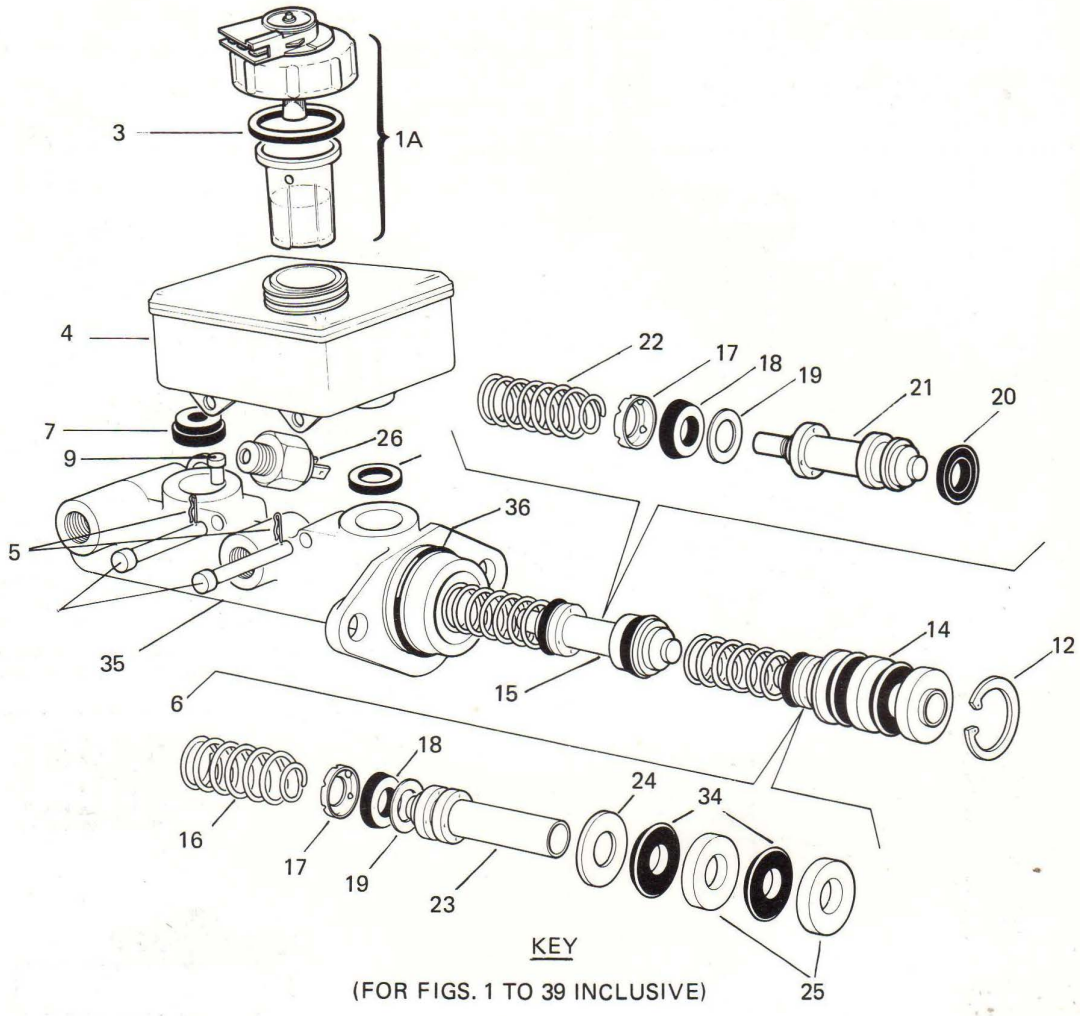
21 Ensure the switch (33) will not foul the sleeves (31B and 31C) and screw the switch by hand fully into the body. If a resistance is felt, recheck the position of the sleeves. Press the 'O' ring (30A) fully against the sleeve (31A); fit gasket (28) to end plug (27) and screw the plug into the body. Tighten the plug with gasket (28) to a torque of 47 to 54 Nm (34 to 40 lbf.ft.) or with the 'O' ring and spacer to a torque of 16 to 25 Nm (11 to 18.5 lbf.ft.) and the switch to 3 to 4 Nm (2 to 3 lbf.ft.).



A0931/2

tandem (A.S.A.S.) master cylinder 5A 6g
(private cars & light commercial vehicles)

22 EXPLODED VIEW OF TYPICAL 'OVERHUNG' MASTER CYLINDER



KEY

(FOR FIGS. 1 TO 39 INCLUSIVE)

1.	FILLER CAP	17.	SEAL RETAINER
1A	FLUID LEVEL INDICATOR FILLER CAP ASSEMBLY	18.	RECUPERATING SEAL
		19.	WASHER
2.	BAFFLE	20.	'L' TYPE PLUNGER SEAL
3.	CAP WASHER	21.	SECONDARY PLUNGER
4.	FLUID RESERVOIR	22.	SECONDARY PLUNGER SPRING
5.	PIN RETAINING CLIP	23.	PRIMARY PLUNGER
6.	FIXING PIN	24.	SPACER (THIN)
6A	ROLL PIN	25.	SPACER
7.	RESERVOIR SEAL	26.	STOP LIGHT SWITCH
8.	ADAPTOR	27.	ENG PLUG
9.	SECONDARY PLUNGER STOP PIN	28.	GASKET
10.	PUSH ROD	29.	PISTON
11.	DUST COVER	30.	'O' RING
11A	DIAPHRAGM DUST COVER	31.	SLEEVE
12.	CIRCLIP	32.	P.D.W.A. CIRCLIP
13.	METAL RETAINING BAND	33.	SWITCH ASSEMBLY
14.	PRIMARY PLUNGER ASSEMBLY	34.	VACUUM SEAL
15.	SECONDARY PLUNGER ASSEMBLY	35.	CYLINDER BODY
16.	PRIMARY PLUNGER SPRING	36.	'O' RING

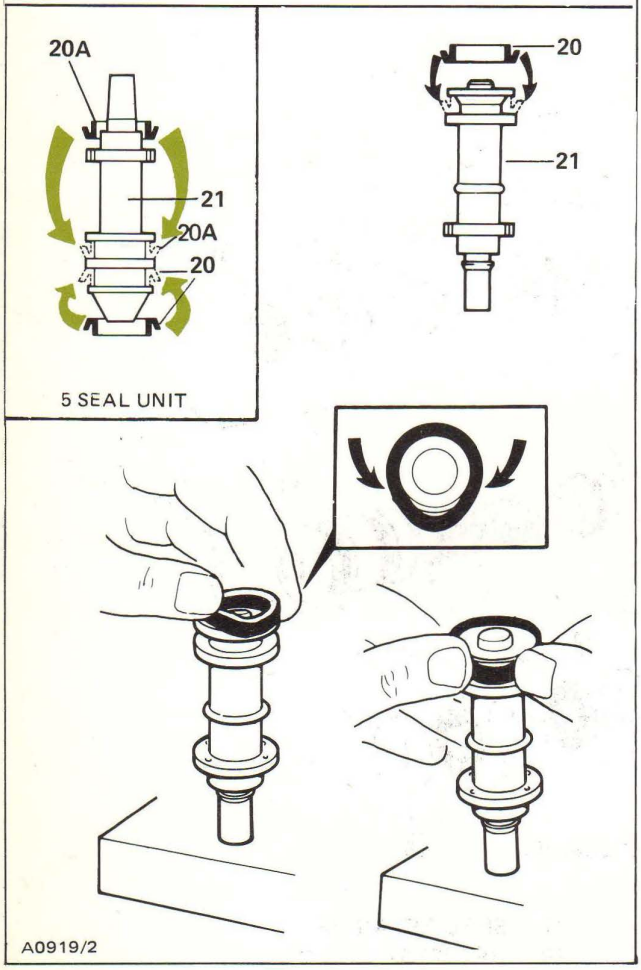
A1133

tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

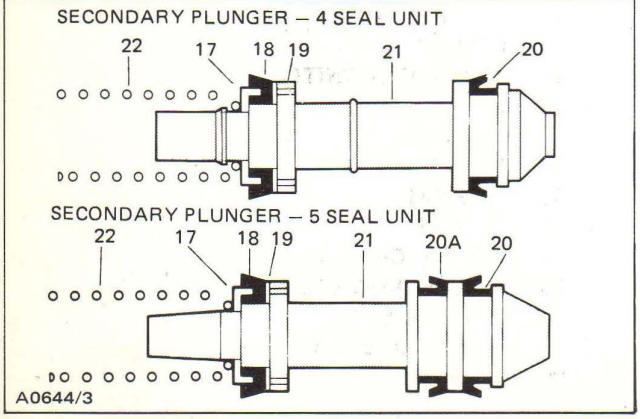
Assembling the Master Cylinder

23 Fit new plunger seal (20) on four seal units or seals (20) and (20A) on five seal units to secondary plunger (21). To fit seal (20A), place seal on the opposite end of plunger as shown, squeeze seal between finger and thumb into an ellipse, then press raised part of seal over the flange using fingers of other hand. Repeat with second flange to get seal into its groove. Fit seal (20), in a similar manner, from the opposite end of plunger.

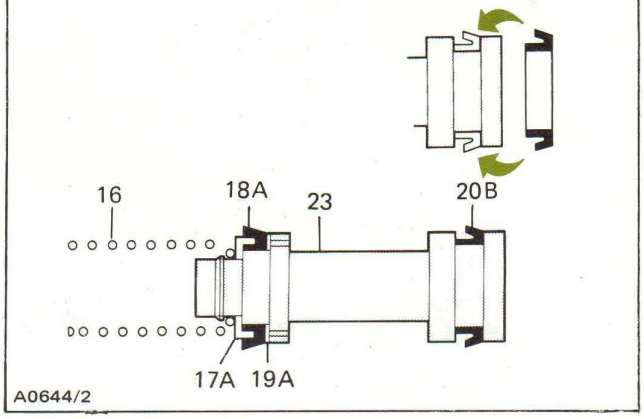
WARNING: WHEN OVERHAULING A FIVE SEAL CYLINDER, ALL FIVE SEALS MUST BE FITTED.



24 Fit washer (19), new recuperating seal (18), seal retainer (17) and spring (22) to secondary plunger (21) as shown. Ensure the seals are fitted correctly as illustrated.

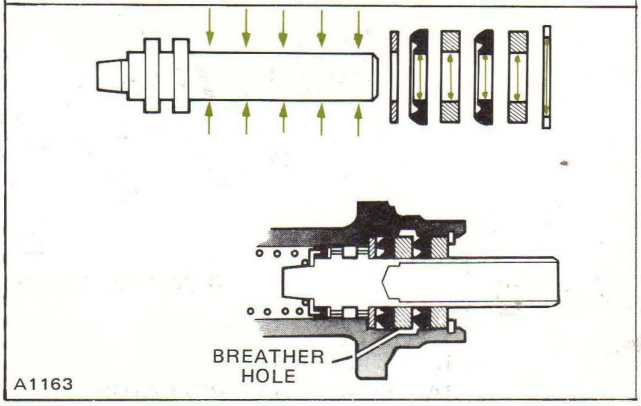


25 Fit seal (20C) into its groove in the primary plunger (23) using the fingers as before. Fit washer (19A), new recuperating seal (18A), seal retainer (17A) and primary spring (16) as indicated. Ensure the seals are fitted as illustrated.

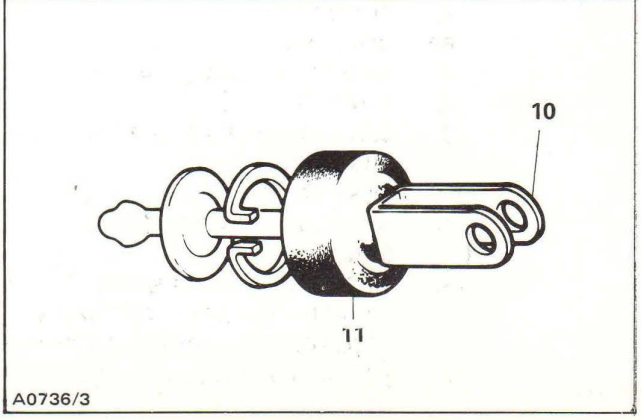


26 If master cylinder looks like this: Check the breather hole is clear, lubricate the large seals, spacers and the plunger where indicated with the special BMS grease (Part Number 64949086), then fit the parts as shown. Depress the plunger by hand several times; lubricate again if necessary.

NOTE: Should the cylinder be separated from the servo unit, then the opportunity should be taken to lubricate the plunger again.



27 Smear the sealing areas of the new rubber dust cover (11), with Girling Rubber Grease. Fit the dust cover to the push rod (10).

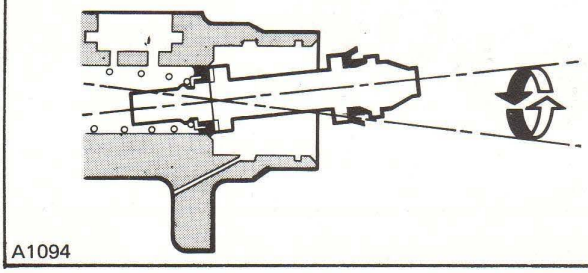


tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

5A 6i

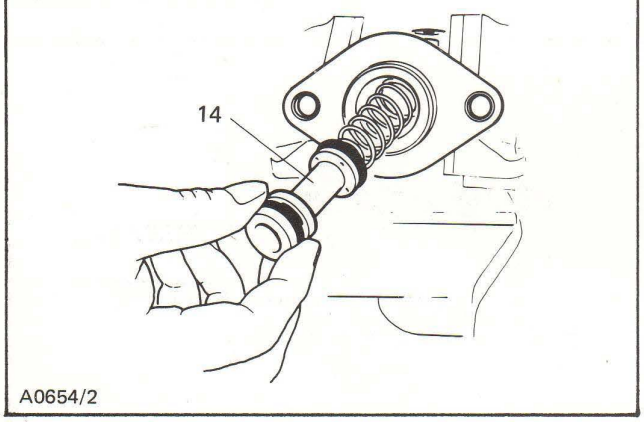
IT IS VITAL THAT THE FOLLOWING INSTRUCTIONS ARE CARRIED OUT PRECISELY OTHERWISE DAMAGE WILL ENSUE TO THE NEW SEALS WHEN INSERTING THE PLUNGERS INTO THE CYLINDER BORE. IT IS ALSO ESSENTIAL THAT GENEROUS AMOUNTS OF UNUSED CASTROL-GIRLING BRAKE FLUID ARE USED TO LUBRICATE THE CYLINDER BORE AND PLUNGER SEALS.

28 Clamp cylinder in bench vice and lubricate secondary plunger seals and cylinder bore as described above. Offer the plunger assembly (15) to the cylinder until the recuperation seal (18) is resting centrally in the mouth of the bore. Ensuring the seal is not trapped whilst so doing, GENTLY introduce the plunger with a circular rocking motion as illustrated to ease the seal, then SLOWLY push the plunger down the bore in one continuous movement.



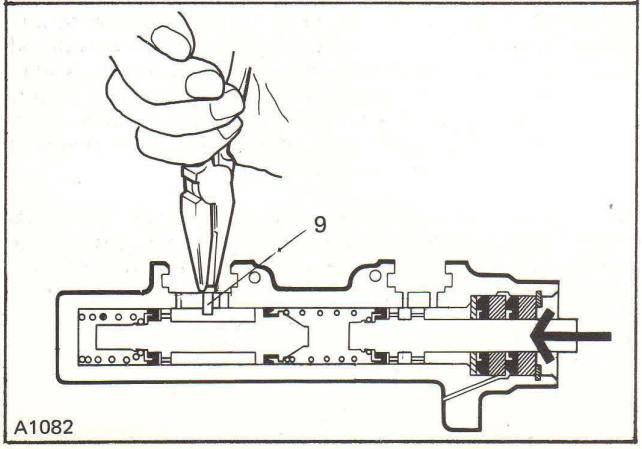
A1094

29 Repeat lubricating and fitting procedure exactly with primary plunger assembly (14); holding the plunger down the bore and fitting the circlip, with push rod, if applicable.



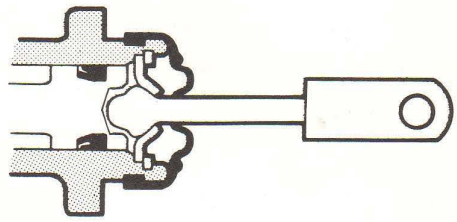
A0654/2

30 Using a clean screwdriver, or the push rod if fitted, slowly press the plunger fully down the bore to enable the secondary plunger stop pin (9) to be fitted in its correct position as shown.



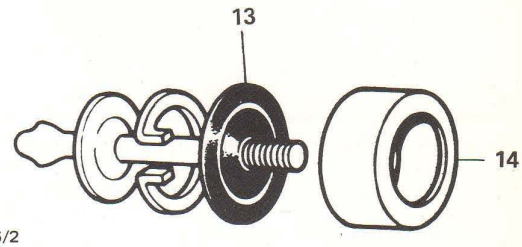
A1082

31 If a push rod is fitted, settle the dust cover on the cylinder.



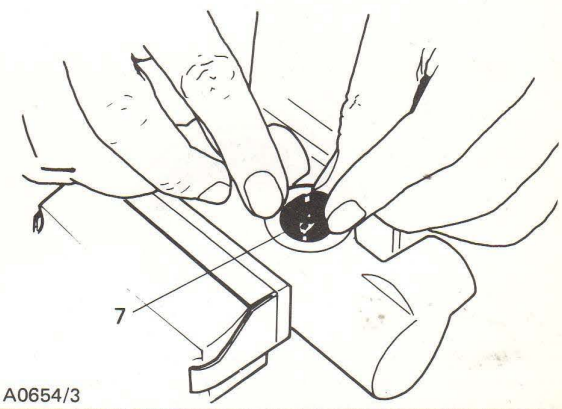
A0744

32 If the dust cover is flat (13), smear with Girling Rubber Grease and position over the cylinder bore; firmly press metal retaining band (14) against rubber dust cover, then crimp the edge of the band in three places.



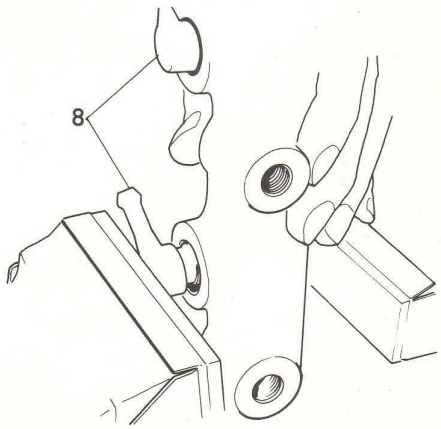
A0736/2

33 Lubricate new seals (7) with unused Castrol-Girling Brake Fluid and fit to the inlet ports.



A0654/3

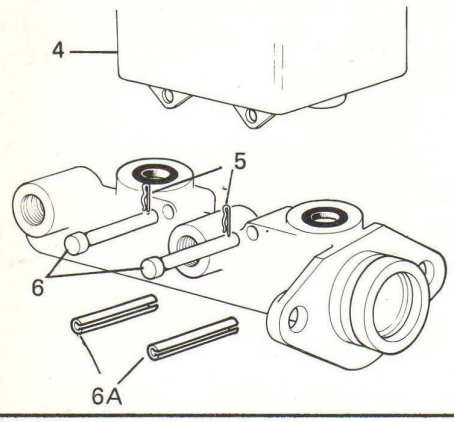
34 To fit adaptors (8): Lubricate with unused Castrol-Girling Brake Fluid and GENTLY press into position.



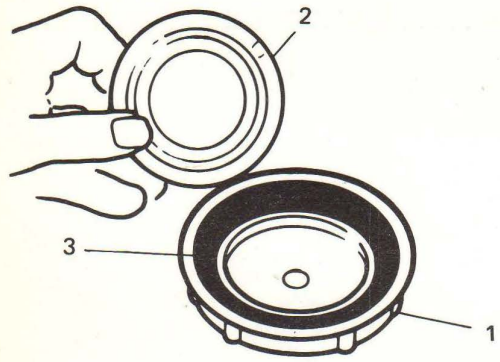
A0654/4

5A 6j tandem (A.S.A.S.) master cylinder (private cars & light commercial vehicles)

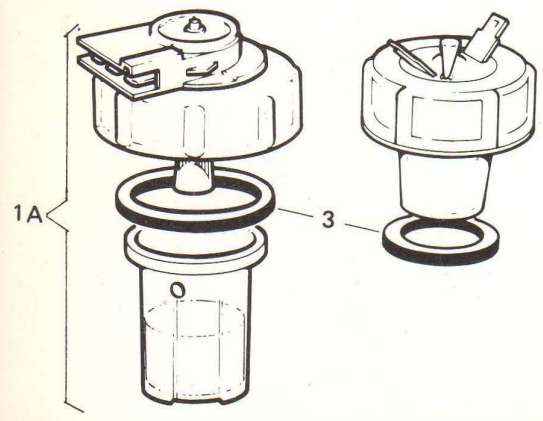
35 To fit fluid reservoir (4): Lubricate the seals and press the fluid reservoir into position on the cylinder. Fit the roll pins (6A) or the fixing pins (6) and retaining clips (5).



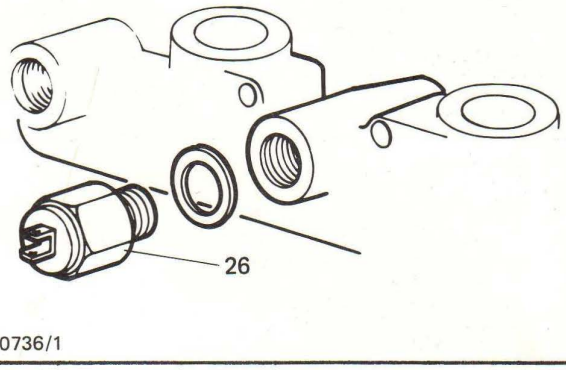
36 Fit a new washer (3) in the filler cap (1), press in the baffle (2) and screw the cap onto the reservoir. Some kits have a second cap washer and this should be fitted to the additional filler cap or discarded as applicable.



37 If the filler cap looks like this, a fluid level indicator is incorporated. Just place the rubber washer (3) into position.



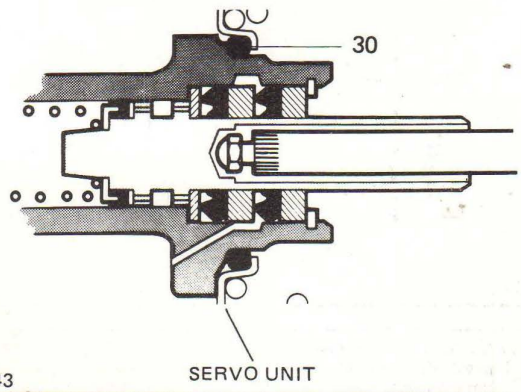
38 To fit stop light switch (26): Screw the switch into the cylinder body and tighten to a torque of 16 to 20 Nm (12 to 15 lbf.ft.).



Re-fitting

When refitting the cylinder to the vehicle, temporarily cover all open bores to prevent foreign matter entering the cylinder.

39 When fitting the overhauled or new 'Overhung' master cylinder onto the vehicle ensure that a new 'O' ring (36) is fitted between the cylinder flange and the face of the servo unit. Failure to fit a new 'O' ring may result in lack of servo assistance.

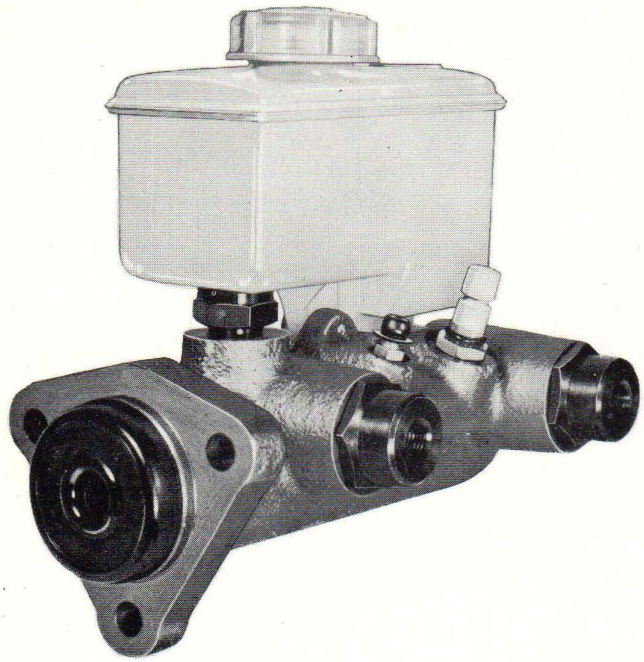


NOTE: When connecting the push rod it is essential to preserve the 0.8mm ((1/32 in.) gap between the push rod and the primary plunger when the push rod is fully returned. With installations where the pedal returns until checked by the cylinder there is no danger, but where a separate pedal stop or stop light switch is fitted care must be taken.

If the master cylinder does not incorporate a push rod and fits directly onto a Girling Mechanical Servo Unit, there is no necessity to alter the height of the push rod fitted to the Servo Unit.

MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

1



Introduction

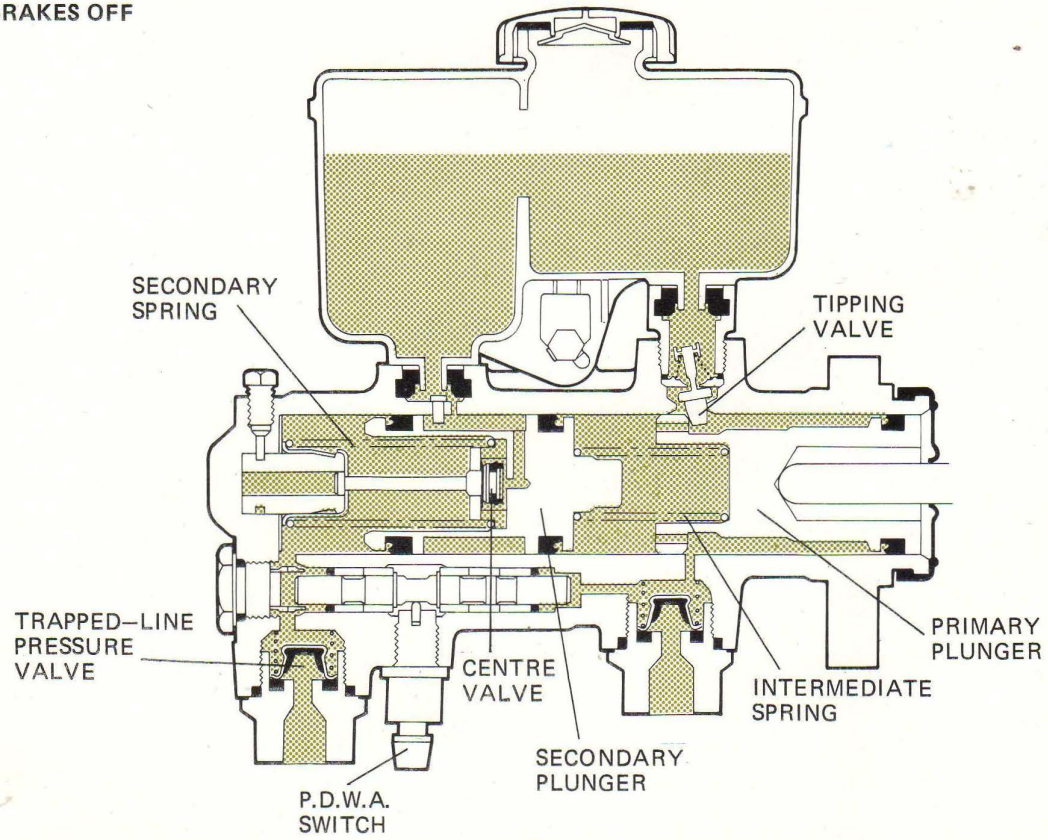
The Tandem Master Cylinder is designed to operate split-line hydraulic systems. It consists of two independent hydraulic cylinders housed in a single cast-iron body and should one cylinder, or system, develop a fault the other remains operative.

The Mk 2 T.V.C.V. (Tipping Valve, Centre Valve) Tandem Master Cylinder (Fig.1), is a development of the popular Mk I cylinder redesigned to meet current legislation requirements. Proven design features have been retained and basically the unit is unchanged except for the position of the centre valve assembly which has been reversed so that the valve seals off against the secondary plunger (Fig.2) and not against the end of the cylinder bore.

With commercial vehicle tandem master cylinders the secondary system is usually connected to the front brakes, but this is not a hard and fast rule and may be reversed on some installations, depending on the vehicle requirements and master cylinder characteristics. A P.D.W.A. (Pressure Differential Warning Actuator) is integral with most cylinders and whilst details may vary on some installations the general servicing procedure should be followed.

In the "Brake Off" position the hydraulic fluid can move unrestricted between each split-line system and its separate compartment reservoirs in the fluid supply tank. When the brakes are applied, a push rod moves the primary plunger up the cylinder bore and allows a spring loaded tipping valve to return to centre. The fluid supply port from the primary reservoir to the cylinder is closed by the valve and further movement of the primary plunger results in hydraulic pressure being transmitted via the P.D.W.A. and trapped-line pressure valve to the wheel cylinders; front or rear as the case may be.

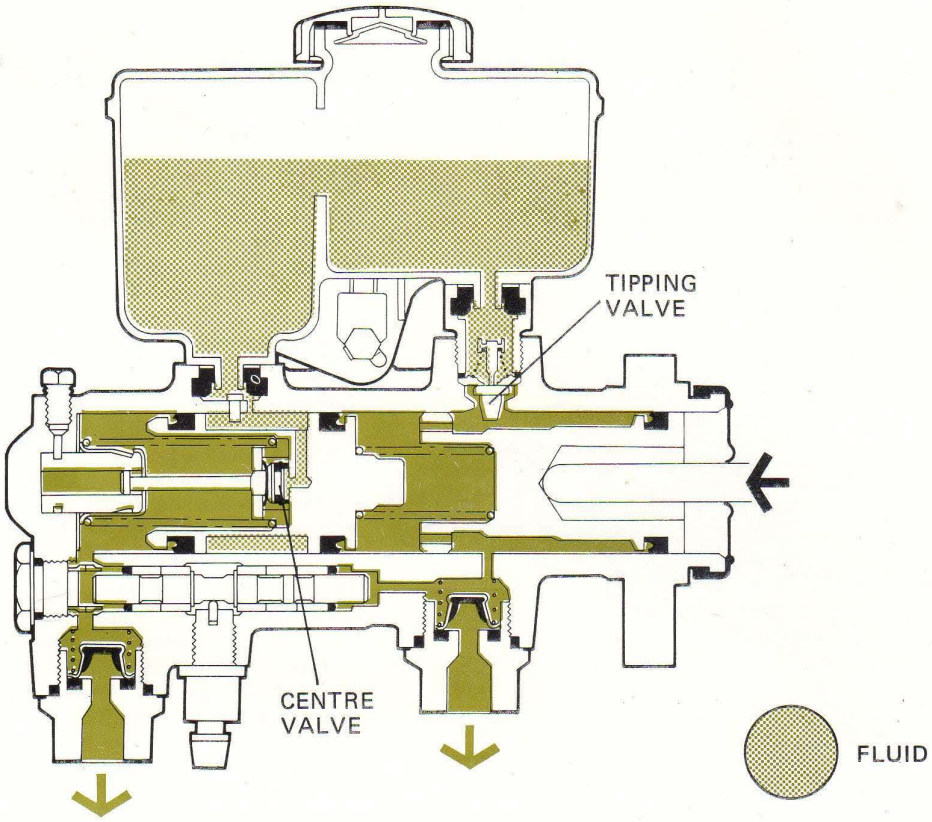
2 BRAKES OFF



A 0887

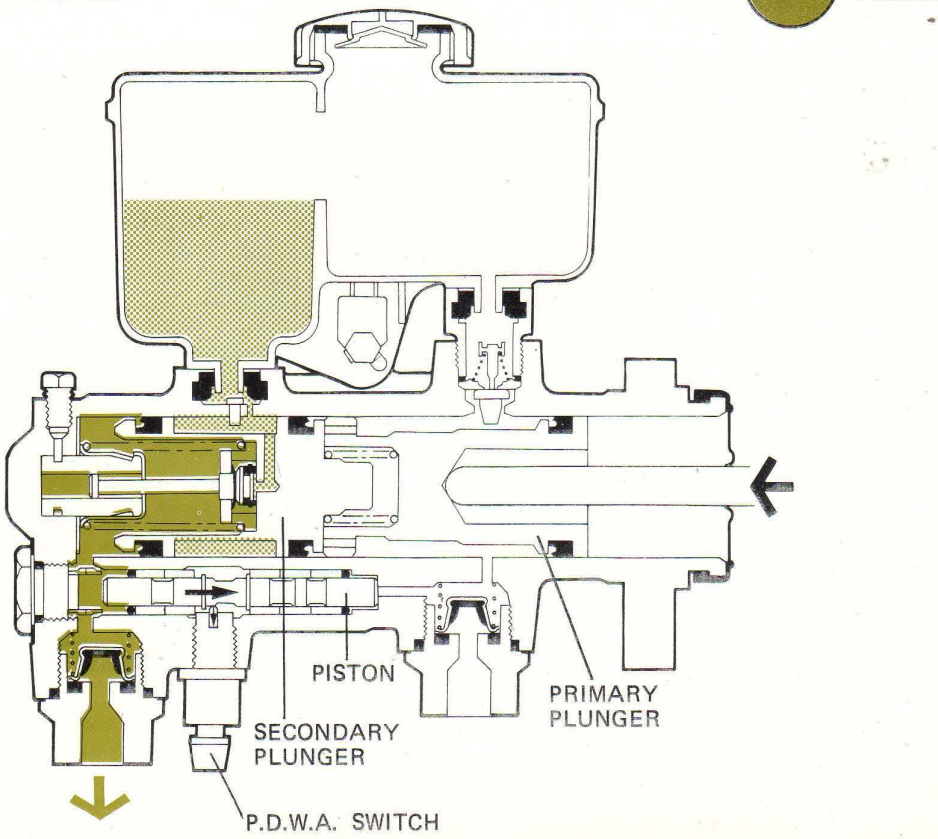
MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

3 BRAKES APPLIED



A 0888

4 FAILURE PRIMARY SYSTEM



A 0889

MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

At the same time the pressure created acts in conjunction with the increasing force of the intermediate spring to overcome the stronger secondary spring, thus actuating the secondary plunger.

Initial movement of the secondary plunger compresses the secondary spring and relieves the pressure on the valve head. The spring washer fitted under the valve head is allowed to resume its natural 'bowed' shape and moves the centre valve head and seal to close the fluid entry port in the secondary plunger. As the plunger continues to move up the bore fluid is forced via the P.D.W.A. and trapped-line pressure valve through the brake pipes to the wheel cylinders.

On return stroke the plungers move back, the ports are opened and the fluid can again move unrestricted between separate systems and the fluid reservoir.

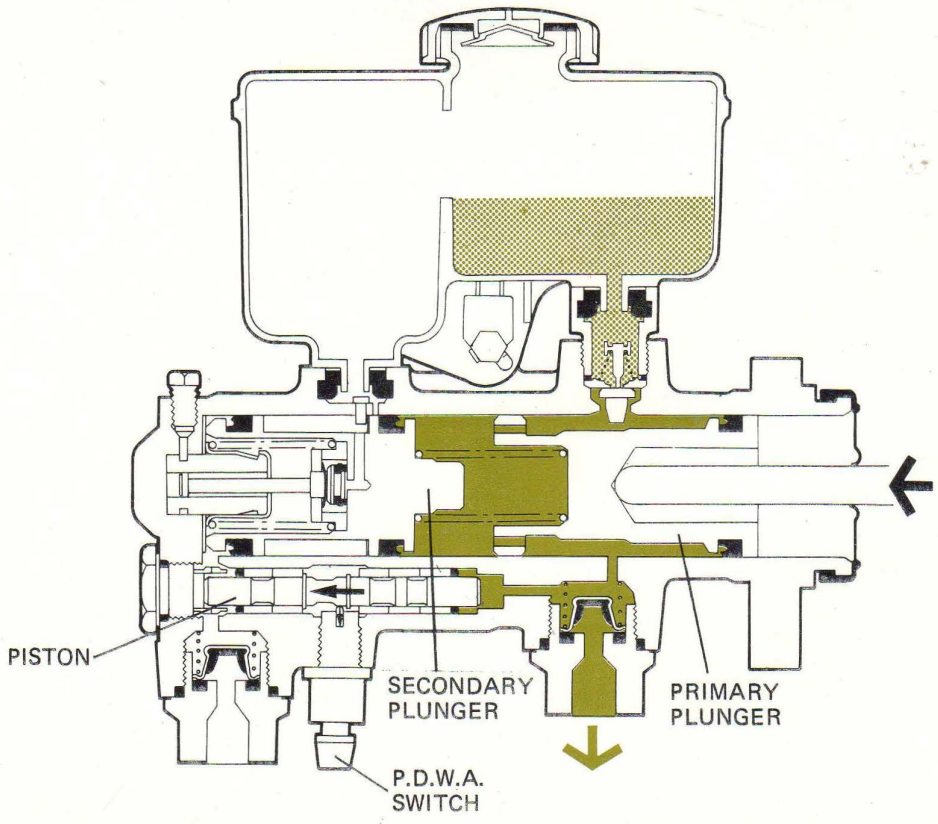
Should a failure occur in one system, brake pedal travel will increase and the resultant imbalance of pressures would cause the P.D.W.A. piston to move towards the system in which the failure and loss of pressure had occured (Figs. 4 and 5). As the plunger of the electrical switch assembly seats in a groove in the piston, movement of the piston pushes the plunger into the body of the electrical switch and completes the electrical circuit to a warning light on the dashboard.

The remaining system will still operate effectively and once the fault is traced and rectified, the P.D.W.A. piston automatically returns to its neutral position upon pedal application and this would be indicated by the light going out on the dashboard.

Servicing

Every 80,000 km (50,000 miles) or two years, whichever occurs first, all hydraulic cylinders fitted to Commercial Vehicles should be replaced by new guaranteed units. However, provided the working surfaces of the master cylinder and plungers are in perfect condition, then new seals from a Girling Service Kit can be fitted. If doubt exists regarding the condition of the cylinder bore or plungers then a new guaranteed master cylinder must be fitted.

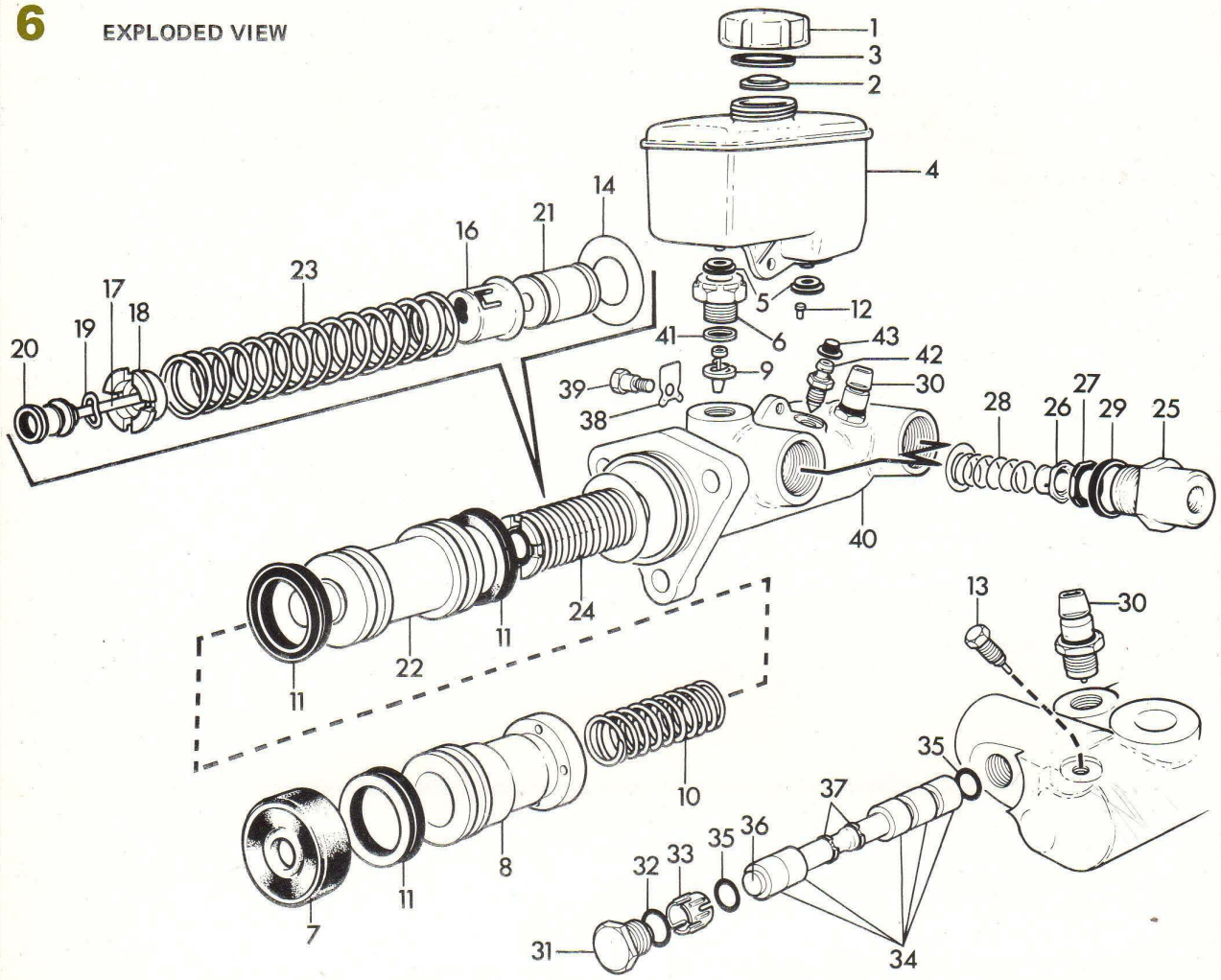
5 FAILURE SECONDARY SYSTEM



A 0890

MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

6 EXPLODED VIEW



KEY

(FOR FIGS. 1 TO 27 INCLUSIVE)

1. FILLER CAP
2. BAFFLE
3. CAP WASHER
4. FLUID RESERVOIR
5. RESERVOIR SEAL
6. RESERVOIR ADAPTOR
7. DUST COVER
8. PRIMARY PLUNGER
9. TIPPING VALVE ASSEMBLY
10. INTERMEDIATE SPRING
11. PLUNGER SEAL
12. STOP PIN
13. STOP SCREW
14. GUIDE WASHER
15. RETAINER LEAF
16. SPRING RETAINER
17. VALVE STEM
18. VALVE SPACER
19. SPRING WASHER
20. VALVE SEAL
21. VALVE STEM GUIDE
22. SECONDARY PLUNGER
23. SECONDARY SPRING
24. VALVE ASSEMBLY
25. OUTLET ADAPTOR
26. T.L.P.V. SEAL ASSEMBLY
27. VALVE SEAT
28. SPRING
29. SEALING RING
30. P.D.W.A. SWITCH
31. END PLUG
32. 'O' RING
33. SPACER
34. SLEEVE
35. 'O' RING
36. PISTON
37. CIRCLIP
38. TAB WASHER
39. RESERVOIR RETAINING BOLT
40. CYLINDER BODY
41. COPPER WASHER
42. BLEEDSCREW
43. BLEEDSCREW CAP

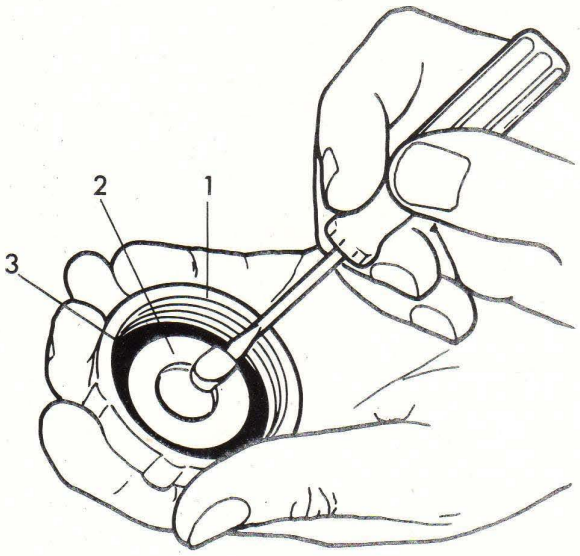
A 0886

MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

Dismantling

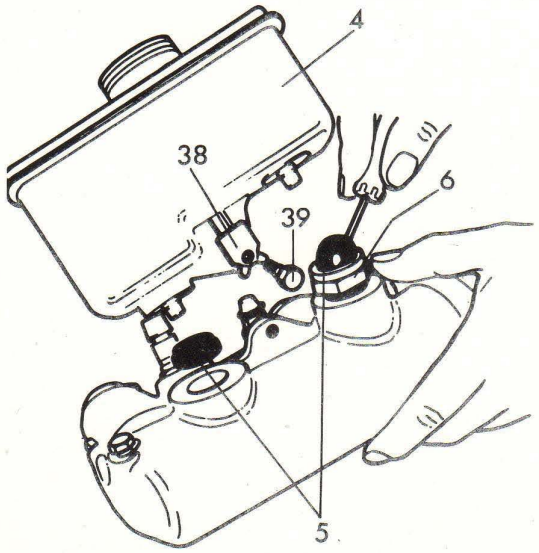
Drain the fluid from both front and rear brake systems. Disconnect the outlet pipes, unscrew the flange fixing bolts and remove the cylinder from the vehicle. Before proceeding, make sure the cylinder, work area, all tools and the hands are clean. Whilst details may vary from those shown, the general procedure should be followed.

7 Unscrew filler cap (1) and drain off surplus brake fluid. Lever out plastic baffle (2) and remove rubber washer (3).



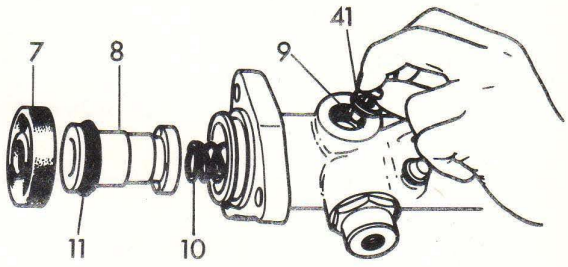
A 0878/1

8 Bend back tabwasher (38) and unscrew fluid reservoir retaining bolt (39). Remove fluid reservoir (4) and seals (5). Unscrew nut (6).



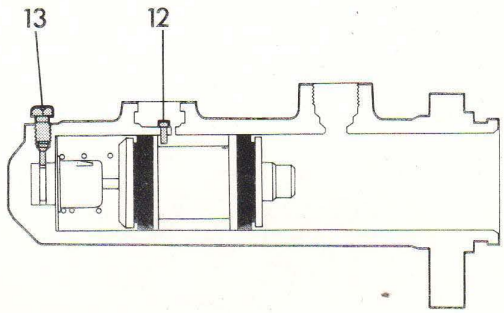
A 0878/2

9 Remove dust cover (7). Depress plunger (8), lift out tipping valve (9) and copper washer (41). Pull out plunger (8) and spring (10). Remove seal (11) from plunger (8).



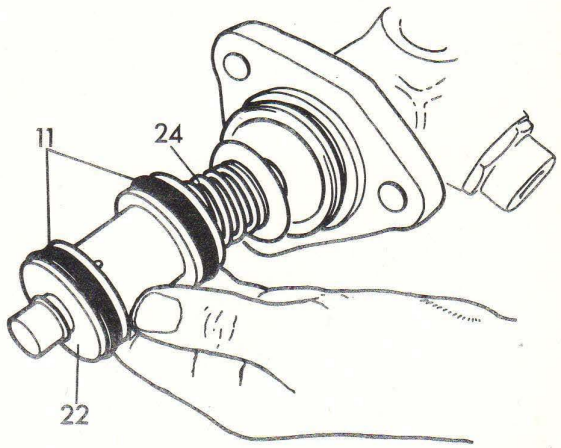
A 0881/1

10 Pull out stop pin (12) and unscrew stop screw (13).



A 0885

11 Tap cylinder on wooden surface to remove secondary plunger (22) and valve assembly (24). If necessary, lubricate cylinder bore with unused Castrol-Girling Brake Fluid to ease removal. Remove the valve assembly from plunger. Remove seals (11) from plunger (22).

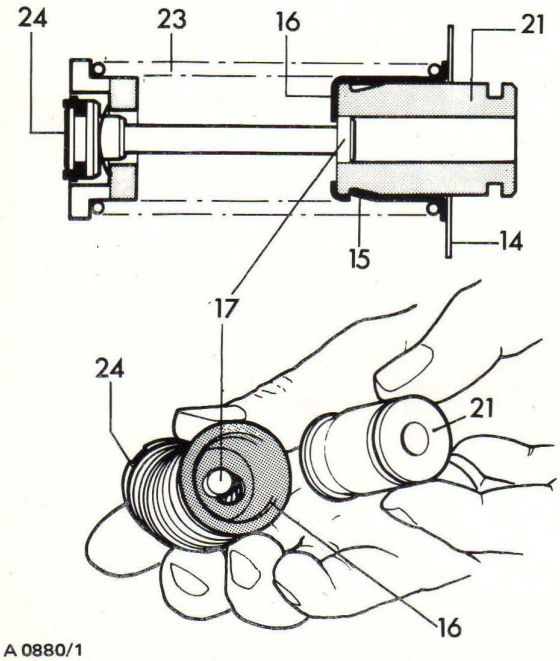


A 0881/3

MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

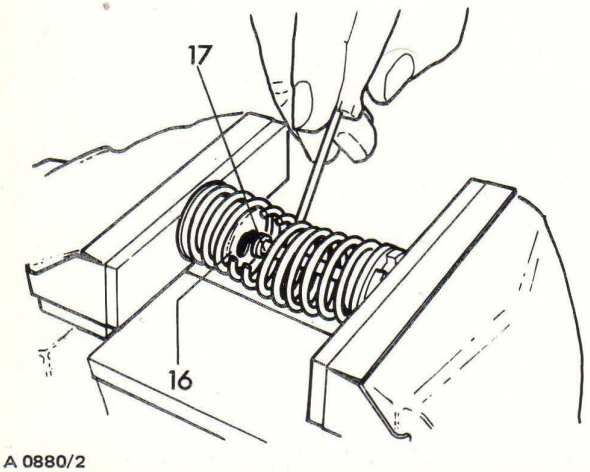
12 CAUTION: THE STRENGTH OF THE SPRING (23) NECESSITATES CARE BEING TAKEN WHEN DISMANTLING THE VALVE ASSEMBLY (24). IF THE VALVE STEM (17) INADVERTENTLY BECOMES DISENGAGED FROM THE RETAINER (16), THE FORCE OF THE SPRING WILL EJECT THE RETAINER WITH CONSIDERABLE FORCE AND MAY CAUSE INJURY.

Remove guidewasher (14). Lift spring retainer leaf (15) and remove valve stem guide (21). PLACE VALVE ASSEMBLY IN A LARGE BENCH VICE WHICH OPENS APPROXIMATELY 152mm (6 in.) (FIG. 13).



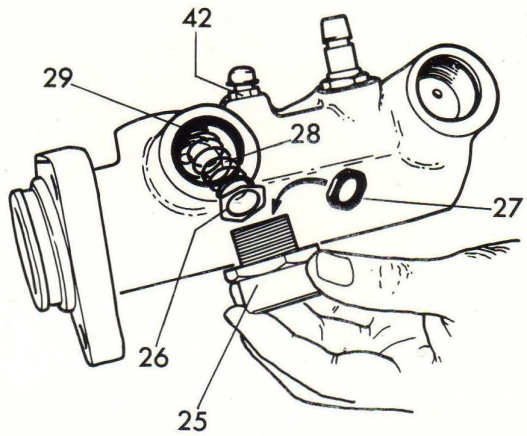
A 0880/1

13 Compress spring sufficiently to remove load from valve stem (17), release the valve stem from the keyhold of the spring retainer (16). SLOWLY OPEN VICE UNTIL SPRING IS RELAXED. Separate parts.



A 0880/2

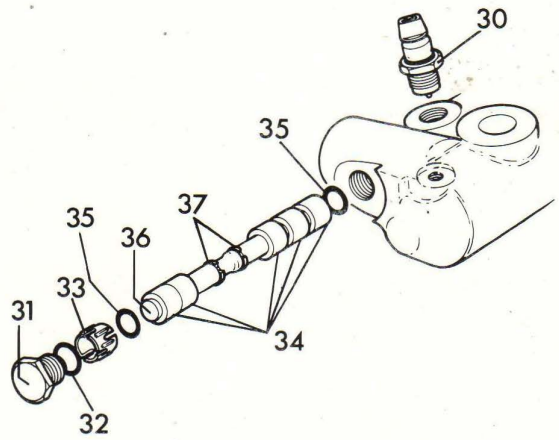
14 Unscrew outlet adaptors (25) and withdraw the valve and seal assemblies (26), valve seats (27), springs (28) and sealing rings (29). Unscrew bleed-screw (42).



A 0879/1

Dismantling the P.D.W.A.

15 Unscrew switch (30) and plug (31). Remove 'O' ring (32) and spacer (33) from plug (31). Tap cylinder on soft or wooden surface to remove internal parts; note position and number of sleeves (34) for reassembly. If necessary, hook out the second 'O' ring (35). Taking care not to damage the piston (36), press the circlips (37) from their grooves.



A 0886/1

Cleaning

Examine the bore of the cylinder and the plungers for visible score marks, ridges and corrosion. Ensure the bore is smooth to the touch. Unless in perfect condition, fit a new guaranteed master cylinder.

Replace all seals and parts with those contained in the appropriate Girling Service Kit. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid.

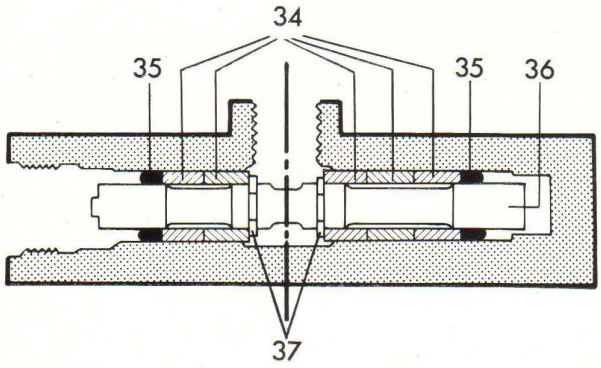
MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

Reassembly

IT IS IMPORTANT THAT GENEROUS AMOUNTS OF UNUSED CASTROL-GIRLING CRIMSON BRAKE FLUID ARE USED AT ALL STAGES OF SEAL ASSEMBLY.

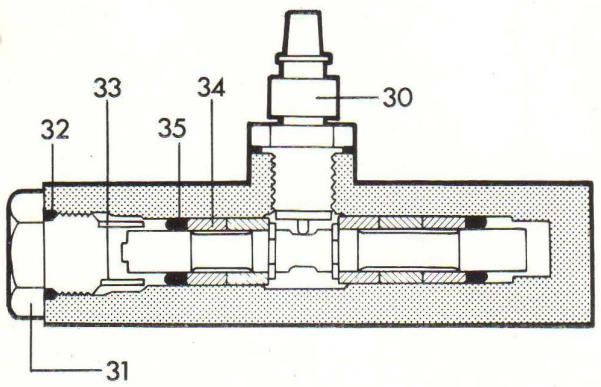
Assembling the P.D.W.A.

16 Fit circlips (37) to piston (36). Follow with sleeves (34) and new 'O' rings (35). Ensure the sleeves are positioned on the piston in the same order as noted when dismantling. Lubricate parts and cylinder bore with unused Castrol-Girling Crimson Brake Fluid and insert the piston until the radiused groove in the piston is centrally opposite the switch aperture.



A 0742/1

17 Ensure the switch (30) will not foul the sleeves (34) and screw the switch by hand fully into the body. If a resistance is felt, recheck the position of the sleeves. Press the 'O' ring (35) against the sleeve (34); fit spacer (33) and 'O' ring (32) to plug (31) and screw the plug into body. Tighten the plug to a torque of 16 to 20 Nm (12 to 15 lbf.ft.) and the switch to 3 to 7 Nm (2 to 5 lbf.ft.).

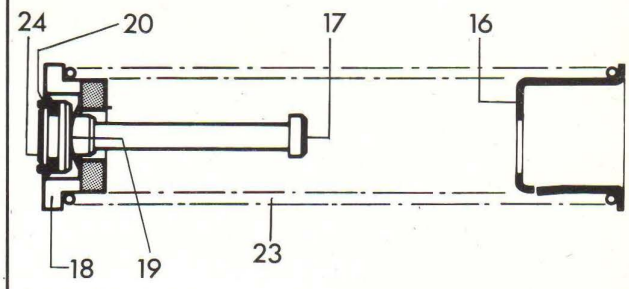


A 0742/2

Assembling the Master Cylinder

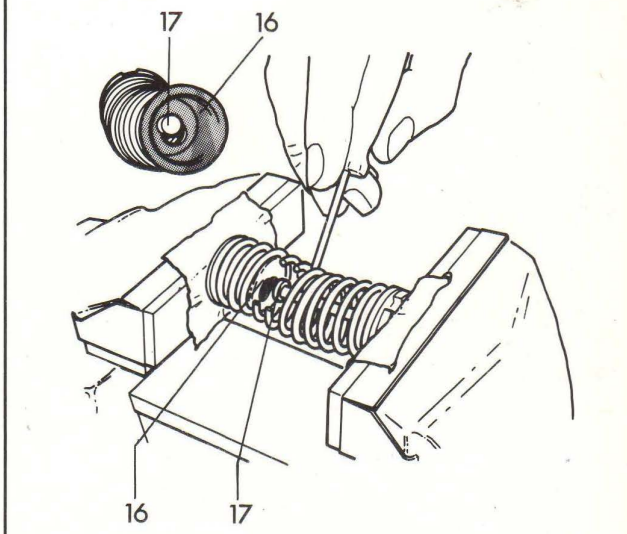
18 CAUTION: THE STRENGTH OF THE SPRING (23) NECESSITATES CARE BEING TAKEN WHEN ASSEMBLING THE VALVE ASSEMBLY (24). IF THE VALVE STEM (17) INADVERTENTLY BECOMES DISENGAGED FROM THE RETAINER (16), THE FORCE OF THE SPRING WILL EJECT THE RETAINER WITH CONSIDERABLE FORCE AND MAY CAUSE INJURY.

Fit new seal (20) and spring washer (19) on to valve head (24) as shown. Follow with valve spacer (18) and secondary spring (23). Fit spring retainer (16) to the spring. To prevent possible contamination two small pieces of clean paper are required to protect the hydraulic parts. Refer to Fig. 19 . . .



A 0882/1

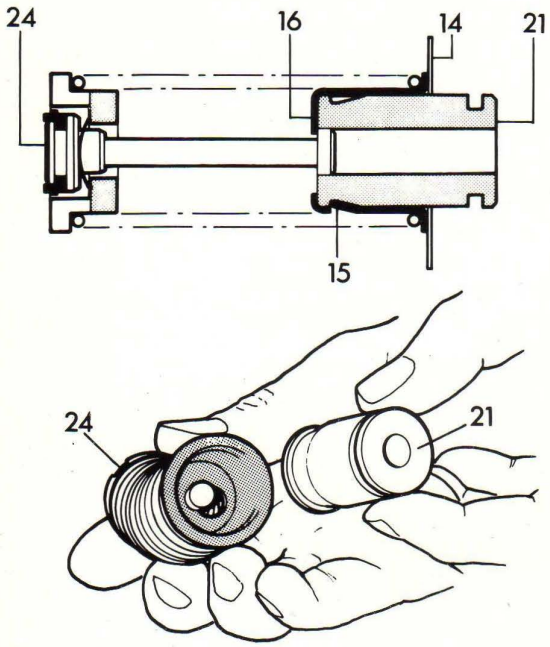
19 Position the valve assembly between the jaws of a bench vice with a clean piece of paper interposed at each end of the assembly and the jaws of the vice. Close the vice to compress the spring whilst guiding the valve stem (17) through the keyhole in the spring retainer (16); engage the valve stem in the small section of the keyhole and slowly slacken the vice and remove the valve assembly.



A 0879/2

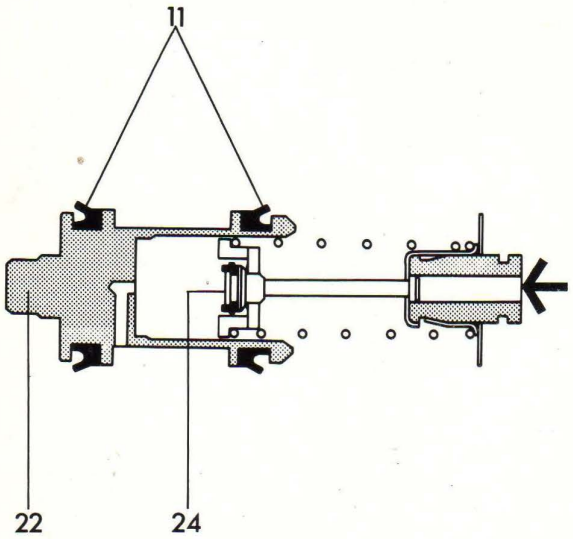
MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

20 Fit valve stem guide (21) to valve assembly (24) and press home the leaf (15) of spring retainer (16) to secure. Check engagement of leaf; it must be straight and firmly engaged behind head of valve stem guide (21). Fit guide washer (14) to valve stem guide (21).



A 0880/1

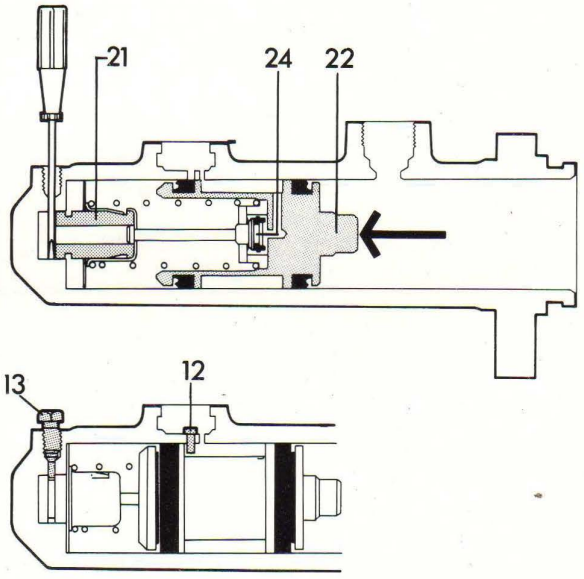
21 Fit seals (11) to secondary plunger (22) as shown. Fit the valve assembly (24) into the plunger (22), with valve head (24) leading. Lubricate the cylinder bore and the plunger seals (11) with unused Castrol-Girling Crimson Brake Fluid.



A 0882/2

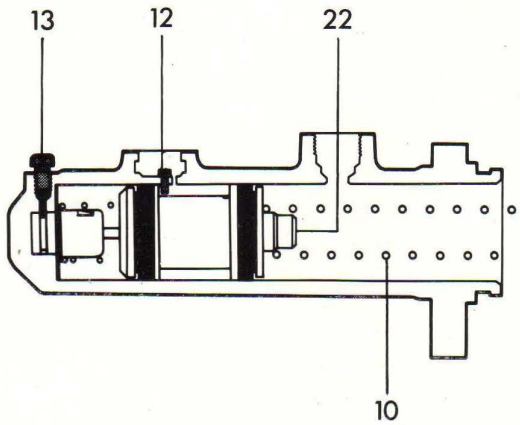
22 Insert a suitable, clean, screwdriver fully into the cylinder as shown. With cylinder horizontal on bench, ease the plunger (22) and valve assembly (24) into the cylinder and gently push the plunger up the bore until the valve stem guide (21) contacts the screwdriver blade. Slowly withdraw the screwdriver whilst maintaining pressure on the plunger until the valve stem guide (21) fully enters its counterbore; keeping pressure on the piston immediately screw home the stop screw (13), which must locate in the groove in the valve stem guide (21). Fit stop pin (12).

WARNING: THE STOP PINS MUST FIT AS ILLUSTRATED (SEE INSET). IF DOUBT EXISTS AS TO THEIR LOCATION REMOVE AND RE-ASSEMBLE PARTS.



A 0882/4

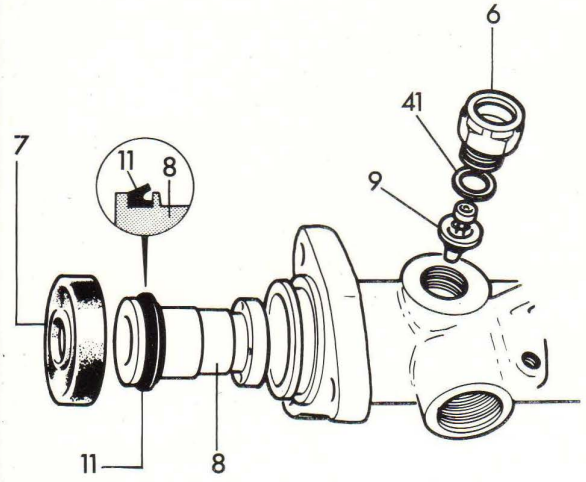
23 Fit spring (10) to plunger (22).



A 0881/2

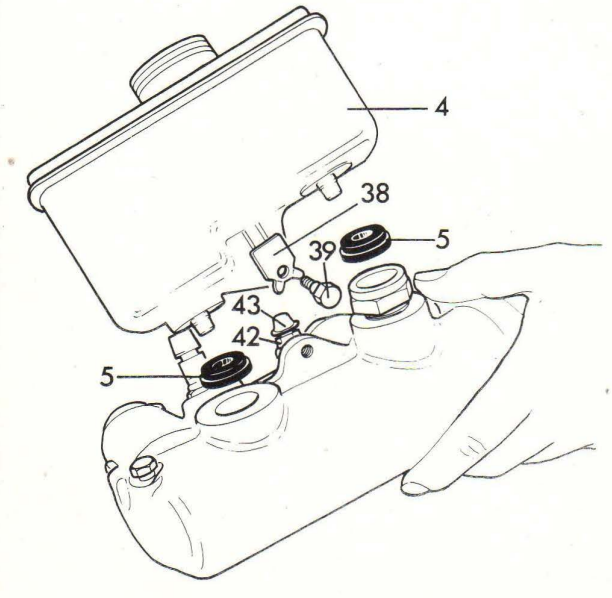
MK 2 tandem (T.V.C.V.) master cylinder (commercial vehicles)

24 Fit seal (11) to plunger (8) as shown. Lubricate the seal and the cylinder bore with unused Castrol-Girling Crimson Brake Fluid and ease the plunger into the bore; depress plunger to fit tipping valve (9). Fit copper washer (41) and screw in nut (6) finger tight, depress plunger (8) whilst tightening nut (6) to a torque of 47 to 61 Nm (35 to 45 lbf.ft.). Smear sealing areas of dust cover (7) with Girling Rubber Grease and fit.



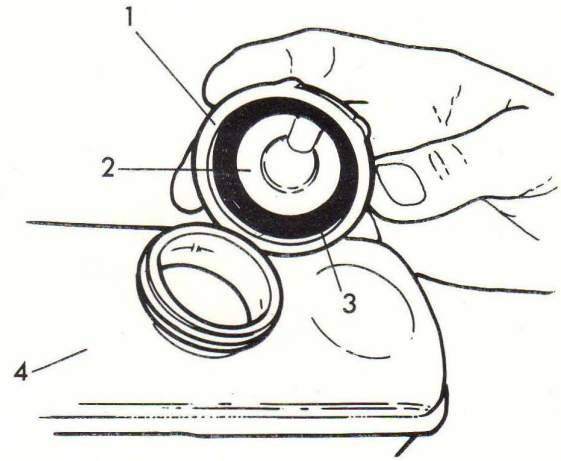
A 0882/3

25 Screw in bleedscrew (42) but do not overtighten. Fit bleedscrew dust cap (43). Fit seals (5) and fluid reservoir (4). Position tabwasher (38) and reservoir retaining bolt (39); push down on reservoir and screw in bolt. Tighten to a torque of 4.5 to 8.5 Nm (3 to 6 lbf.ft.) and bend up tabwasher).



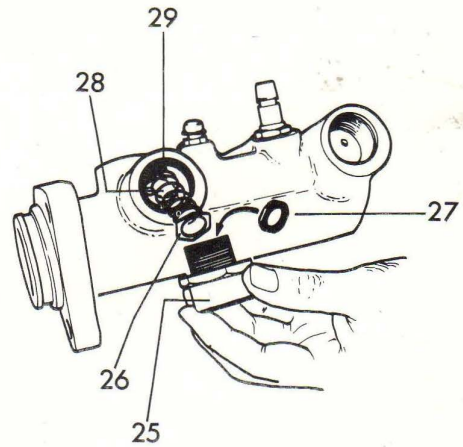
A 0884

26 Place rubber washer (3) in filler cap (1) and press home baffle (2). Screw cap onto reservoir (4).



A 0878

27 Fit springs (28), valve assemblies (26), valve seats (27) and sealing rings (29). Screw in outlet adaptors (25) and tighten to a torque of 40 to 47 Nm (30 to 35 lbf.ft.).

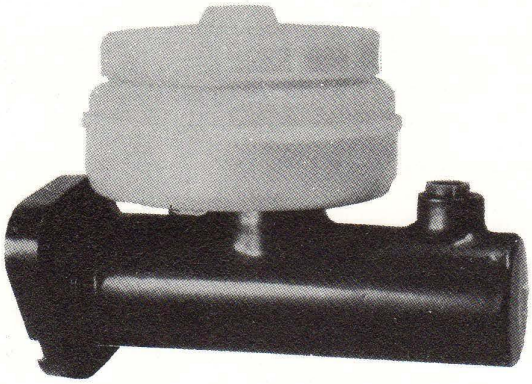


A 0879/1

Refit the cylinder assembly to the vehicle and ensure there is a clearance between the push rod and the primary plunger. Connect up the hydraulic pipes, fill up the supply tanks with unused Castrol-Girling Brake Fluid and bleed the system as described in Section 1, Page 1D2.

tipping valve (T.V.) master cylinder 5A9a

1



Introduction

Designed primarily for commercial vehicles with air hydraulic actuated braking systems, this simple master cylinder uses the well proven tipping valve (T.V.) method of reservoir cut off. T.V. cylinders are fitted in pairs, one cylinder actuates the primary system, the other the secondary system. The cylinder (Fig.1) is fitted with a semi-translucent polypropylene reservoir which is equipped with a filter (Fig. 2) to prevent foreign matter entering the system.

At rest (Fig. 3), the return spring holds the plunger fully retracted in the bore, with the shoulder flange on the plunger pushing the tipping valve lever off its seat allowing fluid from the reservoir to enter the brake system.

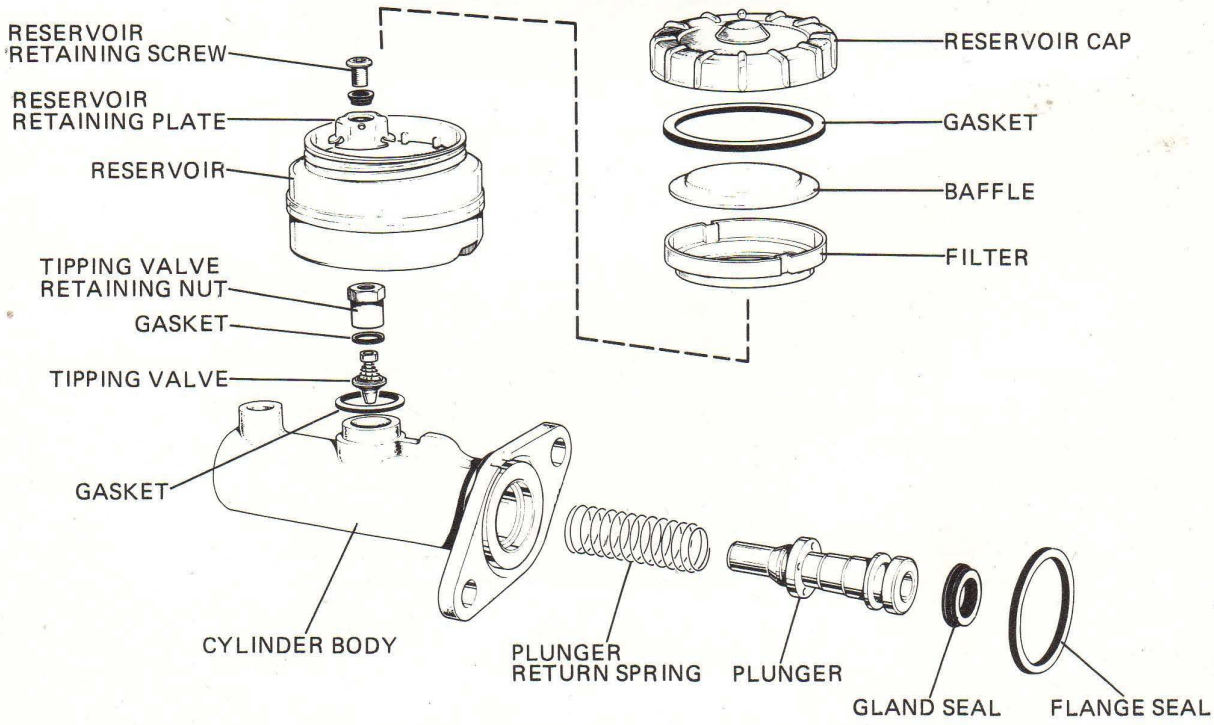
Upon application (Fig. 4), the plunger's initial movement along the bore allows the spring loaded tipping valve to return to vertical, sealing the inlet port. Further movement of the plunger results in hydraulic pressurization of the brake system.

On the full return stroke the disengagement of the tipping valve by the plunger shoulder allows un-restricted movement of fluid between system and reservoir.

Early cylinders have only one outlet port, while later versions have two - the top one of which is fitted with a bleedscrew. When replacing an early single outlet port cylinder with a later two outlet port cylinder, the bleedscrew must not be removed from the top port - the side port being used as the outlet.

A1774

2



A1166

5A9b tipping valve (T.V.) master cylinder

Servicing

The servicing periods for hydraulic equipment fitted to commercial vehicles is 80,000 km (50,000 miles) or two years whichever occurs first.

When the mileage is recorded or the time schedule expires, whichever is sooner, the master cylinder should be replaced by a new guaranteed unit. However, provided the working surfaces of the cylinder and the piston are in perfect condition, then new seals from a Girling service kit may be fitted. If doubt exists regarding the condition of the cylinder or the piston, then a new guaranteed master cylinder must be fitted.

Dismantling

Drain the brake system of fluid. Disconnect the outlet pipe, unscrew the flange fixing bolts and remove the cylinder from the vehicle.

Clean the exterior of the master cylinder. Before proceeding make sure the work area, all tools, and the hands are clean.

Warning: SPECIAL EMPHASIS IS PLACED ON THE CLEANLINESS OF THE TOOLS USED TO REMOVE AND REFIT THE RESERVOIR RETAINING BOLT AND THE TIPPING VALVE RETAINER. TO PREVENT CONTAMINATION OF THE BRAKE FLUID USED IN THE SYSTEM, IT IS ESSENTIAL THESE TOOLS ARE CLEAN, DRY AND FREE FROM ALL TRACES OF DIRT, OIL AND GREASE.

Secure the unit horizontally in a vice with padded jaws. Remove the retainer bolt, lift off the reservoir retainer, reservoir and seal.

Remove the bleedscrew (where applicable).

Unscrew the tipping valve retainer. Depress the plunger slightly and pull out the tipping valve and the copper gasket beneath the seat. The plunger with the return spring attached may now be removed.

Remove seal from plunger.

Cleaning

Comparison of the parts contained in the appropriate Girling service kit will indicate which used parts should be discarded. Clean the remaining parts with new unused Castrol Girling Brake Fluid or Girling cleaning fluid and place the cleaned parts on a clean sheet of paper.
Examine the plunger and cylinder bore for visible score marks, ridges and corrosion. Check the bore is smooth to the touch. If there is the slightest doubt as to the condition of the parts then a new guaranteed master cylinder should be fitted. Inspect all other components and ensure they are all in good working order.

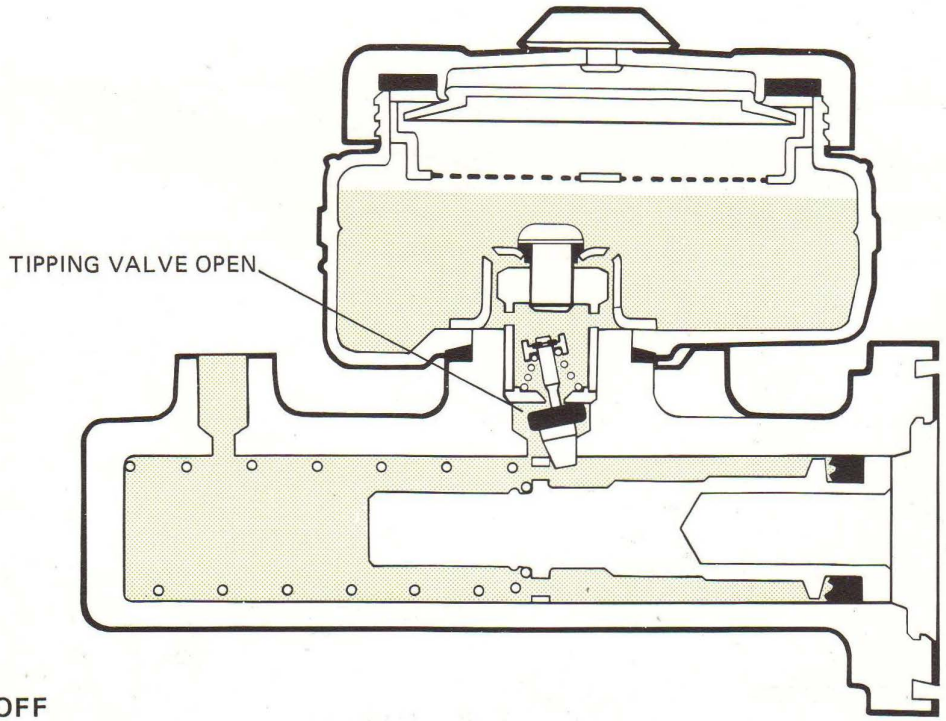
Assembly

Use the new parts from the Girling Service Kit when reassembling. To assist reassembly, hold the unit in a vice with padded jaws.

3

FLUID NOT UNDER PRESSURE

FLUID UNDER PRESSURE



BRAKE OFF

A1168

Dip seal in fluid, then fit to the plunger and spring assembly, lubricate with new unused Castrol Girling Brake Fluid and ease into the bore.

NOTE: ENSURE LIPS OF SEAL ARE FACING FLUID PRESSURE.

Push the plunger along the bore and hold in this position to allow the tipping valve to be fitted. While still holding the plunger down the bore screw in the tipping valve retainer and tighten to a torque of 47 to 61 Nm (35 to 45 lbf.ft). Fit the reservoir seal into position and fit the reservoir, ensuring that the rib on the body casting is in the slot of the reservoir base. Place the reservoir retainer over the tipping valve retainer. Screw in the retaining bolt and tighten to a torque of 16 to 19 Nm (12 to 14 lbf.ft).

Before refitting the filter ensure that the reservoir is free from any foreign matter. If in doubt strip again and rectify.

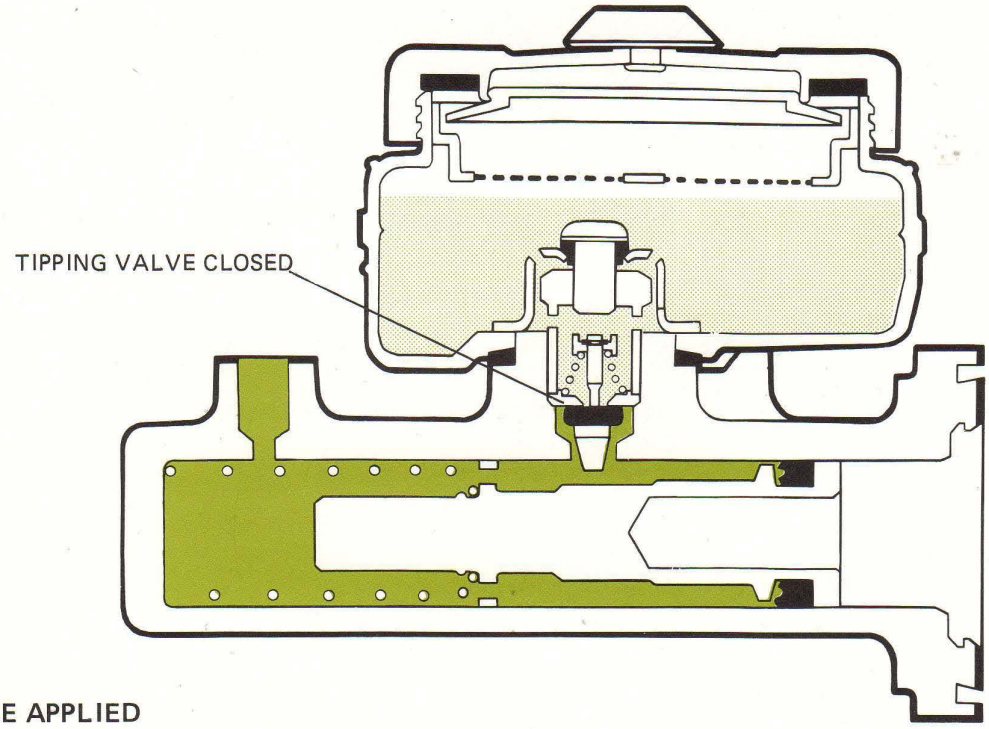
Fit the new filler cap seal and secure with the baffle. Screw the filler cap onto the reservoir.

Fit the bleedscrew (where applicable).

Ensure that the end face flange seal is in position before bolting to the vehicle.

Refill the fluid reservoir with Castrol Girling Crimson Brake and Clutch Fluid. Bleed the system commencing and finishing with master cylinder bleedscrew (where fitted).

4



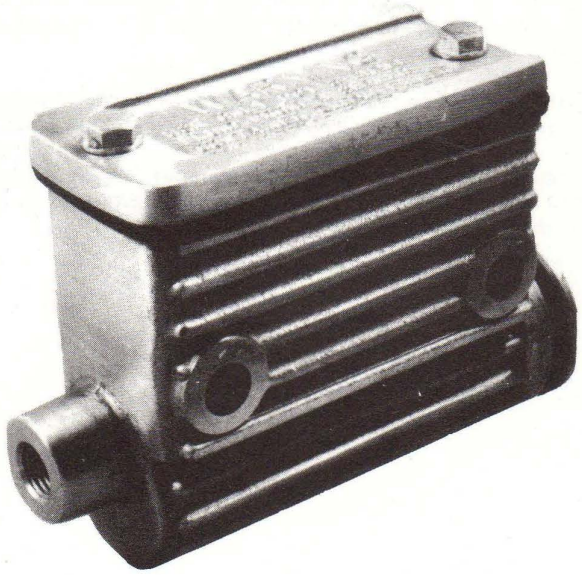
BRAKE APPLIED

A1169

A.S. master cylinder

5A10a

1



Introduction

The A.S. master cylinders shown in Fig. 1 utilise tried and proven principles adapted for motorcycle applications. Various designs are available and maybe either foot pedal or hand lever operated. Integral and remote fluid reservoirs are used and moisture barriers may be fitted. Upon application of the appropriate lever/pedal, the initial movement forces the piston along the bore sufficiently for the cup seal to close the inlet supply port and build up pressure in the line to the disc brake caliper. When the lever/pedal is released the rapid return of the piston causes the cup seal to momentarily collapse, allowing a fast recuperation of the fluid and rapid brake release.

The rear seal on the plunger is used only to prevent fluid loss and is not subject to brake line pressures at any time.

WARNING: THIS BRAKE SYSTEM IS DESIGNED FOR USE WITH DOT 5 BRAKE FLUID. USE ONLY DOT 5 BRAKE FLUID FOR CLEANING THE HYDRAULIC COMPONENTS.

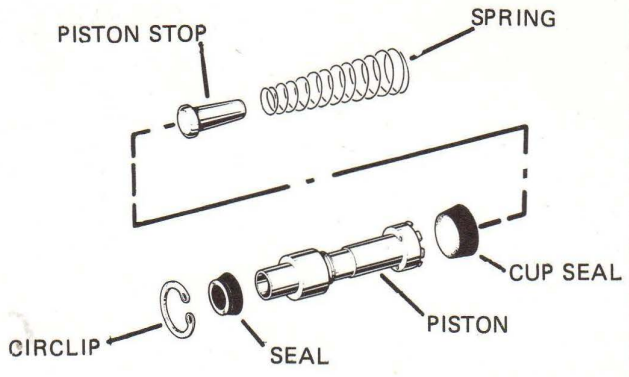
Servicing

Every 30,000 miles (48,000 km) or 3 years, whichever occurs first, hydraulic cylinders should be replaced by new units. However, provided the working services of the master cylinder are in perfect condition then new seals and components from a Girling Service Kit can be fitted. If any doubt exists regarding the condition of the cylinder then a new guaranteed unit must be fitted.

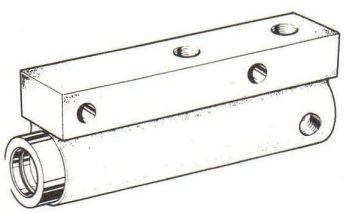
Dismantling (Disassembly) Fig. 2

There are various sizes of A.S. master cylinders but basically they are all similar in the types of components fitted.

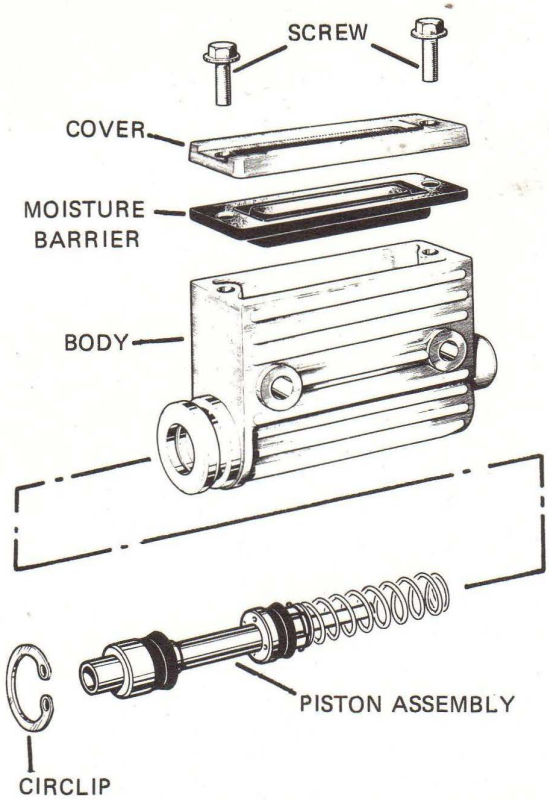
2



A1171 EARLY DESIGN PISTON ASSEMBLY



A1171 ALTERNATIVE BODY DESIGN



A1561
A1174

A.S. master cylinder

Attach a bleed tube to caliper bleed screw and open the bleed screw half a turn. Operate the brake and discharge all the brake fluid from the system into a jar and discard. Disconnect the hydraulic connection(s) to the master cylinder and stoplight etc., refer to illustration fig. 2. Dismantle accordingly. Basically the hydraulic piston assembly is the same for all models and should be serviced as follows.

Secure the master cylinder in a bench vice fitted with padded jaws and remove the circlip. Extract the piston assembly from the bore, it should withdraw complete. However, if an early design piston assembly, it may be necessary to remove the cup seal, piston stop and spring separately. This operation must be executed carefully to avoid damaging the smooth machined bore of the cylinder. Discard the piston assembly complete.

Cleaning

Clean all road dirt and corrosion from the exterior of the master cylinder body. Clean the cylinder bore thoroughly with new un-used DOT 5 brake fluid. Inspect the cylinder bore for scratches, score marks or corrosion and if evident DO NOT proceed further with this overhaul, obtain a new guaranteed master cylinder.

Re-Assembly

If you are satisfied that the cylinder is in near perfect condition carefully re-assemble the unit with the new piston assembly and circlip, supplied in the service kit, use new un-used DOT 5 brake fluid as a lubricant to assist re-assembly (refer to Fig. 2). Refit the stoplight switch where applicable and attach the master cylinder to the brake, locating the pedal/lever linkage and refitting the two securing bolts. Carefully refit the hydraulic connection(s), be wary of cross threading or over-tightening and stripping the threads.

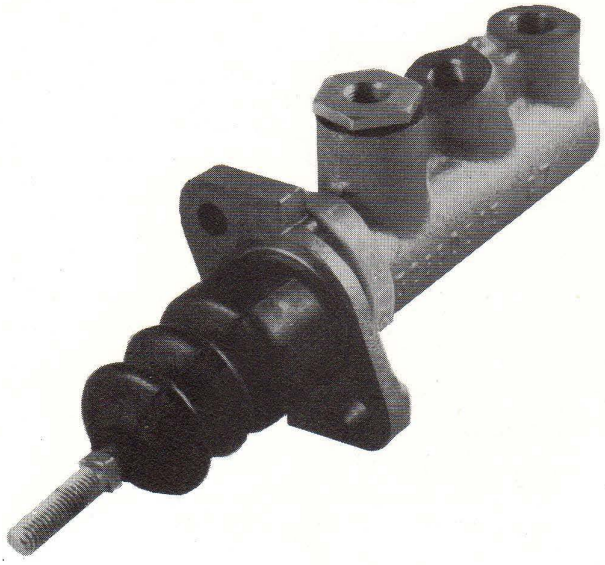
Use new un-used DOT 5 brake fluid to bleed the brake system; referring to the vehicle manufacturer's recommendations for the bleed procedure.

Having successfully bled the system ensure that no leaks are evident at any of the disturbed hydraulic connections.

For master cylinders with integral reservoirs, top up the reservoir and refit the moisture barrier, secure with the lid. Ensure the vent hole is clear.

C.C.V. Mk 4 master cylinder (compensating centre valve) 5A11a

1



A1900

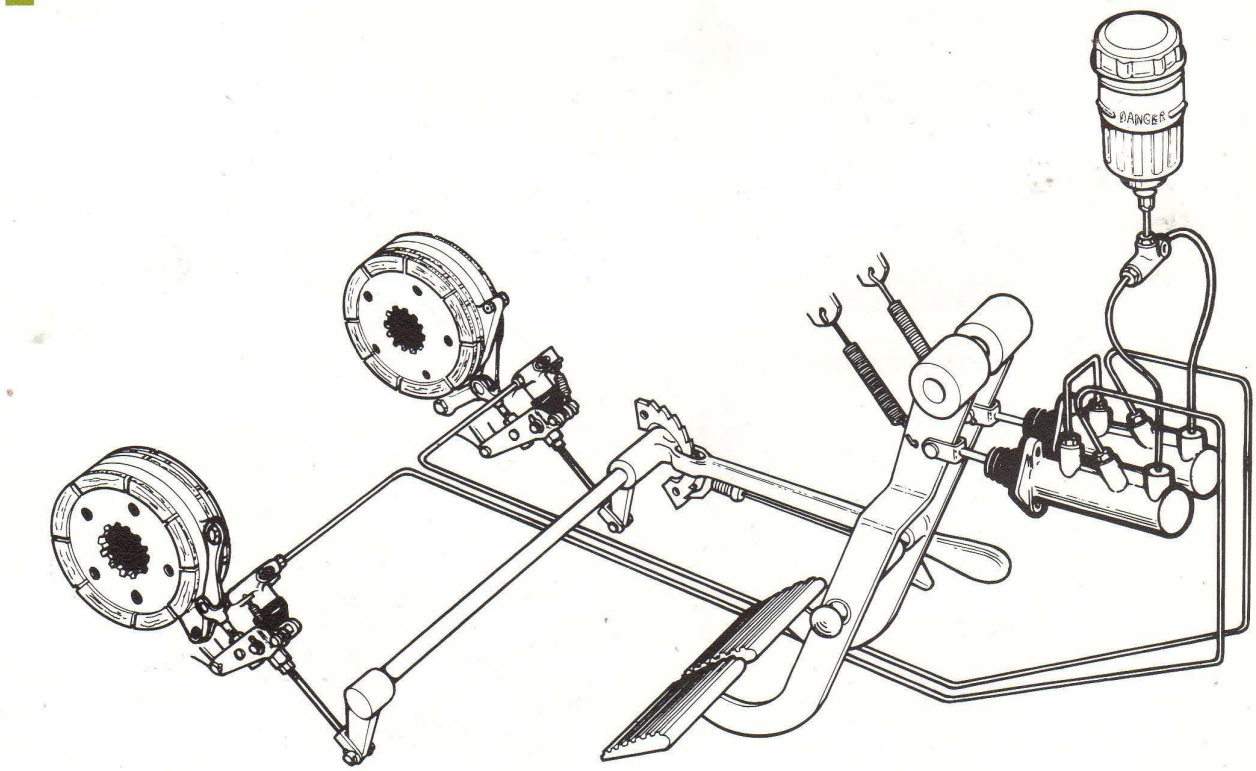
Most tractors are produced for agricultural use and to enable them to perform their field function satisfactorily they must be capable of performing spin turns. This manoeuvre is achieved by braking one wheel and causing the tractor to change direction by pivoting on that wheel. A similar action is carried out when using certain land implements when the drag on the tractor caused by the implement is so great that directional stability cannot be maintained by the steering wheels. Correction has to be made by partial brake application on one side only.

To meet this requirement it is essential to have separate brake pedals for each side of the vehicle, operating separate master cylinders to provide pressure to the brakes. On the road it is mandatory that the two pedals are linked to ensure that both brakes operate. However, if one brake has been used excessively throughout the day's field operation, the lining material will have been subject to wear and that brake will be more out of adjustment than the other brake. By linking the pedals, their travel will be limited to that needed to apply the least worn brake and the other will not be operating with the same effort. A pull condition would result. To overcome this, some form of compensation must be built into the brake system so that with linked pedals the tractor will pull up in a straight line.

The latest method to be designed and produced is the Compensating Centre Valve Master Cylinder which incorporates both master cylinder and compensating valve function in one unit.

The compensating function centres around the valve seal (Fig. 15) which has a raised lip of rubber serving to hold the valve open until brake pressure is applied.

2

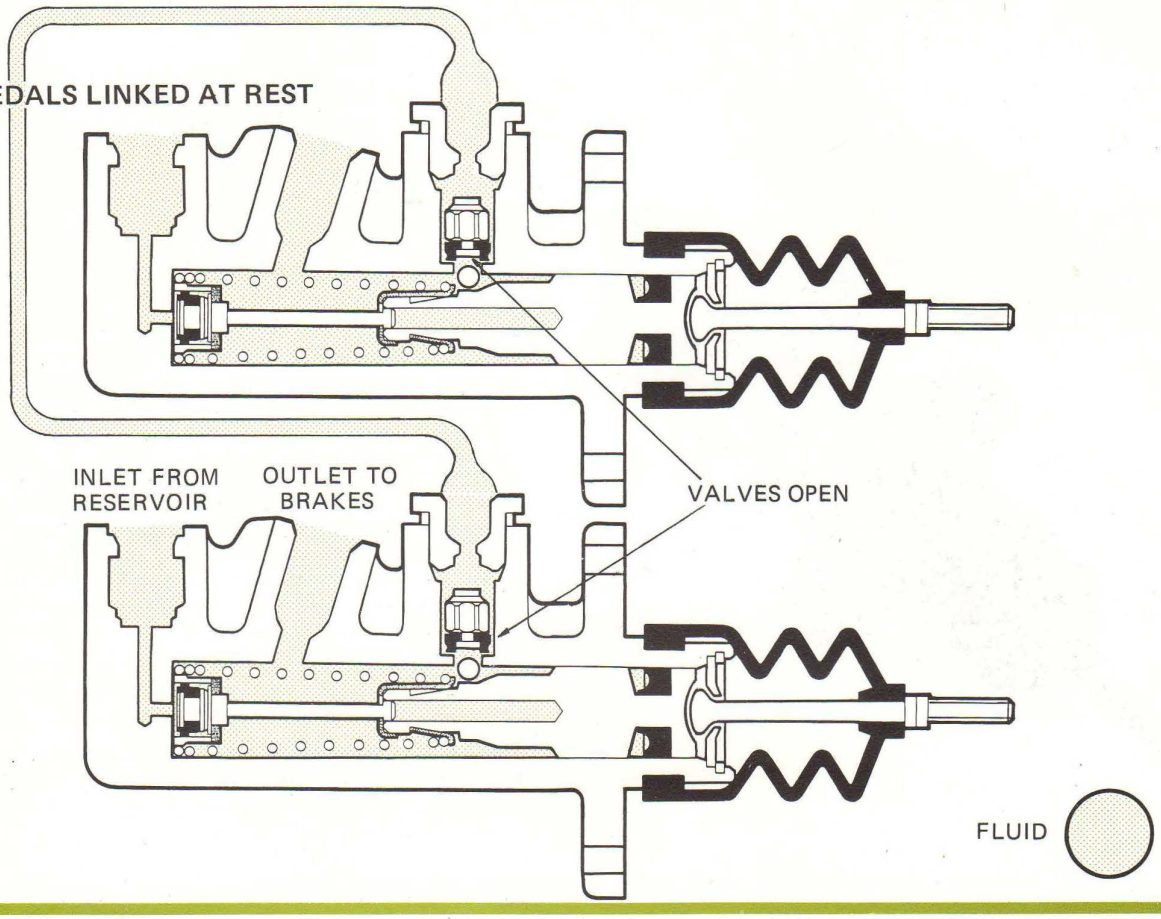


A0964

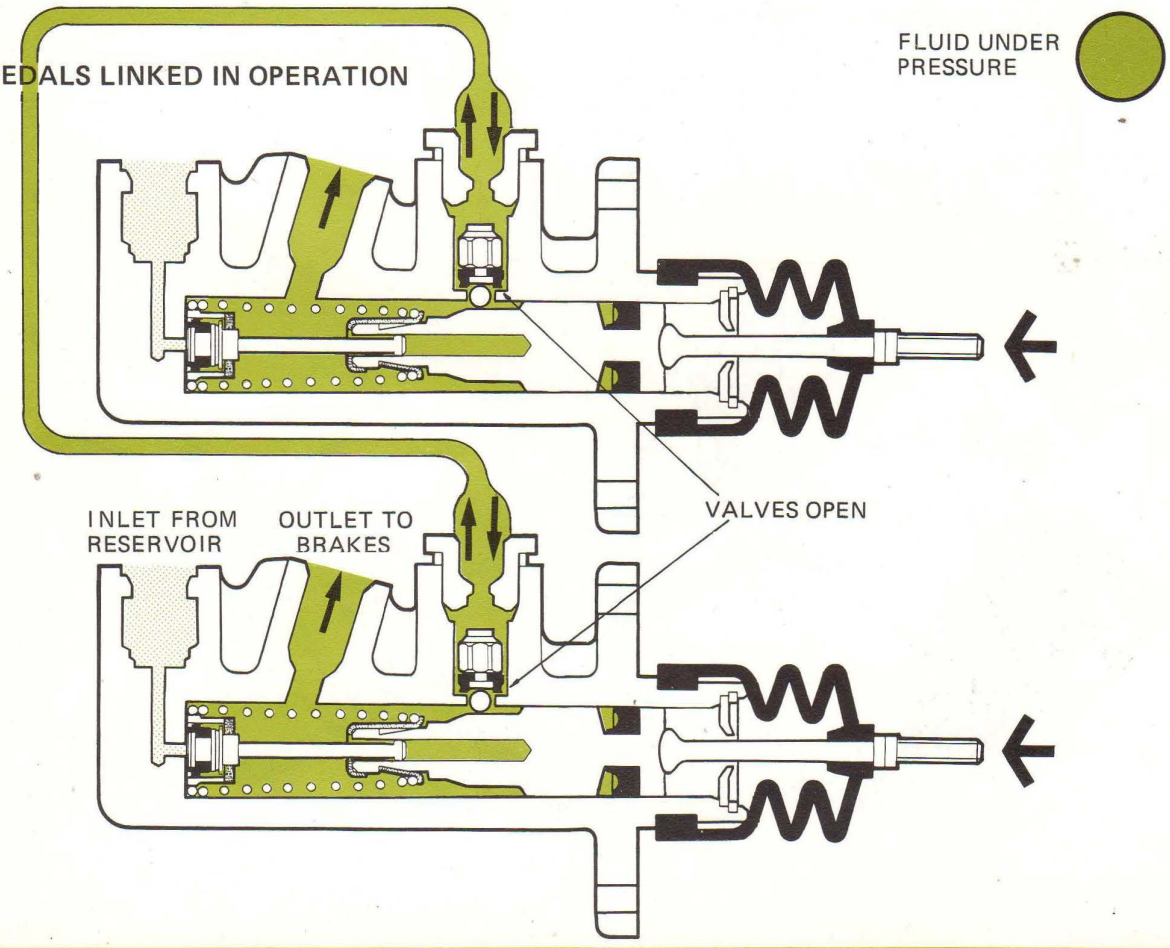
5A11b

C.C.V. Mk 4 master cylinder
(compensating centre valve)

3 PEDALS LINKED AT REST



4 PEDALS LINKED IN OPERATION



C.C.V. Mk 4 master cylinder (compensating centre valve) 5A11c

WARNING: BOTH MINERAL AND NON MINERAL BASED UNITS ARE IN USE. IT IS ESSENTIAL THAT THE CORRECT FLUID OR OIL IS USED OTHERWISE BRAKE FAILURE WILL RESULT.

GREEN PAINT MARKING ON A UNIT – **MINERAL**. USE VEHICLE MANUFACTURERS RECOMMENDED BRAKE OIL.

NO PAINT MARKINGS ON UNIT – **NON MINERAL**. USE CASTROL GIRLING UNIVERSAL OR CRIMSON BRAKE FLUID.

In the following text substitute brake oil for brake fluid whenever applicable.

How it Works

Two cylinders are employed on any one vehicle (Fig.2), one operating the right hand brake, the other the left hand brake, each having an independent pedal which can be mechanically linked together.The cylinders are fed from a single fluid reservoir and are interconnected hydraulically by a bridge pipe. Under coupled braking (Figs.3 and 4) the compensating valves are opened, allowing fluid to transfer from one cylinder to the other thus equalising pressures. Under single pedal braking (See Fig.5) the valve in the unoperated cylinder will be flowed closed thus preventing fluid transfer.

The basic operating principle of the unit, ignoring the compensating valve arrangements, is similar to that of a standard Centre Valve Master Cylinder (See Page 5A1a).

When pressure is applied to the brake pedal the push rod contacts the plunger and pushes it up the bore of the cylinder. During the initial movement the flow of fluid along the centre valve seal causes it to move and close off the reservoir supply port. As the plunger continues to move up the bore, pressure is applied to the brakes via the brake pipes and hoses.

To appreciate the complete method of operation of the unit there are two operating conditions that must be considered.

1. Pedals Unlinked

Effort applied to a single pedal moves its push rod and hence plunger down the bore of the active cylinder. The centre valve closes the reservoir supply port, the compensating valve seal moves away from its valve face and fluid is displaced into the passive cylinder via the bridge pipe.

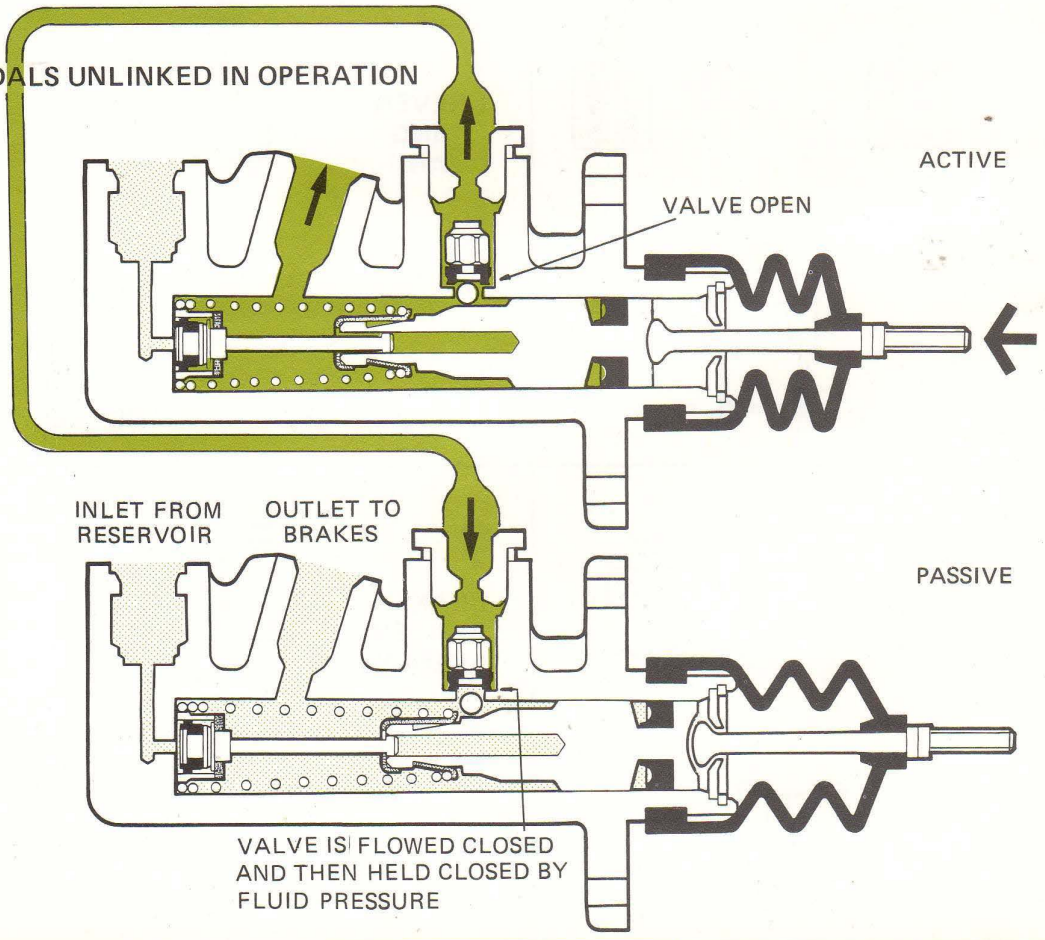
The fluid flow closes the compensating valve in the passive cylinder, which is then held on to its seal by the resulting build up of pressure. This pressure is retained by the compensating valve seal and the main plunger seal, and continued pedal application pressurises the active circuit only, thereby applying the one brake (See Fig. 5).

2. Pedals Linked

Effort applied to the push rods of both cylinders by the brake pedals causes the plungers to move down the bores. This initial plunger and fluid displacement moves the centre valve seal over the reservoir supply port closing off that inlet.

Further movement of the plunger down the bore causes the ball bearing to travel up the taper of the plunger, lifting the flow valve from its seat, preventing it from closing. This allows fluid movement via the bridge pipe to the other cylinder. The same process takes place in the opposite cylinder allowing equalised pressure within the two cylinders.

5 PEDALS UNLINKED IN OPERATION



5A11d C.C.V. Mk 4 master cylinder (compensating centre valve)

If the linings are worn evenly the same amount of fluid displacement will be needed on both sides of the vehicle to apply the brakes (See Fig. 6). Therefore the amount of fluid displacement between cylinders will be small, and the brakes will be applied evenly.

It however, the linings are unevenly worn, which will be the true condition in service (See Fig. 7), the amount of fluid displacement to apply the brakes will differ from one side of the vehicle to the other. This different amount of fluid displacement is achieved by compensation between the two cylinders (See Fig. 8).
The plunger operating the brake with the least worn linings, having diisplaced sufficient fluid to bring the linings into contact will continue to move down the bore since effort is still being applied to the pedal. If further displacement took place at the lining end the brake would be applied, so the cylinder begins to compensate for the other plunger which is operating the most worn linings, by displacing fluid via the bridge pipe into the other cylinder until hydraulic pressures are equalised. In this condition both compensating valves are open allowing fluid movement between master cylinders as required and both brakes are evenly applied (See Fig. 9).

After 3,000 hrs or a period of 3 years, whichever occurs first, the master cylinder should be replaced by a new guaranteed unit. However, the cylinders may be serviced at this period when new seals from the appropriate Girling Service Kit should be fitted, but only if the cylinder bore is in perfect condition. At all times during any overhaul extreme care and scrupulous cleanliness must be exercised. If any doubt exists regarding the condition of the bore a new cylinder must be fitted.

Dismantling

Drain the system of fluid by attaching a rubber tube to a bleed screw, unscrew half a turn and pump out the fluid by operating the foot pedal, discard the fluid.

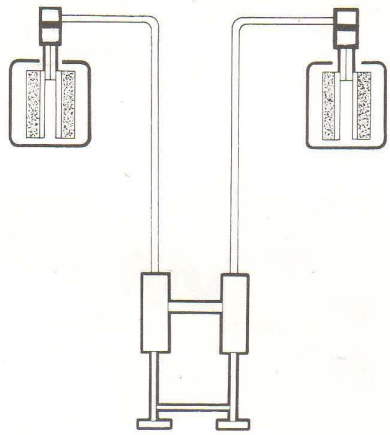
Disconnect the pipes from the master cylinder. Unscrew the securing bolts, disconnect the push rod from the pedal and remove the cylinder from its mounting.

Secure the cylinder in a bench vice but do not clamp with excessive force. Remove the flow valve adaptor using the correct size spanner. If fitted, remove the adaptor from the inlet port. Using a small screwdriver with the end of the blade rounded and polished, carefully lever out the inlet port adaptor seal. AVOID DAMAGING THE INLET PORT.

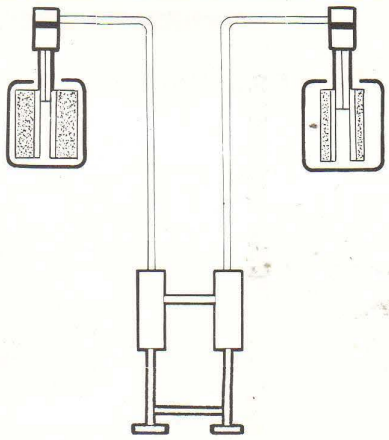
Remove cylinder from vice and invert to remove flow valve and ball bearing. Place ball bearing in a safe place. Remove seal from flow valve. Pull back the rubber dust cover, then, using a pair of long nosed pliers, remove the circlip. The plunger can now be removed either by shaking the cylinder or gently applying compressed air to an inlet, whilst blocking off the remaining ports.

PRIOR TO HANDLING SEALS AND COMPONENTS ENSURE THE HANDS ARE CLEAN TO AVOID CONTAMINATION.
If the seals are loose on the plunger and appear oversize, suspect contamination. Compare the old seals with the new but do not let them touch. If the old seals are appreciably larger, contamination is definitely indicated and the system should be thoroughly flushed out with the appropriate unused brake fluid or Girling Cleaning Fluid and all seals and hoses changed without delay.

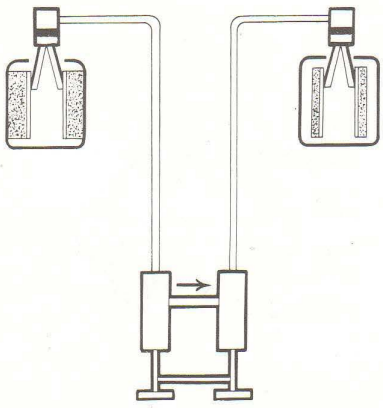
6 EVEN LINING WEAR



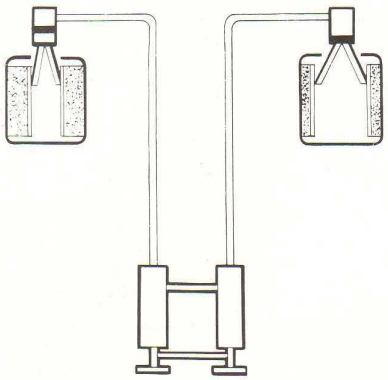
7 UNEVEN LINING WEAR



8 FLUID TRANSFER



9 BRAKES APPLIED EVENLY



A1000

C.C.V. Mk 4 master cylinder (compensating centre valve) 5A11e

Lift the leaf of the spring retainer(Fig. 11)and remove the spring assembly from the plunger. Compress the spring to free the valve stem from the keyhole of the spring retainer, thus releasing the tension of the spring. Remove the spring, valve spacer and curved washer from the valve stem and the valve seal from the valve head.

Remove the plunger seal as follows:-

Select a small screwdriver and round off and highly polish the end of the blade.

NOTE: It is important that the screwdriver is prepared in this way to avoid damaging the surface of the plunger.

Refer to Fig. 12 and squeeze the seal until the polished blade can be inserted then lever the seal as shown in Fig. 13, then pressing the seal remove it from the plunger.

Cleaning

Comparison of the parts contained in the appropriate Girling Service Kit will indicate which parts to discard.
Examine the plunger and cylinder bore for visible score marks, ridges and corrosion. Check that the bore is smooth to the touch. If there is the slightest doubt as to the condition of the parts than a new guaranteed master cylinder must be fitted. Inspect all other components to ensure they are in good working order.

Assembly

Use the new parts from Service Kit when re-assembling. Lubricate the inner diameters of the seals with unused brake fluid before fitting.

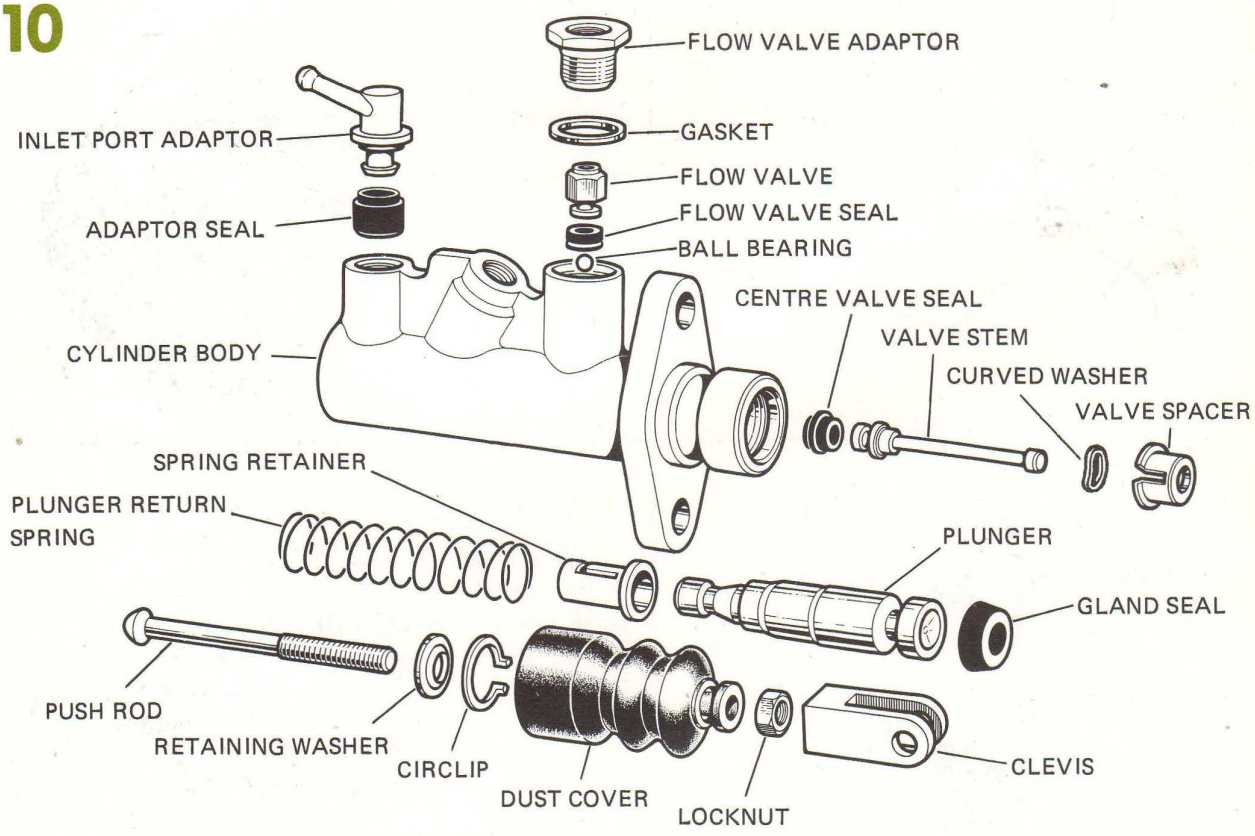
Fit the new plunger seal to the plunger. Fit the new centre valve seal as shown in Figure 14 onto the head of the valve stem. Position the curved washer on the valve stem so that it 'flares' away from the valve stem shoulder as illustrated (Fig. 14). Follow with the valve spacer-legs first, and then the spring.

Fit the spring retainer to the spring and compress the spring until the valve stem passes through the keyhole in the spring retainer and engages in the centre. Fit the spring sub-assembly immediately to the plunger and press hole the leaf of the spring retainer to secure (Fig. 15)
Liberally lubricate the plunger assembly and the cylinder bore with new unused brake fluid.
Insert the plunger assembly into the cylinder bore, easing the entrance of the plunger seal. Position the push rod and retaining washer and fit the circlip. Smear the sealing areas of the rubber dust cover with Girling Rubber Grease and fit to the push rod.

NOTE: Prior to fitting the flow valve seal you will notice a raised portion on the sealing face (Fig. 15). This raised portion is a design feature of the seal - not moulding flash. Do not remove this material.

Fit flow valve seal to flow valve. Secure cylinder in a bench vice. Place ball bearing into flow valve port ensuring that it comes to rest in the hole through to the bore. Insert the flow valve into the flow valve port and position centrally over ball bearing.

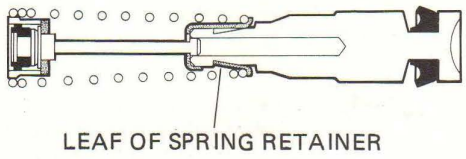
10



A1895

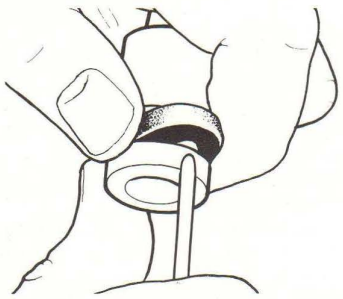
5A11f C.C.V. Mk 4 master cylinder (compensating centre valve)

11



A1790

12



A0296/5

Install the gasket on the flow valve adaptor. Carefully screw the adaptor into the flow valve port by hand. If a resistance is felt before the adaptor is screwed in fully, unscrew the adaptor, centralise the flow valve, then refit the adaptor. Tighten to a torque of 41 to 47 Nm (30 to 34 lbf.ft). Fit the seal to the inlet port. Press the inlet port adaptor firmly into the seal ensuring that the lip on the adaptor locates in the bottom of the seal. Position the dust cover over the cylinder body. Refit the cylinder to the vehicle and reconnect pipes. Reset the pedal to the push rod clearance.

IMPORTANT: PUSH ROD-TO-PLUNGER CLEARANCE IS CRITICAL AND MUST BE SET AS FOLLOWS:-

Depress push rod to stroke master cylinder and allow plunger to return freely. Adjust the push rod to plunger clearance dimension to 0.6 to 1.3mm (0.025 to 0.05 in) Fig. 16.

Bleeding

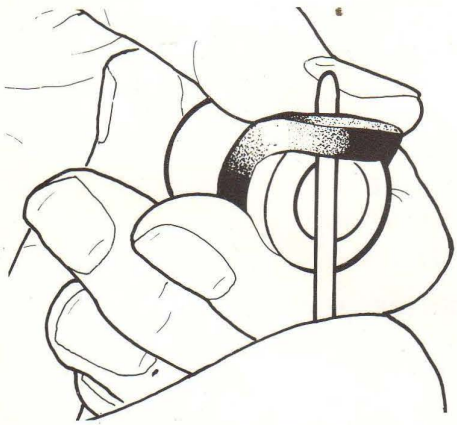
To bleed the system the following procedure must be followed:-

1. Attach a bleed tube to each bleed screw and immerse the open ends in a clean jar containing a small quantity of new clean Castrol Girling brake fluid.
2. Open both bleedscrews ¼ to ½ turn, depress and release the coupled pedals several times, topping-up the reservoir as necessary, until all of the air has been expelled.
3. Close both bleedscrews.
4. Open left-hand bleed screw ¼ to ½ turn and hold left-hand pedal at approx ¼ of its travel.
5. Fully depress right hand pedal, close left hand bleed screw and release right hand pedal.

NOTE:

Steps 1 - 3 may be taken for each side independantly.

13



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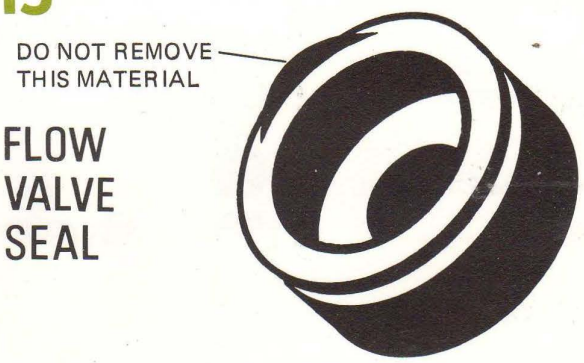

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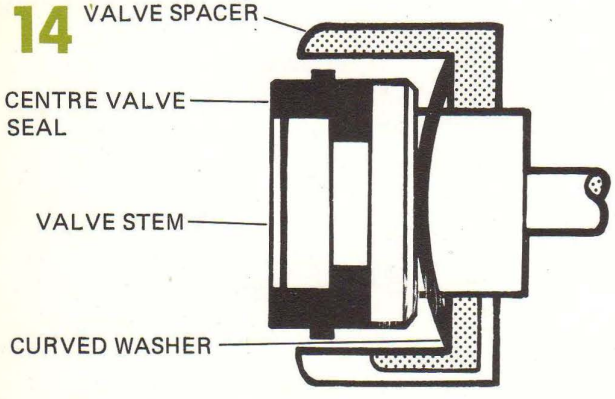

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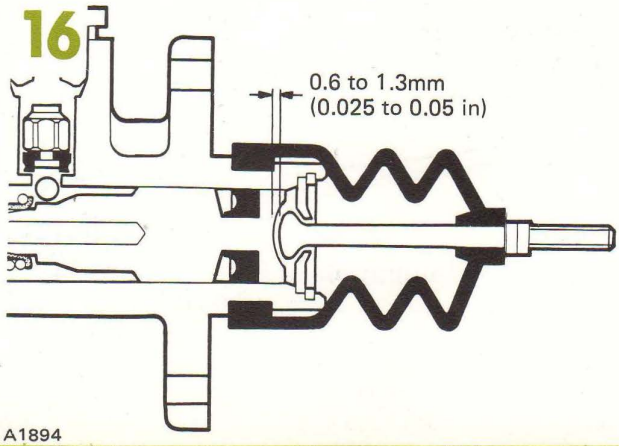

A1894

double-acting wheel cylinders 5B 1a

Introduction

The details of brake equipment can vary considerably and there is a wide variation of brake sizes, both in diameter and in width, and variation in design of front and rear brakes to satisfy different conditions.

Master cylinders and wheel cylinder sizes and types vary and each brake system is designed to meet the individual characteristics of each model.

However, all wheel cylinders are basically the same with the service periods depending on the installation. The illustrations below, show some typical double-acting wheel cylinders, so called because they have two pistons. Details of single-acting (one piston) wheel cylinders can be found in this Section, Page 5B2.

Servicing

The servicing periods for hydraulic equipment fitted to Private Cars and Light Commercial Vehicles is 40,000 miles (64,000 km) or three years and for Medium and Heavy Commercial Vehicles it is 50,000 miles (80,000 km) or two years.

When the mileage is recorded or the time schedule expires, whichever is the sooner, all hydraulic cylinders should be replaced by new guaranteed units. However, the wheel cylinders may be serviced at this time when new seals from the appropriate Girling Service Kit should be fitted, but only if the cylinder bores and pistons are in perfect condition.

Never service just one wheel cylinder. To be sure of balanced braking, always service wheel cylinders on both sides of the vehicle.

Dismantling

To overhaul wheel cylinders, remove from the backplate and, keeping the parts separate, dismantle each cylinder in turn as indicated by the illustrations.

If fitted, unscrew the bleedscrew. Note that the two types of bleedscrew illustrated below (Fig. 3) are not interchangeable.

Cleaning

The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place the cleaned parts onto a clean sheet of paper.

Examine the cylinder bore and the pistons for signs of corrosion, ridges or score marks. Provided the working surfaces are in perfect condition new seals from the Girling Service Kit can be fitted, but if there is any doubt as to the condition of the parts then new guaranteed cylinders must be fitted to both sides of the vehicle.

Ensure all other parts are in good working order.

Assembling

Fit the new seals to the pistons with the flat back of the seal against the shoulder of the piston.

Lubricate the seals and the cylinder bore with unused Castrol-Girling Brake Fluid and re-assemble the cylinder.

Refit the cylinders to the backplate in accordance with the instructions for the relevant brake service page in Section 2 or 3, as applicable.

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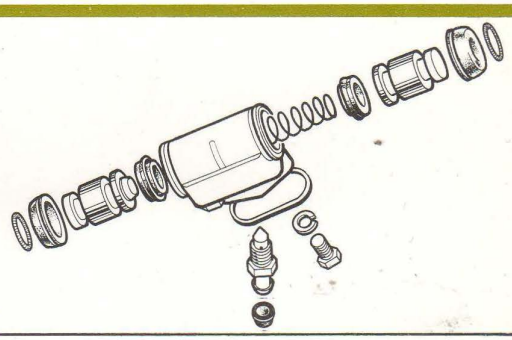

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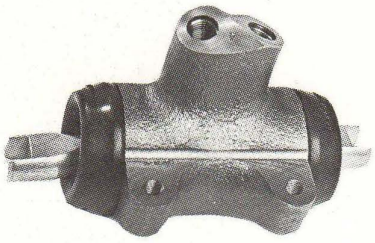

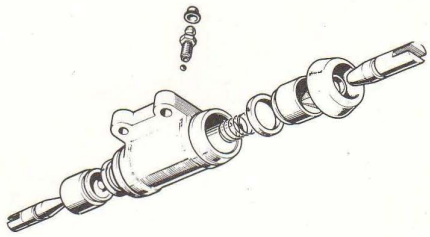

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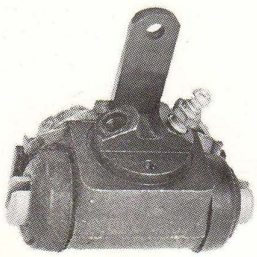

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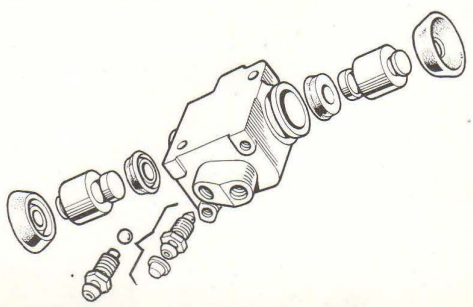

A0131

single-acting wheel cylinders 5B 2a

Introduction

The details of brake equipment can vary considerably and there is a wide variation of brake sizes, both in diameter and in width, and variation in design of front and rear brakes to satisfy different conditions.

Master cylinders and wheel cylinder sizes and types vary and each brake system is designed to meet the individual characteristics of each model.

However, all wheel cylinders are basically the same with the service periods depending on the installation. The illustrations below, show some typical single-acting wheel cylinders, so called because they have only one piston. Details of double-acting (two piston) wheel cylinders can be found in this Section, Page 5B1.

Servicing

The servicing periods for hydraulic equipment fitted to Private Cars and Light Commercial Vehicles is 40,000 miles (64,000 km) or three years and for Medium and Heavy Commercial Vehicles it is 50,000 miles (80,000 km) or two years.

When the mileage is recorded or the time schedule expires, whichever is the sooner, all hydraulic cylinders should be replaced by new guaranteed units. However, the wheel cylinders may be serviced at this time when new seals from the appropriate Girling Service Kit should be fitted, but only if the cylinder bores and pistons are in perfect condition.

Never service just one wheel cylinder. To be sure of balanced braking, always service wheel cylinders on both sides of the vehicle.

Dismantling

To overhaul wheel cylinders, remove from the backplate and, keeping the parts separate, dismantle each cylinder in turn as indicated by the illustrations.

If fitted, unscrew the bleedscrew. Note that the two types of bleedscrew illustrated below (Fig. 3) are not interchangeable.

Cleaning

The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place the cleaned parts onto a clean sheet of paper.

Examine the cylinder bore and the piston for signs of corrosion, ridges or score marks. Provided the working surfaces are in perfect condition new seals from the Girling Service Kit can be fitted, but if there is any doubt as to the condition of the parts then new guaranteed cylinders must be fitted to both sides of the vehicle.

Ensure all other parts are in good working order.

Assembling

Fit the new seal to the piston with the flat back of the seal against the shoulder of the piston.

Lubricate the seal and the cylinder bore with unused Castrol-Girling Brake Fluid and re-assemble the cylinder.

Refit the cylinders to the backplate in accordance with the instructions for the relevant brake service page in Section 2 or 3, as applicable.

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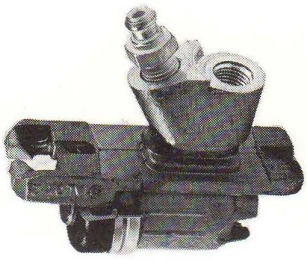

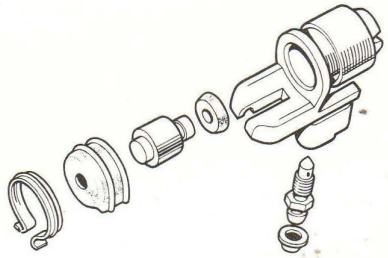

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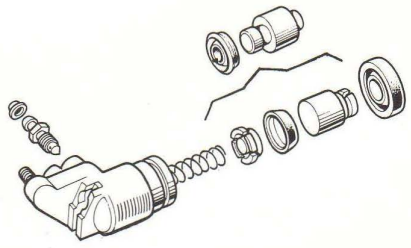

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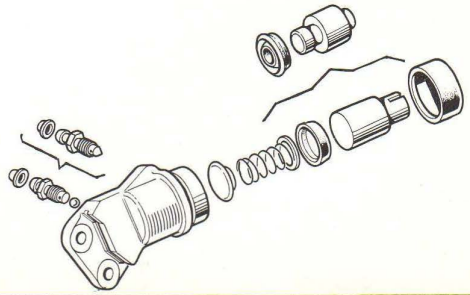

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A0130:2

transverse wheel cylinder (puller type) 5B 3a

Introduction

The puller type transverse wheel cylinder (Fig. 1) is designed for the rear brakes of commercial vehicles and operates by pulling directly on the expander drawlink. The design incorporates an independent connection for handbrake operation.

The puller cylinder is used in conjunction with a pusher cylinder operating the front brakes.

Servicing

At intervals of 50,000 miles (80,000 km) or two years, whichever occurs first, all hydraulic cylinders fitted to commercial vehicles should be replaced by new guaranteed units. However, provided the working surfaces of the cylinder bore and piston are in perfect condition, then new seals from the appropriate Girling Service Kit can be fitted. But if doubt exists regarding the condition of the cylinder or piston then a new guaranteed cylinder must be fitted.

Dismantling

NOTE: Use of the Girling Hose Clamp (see Section 1, Page 1B1) will keep the loss of fluid to a minimum and after servicing the cylinders only the affected parts require bleeding. The use of other tools to clamp the hoses is not recommended because internal damage may be caused to the hose without it being noticed externally. If, therefore, Girling Hose Clamps are not available it is necessary to drain the fluid from the system.

Attach a bleed tube to a bleedscrew, unscrew half a turn and pump out the fluid by operating the foot pedal or treadle valve. It is important to exhaust most of the air pressure before operating the valve.

Wipe clean the cylinder and the adjacent area of backplate. Disconnect the handbrake rod from the drawlink and unscrew the fluid pipe union. Remove the rubber dust cover, slacken the locating bolt and turn the sleeve assembly anti-clockwise until it can be removed. If the cylinder is cable operated, the cable end must be removed from the handbrake sleeve first. The cylinder can then be removed from the backplate.

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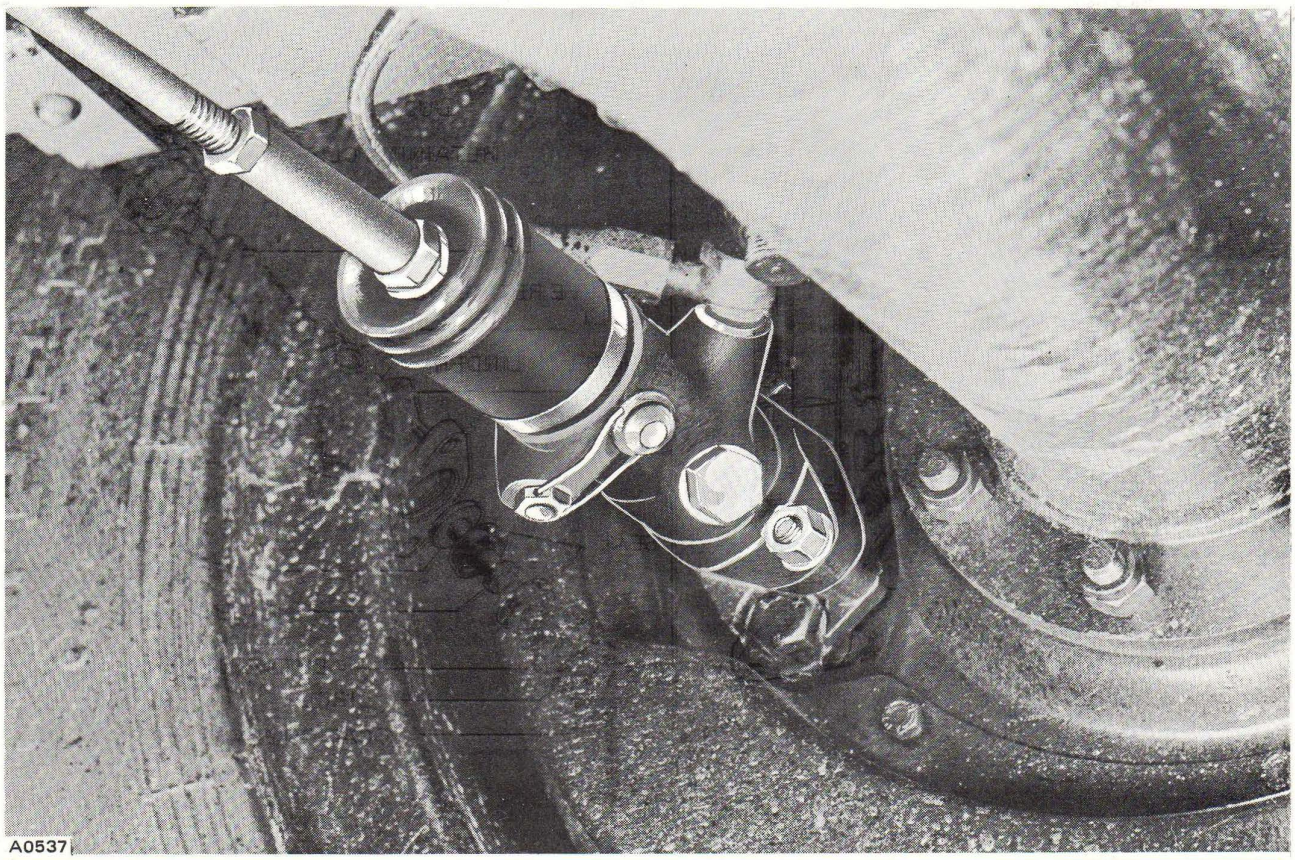


A0537

transverse wheel cylinder (puller type)

The piston and seals must be removed from the flange end of the cylinder. To do this the end plug must be removed. The type shown on Fig. 2 has a one-piece end plug and the unit shown on Fig. 3 is in three parts, i.e. a location plate, a circlip and an abutment.

Cleaning

The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place the cleaned parts onto a clean sheet of paper.

Examine the cylinder bore and the piston for signs of corrosion, ridges or score marks. Provided the working surfaces are in perfect condition new seals from the Girling Service Kit can be fitted, but if there is any doubt as to the condition of the parts then a new guaranteed cylinder must be fitted.

Ensure all other parts are in good working order.

Assembling

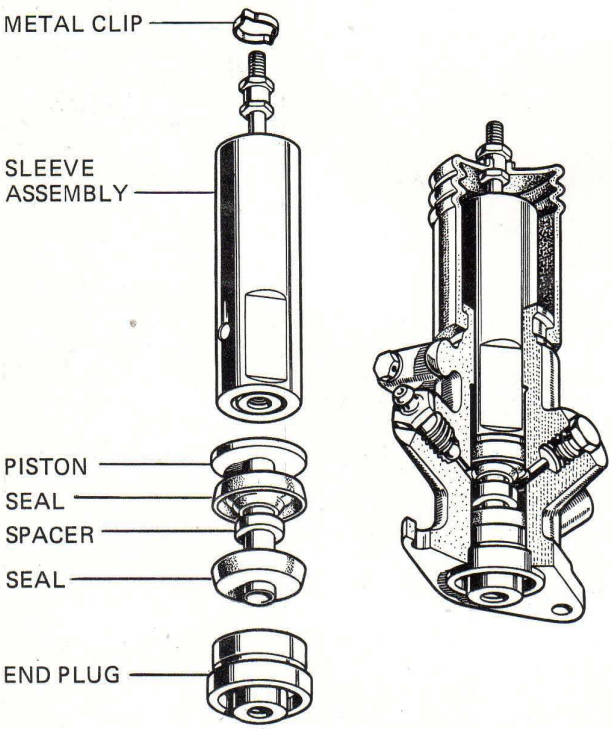
Place one seal onto the piston with the lips of the seal facing away from the piston head, follow with the spacer and the other seal with the lips of the seal facing the piston head. Smear the assembled piston and seals with unused Castrol-Girling Brake Fluid and insert into the bore from the flange end of the cylinder. Replace the end plug if the cylinder is the type shown in Fig. 2, or the abutment, circlip and location plate if the cylinder is as shown on Fig. 3. Place the marcalline gasket and return spring in position and bolt the cylinder to the backplate. When fitting the type shown in Fig. 3 it is absolutely essential that the location plate is in position. If this plate is left out the circlip may be forced out of its groove and this would result in excessive pedal travel.

Smear the handbrake sleeve with unused Castrol-Girling Brake Fluid and insert into the cylinder body. Lock the shoes in the drum by means of the adjuster. Screw the sleeve onto the expander drawlink by turning it in a clockwise direction, until resistance is felt (for the type on Fig. 2), or until the circlip just touches the body (for the type on Fig. 3). Turn the sleeve back until a flat is level with the stop bolt, then screw home the stop bolt and secure it with a locking wire. Adjust the shoes in the normal manner by slackening back two clicks until the drum rotates freely.

Setting and Checking the Handbrake Sleeve Travel

The setting of the cylinder, with the expander, can be checked by measuring the position and movement of the handbrake sleeve. To do this, slide back the dust cover on the cylinder and measure from the top of the body to the end of the sleeve (Dimension 'A') Fig. 4.

2



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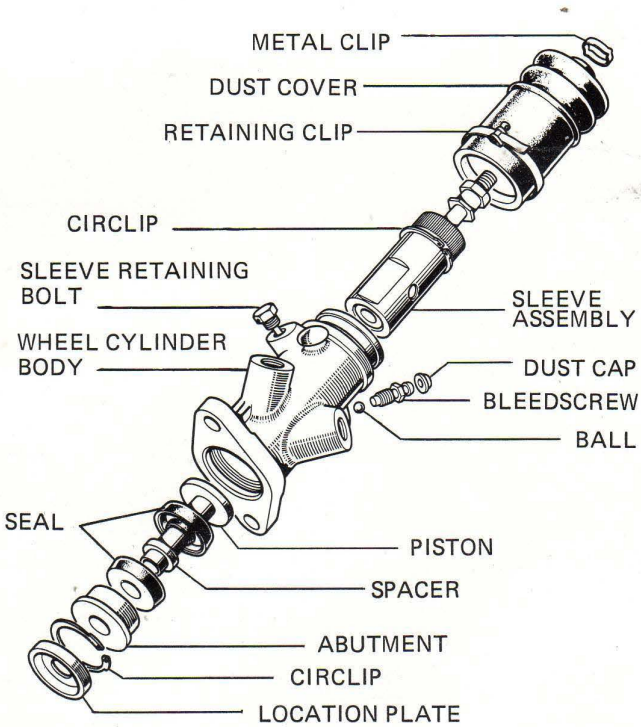

A0182

transverse wheel cylinder (puller type) 5B 3c

On the type shown in Fig. 4, the sleeve should not project more than 1.1/16 in. or 27 mm (Dimension 'A'). With the handbrake hard on, the sleeve should not project more than 1.11/16 in. or 43 mm (Dimension 'B').

Cylinder shown in Fig. 5 has a circlip round the sleeve which assists when setting the correct position for the handbrake sleeve. With the handbrake off the circlip should be almost touching the body (this represents Dimension 'A'). When the handbrake is hard on, the circlip should not be more than 5/8 in. or 16 mm (Dimension 'B') from the body.

It should be noted that Dimension 'B' is the safe maximum dimension; if the brake has recently been overhauled and is correctly adjusted the dimension will be nearer 'A'. The travel of the sleeve must not be more than 5/8 in. or 16 mm for all three types.

If adjusting the brake in the recommended manner does not correct the setting, disconnect the handbrake rod from the cylinder and turn the brake adjuster stem clockwise until the shoes are locked hard against the drum. Dimension 'A' should now be correct. If not, loosen the stop bolt and rotate the sleeve clockwise to screw it right on to the drawlink. If the sleeve cannot be screwed on correctly, remove the sleeve, check the threads and, if necessary, change the sleeve assembly.

Do not attempt to dismantle the sleeve. Both UNF and BSF versions are available. When the sleeve is correctly fitted, reset the handbrake linkage so that it can be re-connected to the cylinder without tension. Slacken back the brake adjuster two or three clicks and apply the handbrake. If the travel of the sleeve is more than 5/8 in. or 16 mm, which is indicated by the second measurement ('B') being exceeded, remove the drum and examine the shoes, bellcrank setting and expander parts until the reason for the excessive movement is found. When satisfactory, fit the drum, lock up the shoes in the drum by turning the adjuster and click back.

NOTE: Measurement 'B' indicates a safe maximum travel. If this is exceeded it should be regarded as a warning to adjust the brakes immediately.

Pack the rubber dust cover with Girling Rubber Grease; ensure the sealing edges of the dust cover are smeared with the grease. Fit the dust cover and secure with a clip. Connect the hydraulic pipe and repeat with the cylinder fitted to the opposite wheel.

After bleeding, slacken back the rear brake adjusters until the wheels just rotate freely and road test.

Bleeding the System

Remove Hose Clamps if fitted and bleed the system as described in Section 1, Page 1D2.

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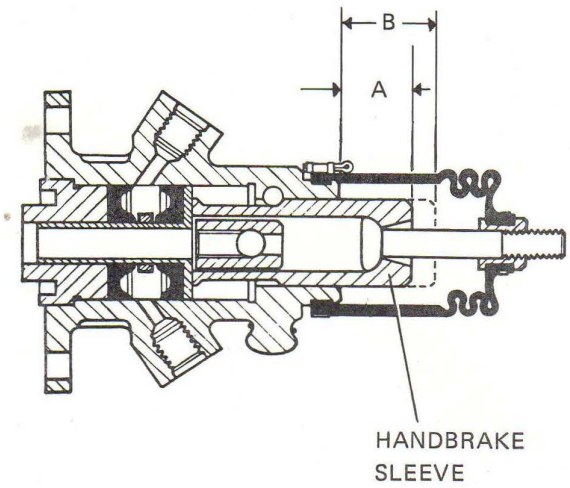

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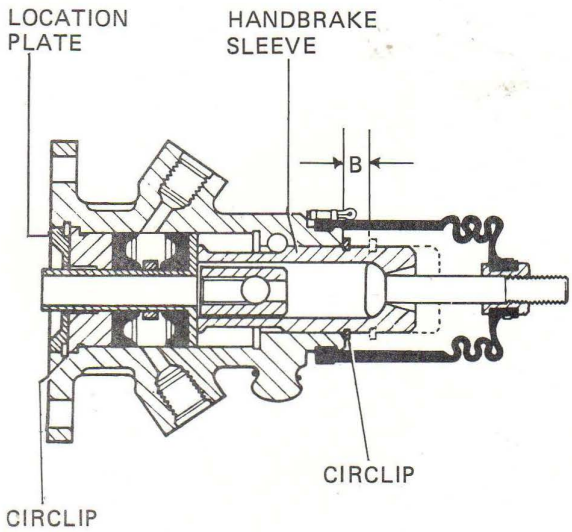


A0525/2

transverse wheel cylinder (pusher type) 5B 4a

Introduction

The pusher type transverse wheel cylinder (Fig. 1) is designed for the front brakes of commercial vehicles and operates by pushing directly on the expander plunger.

The pusher cylinder is used in conjunction with a puller cylinder operating the rear brakes. This unit pulls the expander drawlink and incorporates an independent connection for handbrake operation. The transverse puller cylinder is fully described on page 5B3.

Servicing

At intervals of 50,000 miles (80,000 km) or two years, whichever occurs first, all hydraulic cylinders fitted to Commercial Vehicles should be replaced by new guaranteed units. However, providing the working surfaces of the cylinder bore and piston are in perfect condition, then new seals from the appropriate Girling Service Kit can be fitted. But if doubt exists regarding the condition of the cylinder or piston then a new guaranteed cylinder must be fitted.

Dismantling

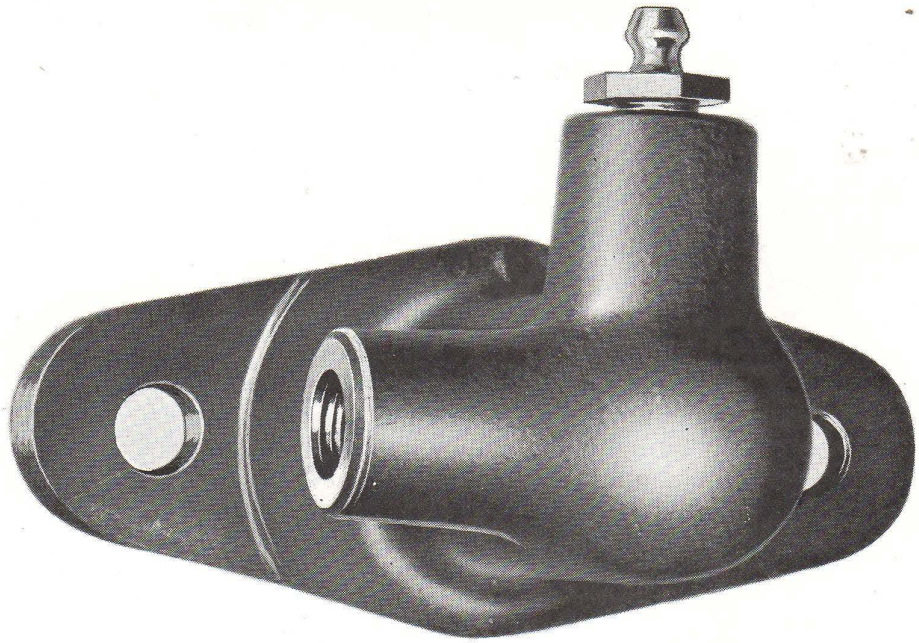
NOTE: Use of the Girling Hose Clamp (see Section 1, Page 1B1), will keep the loss of fluid to a minimum and after servicing the cylinders only the affected parts require bleeding. The use of other tools to clamp the hoses is not recommended because internal damage may be caused to the hose without it being noticed externally. If therefore, Girling Hose Clamps are not available it is necessary to drain the fluid from the system.

Attach a bleed tube to a bleedscrew, unscrew half a turn and pump out the fluid by operating the foot pedal or treadal valve. It is important to exhaust most of the air pressure before operating the valve.

Wipe clean the cylinder and the adjacent area of backplate. Disconnect the fluid inlet pipe and place a bleedscrew dust cap over the end to keep out the dirt.

Unscrew the securing nuts and remove the complete cylinder from the backplate. To fit a new cylinder, reverse the removal procedure and bleed the system as described in Section 1, Page 1D2.

1



A0522

5B 4b transverse wheel cylinder (pusher type)

To service the cylinder, refer to Fig. 2 and take out the piston, seal and spring. Unscrew the bleedscrew and shake out the ball, if fitted.

Cleaning

The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place the cleaned parts onto a clean sheet of paper.

Examine the cylinder bore and piston for signs of corrosion, ridges or score marks. Ensure the cylinder body is undamaged with no signs of cracks on the flange and that all parts are in good working order. The cylinder bore and piston must be in perfect condition and where doubt exists as to the condition of the parts, a new complete unit must be fitted.

Assembling

Lubricate the new seal and cylinder bore with unused Castrol-Girling Brake Fluid.

Fit the seal to the piston as indicated on the illustration (Fig. 2) with the flat back of the seal against the piston.

Insert the spring into the cylinder bore and follow with the piston, easing in the seal. Ensure the piston spigot locates with the spring.

If the piston head is flat and a seal support is used, insert the parts in the manner indicated on the illustration.

The two types of bleedscrew shown on the illustration are not interchangeable. Fit the ball if applicable and screw in the bleedscrew, but do not overtighten.

Ensure the backplate is clean and replace the cylinder. Connect up the hydraulic pipe and repeat with the cylinder fitted to the opposite wheel.

Bleeding the System

Remove hose clamps if fitted and bleed the system as described in Section 1, Page 1D2 and road test.

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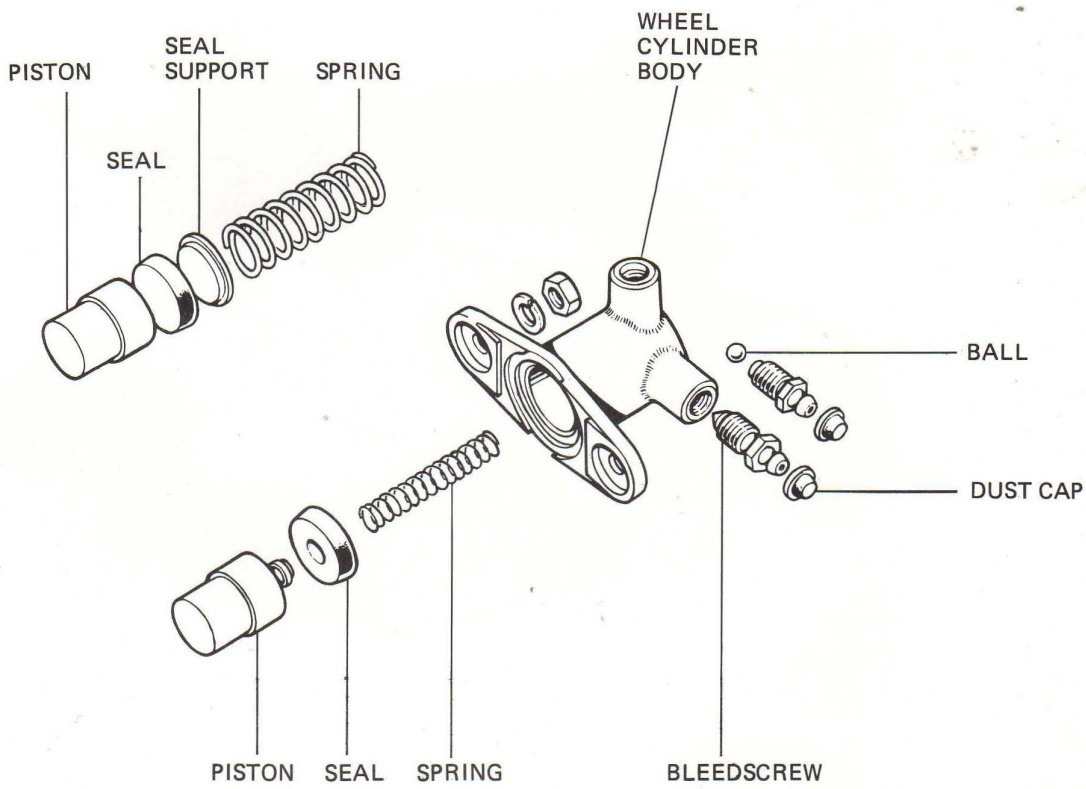

A0523

dual wheel cylinders 5B 5a

Introduction

The Dual Wheel Cylinder (Fig. 1), has been designed for the rear brakes of commercial vehicles with split hydraulic braking systems. The cylinder and special assembled backplate are fitted in place of the conventional twin-piston wheel cylinder and backplate on Duo-Servo rear brakes, with the advantage the brake can be connected to the split systems on the vehicle.

As its name implies, the Dual Wheel Cylinder is two completely independent cylinders which work as one unit — as long as both parts of the split braking system are functioning. If a failure to one of the systems resulted in loss of fluid pressure to one side of each rear cylinder, the remaining halves would still operate the rear brakes in the conventional way, but with halved output.

How it works

Each cylinder consists of three main parts (Fig. 2). Body 'A' which in effect is a conventional wheel cylinder with its own feed and bleed ports. Outer piston 'B' which also has its own feed and bleed ports. And inner piston 'C', which links the two together.

Brake fluid from one part of the split braking system is connected to the inlet port on piston 'B'. When the brakes are applied fluid pressure acting against the opposed end faces of the pistons, pushes them apart and this expanding movement is transferred by struts to the brake shoes.

Brake fluid from the other part of the split braking system is connected to the inlet port on body 'A'. When the brakes are applied, the fluid pressure acts in opposition with the end face of piston 'B' and the flange of piston 'C', producing a similar expanding force to that at the other end of the cylinder. This action assists in pushing the two pistons apart to operate the brake shoes and the two expanding forces combined, provide normal brake operation.

A failure in either of the split braking systems would result in the dual wheel cylinders still supplying 50% of normal brake torque for the same pedal effort. Higher pedal efforts will help overcome this loss, and so produce acceptable emergency braking performance.

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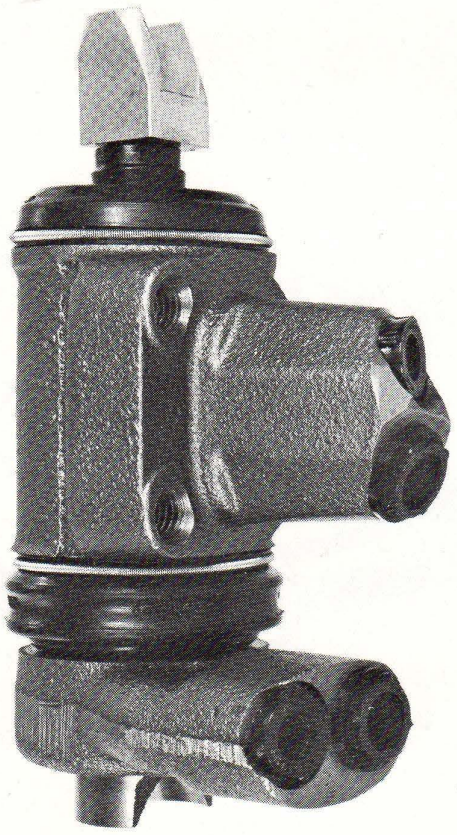

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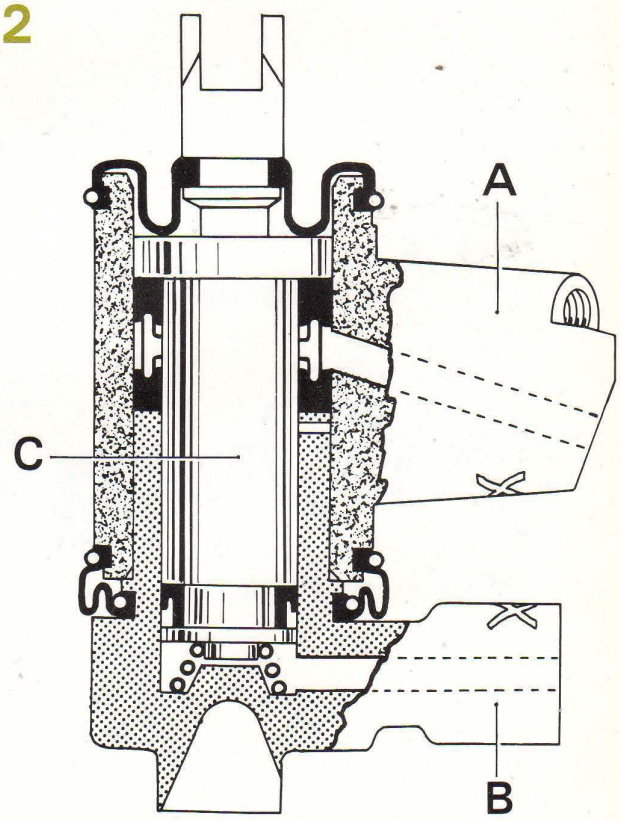

A 0365/1

dual wheel cylinders

Servicing

At intervals of 50,000 miles (80,000 km) or two years, whichever occurs first, all hydraulic cylinders fitted to Commercial Vehicles should be replaced by new guaranteed units.

Re-sealing is not recommended, but provided the internal working surfaces are in perfect condition, new seals from a Girling Service Kit can be fitted. If re-sealing is contemplated, a special tool is required when fitting the inner and outer pistons together (refer to Figs. 4, 5 and 6).

Dismantling

To assist re-assembly, mark the inner faces of the outer piston and cylinder body as shown on Fig. 3.

Pull back the dust cover and retaining ring between the outer piston and the cylinder body. Withdraw the outer piston and dismantle all parts.

NOTE: Take care not to damage the seal surfaces when removing seals.

Cleaning

The parts contained in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid.

Examine the pistons and cylinder bores for any signs of damage, such as score marks, pitting or corrosion. If the working surfaces are not in perfect condition, a new cylinder assembly must be fitted.

Reassembly

Fit the two large seals and the spacer to the inner piston as shown on Fig. 2. Follow with the smaller end seal.

Again refer to Fig. 2 and fit the dust cover and small retaining ring to the outer piston. Next, position the conical spring on the spigot at the bottom of the piston bore.

NOTE: When fitting the inner and outer pistons together care must be used in order not to damage the seal lips on the inner piston. This seal prevents fluid movement between the two systems and if damaged on assembly, the effect may not be noticeable as the leak would be from one system to the other.

To assist in pressing the seal into the bore, a seal guide can be made (Fig. 5) and its use is strongly recommended.

An alternative method of fitting the seal is to use an electrical screwdriver or similar tool, with the end rounded and smoothed with fine emery-cloth (Fig. 4); but great care must be used.

Liberally lubricate with unused Castrol-Girling Brake Fluid, the bore of the outer piston and the end seal on the inner piston. Use the seal guide to assemble the two pistons

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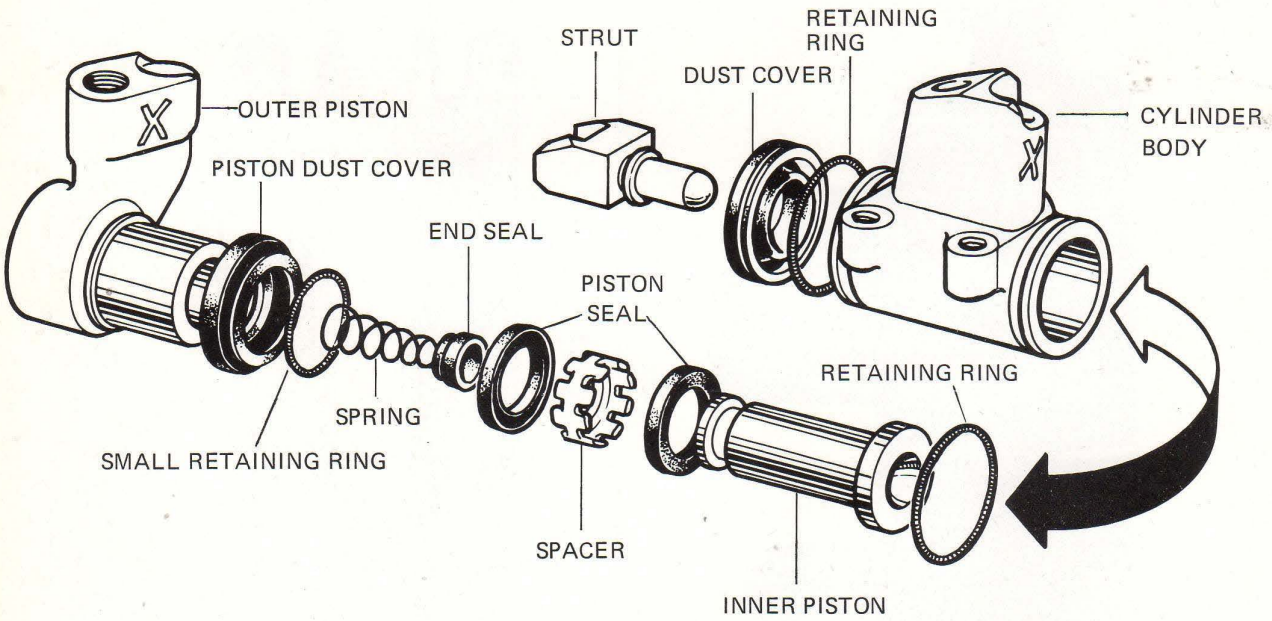

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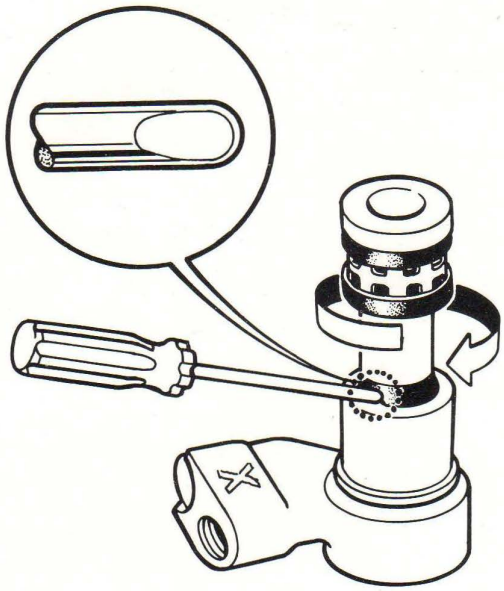


together (Fig. 4). Afterwards, unscrew the two screws and remove the tool from the piston.

Alternatively, position the two pistons as shown on Fig. 4 and, using a small electrical screwdriver or similar tool with the blade rounded and smoothed with fine emery-cloth, press GENTLY down and rotate the inner piston whilst pressing the seal lip into the bore. EXTREME CARE MUST BE TAKEN TO AVOID DAMAGING THE LIPS OF THE SEAL.

Liberally lubricate with unused Castrol-Girling Brake Fluid the bore of the cylinder body and the seals on the inner piston.

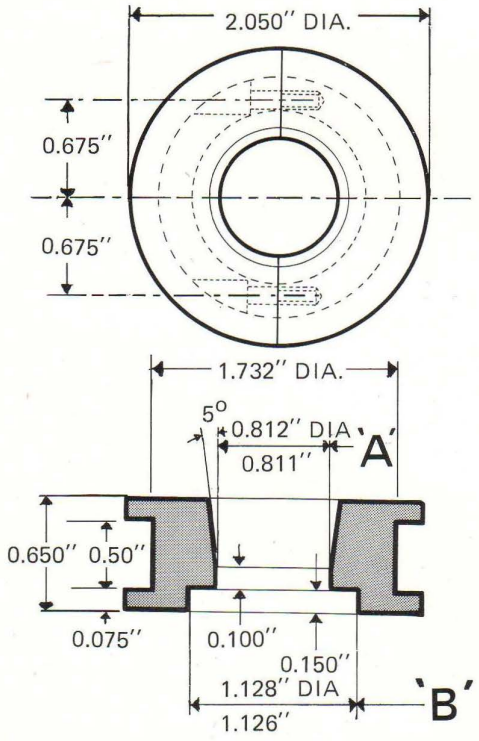
With marked faces opposite each other, offer the piston sub-assembly to the cylinder body. Fit the two parts together easing the entrance of the piston seals and locating the rim of the dust cover in the groove in the cylinder body. Slip a retaining ring over the turret of the outer piston and into the groove in the dust cover on the cylinder body.

Fit the remaining dust cover to the strut and fit these parts to the cylinder body. Fit the retaining ring onto the dust cover to secure.

If fitted, screw in the bleedscrews, but do not overtighten.

A 0389/1

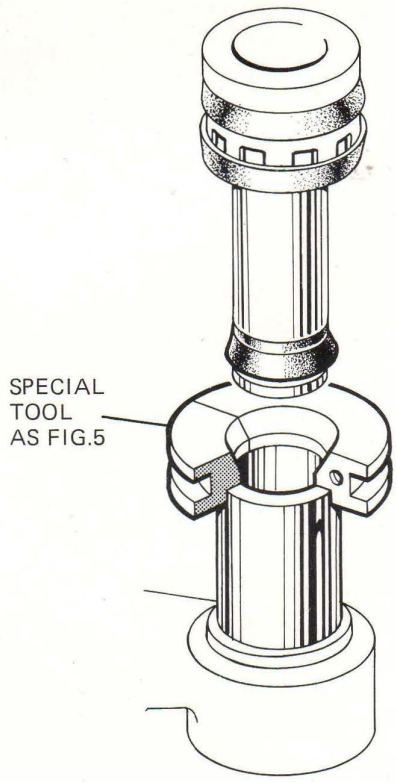
5



NOTE: This tool must be made from two halves of Tufnel and not from one piece But the two halves can be held by two 4BA screws, as shown, and machined together. At the present time there are two sizes of outer piston. The dimensions shown are suitable for the 1.1/8" (28.575 mm) diameter piston. If the diameter of the outer piston is 1" (25.4 mm) then dimension 'A' should be 0.698" – 0.699" and dimension 'B' should be 1.001" – 1.003".

A 0389/1

6



A 0389/2

double acting wheel cylinder (integral P.C.R.V.) 5B6a

1

Introduction

The double acting wheel cylinder with integral pressure conscious reducing valve (P.C.R.V.) has been designed for the rear brakes of vehicles with a split hydraulic braking system. This combination of cylinder and P.C.R.V. alleviates the need for two completely separate units for each hydraulic system.

The P.C.R.V. part of the unit helps to maintain the correct front-to-rear braking ratio of the vehicle. This is achieved after a certain pressure is reached by the valve allowing only a proportion of any increased fluid pressure to be utilized.

How it works

The control of fluid pressure centres around the special seal (Fig. 3). This has ribs spaced around its top face and part of the way down its edge and on the seals underside are a number of raised dimples.

When the footbrake is applied hydraulic pressure moves both pistons outward to apply the brakes in the normal way. The P.C.R.V. at this stage is open and inoperative and fluid flows between the dimples on the seal and the P.C.R.V. piston (Fig. 3).

When the cut-in pressure is reached the P.C.R.V. piston moves to the right and the underside of the piston head seals against the inner diameter of the seal thus preventing full pressure from operating on the wheel cylinder pistons (Fig. 3).

Any increase in pressure, together with the spring pressure, causes the P.C.R.V. piston to move to the left and open the valve. This allows a further pressure increase to be applied to

A1967

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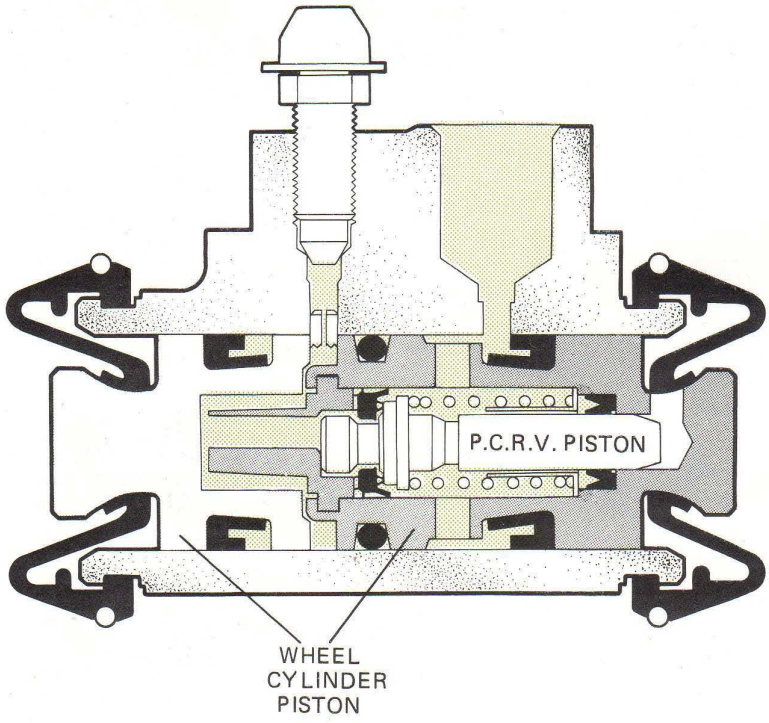

A1814

5B6b double acting wheel cylinder (integral P.C.R.V.)

the wheel cylinder pistons and therefore to the brakes until the P.C.R.V. piston is again closed by that increased pressure.

Due to the P.C.R.V. piston design once the cut-in pressure is reached any further increase in master cylinder pressure will result in only a proportion of that pressure being utilised on the rear brakes.

When the brakes are released the shoe-return-springs retract the shoes and the shoes push the wheel cylinder pistons back. The outer lips of the P.C.R.V. seal collapse inwards and allow fluid to flow past.

Servicing

The recommended overhaul time for Private Car and Light Commercial Vehicles is 64,000 km (40,000 miles) or three years, whichever is reached first. At this juncture, all hydraulic cylinders, including the wheel cylinder with integral P.C.R.V., should be replaced by new guaranteed units.

No attempt should be made to dismantle the unit and if a fault develops a new guaranteed unit should be fitted.

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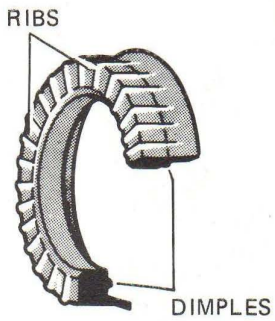

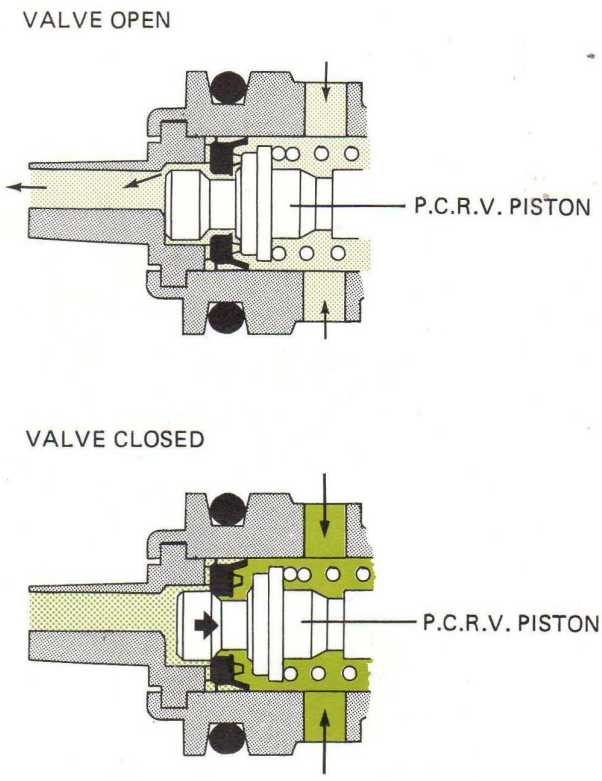

slave cylinders

Introduction

The illustration (Fig.1) shows some of the various types of slave cylinders produced to accommodate the many vehicle applications.

Alloy and cast-iron cylinders are in use and the internal parts may also vary. In addition, some units do not incorporate dust covers and the push rod is not always supplied by Girling. However, all cylinders are basically the same with the service periods depending on the installation.

A few cylinders with special seals and dust covers are fitted to vehicles with Mineral Fluid Systems and it is essential that only Castrol-Girling Mineral Fluid (BLUE) is used. Mineral Fluid Systems can usually be identified by the blue paint and parts on the cylinder, but where doubt exists, the vehicle manufacturer's handbook should be referred to.

Servicing

The servicing periods for hydraulic equipment fitted to Private Cars and Light Commercial Vehicles is 40,000 miles (64,000 km) or three years and for Medium and Heavy Commercial Vehicles it is 50,000 miles (80,000 km) or two years.

When the mileage is recorded or the time schedule expires, whichever is the sooner, the slave cylinder should be replaced by a new guaranteed unit. However, provided the working surfaces of the cylinder bore and piston are in perfect condition, new seals from a Girling Service Kit may be fitted. But if doubt exists regarding the condition of the cylinder bore or the piston, then a new slave cylinder should be fitted.

Use only the recommended fluids. Use Castrol-Girling Brake Fluid for Vegetable based Systems and Castrol-Girling Mineral Fluid for Mineral based Systems. Where doubt exists, consult the vehicle manufacturer's handbook.

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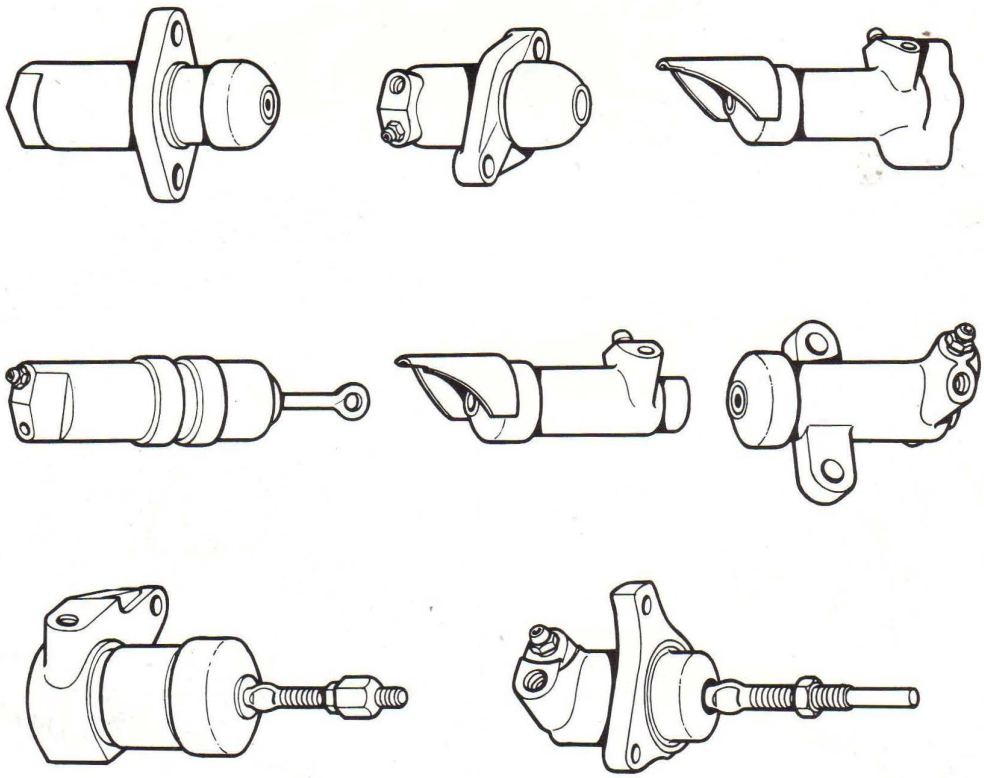

A0127

Dismantling

Refer to the units illustrated on Fig. 2 and dismantle the cylinder in the obvious manner.

Unscrew the bleedscrew.

Cleaning

The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts and the cylinder thoroughly with Girling Cleaning Fluid or unused Brake Fluid of the recommended type and place the cleaned parts onto a clean sheet of paper.

Examine the cylinder bore and the pistons for signs of corrosion, ridges or score marks. Provided the working surfaces are in perfect condition new seals from the Girling Service Kit can be fitted, but if there is any doubt as to the condition of the parts then a new guaranteed cylinder must be fitted.

Ensure all other parts are in good working order.

Assembling

Fit the new seal to the piston with the flat back of the seal against the shoulder.

Lubricate the seal and the cylinder bore with unused Brake Fluid of the recommended type and reassemble the cylinder. Before fitting the dust cover, smear the sealing areas with Girling Rubber Grease if the system is vegetable based, or Girling Brake Grease if the system is mineral based. Squeeze the remainder of the grease from the satchet into the cover to help protect the internal parts.

Bleeding the System

Refit the slave cylinder to the vehicle and bleed the system as described in Section 1.

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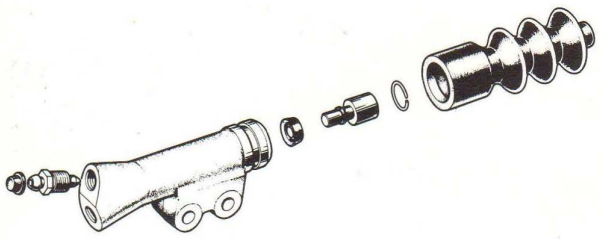

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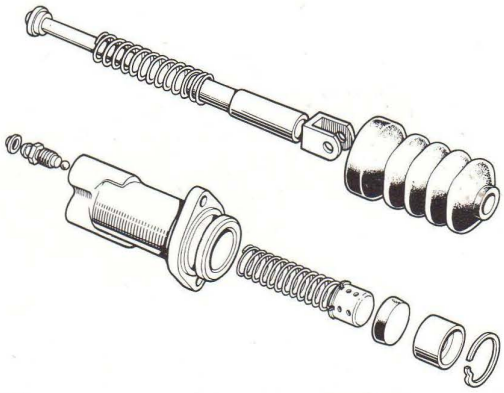

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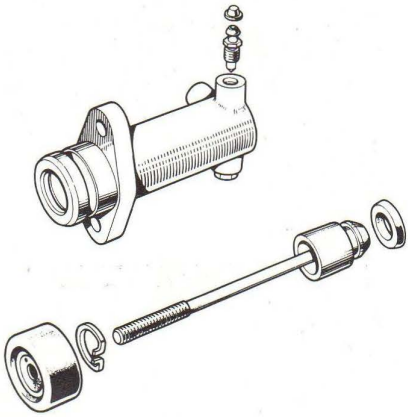
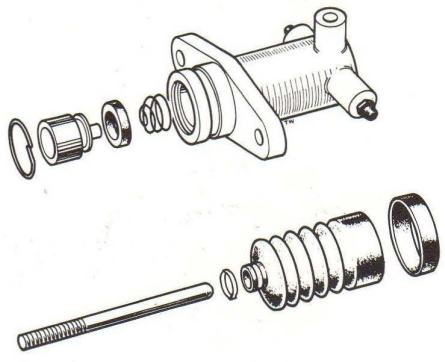


A0150



A0278

'G' valve

Introduction

The adhesion between the tyres and the road limits the amount of braking that can be applied to the wheels of a vehicle. If the limit is exceeded, the wheels will skid and control of the vehicle is temporarily lost. During deceleration, the weight of a vehicle is transferred towards the front and with less weight on the rear, there is less adhesion between the tyres and the road, therefore, rear wheel skids are more common than front wheel skids when braking fiercely or in an emergency and to assist in preventing such occurrences, the Girling 'G' Valve was designed. Under normal braking conditions, the 'G' Valve would remain inoperative.

The 'G' Valve (Fig. 1) incorporates a ball valve, which seals off the inlet port to the rear brakes at a pre-determined deceleration and (in parallel) a differential diameter piston which reduces the rate of increase in hydraulic pressure to the same brakes.

The movement of the ball is controlled by the angle of the ramp up which the ball travels and any changes in the attitude of the car due to road gradient provide automatic correction of the braking ratio, i.e. when braking travelling downhill, the ball cut-off valve would be closed earlier (the ramp angle being less) and pressure to the rear brakes would be less than on the level. Conversely, when travelling uphill, the proportion of braking on the rear would be more (the ramp angle being greater).

As the ball valve is sensitive to deceleration, it is not influenced by the hydraulic pressures resulting from increased vehicle loading and therefore, the 'G' Valve has a distinct advantage over pressure sensitive cut-off valves which operate when a pre-determined hydraulic pressure is reached regardless of ambient conditions.

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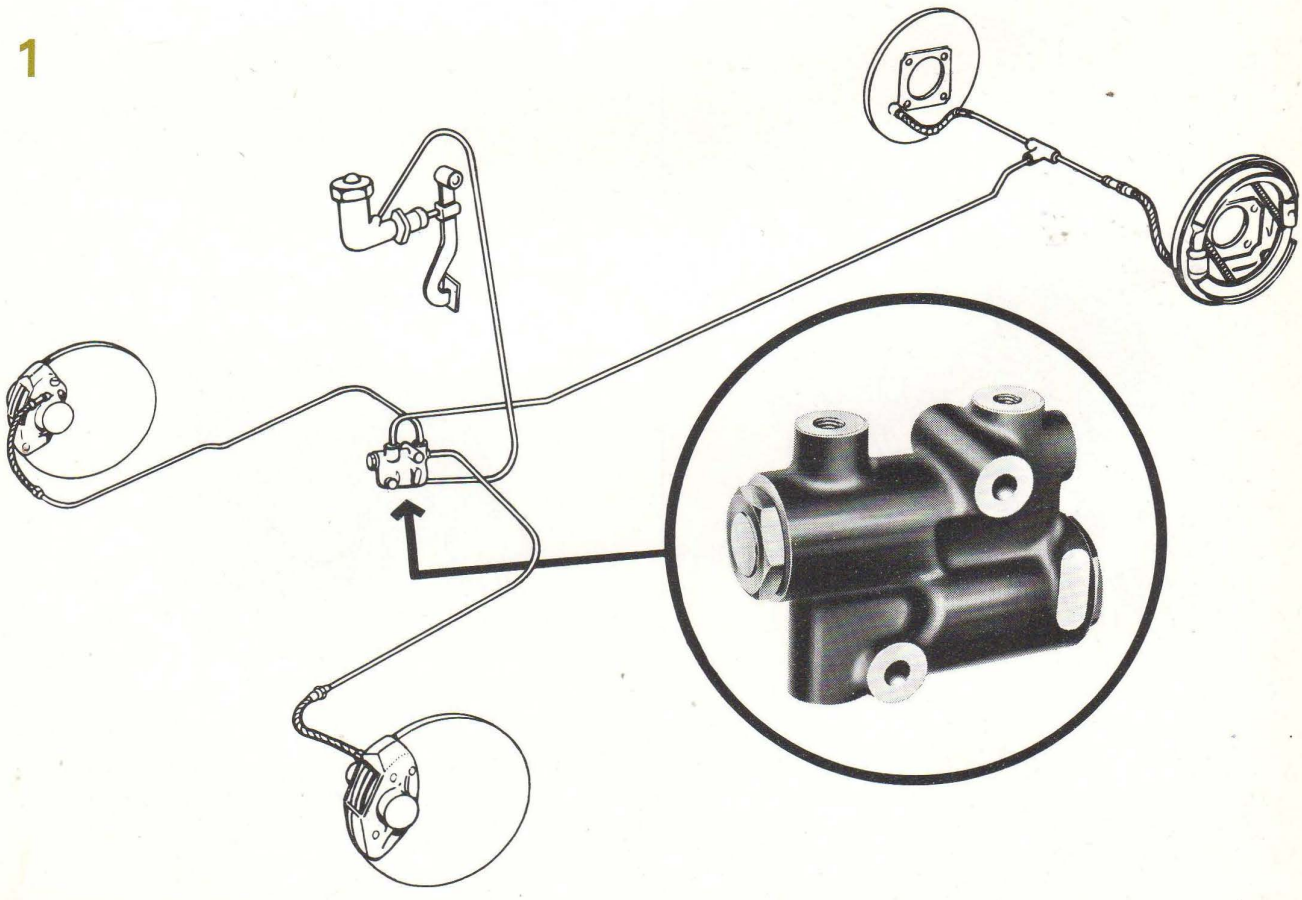

A 0395

'G' valve

How it works

Hydraulic fluid pressure is directed via the channels in the spacer to the front brakes and also through the spacer orifice, around the steel ball and through the valve to the rear brakes (Fig. 2). As the fluid pressure acts equally throughout the unit, the main spring is compressed by the initial movement of the differential piston. The forward movement of the car is checked and the ball, by its inertia, rolls up the incline and closes the valve to the rear brakes (Fig. 3).

Any further pedal movement results in increased fluid pressure being transmitted directly to the front brakes (Fig. 4). Increase in fluid pressure to the rear brakes is effected by the differential piston moving the primary piston and due to the ratio of the two pistons, the increase is at a lower rate than that for the front. The stored energy of the main spring (which was compressed by the initial movement of the primary piston) ensures that the change in rate of the pressure increase to the rear takes place smoothly and the optimum braking ratio is achieved.

Servicing

Every 40,000 miles (64,000 km) or a period of three years, whichever occurs first, all hydraulic cylinders fitted to Private Cars and Light Commercial Vehicles should be replaced by new guaranteed units. However, the cylinders may be serviced at this period when new seals from the appropriate Girling Kit should be fitted, but only if the cylinder bores and pistons are in perfect condition.

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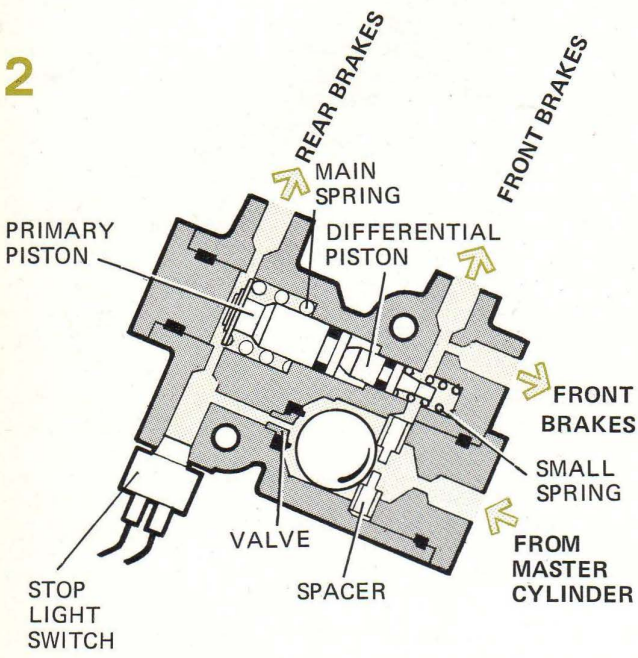
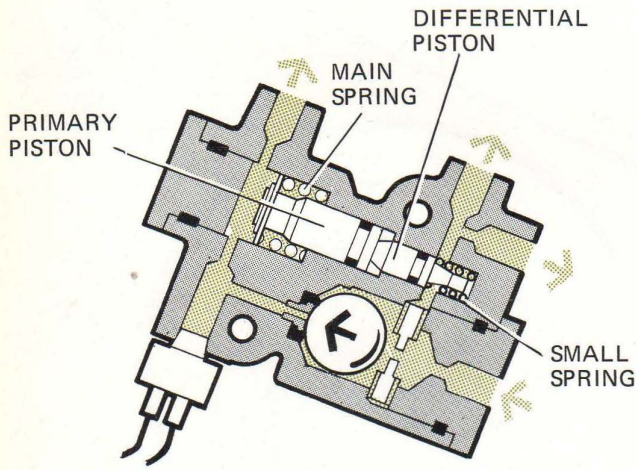


LOW DECELERATION
VALVE OPEN, FREE FLOW FOR
COMMON PRESSURE FRONT AND REAR

A 0400

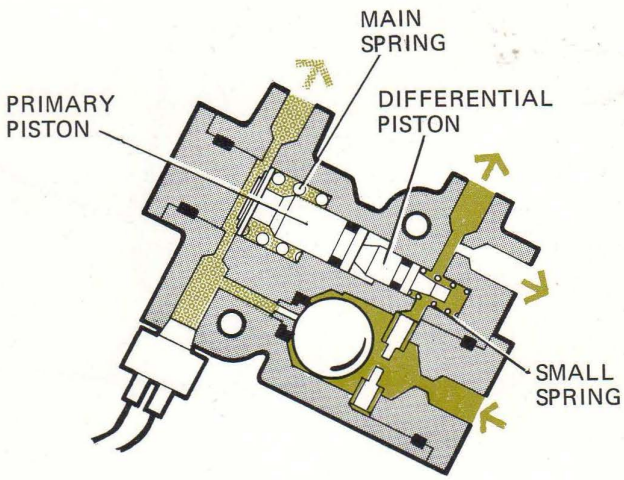
3



MODERATE DECELERATION (.3G)
DECELERATION CONSCIOUS CUT-OFF VALVE CLOSING
COMMON PRESSURE FRONT AND REAR

A 0401

4



HIGHER DECELERATION
CUT-OFF VALVE CLOSED, PRESSURE TRANSDUCER
OPERATING TO CONTROL PRESSURE OUTPUT TO
REAR BRAKES AND ACHIEVE OPTIMUM BRAKING
RATIO

A 0402

Dismantling

Unscrew the inlet plug, invert the unit and catch the spacer and ball as they fall from the bore. Remove the sealing ring from the inlet plug. Using an 'Easyout' introduced down the centre of the insert, withdraw the valve insert and seal.

Unscrew the end plug and remove the sealing ring from the plug. Shake the valve body to eject the two piston assemblies and catch them as they fall from the bore. Remove the sealing ring and spring from each piston, but there is no necessity to remove the circlip from the large piston.

Some units have a trapped-line pressure valve screwed into the outlet to the rear brakes. If this requires servicing, service as an assembly.

Cleaning

Examination of the parts in the service kit will indicate which used parts should be discarded. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine the bores and pistons. If they are smooth to the touch with no corrosion, score marks or ridges then new seals from a Girling Service Kit may be fitted. If, however, there is any doubt as to the condition of these parts, fit a new guaranteed unit.

Assembling

Use the parts from the appropriate Service Kit and lubricate all parts with unused Castrol-Girling Brake Fluid immediately before assembling.

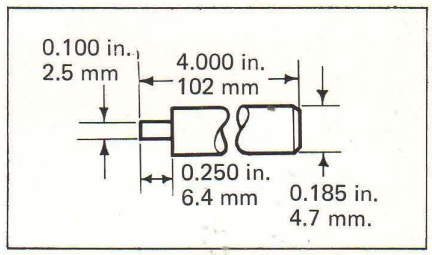
Fit the sealing ring and spring to the small piston and insert into its bore, spring end leading. Fit the main spring and sealing ring to the large piston in that order (it is essential not to slide the spring over the seal) and complete with circlip and washer insert into the large bore, seal end leading. Fit the sealing ring to the end plug and screw the plug into the body; tighten to a torque of 25 to 35 lb. ft. (34 to 48 Nm).

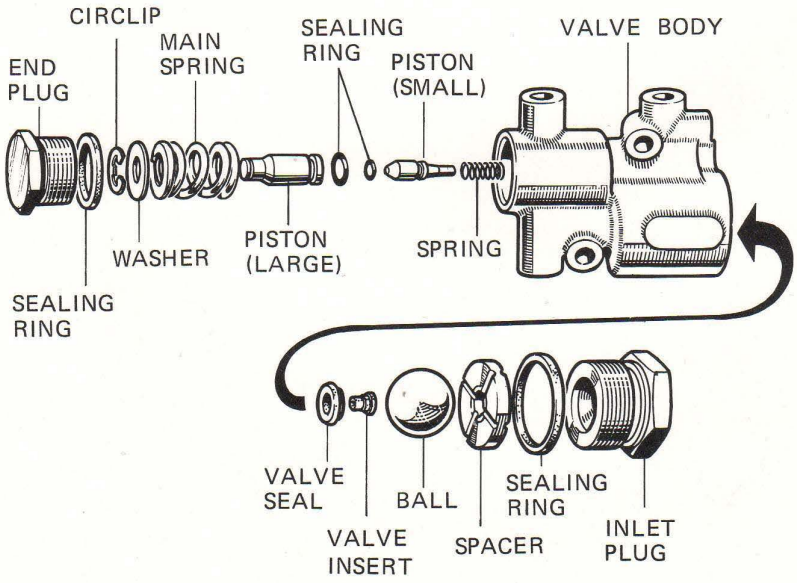
Fit the valve seal to the valve insert so that the lettered side of the seal will face the ball when fitted. Using a locating tool made to the specification given in the inset (Fig. 5), lightly tap home the insert. Insert the ball followed by the spacer. Fit the sealing ring to the inlet plug and screw the plug into the body; tighten to a torque of 25 to 35 lb.ft. (34 to 48 Nm).

Bleeding the System

After re-fitting the valve to the vehicle, bleed the system as described in Section 1, Page 1D1.

5





A 0168

'G' limiting valve

Introduction

The 'G' Limiting Valve (Fig. 1) is designed to help maintain the correct front-to-rear braking ratio and the unit incorporates a ball valve which seals off the inlet port to the rear brakes at a pre-determined deceleration.

The movement of the ball (Fig. 2) is controlled by the angle of the ramp up which the ball travels and any changes in attitude of the car due to changes in road gradient, or load, provide automatic correction of the braking ratio; i.e. when braking travelling downhill the ball cut-off valve would be closed earlier (the ramp angle being less) and hydraulic pressure to the rear brakes would be less than on the level. Conversely, when travelling uphill and when loaded, the proportion of braking would be more (the ramp angle being greater).

Servicing

Every 40,000 miles (64,000 km) or a period of three years whichever occurs first, all hydraulic cylinders fitted to Private Cars and Light Commercial Vehicles should be replaced by new guaranteed units. However, the cylinders may be serviced at this period when new seals from the appropriate Girling Kit should be fitted, but only if the cylinder bores and pistons are in perfect condition.

Dismantling

Unscrew the inlet plug, invert the unit and catch the spacer and ball as they fall from the bore. Remove the sealing ring from the inlet plug. Using an 'Easyout' introduced down the centre of the inlet, withdraw the valve insert and seal.

Cleaning

The new parts in the Girling Service Kit will indicate which used parts should be discarded. Clean the remaining parts thoroughly with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place them onto a clean sheet of paper.

Examine all parts to see they are undamaged and in good working order.

Assembling

Use the parts from the Girling Service Kit and lubricate all parts with unused Castrol-Girling Brake Fluid immediately before assembling.

Fit the valve seal to the valve insert as shown on Fig. 3. Using a locating tool made to the specification given in the inset, lightly tap home the insert. Insert the ball followed by the spacer. Fit the sealing ring to the inlet plug and screw the plug into the body; tighten to a torque of 25 to 35 lb. ft. (34 to 48 Nm).

Bleeding the System

After re-fitting the valve to the vehicle, bleed the system as described in Section 1, Page 1D1.

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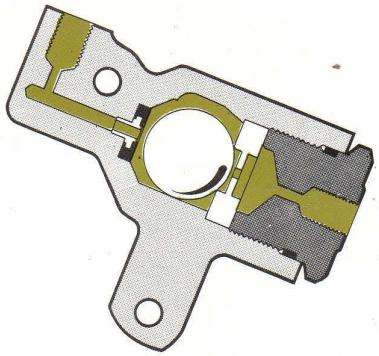

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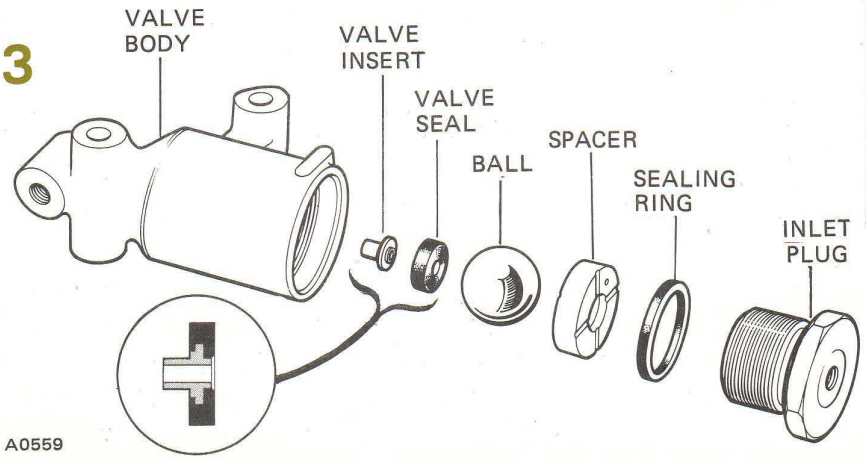

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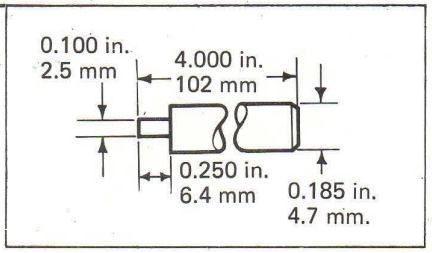

pressure reducing valve 5D 3a

Introduction

The Pressure Reducing Valve (Fig. 1) is designed for fitting into the rear hydraulic pipe line of private cars to reduce any tendency for the rear wheels to lock and skid under heavy braking. It allows a free passage of fluid in both directions until a certain braking pressure is reached when the valve closes. From this point the valve allows only a proportion of the increasing pressure to reach the rear brakes so that at normal braking there is equal pressure all round, but at heavy braking there is considerably less pressure in the rear brakes than there is in the front.

How it works

Fluid travels from the inlet port past the ball valve to both rear brakes (Fig. 2). The ball valve is held off its seat by the taper plunger. As pressure builds up the plunger is forced downwards (Fig. 3) against the spring allowing the ball valve to seat trapping the pressure in the rear line.

The pressure is retained until one of three conditions occur. If the pressure reduces in the rear line due to the drum expanding away from the shoes the plunger moves upwards pushing the ball off the seat allowing fluid to pass and rebuild the pressure. This keeps the braking constant under a condition of expanding drums which a pressure limiting valve cannot do.

The second condition is when the braking is increased. The extra pressure in the lower chamber forces the plunger upwards which opens the ball valve allowing fluid to pass until the plunger is moved down again closing the ball valve. The pressure increase to the rear brakes is a small proportion of the increase to the front brakes.

The third condition is when the brakes are released. With no pressure in the lower chamber the sleeve (with the ball) is pushed downwards opening the valve which allows the plunger to return and the unit takes up the condition in Fig. 2.

Servicing

No attempt should be made to dismantle the unit. If a fault develops a new guaranteed unit should be fitted.

The recommended overhaul time for Private Car and Light Commercial Vehicle hydraulic parts is 40,000 miles (64,000 km) or three years, whichever is reached first. At this juncture, all hydraulic cylinders including the Pressure Reducing Valve should be replaced by new guaranteed units.

Bleeding the System

Bleed the system as described in Section 1, Page 1D1.

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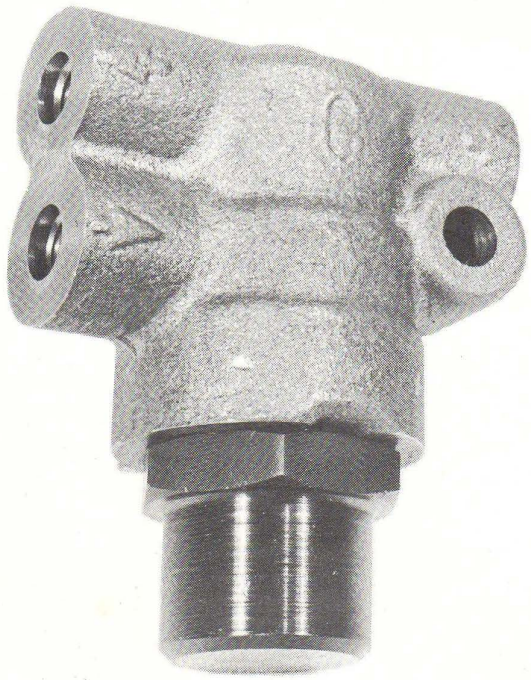

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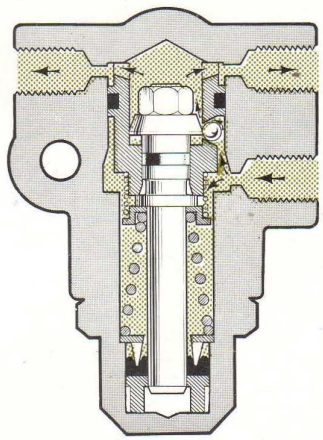

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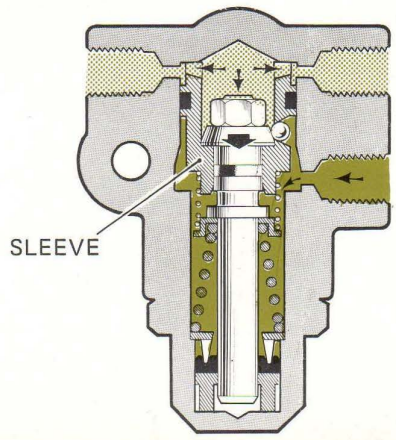

A 0421

load conscious reducing valve MK1 (for commercial vehicles)

Introduction

The difficulty of providing effective brakes for commercial vehicles under conditions varying from unladen to fully laden is nothing new, and the problem is to relate braking forces on the rear to the load on the vehicle.

The Girling solution to the problem is the 'Girling Brake Apportioning Valve' (Fig. 1). This is an ingenious self-contained unit which not only adjusts the hydraulic pressure applied to the rear brakes to suit the load, but also makes adjustments during brake application.

The unit fits into the rear brake hydraulic pipe line and all articulated vehicles, tippers and short wheel based vehicles with hydraulic brakes will benefit from the fitment of the valve. The brakes can be applied with confidence because 'touchiness' is eliminated and shorter stopping distances are achieved.

Because of the vast differences in road springs, loads, centre of gravity etc: each unit is tailored to suit the different types of vehicle and every installation is approved by the vehicle manufacturer. The unit is not an accessory, it is part of the original brake specification and fitted at the production factory.

How it works

The hydraulic cylinder houses a ball valve and two opposed pistons of different diameter. The pistons control the ball valve and hydraulic fluid to the rear brakes passes through the cylinder via the valve.

The pistons are linked by a yoke which is influenced by movement of a lever attached to one end of the sensing springs. The other end of the springs are attached to the differential casing by an adjustable rod.

With the vehicle unladen, the ball valve is open and fluid movement to the rear brakes is unrestricted (Fig. 2). Immediately the brakes are applied, both pistons are pressurised by the fluid and the difference in area results in piston 'A' (being larger) moving upwards and the ball moves with the piston to close the valve.

As fluid pressure to the valve increases, piston 'B' is pushed downwards. This movement is transferred by the yoke to piston 'A' and results in the ball being pushed off its seat opening the valve allowing fluid through again. Immediately this happens, the extra pressure moves piston 'A' upwards and the valve closes. These rapid controlling movements of the pistons occur constantly throughout the entire time the brakes are applied until balanced braking is achieved.

When the vehicle is loaded (Fig. 4), the sensing springs via the yoke, apply a downward force to the pistons in proportion to the load, and the fluid pressure to the brakes has to be proportionally higher before the upper piston 'A' can be moved to close the valve. When fully laden, the downward force on the piston 'A' is such that maximum braking pressure is insufficient to move it and the valve remains open. In this condition, the valve is inoperative and offers no restriction to the fluid.

Regardless of the load on the vehicle, the valve responds to unusual road conditions before and during brake application. If the vehicle goes over a hump-backed bridge or a large pot hole, the weight on the axle varies and the altering relationship between the vehicle, chassis and axle is sensed by the sensing springs and the correct signal is given to the brakes on initial application. The load applied by the sensing springs on the yoke, will either increase and move the pistons down,

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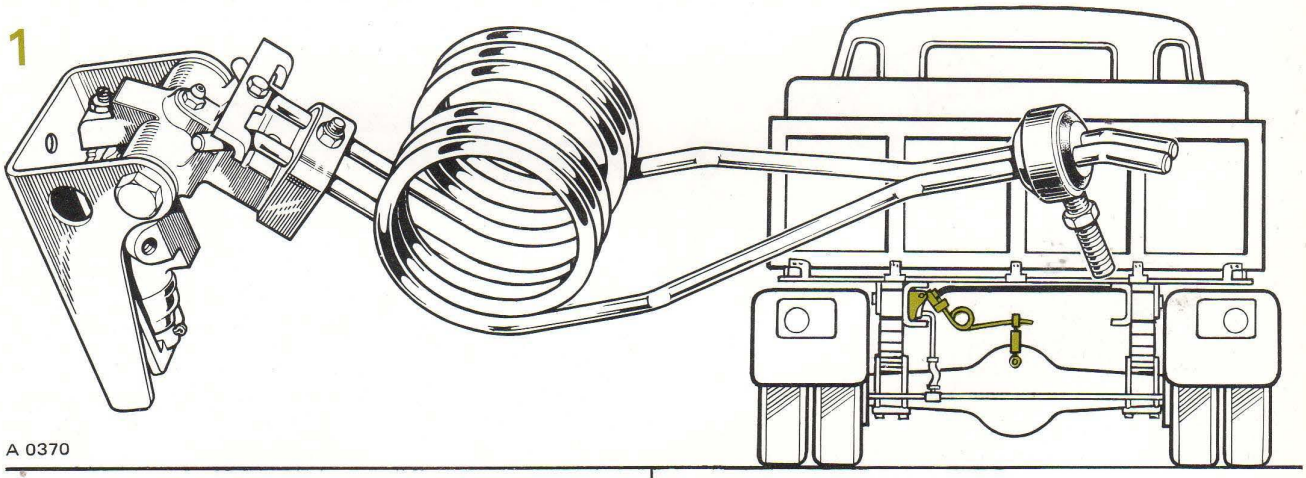

A 0370

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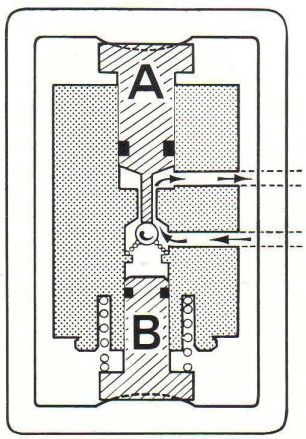

A 0160

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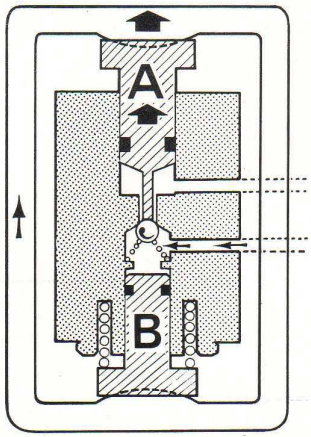

A 0160

load conscious reducing valve MK1 (for commercial vehicles)

allowing increased fluid pressure to the rear brakes; or decrease and allow the pistons to rise; thus reducing the pressure in the rear pipe line by increasing the volume of fluid. The signal would be instantly corrected in this way the whole time the brakes were applied, even when the vehicle encountered normal road conditions again.

The fluid pressure to the rear brakes for any particular condition depends on the characteristics of the valve and the sensing spring rate; which are tailored to suit the vehicle for which the valve is designed.

Servicing

It is essential that adjustments to dimension 'X' (Fig. 5) are carried out in accordance with the vehicle manufacturer's recommendations and if new road springs are fitted. Because of the variation in equipment, it is impractical to quote the dimensions for all vehicles in this publication. Some vehicles have a plate fixed to the vehicle with the setting instructions on, but this is not a common practice and the service literature of the vehicle manufacturer should be referred to.

NOTE: Most current units incorporate an adjusting screw on the lever (Fig. 5); this is correctly set at the production factory and must never be disturbed. To indicate this, the screw and locking nut are painted with green paint.

A grease nipple is provided on the lever pivot (Fig. 5) and greasing at normal service periods is recommended. Use Castrolease LM Grease or equivalent.

The recommended overhaul time for commercial vehicle hydraulic brake parts is 50,000 miles (80,000 km) or two years, whichever is reached first. At this juncture, all hydraulic cylinders including the valve assembly should be replaced by new assemblies, or serviced by new parts from Girling service kits. The mechanical parts of the valve assembly should also be serviced when necessary with Girling kits of new springs and spring mounting parts.

Fitting a New Valve Assembly

This is merely a matter of bolting the new assembly in place of the old and reconnecting the hydraulic pipes, but it is essential to set the valve in accordance with the vehicle manufacturer's instructions. Bleed the system and road test.

Fitting New Parts to Valve Assembly (Fig. 6)

Obtain correct Girling service kit, remove valve assembly from the vehicle and proceed as follows:—

a) Fit the new seals to the pivot bolt as follows:—

1. Remove the two new BLUE coloured seals from the kit and place to one side.
2. Unscrew the self-locking nut, remove the pivot bolt and remove the worn seals from the lever and bearing.
3. Lubricate the new seals and the pivot bolt with Castrolease LM Grease or equivalent. THIS GREASE MUST NOT BE ALLOWED TO CONTACT ANY OF THE OTHER KIT PARTS.
4. Fit the new seals and refit the pivot bolts. Tighten the self-locking nut to a torque 16 to 20 lb. ft. (22 to 27 Nm).

b) Service the valve assembly as follows:—

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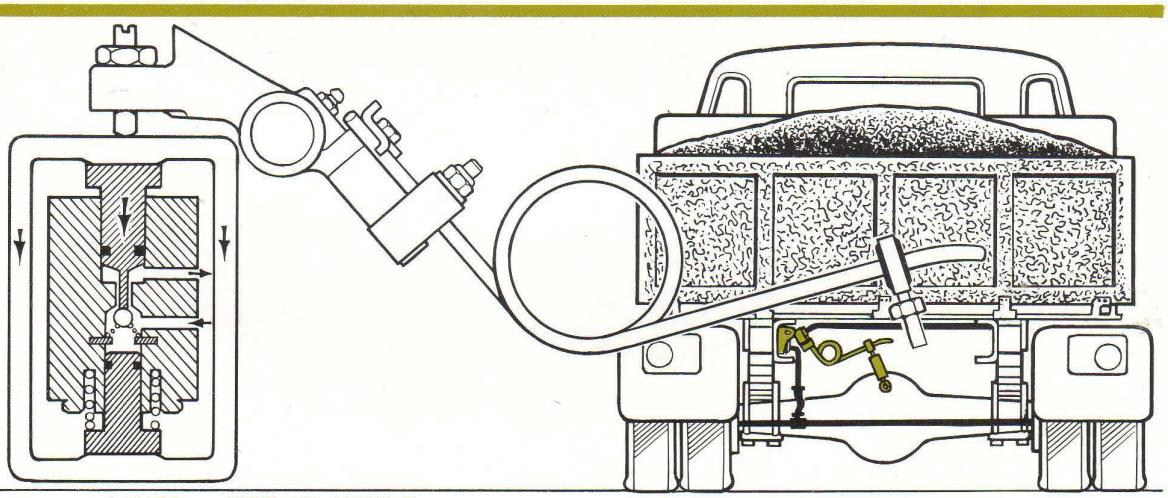

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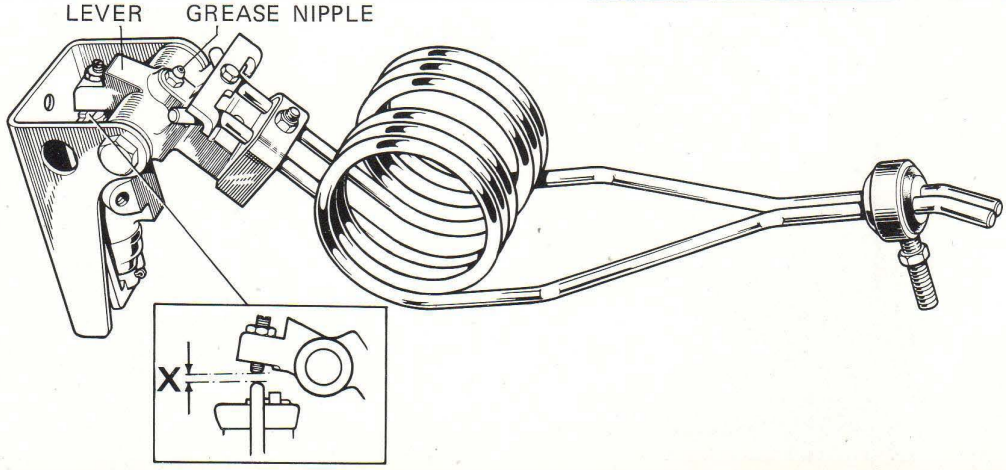


A 0370

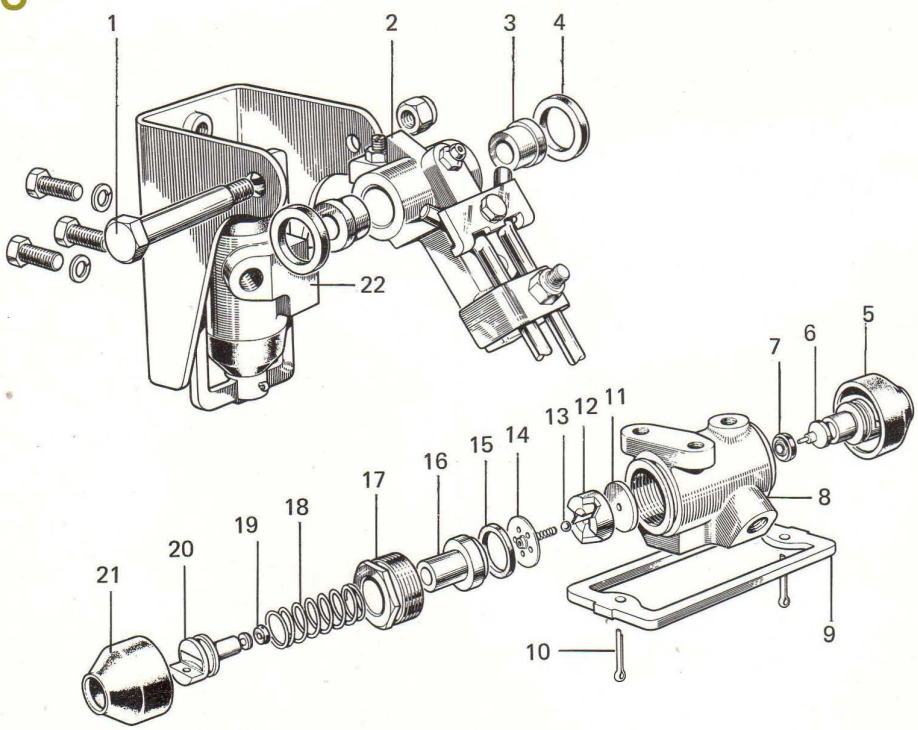
load conscious reducing valve MK1 5D 4c
(for commercial vehicles)

1. Drain system, disconnect hydraulic connections, unscrew the securing bolts and remove the valve assembly from the mounting bracket. Wipe the exterior clean.
2. Layout a clean sheet of paper on the workbench on which to place the parts.

IMPORTANT:
TO PREVENT CONTAMINATION, SCRUPULOUS CLEANLINESS MUST BE MAINTAINED DURING DISMANTLING AND RE-ASSEMBLY AND ONLY THE RECOMMENDED LUBRICANTS MUST BE USED.

3. Dismantling
   Remove the split pins securing the pistons to the yoke and position the valve in a soft jawed bench vice with the spring loaded piston uppermost.
4. Press down on piston to compress spring and move yoke off piston towards valve body flange. Gradually ease pressure on piston allowing spring to expand.
5. Remove piston, spring and dust cover.
6. Unscrew hexagon end plug and withdraw sleeve and seal.
7. Remove valve from vice and shake out internal parts.
8. Remove retaining dust cover and piston and remove the yoke from the valve body.
9. Remove the seals from the piston.
10. Cleaning
    Clean all parts with Girling Cleaning Fluid or approved brake fluid. Examine all parts for signs of wear, damage or corrosion, and ensure they are in good working order. Use the new kit parts on re-assembly.
11. Re-Assembly
    Fit the yoke to the valve body.
12. Liberally apply the Girling Rubber Grease in the kit to the sealing areas of the dust covers.
13. Fit a new seal to each of the pistons, with flat back of seal leading over reduced end of piston.
14. Lubricate the larger diameter piston seal and relevant bore in valve body with clean, unused Brake Fluid of the recommended grade. Insert the piston into the bore and fit the dust cover. The piston projection with the split pin hole should be adjacent to the hydraulic ports.
15. Position valve body in bench vice with open end uppermost.
16. Place the valve seat in valve body. One side of the valve seat is imprinted with a concentric ring towards the outer periphery and it is essential that the valve seat is fitted into the valve body with this side leading. Follow with ball housing, flat face leading, and place the ball in centre of housing. Position spring plate on ball housing with spring seat on ball.
17. Fit the seal to the sleeve and insert into bore; press down on sleeve to seat seal.
18. Screw in hexagon end plug and tighten to a torque of 35 to 45 lb. ft. (47 to 61 Nm).
19. Fit the dust cover to the piston and lubricate the piston seal and bore with clean unused Brake Fluid of the recommended grade.
20. With yoke leaning towards valve body fixing flange insert the spring into the bore and position the piston on the spring. The piston projection with split pin hole should be adjacent to the hydraulic ports.
21. Press down on piston, compressing spring and ease

6



KEY

1. PIVOT BOLT
2. LEVER & BEARING BRACKET.
3. BEARING
4. BEARING SEAL (BLUE)
5. DUST COVER
6. PISTON
7. PISTON SEAL (LARGE)
8. VALVE BODY
9. YOKE
10. SPLIT PIN.
11. VALVE SEAT.
12. BALL HOUSING
13. BALL
14. RETAINING PLATE & SPRING
15. SLEEVE SEAL
16. SLEEVE
17. END PLUG
18. SPRING
19. PISTON SEAL (SMALL)
20. PISTON
21. DUST COVER
22. VALVE ASSEMBLY

A 0372

load conscious reducing valve MK1 (for commercial vehicles)

the piston seal into the sleeve bore. With spring fully compressed, position yoke on piston. Ease dust cover rim into groove in valve body.

22. Remove the unit from the bench vice and check the yoke is seated correctly on both pistons. Ensure that the dust covers are undamaged and fitted correctly, then fit split pins to secure yoke.
23. Refit the valve assembly to the mounting bracket and tighten the securing bolts to a torque of 8 to 12 lb.ft. (11 to 16 Nm)
24. Re-connect hydraulic connections, bleed system, check for leaks and road test vehicle.

Fitting New Springs & Spring Mounting Parts (Fig. 7)

The illustration shows the general arrangement of the parts. Unscrew the nuts and bolts and remove the springs from the valve assembly.

Examine the spring seats and clamps for wear and damage. Also ensure the adjuster eye and ferrule assembly is in good condition. Renew suspect parts. Fit the new parts as indicated on the illustration. It is important to press the ends of the springs firmly against the lever and bracket assembly as the bolts are tightened. The torque for bolt 'A' is 8 to 12 lb.ft. (11 to 16 Nm) and for bolt 'B' 16 to 20 lb.ft. (22 to 27 Nm).

Check the valve setting in accordance with the vehicle manufacturer's instructions and road test.

Fitting a New Adjuster Eye & Ferrule Assembly (Fig. 7)

Unscrew the adjuster eye and ferrule assembly from the vehicle differential casing.

Liberally lubricate the ends of the springs with water and gradually work the assembly off the springs.

Re-wet the ends of the springs to fit the new assembly and reconnect to the differential casing.

Check the valve setting in accordance with the vehicle manufacturer's instructions and road test the vehicle.

Testing the Valve Assembly

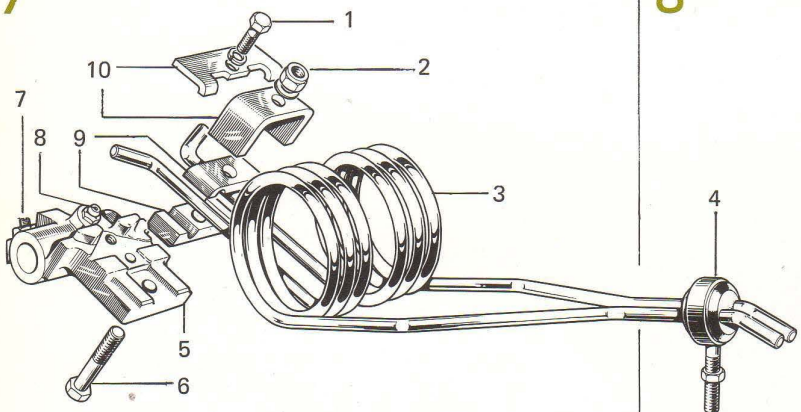
The test is made with the valve in position on the vehicle with vehicle in the unladen condition, standing on a reasonably flat, level surface.

1. Disconnect the link from the differential housing bracket.
2. Examine the valve to make sure there are no fluid leaks. Lift both dust covers and the areas revealed may be moist, but should not be excessively wet.
3. Have the brake applied fairly hard and the yoke should move upwards about 0.060" (1.5 mm) and stop. This movement is quite rapid and positive.
4. Hold the brake on for 10-15 seconds and there should be no further movement of the yoke.
5. On the release of the brakes the yoke should move up momentarily and then move down to its original position.
6. Reconnect the link and check the setting in accordance with the vehicle manufacturer's instructions.

This movement of the yoke can be measured by a depth gauge across the top of the mounting bracket (Fig. 8).

7. If when the brake is applied (3), the yoke does not move at all or moves considerably more than 0.060" (1.5 mm) a new valve should be fitted.
8. During the 10-15 seconds leakage test (4), the yoke should not move further than its first rapid movement, if further movement does occur immediately after the first rapid movement, the valve is faulty and should be replaced. Slow 'Creep' of the yoke after the 10-15 second test is permissible.

7

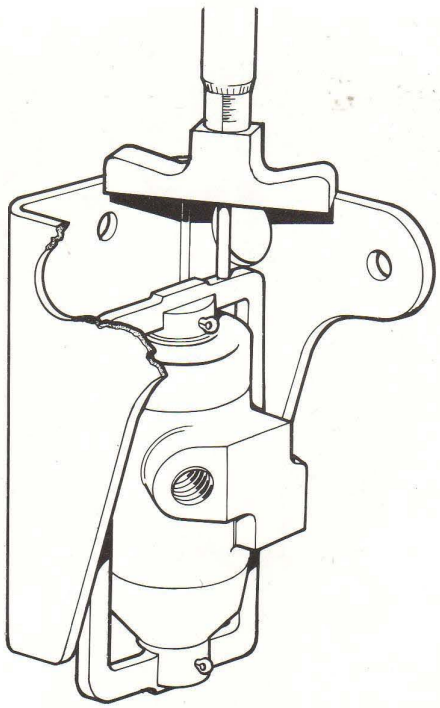


KEY

1. BOLT A
2. SELF-LOCKING NUT
3. SPRING
4. ADJUSTER EYE & FERRULE ASSEMBLY
5. LEVER & BEARING BRACKET
6. BOLT 'B'
7. ADJUSTER SCREW **(THIS IS CORRECTLY SET AT THE PRODUCTION FACTORY AND MUST NEVER BE DISTURBED)**
8. GREASE NIPPLE
9. SPRING SEATS
10. SPRING CLAMPS

A 0371

8



A 0409

self-centring P.D.W.A. (pressure differential warning actuator)

Introduction

The Pressure Differential Warning Actuator (P.D.W.A.), is a unit incorporated in dual hydraulic braking systems to provide a visual warning to the driver should part of the vehicle's braking system fail. The unit illustrated (Fig 1) features a self-centring piston and should not be confused with the unit described on Page 5D6.

How it works

The unit is interposed between the tandem master cylinder and the operating brake cylinders, with the single piston held in balance under equal pressure from the separate systems acting on each end (Fig. 2). The pressure also acts on two 'O' rings, which serve as pressure seals, and two sleeves which carry the piston. Each sleeve presses against a circlip fitted to the piston.

If there is a loss of pressure in one system, because of a seal or pipe failure, the pressure in the other system will immediately push the piston to one side, lifting the switch plunger and causing the warning light to be illuminated (Fig. 3). As the piston moves towards the system without pressure, the circlip on the piston pushes the one sleeve and 'O' ring with it, whilst the piston moves through the other sleeve which is prevented from moving with the piston by the body of the switch; the second circlip therefore moves away from its sleeve (Fig. 3).

When the fault has been located and rectified equal fluid pressure will again be applied to both ends of the piston and sleeves. In the working system the pressure on the sleeve is neutralized as the sleeve is against the body of the switch. Because of the difference in areas, i.e. the piston on one side and the piston and sleeve on the other, the piston moves to the right as drawn (Fig. 3), until the circlip again contacts the sleeve when the piston is in balance. The self-centring of the piston is indicated when the warning light goes out.

Servicing

It is recommended that at intervals not exceeding 16,000km (10,000 miles), the electrical switch and bulb on the dashboard are checked by simulating a brake failure. This can be achieved by opening a bleedscrew to temporarily reduce the pressure in one of the systems when operating the foot pedal. The fluid level in the reservoir must be maintained during this operation and care must be taken to ensure that air does not enter the system. If faulty, the switch assembly or bulb should be renewed.

Before screwing a new switch into the unit, check the sleeves are central under the threaded port and the switch will not foul on the sleeves. If a resistance is felt unscrew the switch and recheck the position of the sleeves. Tighten the switch to a torque of 3 to 7 Nm. (2 to 5 lbf. ft.).

Except for replacement of the switch assembly, no attempt should be made to dismantle the unit. If a fault develops a new guaranteed unit should be fitted.

The recommended overhaul time for Private Car and Light Commercial Vehicles is 64,000km (40,000 miles) or three years, whichever is reached first. At this juncture, all hydraulic cylinders including the P.D.W.A., should be replaced by new guaranteed units.

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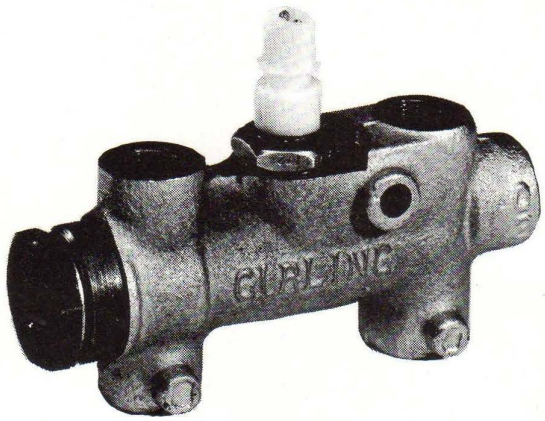

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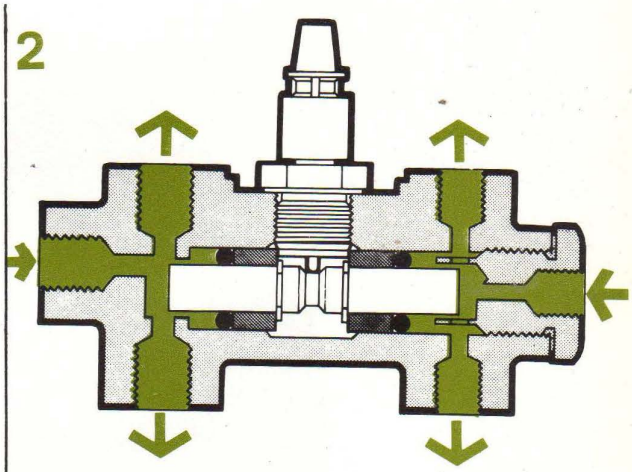

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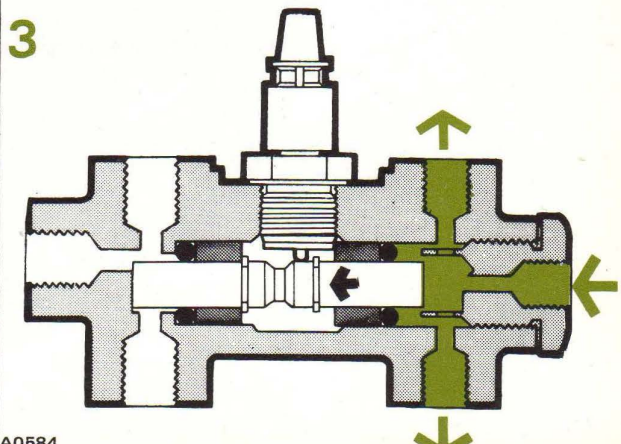


A0584

H.L.S.A.S. brake (hydraulic leading shoe auto-adjust by service brake)

Ensure the shoe linings are free from oil and grease.

Clean the exterior of the drum with a wire brush and wipe the inside with a clean rag moistened with Girling Cleaning Fluid or water. Refit the drum and wheel.

NOTE: Never blow out the dust in a drum, it is dangerous if inhaled. If the drum looks in poor condition, or is scored inside where the brake shoes touch, fit a new drum.

Repeat the whole procedure with the opposite front wheel and jack down the vehicle. Apply the foot brake several times to obtain the correct shoe-to-drum clearance and road test.

Wheel Cylinder Maintenance

Service the wheel cylinders at the intervals stated in Section 1, Page 1A1 of this manual.

When removing or servicing the wheel cylinder, remove the brake shoes as described previously.

NOTE: Use of the Girling Hose Clamp (see Section 1, Page 1B1), will keep the loss of fluid to a minimum and after servicing the wheel cylinders only the affected parts require bleeding. The use of other tools to clamp the hoses is not recommended because damage may be caused internally to the hose without it being noticed externally. If, therefore, Girling Hose Clamps are not available it is necessary to drain the fluid from the system as described below.

Attach a bleed tube to a bleedscrew, unscrew half a turn and pump out the fluid by operating the foot pedal.

To fit a new cylinder, disconnect the hydraulic pipes, unscrew the securing bolts and remove the cylinders from the backplate. Offer the new cylinders to the backplate, secure with bolts and washers and tighten to a torque of 7.5 lb. ft. (10,2 Nm).

Repeat procedure with the opposite front wheel cylinders.

Reconnect hydraulic pipes and refit shoes. Remove hose clamps if fitted and bleed the system as described in Section 1, Page 1D1.

To overhaul the cylinders, remove from the backplate and, keeping the parts separate, dismantle each cylinder in turn.

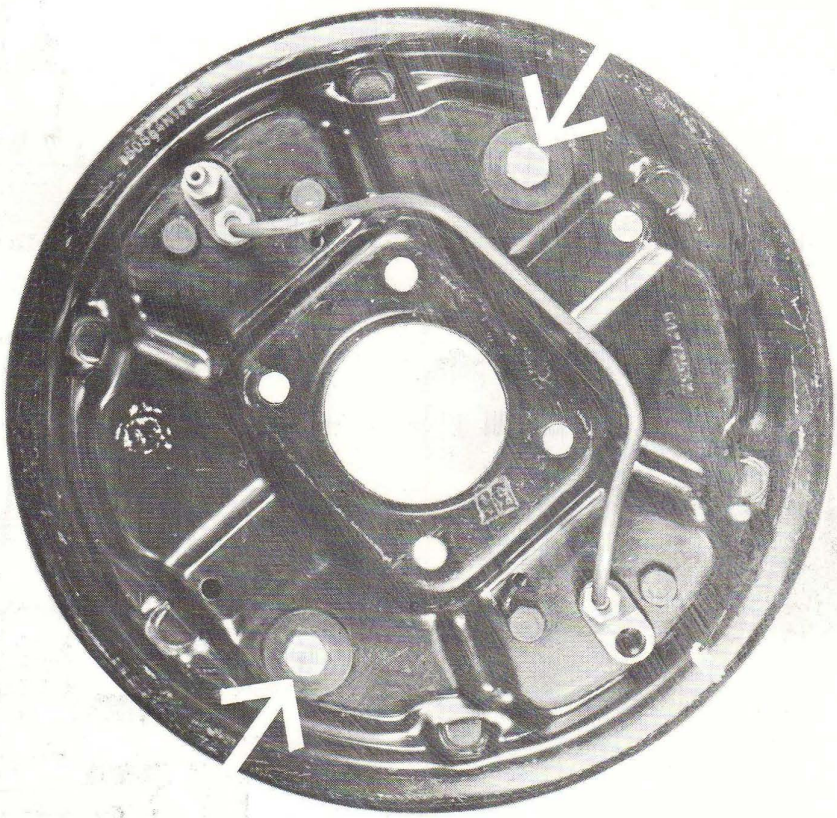
Remove the dust covers, piston inserts, pistons and springs.

Clean all parts with Girling Cleaning Fluid or unused Castrol-Girling Brake Fluid and place the cleaned parts onto a clean sheet of paper.

Examine the cylinder bores and the pistons for signs of corrosion, ridges and score marks. Provided the working surfaces are in perfect condition, new seals from a Girling Service Kit may be used, but if there is any doubt about the condition of the parts, then new guaranteed cylinders should be fitted to both front brakes.

Using the new parts from the appropriate Girling Service Kit, re-assemble as follows:— Fit the new piston seals with flat back leading over the projecting boss of the pistons. Lubricate the piston seals and the cylinder bores with unused Castrol-Girling Brake Fluid and re-fit the spring, pistons, piston inserts and dust covers to the cylinder.

Refit cylinders as described above, remove hose clamps and bleed the system as described in Section 1, Page 1D1.



A 0458

P.D.W.A. (pressure differential warning actuator)

Introduction

The Pressure Differential Warning Actuator (P.D.W.A.) Fig. 1, is a device which is incorporated in dual hydraulic braking systems and is, in effect, two opposed cylinders with a common piston which is connected between the two separate systems. As long as both systems are functioning correctly, the piston is maintained in balance.

How it works

For convenience in assembly, the piston is made in two parts (Fig. 2), and the longer piston of the two has a machined radiused groove acting as a ramp for the plunger of an electrical switch assembly. Provided the pistons remain in balance, the switch plunger is in the 'at rest' position, but if a failure of one system occurred the pistons would be forced from the central position and the switch plunger would be depressed, resulting in a glowing bulb on the dashboard.

The warning light would remain on until the pistons were re-set to allow the switch plunger to resume its normal extended position. Movement of the pistons in the event of a failure of any one part of the system is limited by the end plug and adaptor which acts as stops.

Some units have an aperture for re-setting the pistons mechanically and these units can be recognised by the rubber dust cover which is fitted. The re-setting of the pistons with units which do not incorporate the aperture is achieved hydraulically whilst bleeding the system after the fault has been corrected.

Servicing

It is recommended that at intervals not exceeding 16,000 km (10,000 miles), the electrical switch and bulb on the dashboard are checked by simulating a brake failure. This can be achieved by opening a bleedscrew to temporarily reduce the pressure in one of the systems when operating the foot pedal. The fluid level in the reservoir must be maintained during this operation and care must be taken to ensure that air does not enter the system. If faulty, the switch assembly or bulb should be renewed.

Early units incorporated a switch and a ball as illustrated (Fig. 2); the ball seating in the groove in the piston. Later units used a different switch with a longer plunger and the ball was unnecessary. When fitting a new switch, care must be taken to ensure the ball, if fitted, is left in the unit. Tighten the new switch to a torque of 3 to 3.5 Nm (2 to 2.5 lbf.ft.).

Except for replacement of the switch assembly no attempt should be made to dismantle the unit. If a fault develops a new guaranteed unit should be fitted.

The recommended overhaul time for Private Car and Light Commercial Vehicles is 64,000 km (40,000 miles) or three years, whichever is reached first. At this juncture, all hydraulic cylinders including the P.D.W.A. should be replaced by new guaranteed units.

Bleeding the System

Bleed the system as described in Section 1, Page 1D1.

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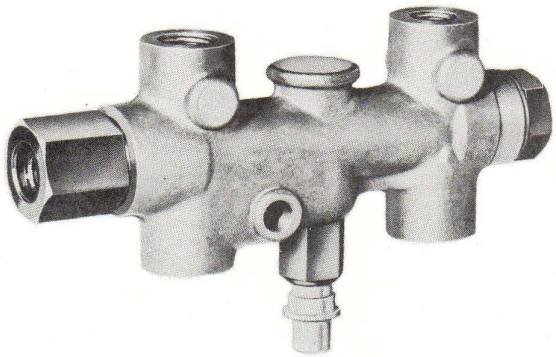

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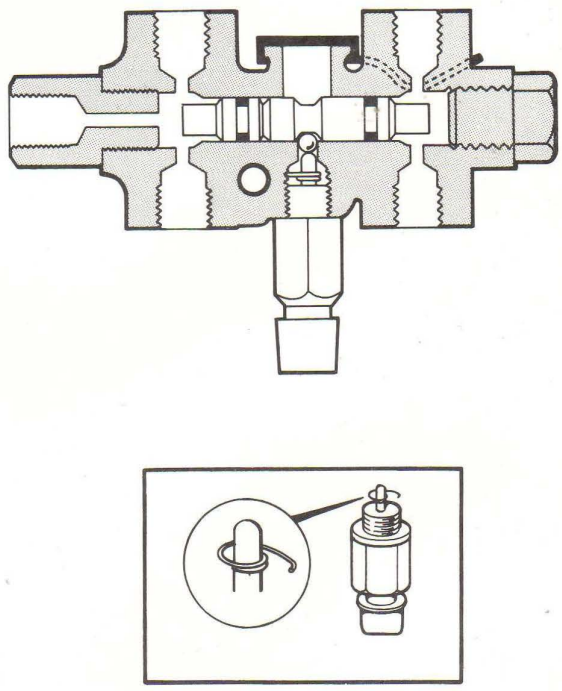


A0399

tractor shuttle valve

5D 7a

1

A0561

Introduction

The Shuttle Valve is a unit fitted to tractors which permits separate hydraulic operation of each wheel and provides compensation, within limits, when both pedals are depressed equally. The illustrations (Figs. 1 and 2) show a unit and a typical installation.

How it works

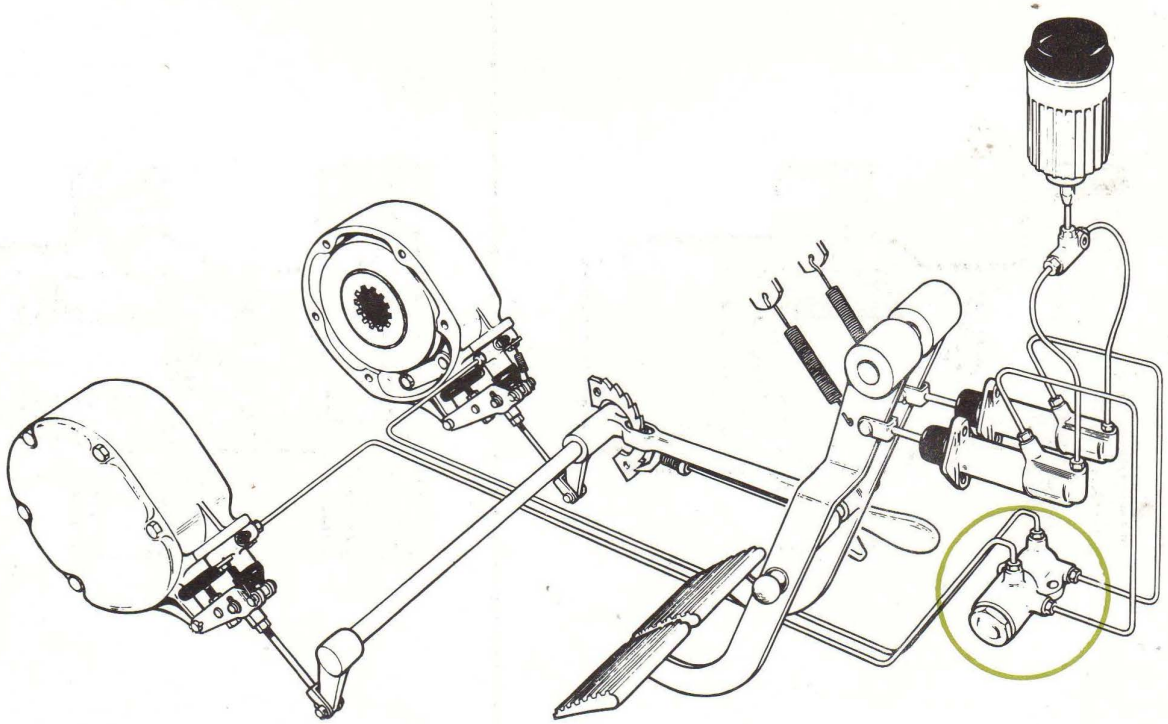
The valve consists of a plunger with a seal which has a limited movement in a cylinder bore. The plunger is held in a central position by a spring (Fig. 3) and the chambers thus formed at each end of the plunger have ports connected to the master cylinder and slave cylinder. There is no hydraulic connection between the two ends of the valve.

When the right-hand brake is applied, the valve plunger moves to the left until it reaches its stop (Fig. 4). Similarly if the left-hand brake was applied, the plunger would move to the right until it reaches its stop (Fig. 5).

If both brakes are applied, the plunger moves only enough to equalise the pressure at both ends, and therefore the pressure at both brakes.

Should the adjustment of both brakes not be precisely the same, or more wear had occured on one brake than the other, equal movement of both pedals could (without the shuttle valve) give widely differing braking between each side. With the valve under these conditions, there would be a different pressure on each end of the plunger and the plunger would move one way or the other until the pressures were equal.

2



A0562

Servicing

No attempt should be made to dismantle the unit and if a fault develops a new guaranteed unit should be fitted.

Some valves with special seals are fitted to tractors with Mineral Fluid Systems and hydraulic cylinders on such vehicles can usually be identified by the green paint and parts on the units. It is essential to use the recommended fluids. Use the recommended Mineral Fluid for Mineral based systems and Castrol-Girling Brake Fluid for Vegetable based systems. Where doubt exists, consult the vehicle manufacturer's hand-book.

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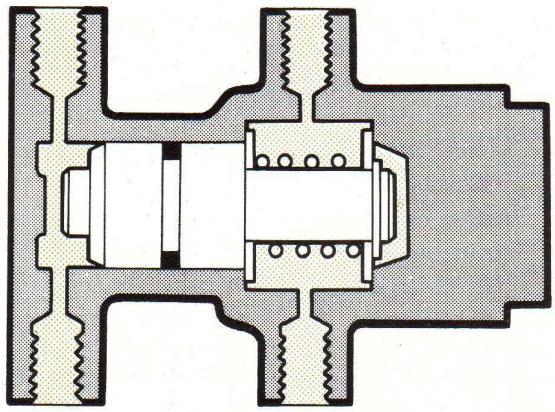
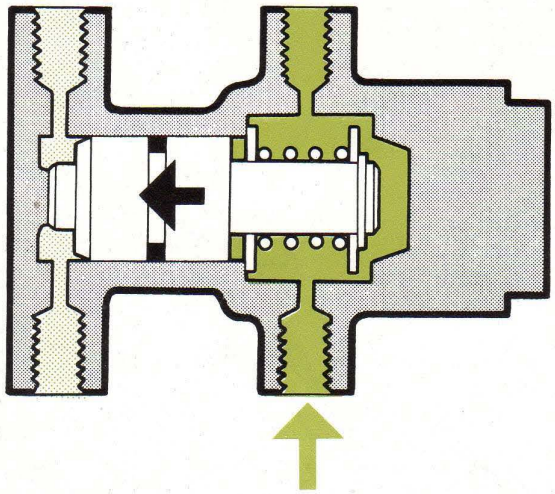


FLUID

FLUID UNDER PRESSURE

4



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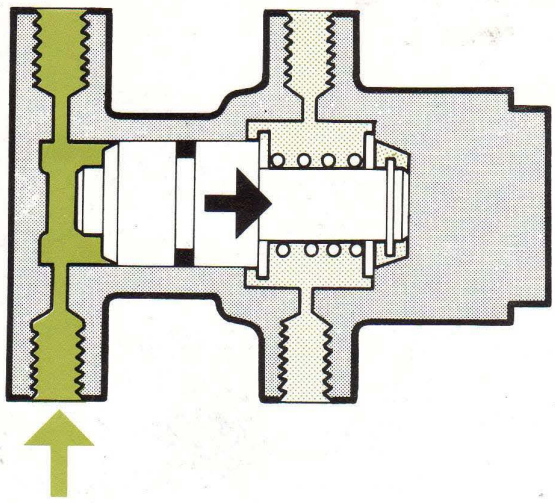

load conscious pressure reducing valves MK2 & 3 (for private cars & commercial vehicles)

5D 8a

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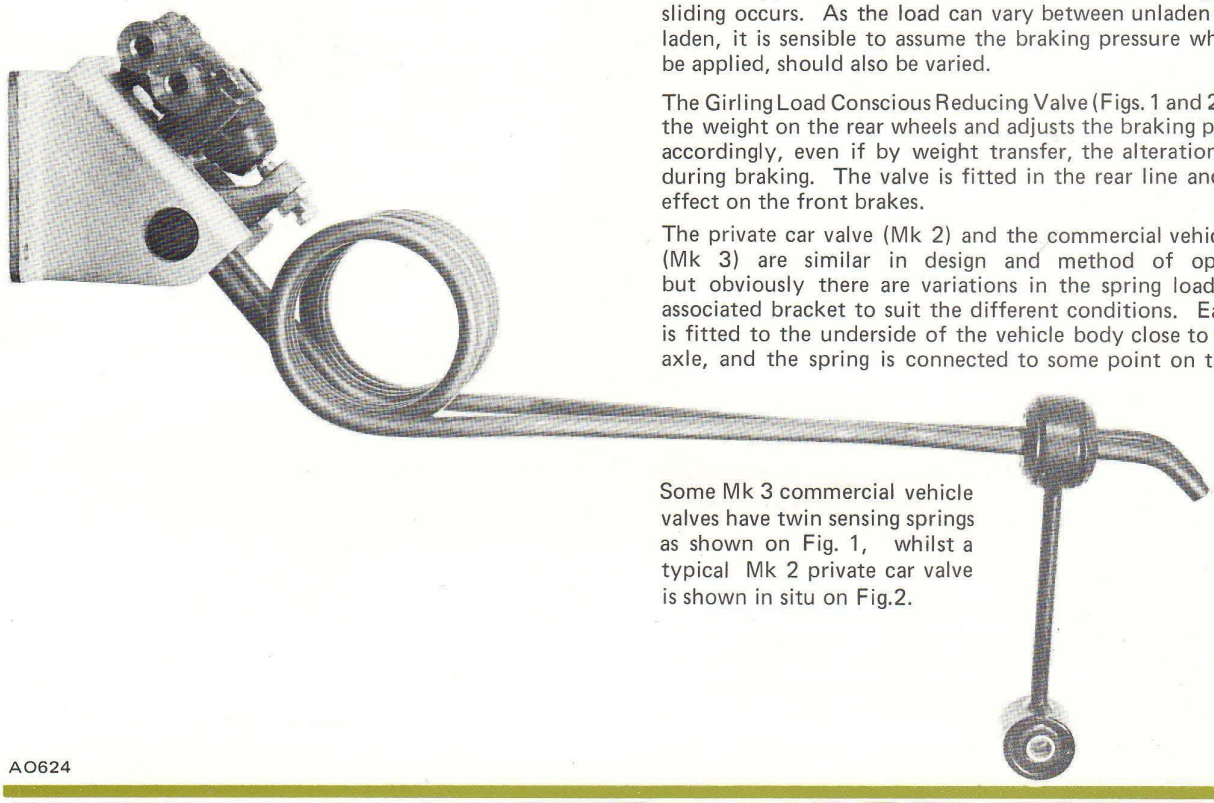


AO624

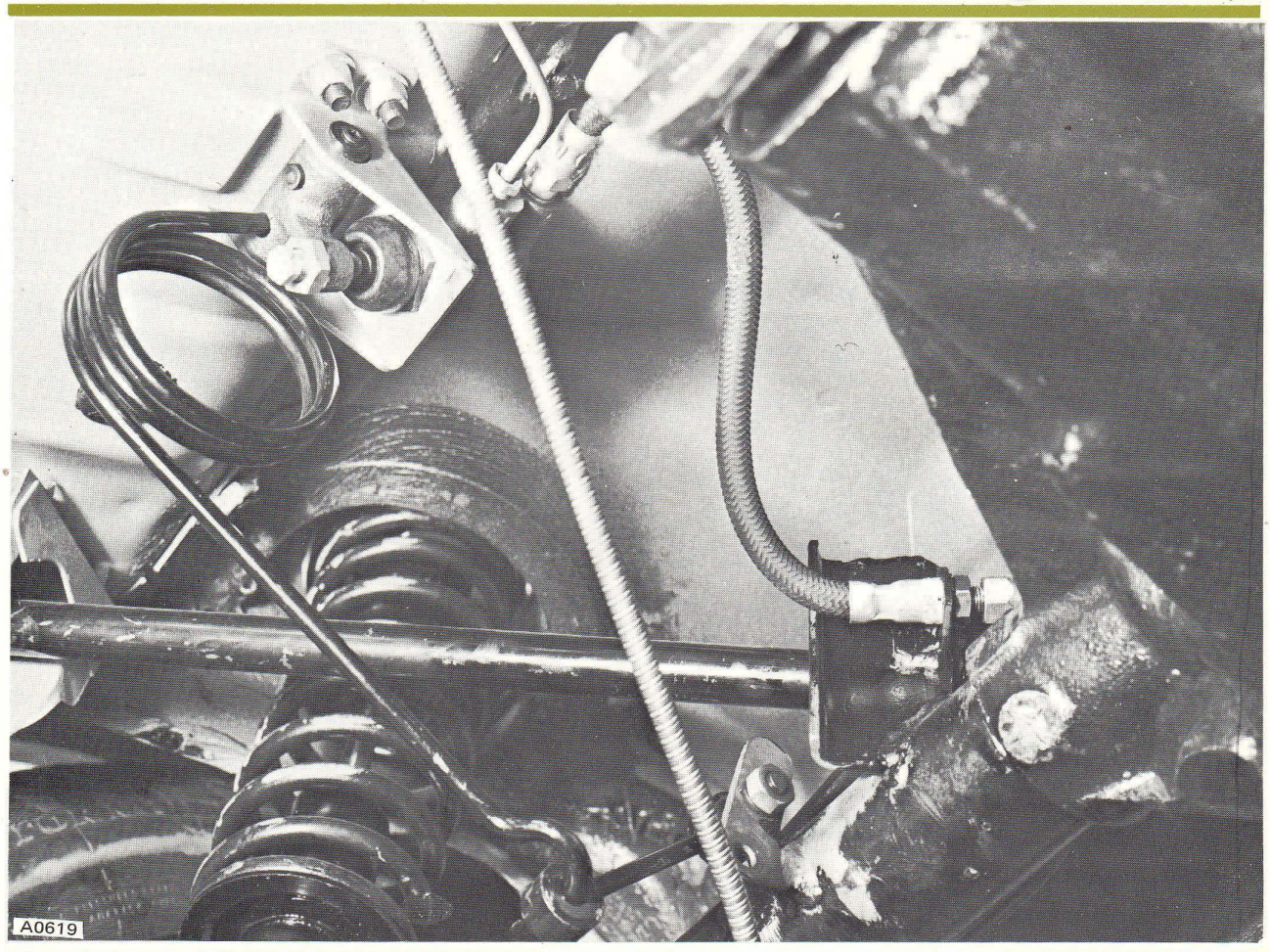
Introduction

The load on a vehicle governs the amount of braking which can be applied to the rear wheels, before locking-up and sliding occurs. As the load can vary between unladen to fully laden, it is sensible to assume the braking pressure which can be applied, should also be varied.

The Girling Load Conscious Reducing Valve (Figs. 1 and 2) senses the weight on the rear wheels and adjusts the braking pressures accordingly, even if by weight transfer, the alteration occurs during braking. The valve is fitted in the rear line and has no effect on the front brakes.

The private car valve (Mk 2) and the commercial vehicle valve (Mk 3) are similar in design and method of operation, but obviously there are variations in the spring loading and associated bracket to suit the different conditions. Each unit is fitted to the underside of the vehicle body close to the rear axle, and the spring is connected to some point on the axle.

Some Mk 3 commercial vehicle valves have twin sensing springs as shown on Fig. 1, whilst a typical Mk 2 private car valve is shown in situ on Fig.2.



A0619

5D 8b load conscious pressure reducing valves MK2 & 3 (for private cars & commercial vehicles)

How it works

Fluid pressure from the master cylinder passes through the open valve to the rear brakes (Fig.6) As pressure in the rear brakes increases, it loads the valve piston until the pressure is sufficient to overcome the combined load from internal spring 'A' and sensing spring 'B'. The piston then moves down allowing the ball valve to close (Fig. 7), thus preventing further pressure going to the rear brakes.

When the brakes are released, the reducing pressure in the lower chamber allows sleeve 'C' to be pushed downwards and this movement opens the ball valve and allows the piston to return to the position shown on Fig. 6.

Should braking be increased after the initial application, the extra pressure from the master cylinder in the lower chamber forces the piston upwards, which opens the ball valve allowing fluid to pass until the piston is moved down again closing the ball valve. The pressure increase to the rear brakes is a proportion of the increase to the front brakes and these rapid controlling movements are repeated as long as the pressure from the master cylinder continues to rise.

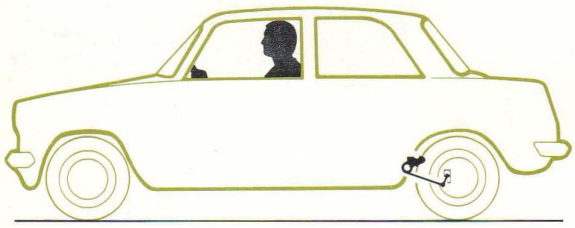
If pressure in the rear brakes reduces due to the drums expanding away from the shoes; the piston moves upwards pushing the ball off its seat, allowing fluid to pass and rebuild the pressure. This keeps the braking constant under a condition of expanding drums.

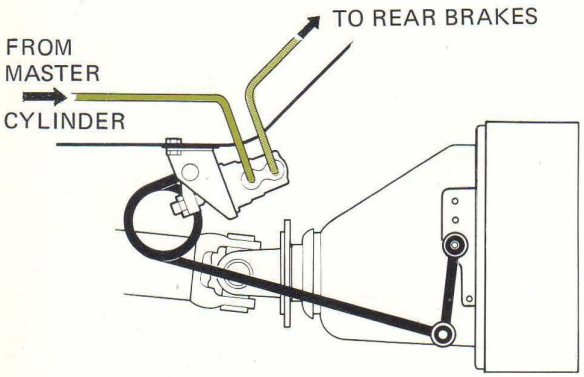
When the vehicle is laden (Fig. 4) the sensing spring 'B' applies an upward force to the piston in proportion to the weight, and fluid pressure to the brakes has to be proportionally higher before the piston can be moved downwards to close the valve. Eventually the force on the piston is such that maximum braking pressure is insufficient to move it and the valve remains open. In this condition, the valve is inoperative and offers no restriction to the fluid.

Regardless of the load on the vehicle, the valve responds to unusual road conditions before and during brake application. If the vehicle goes over a hump-backed bridge or a large pot hole, the weight on the axle varies and the altering relationship between vehicle, chassis and axle is sensed by the sensing spring and the correct signal is given to the brakes on initial application. The load applied by the sensing spring to the piston will either increase and move the piston up allowing increased pressure to the rear brakes; or decrease and allow the piston to move down; thus reducing the pressure in the rear line by increasing the volume of fluid. The signal would be instantly corrected in this way the whole time the brakes were applied, even when the vehicle encountered normal road conditions again.

The fluid pressure to the rear brakes for any particular condition depends on the characteristics of the valve and the sensing spring rate; which are tailored to suit the vehicle for which the valve is designed.

3





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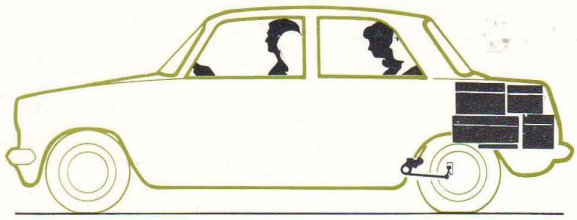
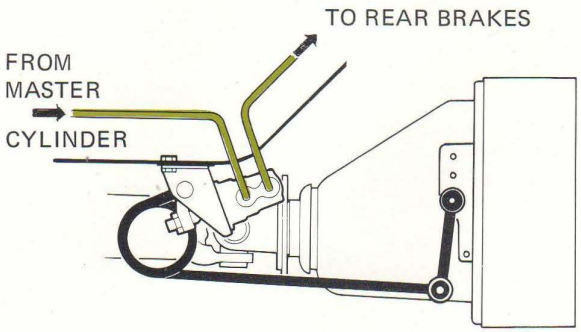
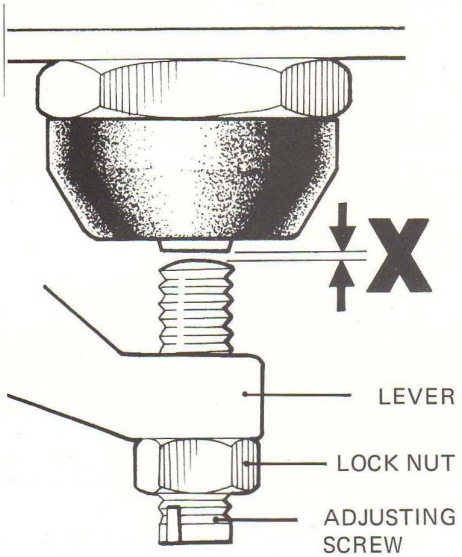




A0607-9

load conscious pressure reducing valves &3 (for private cars & commercial vehicles)

5



A0618

Servicing

If the unit is to operate efficiently it is essential that the gap between the adjusting screw and piston stem (Fig. 5) is checked at intervals recommended by the vehicle manufacturer, and if new road springs are fitted. The required dimension should also be obtained from the vehicle manufacturer's literature as it is impractical to quote the precise measurement for all vehicles in this publication.

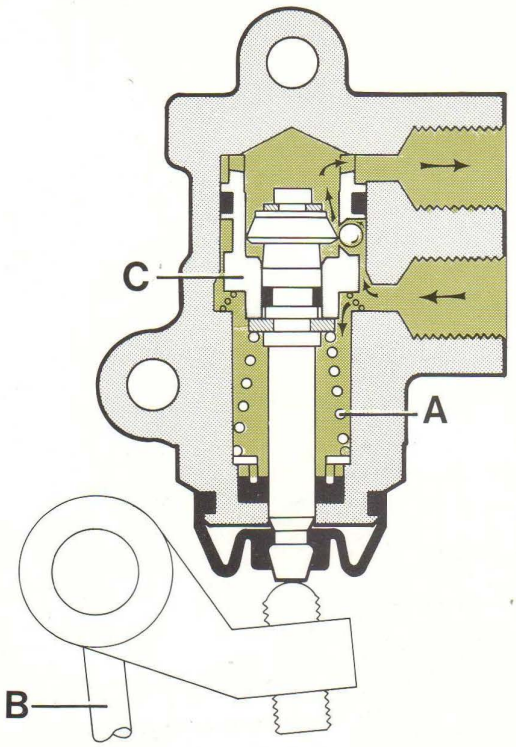
The test is made with the valve in position on the vehicle in the unladen condition, standing on a reasonably flat level surface, over a pit or a hoist. The setting determines the loading of the sensing spring, or springs, and it is important to note the method of working depends on the type of valve fitted.

Mk 2 Valves (Fig. 8)
Disconnect the link from the bracket and refit to the lower hole in the bracket. Check gap 'X' (Fig. 5) is within the limits quoted in the vehicle manufacturer's handbook; if necessary, slacken the locknut and reset the adjusting screw. Tighten the locknut, recheck the gap and refit the link to the upper hole in the bracket.

Mk 3 Valves (Fig. 10)
The adjusting screw in the lever casting on the Mk 3 valves is correctly set at the production factory and must not be disturbed. To adjust gap 'X' (Fig. 5) therefore slacken the locknuts on the adjuster eye and ferrule assembly (Fig.10) and adjust the barrel nut until gap 'X' is within the limits stated in the vehicle manufacturer's handbook. Tighten the locknuts after adjustment.

No attempt should be made to dismantle the hydraulic valve assembly. If a fault develops a new guaranteed unit should be

6



A0608

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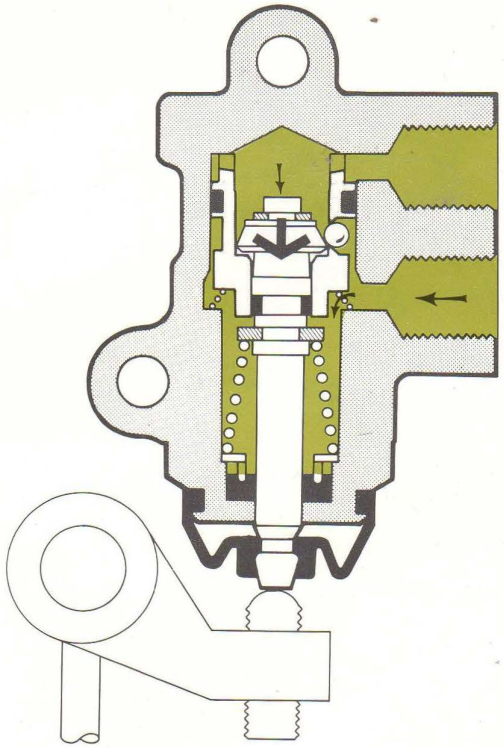


load conscious pressure reducing valves MK2&3
(for private cars & commercial vehicles)

fitted and dimension 'X' reset. This also applies if a new spring or spring mounting parts are fitted to the valve.

The servicing periods for hydraulic equipment fitted to Private Cars and Light Commercial Vehicles is 40,000 miles (64,000km) or three years and for Medium and Heavy Commercial Vehicles it is 50,000 miles (80,000km) or two years. When the mileage is recorded or the time schedule expires, whichever is the sooner, all hydraulic cylinders should be replaced by new guaranteed units.

The mechanical parts of the valve assembly should be serviced when necessary with Girling kits of new springs and spring mounting parts.

Fitting New Valve Assembly

This is simply a case of replacing one unit with another, resetting gap 'X' (Fig. 5) bleeding the system and road testing.

The tightening torque for the bolts securing Mk 3 valves to the bracket is 8 to 12 lb. ft. (11 to 16 Nm).

To replace Mk 2 valves, the lever, bearing pin and associated parts (Fig. 8) must be removed and the following section should be referred to.

Fitting New Springs and Spring Mounting Parts

The illustrations (Figs. 8 and 10) show the general arrangement of the parts for Mk 2 and Mk 3 assemblies.

Loosen the grubscrew in the end of the bearing pin to release the spring and dowel. Push out the bearing pin to release the lever assembly.

Clean but do not grease the parts.

Reassemble in the reverse order, ensuring the ends of the dowel and spring protrude by a value of 0in. to 0.060 in. (0mm to 1.5mm) proud of the lever. Tighten the grubscrew to a torque of 8 to 10 lb. ft. (11 to 13 Nm) for Mk 2 assemblies and 12 to 15lb. ft. (16 to 20 Nm) for Mk 3 assemblies.

NOTE: Some Mk 3 assemblies utilize two springs and therefor do not need the dowel.

Fitting New Adjuster Eye & Ferrule Assembly

Unscrew the adjuster eye and ferrule assembly from the axle bracket.

Lubricate the end of the spring with water and gradually work the assembly off the spring.

Re-wet the end of the spring to fit the new assembly and reconnect to the axle bracket.

Check gap 'X' (Fig. 5)

NOTE: Applicable to Mk 3 units only: The eye and ferrule assemblies are provided with a sighting groove on the male thread that enters the barrel nut. If this groove is visible above one or the other, or both, of the locknuts, this indicates that . . . . .

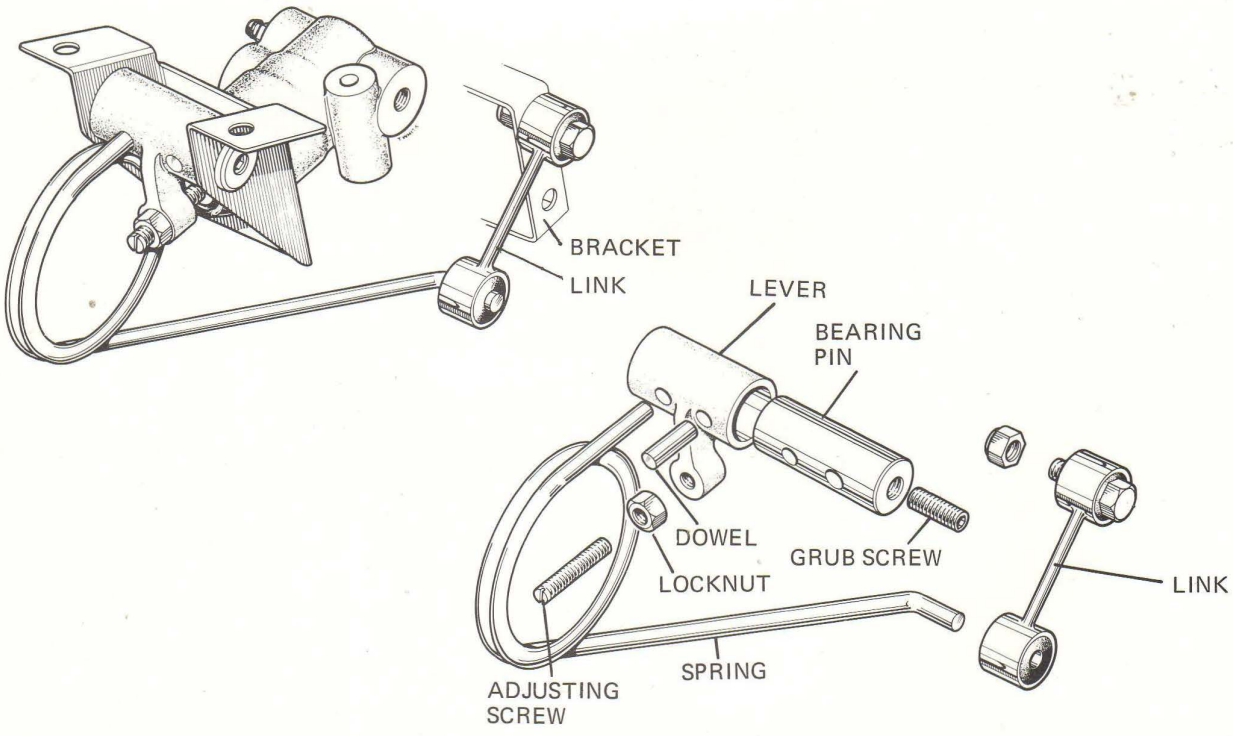
(a) The adjuster eyes did not have an equal amount of engagement in the barrel nut prior to final adjustment.

(b) The barrel nut is not of the correct length to suit the installation, in which case it should be changed for one of the correct length.

The sighting groove indicates when there is sufficient thread engagement in the barrel nut.

Road test the vehicle.

8 MK 2 VALVE

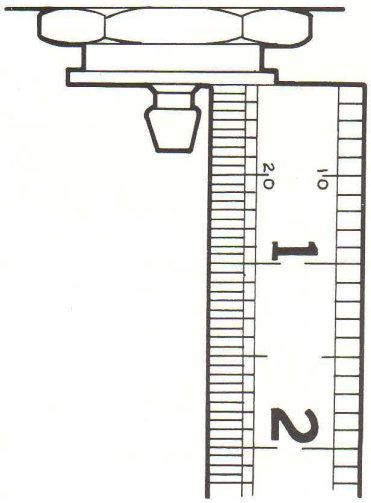


A0246

load conscious pressure reducing valves MK2&3 (for private cars & commercial vehicles)

5D 8e

9 MEASURING THE PISTON STEM MOVEMENT



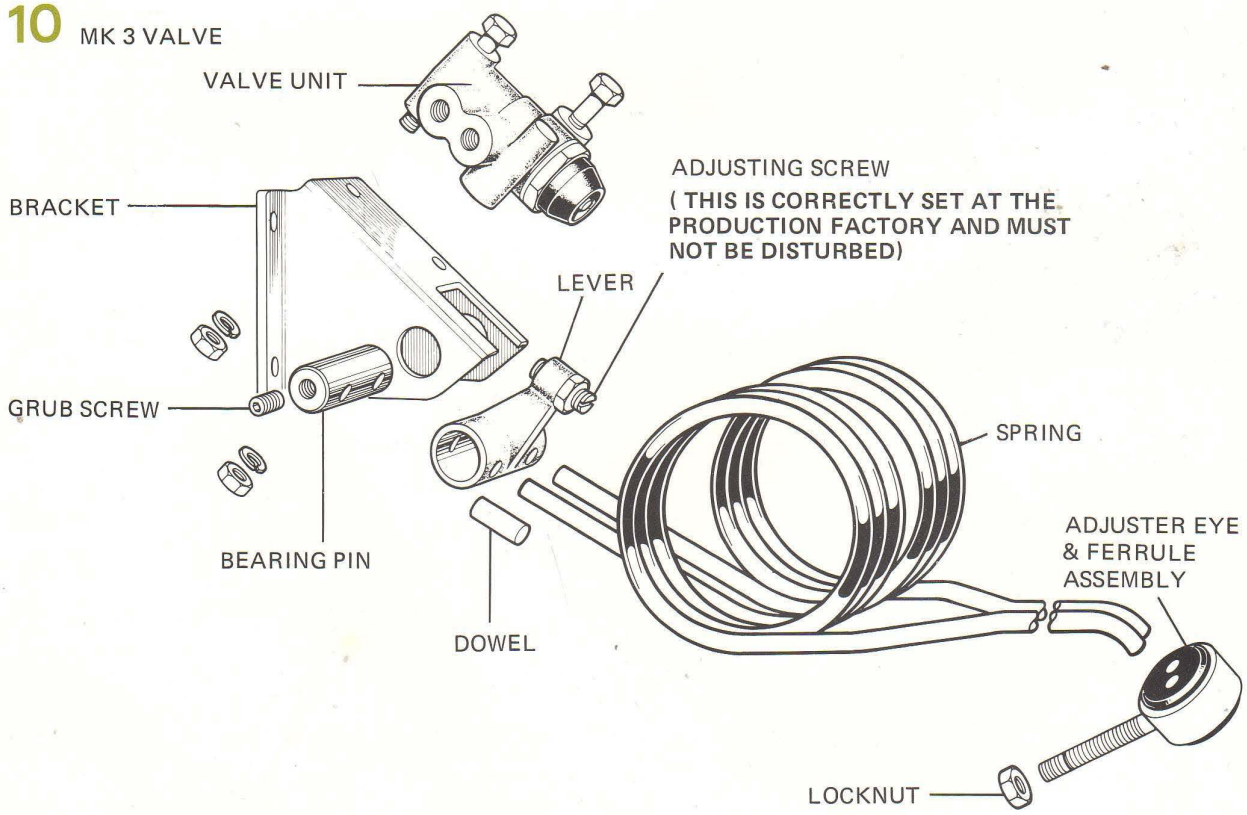
A0617

Testing the Valve Assembly

The test must be made with the valve in position on the vehicle, with the vehicle unladen, standing on a reasonably flat level surface.

1. Disconnect the link from the differential housing bracket.
2. Examine the valve and associated brake pipes for fluid leaks. Lift the dust cover on the valve; the area revealed may be moist but should not be excessively wet.
3. Have the brake applied fairly hard and the piston stem should move downwards about 0.060 in. (1.5 mm) and stop. This movement is quite rapid and positive and can be measured with a ruler if the dust cover is removed. (Fig.9.)
4. Hold the brake on for 10-15 seconds, with no reduction of pedal effort, and there should be no further movement of the piston stem.
5. On release of the brakes the piston stem should again move downwards momentarily and then move back to its original position.
6. If when the brake is applied (3) the piston stem does not move at all, or moves considerably more than 0.060 in. (1.5 mm), a new valve should be fitted.
7. During the 10-15 second leakage test (4) the piston stem should not move further than its first rapid movement; if further movement does occur the valve is faulty and should be replaced. Slow 'creep' of the piston stem after the 10-15 second test is permissible.

10 MK 3 VALVE



A0629

combination valve

Introduction

The Combination Valve (Fig. 1), is in effect a sophisticated pressure differential warning actuator incorporating a self-centering device, a pressure conscious reducing valve and a by-pass all combined in one unit.

Designed for dual-line hydraulic braking systems; the pressure differential warning actuator (P.D.W.A.) remains inoperative as long as both systems are functioning correctly. Fluid pressure from each system is applied to opposite ends of a central piston, which is thereby maintained in balance (Fig. 2).

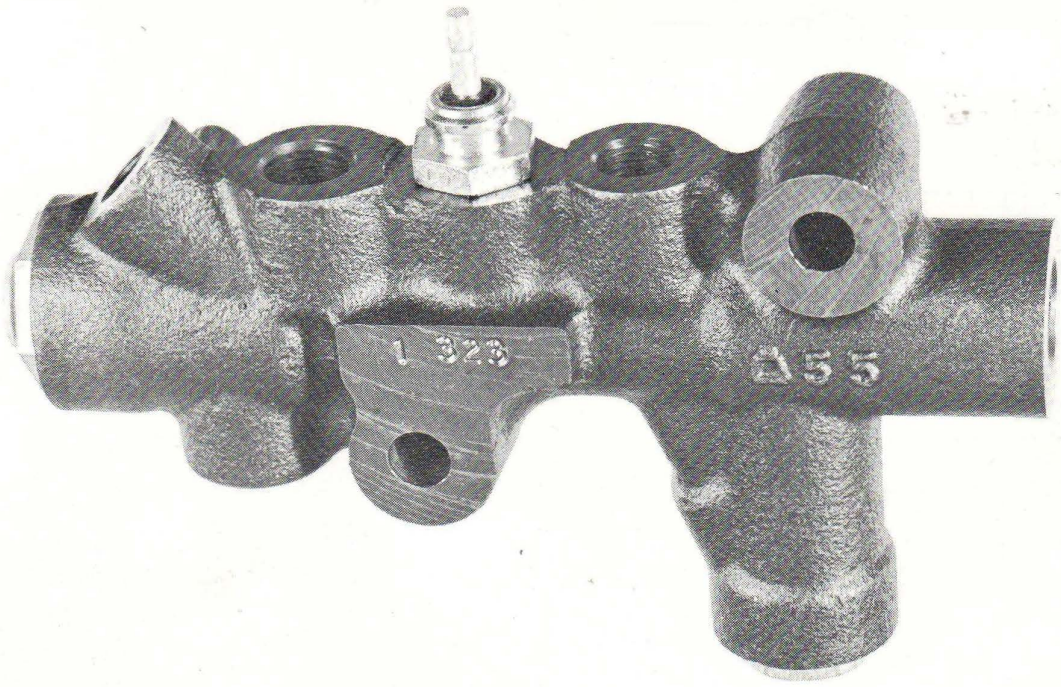
If one system fails; loss of fluid pressure on one side of the piston results in fluid pressure from the operating system moving the piston along the bore in the direction of the failed system.

Movement of the piston in either direction causes the switch assembly plunger to move upwards and activate the switch — resulting in a bulb lighting up on the dashboard. This indicates a failure in one of the brake systems and the light remains on until the fault is traced and rectified, when the piston self-centres and the light goes out.

The pressure conscious reducing valve (P.C.R.V.) allows fluid to the rear brakes until a certain pressure is reached when the valve closes. From this point on, the valve only allows a proportion of any increase in fluid pressure to reach the rear brakes.

Should a failure occur on the front brake system, the design of the valve ensures that fluid to the rear brakes by-passes the P.C.R.V. and maximum pressure is delivered to the rear brakes.

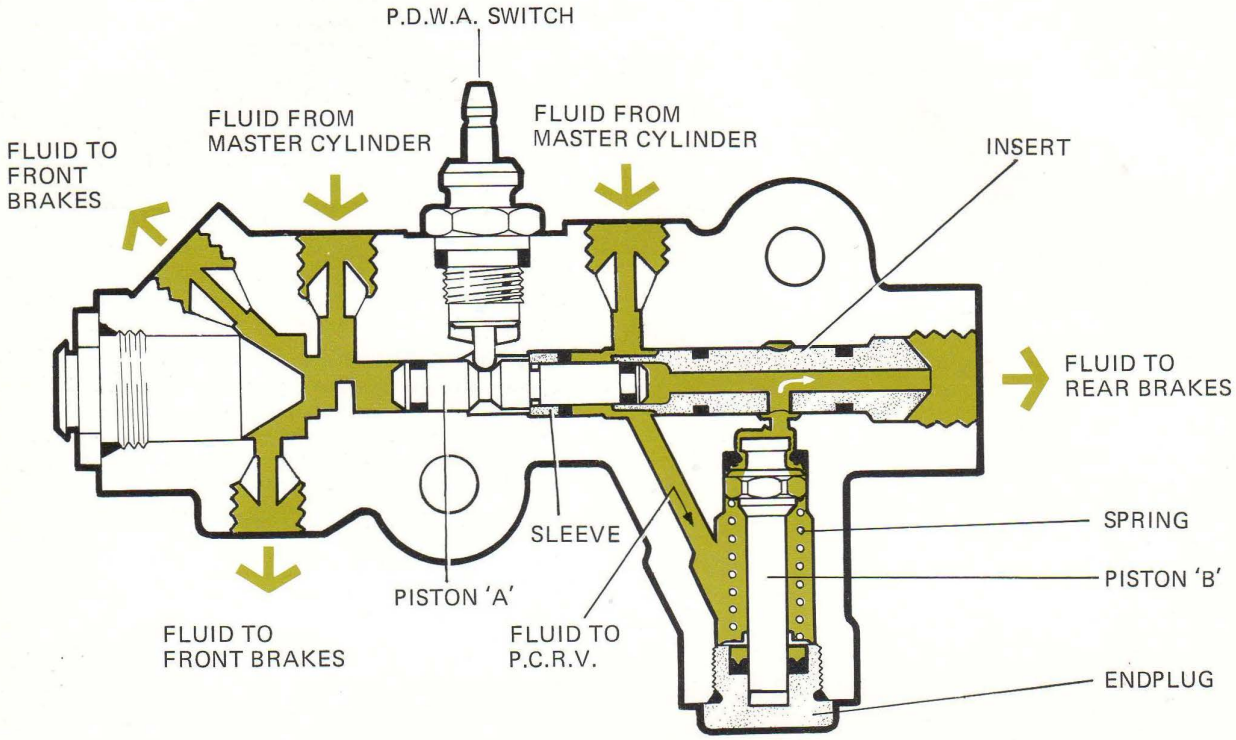
1



A 0411

combination valve

2



A 0 412

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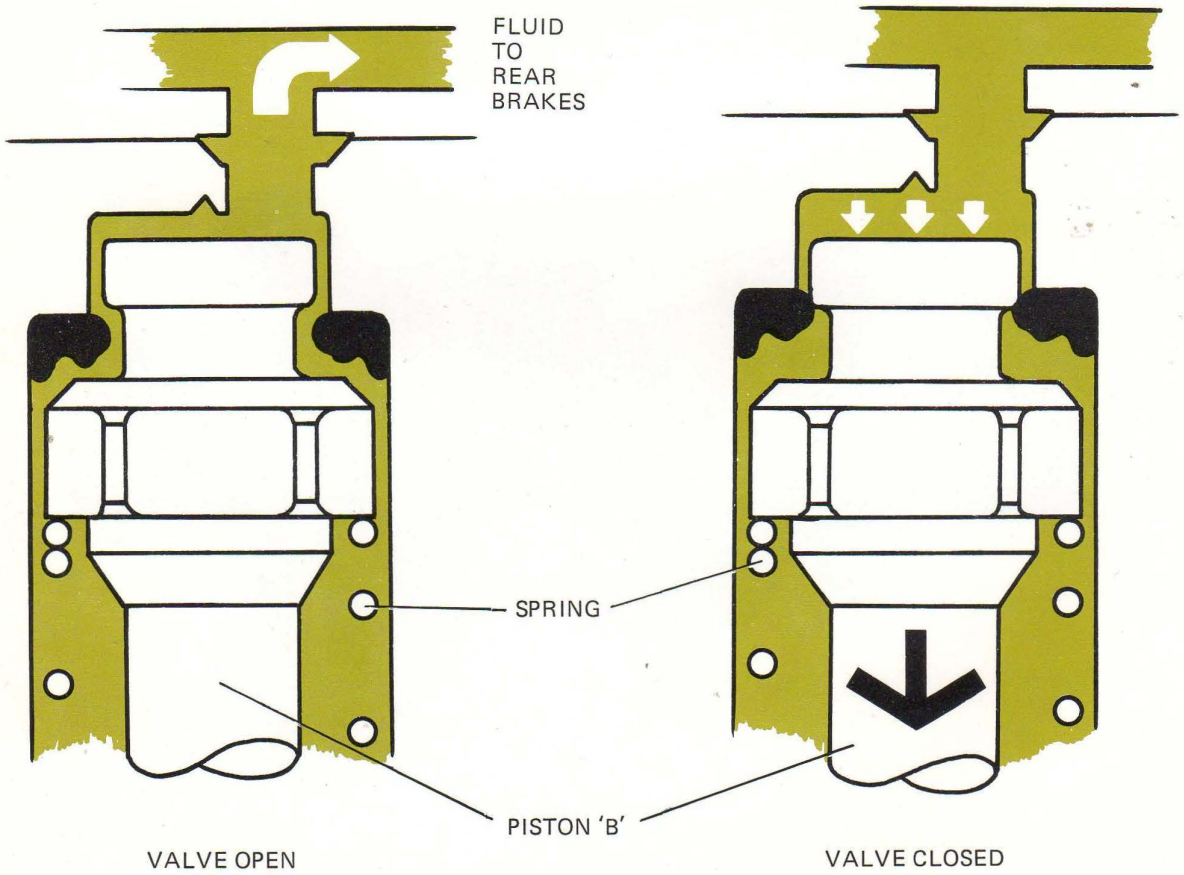


A 0413

combination valve

How it works

When the foot brake is applied, hydraulic pressure builds up in both front and rear brake systems and piston 'A' is maintained in balance.

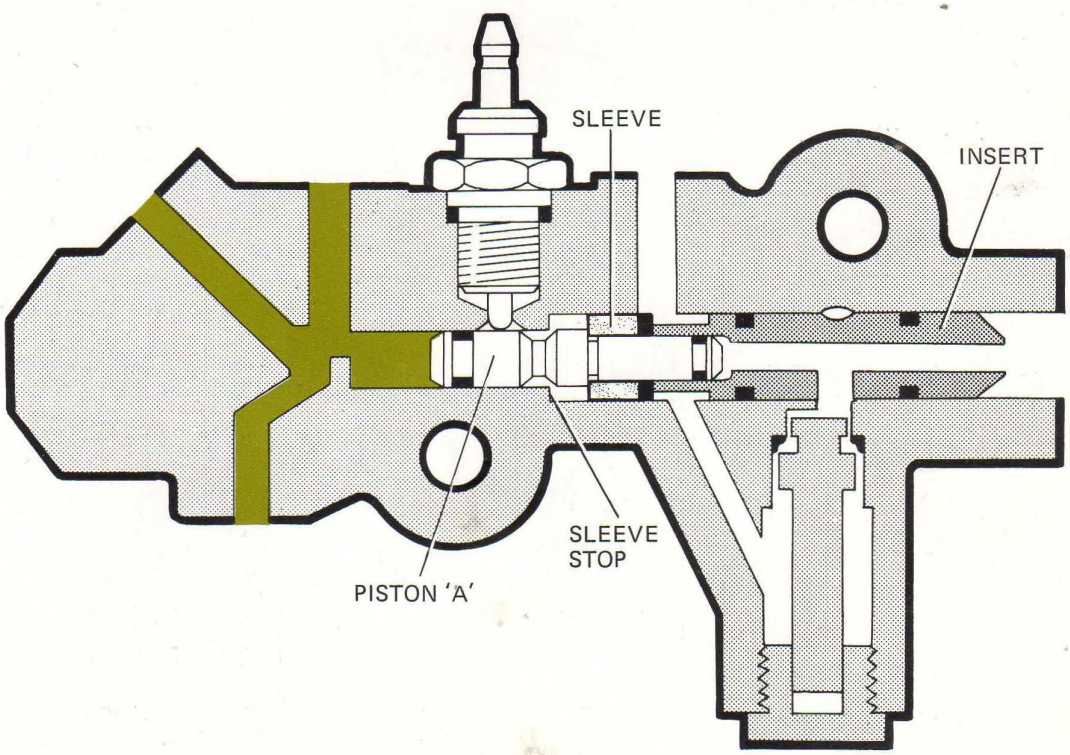
As pressure builds up in the rear brake system, it acts on piston 'B' in the P.C.R.V. until the force of the spring is overcome, when the piston moves in the direction of the endplug (Fig. 3), closing the valve and sealing off further fluid to the rear brakes.

From this point on, the P.C.R.V. allows only a proportion of any increase in fluid pressure to reach the rear brakes. At normal braking there is equal pressure all round, but at heavy braking there is considerably less pressure in the rear cylinders than the fronts.

If a failure occurs in the rear brake system, piston 'A' moves to the right taking with it the sleeve (Fig. 4). When the fault has been located and rectified, fluid pressure on both sides of the piston is the same. But the area of the piston on the rear side of the P.D.W.A., plus the area of the sleeve, is greater than the area of the piston on the front side of the actuator. And thus the fluid moves the piston to the left, until the sleeve contacts the stop in the bore, when the piston is in its original position.

If a failure occurs in the front brake system, piston 'A' moves to the left (Fig. 5) and separates from the insert. Fluid can then flow direct to the rear brakes by-passing the P.C.R.V. When the fault is located and rectified, again equal fluid pressure is applied to both sides of the piston. But as the sleeve is against its stop and is not therefore helping the smaller area of piston on the rear side; the piston moves to the right and returns to its original position.

4 REAR SYSTEM FAILURE



A 0414

combination valve

Servicing

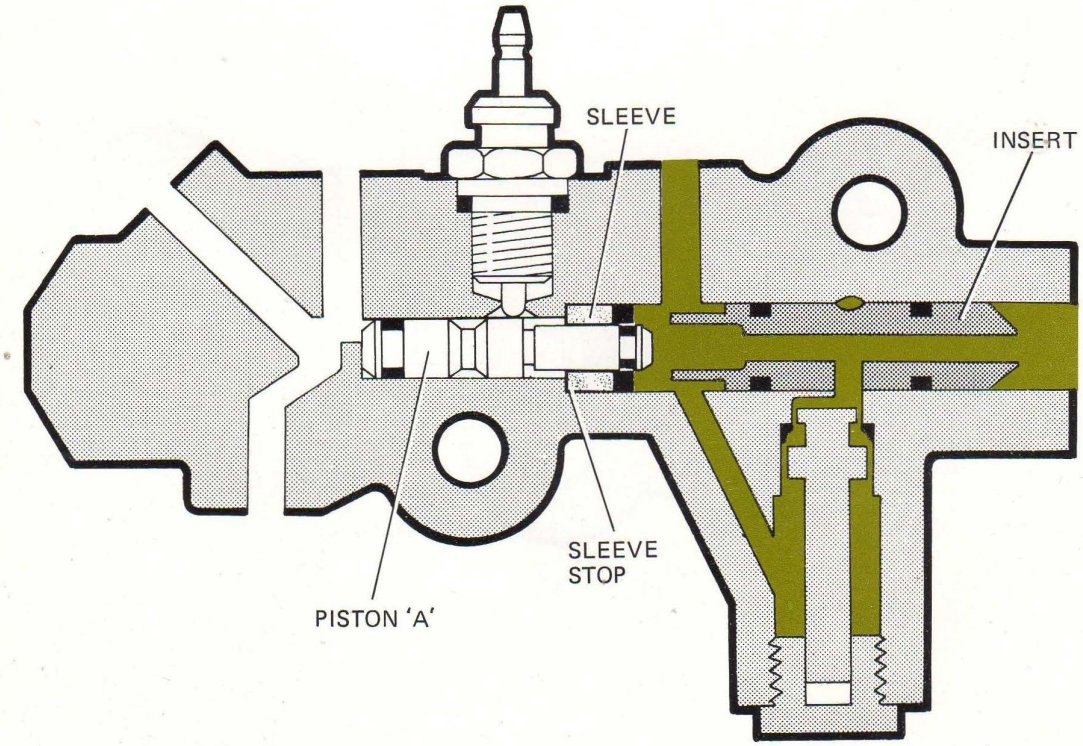
No attempt should be made to dismantle the unit and if a fault develops a new guaranteed unit should be fitted.

Every 40,000 miles (64,000 km) or three years, whichever occurs first, the Combination Valve and all hydraulic cylinders fitted to Private Cars and Light Commercial Vehicles should be replaced by new guaranteed units.

Bleeding the System

Bleed the system as described in Section 1, Page 1D1.

5 FRONT SYSTEM FAILURE



A 0415

combination valve MK2 5D 10a

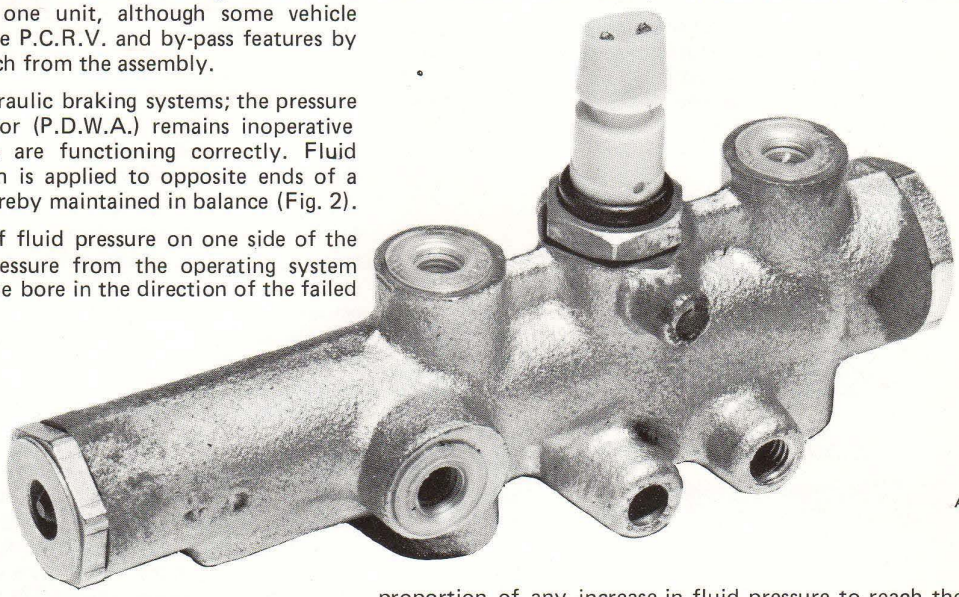
Introduction

The Combination Valve (Fig. 1), is in effect a sophisticated pressure differential warning actuator incorporating a self-centering device, a pressure conscious reducing valve and a by-pass all combined in one unit, although some vehicle applications utilise only the P.C.R.V. and by-pass features by omitting the P.D.W.A. switch from the assembly.

Designed for dual line hydraulic braking systems; the pressure differential warning actuator (P.D.W.A.) remains inoperative as long as both systems are functioning correctly. Fluid pressure from each system is applied to opposite ends of a central piston, which is thereby maintained in balance (Fig. 2).

If one system fails; loss of fluid pressure on one side of the piston results in fluid pressure from the operating system moving the piston along the bore in the direction of the failed system.

1



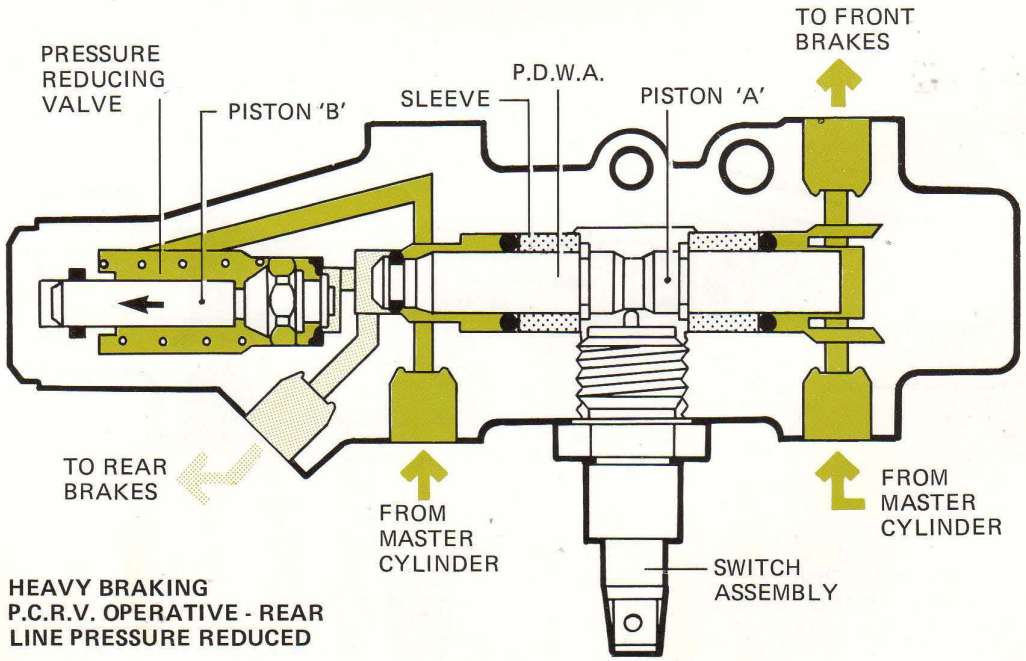
A0829

Sufficient movement of the piston in either direction causes the switch assembly plunger to ride up the ramp and activate the switch – resulting in a bulb lighting up on the dashboard. This indicates a failure in one of the brake systems and the light remains on until the fault is traced and rectified, when the piston self-centres and the light goes out.

The pressure conscious reducing valve (P.C.R.V.) allows fluid to the rear brakes until a certain pressure is reached when the valve closes. From this point on, the valve only allows a proportion of any increase in fluid pressure to reach the rear brakes.

Should a failure occur on the front brake system, the design of the valve ensures that fluid to the rear brakes by-passes the P.C.R.V. and is delivered straight to the rear brakes, without any reduction in pressure.

2 NORMAL OPERATION



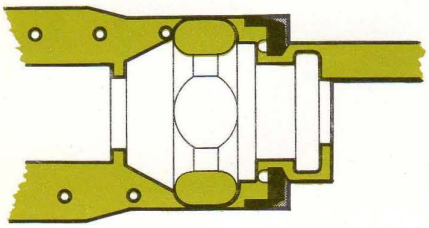
A0807/1

How it works

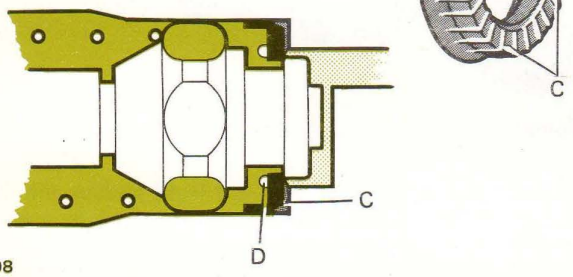
When the foot brake is applied, hydraulic pressure builds up in both front and rear brake systems and piston 'A' is maintained in balance (Fig. 2).

As pressure builds up in the rear brake system, it acts on piston 'B' in the P.C.R.V. until the force of the spring is overcome, when the piston moves to the left (Figs. 2 & 3) onto the rubber seal, closing the valve and sealing off further fluid pressure to the rear brakes.

3 VALVE OPEN



VALVE CLOSED



A0808

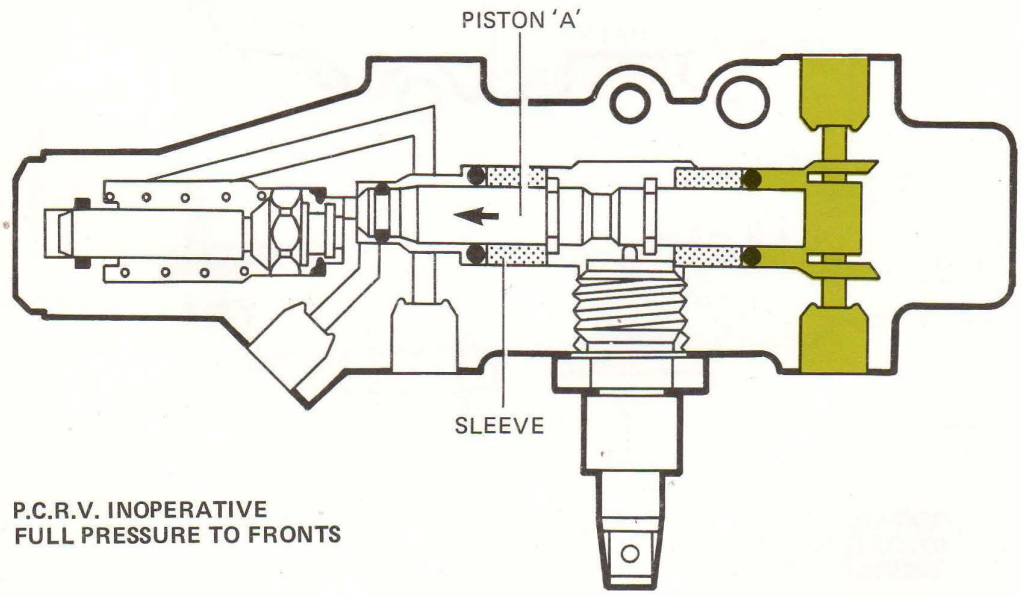
From this point on, the P.C.R.V. allows only a proportion of any increase in fluid pressure to reach the rear brakes. At normal braking there is equal pressure all round, but at heavy braking there is considerably less pressure in the rear cylinders than the fronts.

If a failure occurs in the rear system (Fig. 4) all pressure on the left-hand side of piston 'A' is lost and the pressure being applied to the front brakes acting on the right-hand side of piston 'A' moves the piston and one sleeve over and actuates the switch assembly plunger.

If a failure occurs in the front system (Fig. 5) all the pressure on the right-hand side of piston 'A' is lost and the pressure being applied to the rear brakes acting on the left-hand side of piston 'A' moves the piston and the other sleeve over and actuates the switch assembly plunger. At the same time, the seal on piston 'A' is moved out of its bore thus opening up a direct path to the rear outlet for the fluid and effectively 'by-passing' the P.C.R.V. This enables full breaking pressure to be applied to the rear brakes if required.

In both cases, when the fault has been located and rectified equal fluid pressure will be applied to both ends of the piston and sleeves. In one half of the system both sleeve and circlip will be in contact whereas in the other half the sleeve will be away from the circlip (prevented from making contact by the switch assembly body acting as a stop). As the effective area against which pressure can act will be that of piston and sleeve on one side and only the piston on the other side; the piston will be moved over until the other circlip contacts the other sleeve, when effective areas become equal and hold the piston central. The switch assembly plunger moves into the piston groove, the electrical contact is broken and the warning light will go out.

4 REAR SYSTEM FAILURE



P.C.R.V. INOPERATIVE
FULL PRESSURE TO FRONTS

A0807/3

Valve Operation

The control of fluid pressure, by the valve, centres around the special seal (Fig. 3). This has ribs 'C' spaced around its top face and part way down its edge and on the underside of the seal are a number of raised dimples 'D'.

With only light pressure being applied to the brakes the valve is open and inoperative. The spring pressure holds the valve stem against the dimples which in turn allow the pressure to pass between them to the rear brakes. When the cut-in pressure is reached the pressure being applied to the rear brakes causes the piston to move to the left and the underside of the piston head seals against the radius on the inner diameter of the seal, thus preventing full pressure from reaching the rear line. An increase in master cylinder pressure will produce an increase in input pressure in the unit, this in turn will, together with the spring pressure, cause the piston to move to the right and open the valve allowing a further pressure increase to the rear brakes until the piston is again moved to the closed position by that increase in pressure.

It is important to note that due to the piston design, once the cut-in pressure is reached, any further increase in master cylinder pressure will result in only a proportion of that pressure being passed to the rear brakes.

When the master cylinder pressure is released, the outer lips of the seal collapse inwards and allow fluid to pass back towards the master cylinder.

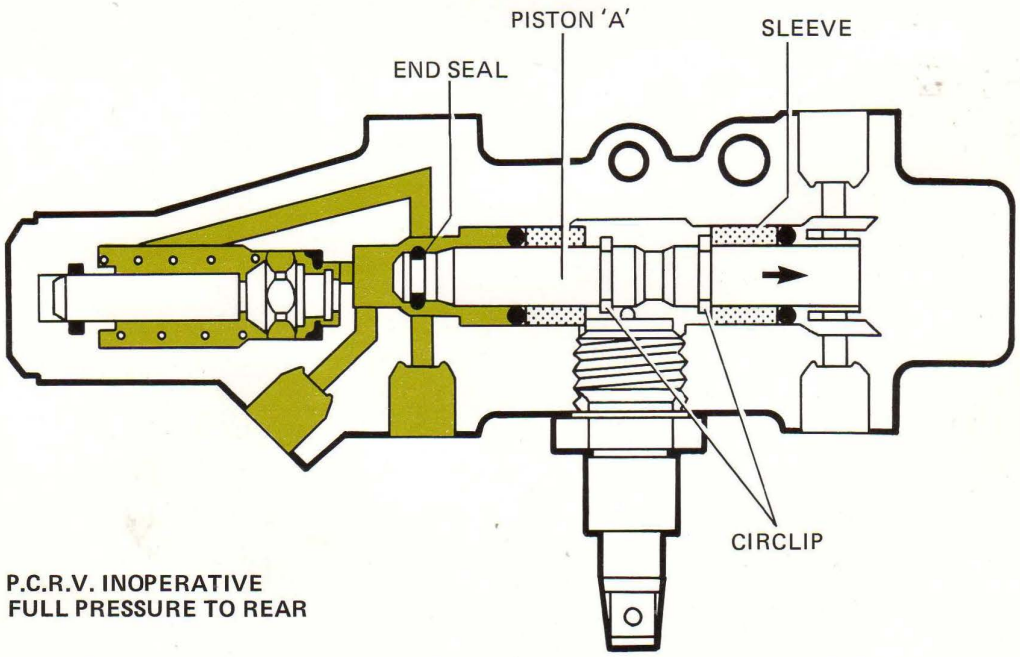
Servicing

It is recommended that at intervals not exceeding 16,000km (10,000 miles), the electrical switch and bulb on the dashboard are checked by simulating a brake failure. This can be achieved by opening a bleedscrew to temporarily reduce the pressure in one of the systems when operating the foot pedal. The fluid level in the reservoir must be maintained during this operation and care must be taken to ensure that air does not enter the system. If faulty, the switch assembly or bulb should be renewed.

Except for replacement of the switch assembly, no attempt should be made to dismantle the unit. If a fault develops a new guaranteed unit should be fitted

The recommended overhaul time for Private Car and Light Commercial Vehicles is 64,000km (40,000 miles) or three years, whichever is reached first. At this juncture, all hydraulic cylinders including the combination valve should be replaced by new guaranteed units.

5 FRONT SYSTEM FAILURE



P.C.R.V. INOPERATIVE
FULL PRESSURE TO REAR

A0807/2

load conscious pressure reducing valve (for private cars & light commercial vehicles)

Introduction

The load on a vehicle governs the amount of braking which can be applied to the rear wheels before locking-up and sliding occurs. As the load can vary between unladen to fully laden, it is sensible to assume the braking pressure which can be applied should also be varied.

The Lucas Girling Twin Load Conscious Reducing Valve senses the weight on the rear wheels and adjusts the braking pressure accordingly, even if by weight transfer, the alteration occurs during braking. The valve is fitted in the rear line and has no effect on the front brakes.

The unit is fitted to the underside of the vehicle body, close to the rear axle and the spring is connected to some point on the axle.

How It Works

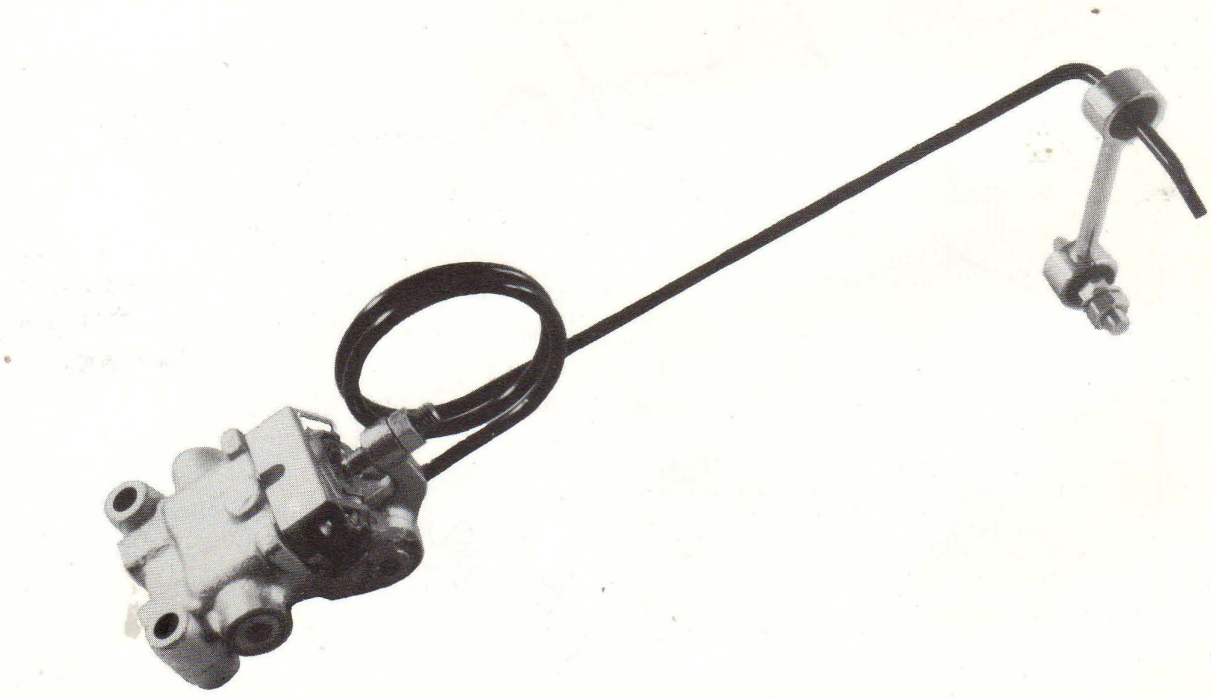
At normal braking there is equal pressure all round and fluid pressure from the master cylinder passes through the open valve to the rear brakes (Fig. 4). As the pressure builds up in the rear brake system it acts on the L.C.R.V. until the force of the springs 'A' is overcome when the pistons move to the right (Fig. 4.) onto the rubber seal, closing the valve and sealing off further fluid pressure to the rear brakes.
Should braking be increased after the initial application the L.C.R.V. then allows only a proportion of any increase in fluid pressure to reach the rear brakes and there will be considerably less pressure in the rear cylinders than in the front.

If pressure in the rear brakes reduces due to the drums expanding away from the shoes, fluid is allowed to pass and rebuild the pressure. This keeps the braking constant under a condition of expanding drums.

At all points between laden and unladen vehicle (Fig. 3.) the sensing spring 'B' applies force to the pistons in proportion to the weight being carried and fluid pressure to the brakes has to be proportionally higher before the piston can be moved to the right to close the valve.

Regardless of the load on the vehicle, the valve responds to unusual road conditions before and during brake application. If the vehicle goes over a hump backed bridge, or large pot-hole, the weight on the axle varies and the altering relationship between the vehicle, chassis and axle is sensed by the sensing spring and the correct signal is given to the brakes on initial application. The load applied by the sensing spring to the piston will either increase and move the piston up allowing increased pressure to the rear brakes ; or decrease and allow the piston to move down; thus reducing the pressure in the rear line by increasing the volume for the fluid to fill. The signal would be instantly corrected in this way the whole time the brakes were applied, even when the vehicle encountered normal road conditions again.

The fluid pressure to the rear brakes for any particular condition depends on the characteristics of the valve and the sensing spring rate, which are tailored to suit the vehicle for which the valve is designed.



A1919

load conscious pressure reducing valve
(for private cars & light commercial vehicles)

Valve Operation Detail

The control of fluid pressure, by the valves, centres around the special seal (Fig. 4.). This has ribs "C" spaced around its top face and part way down its edge and on the underside of the seal are a number of raised dimples "D".

With only light pressure being applied to the brakes the valve is open and inoperative. The spring pressure holds the valve stem against the dimples which in turn allow the pressure to pass between them to the rear brakes. When the cut-in pressure is reached the pressure being applied to the rear brakes causes the piston to move to the right and the underside of the piston head seals against the radius on the inner diameter of the seal.
An increase in master cylinder pressure will produce an increase in input pressure in the unit, this in turn will together with the spring pressure, cause the piston to move to the left and open the valve allowing a further pressure increase to the rear brakes until the piston is again moved to the closed position by that increase in pressure.

It is important to note that due to the piston design, once the cut-in pressure is reached, any further increase in master cylinder pressure will result in only a proportion of that pressure being passed to the rear brakes.

When the master cylinder pressure is released, the outer lips of the seal collapse inwards and allow fluid to pass back towards the master cylinder.

Servicing

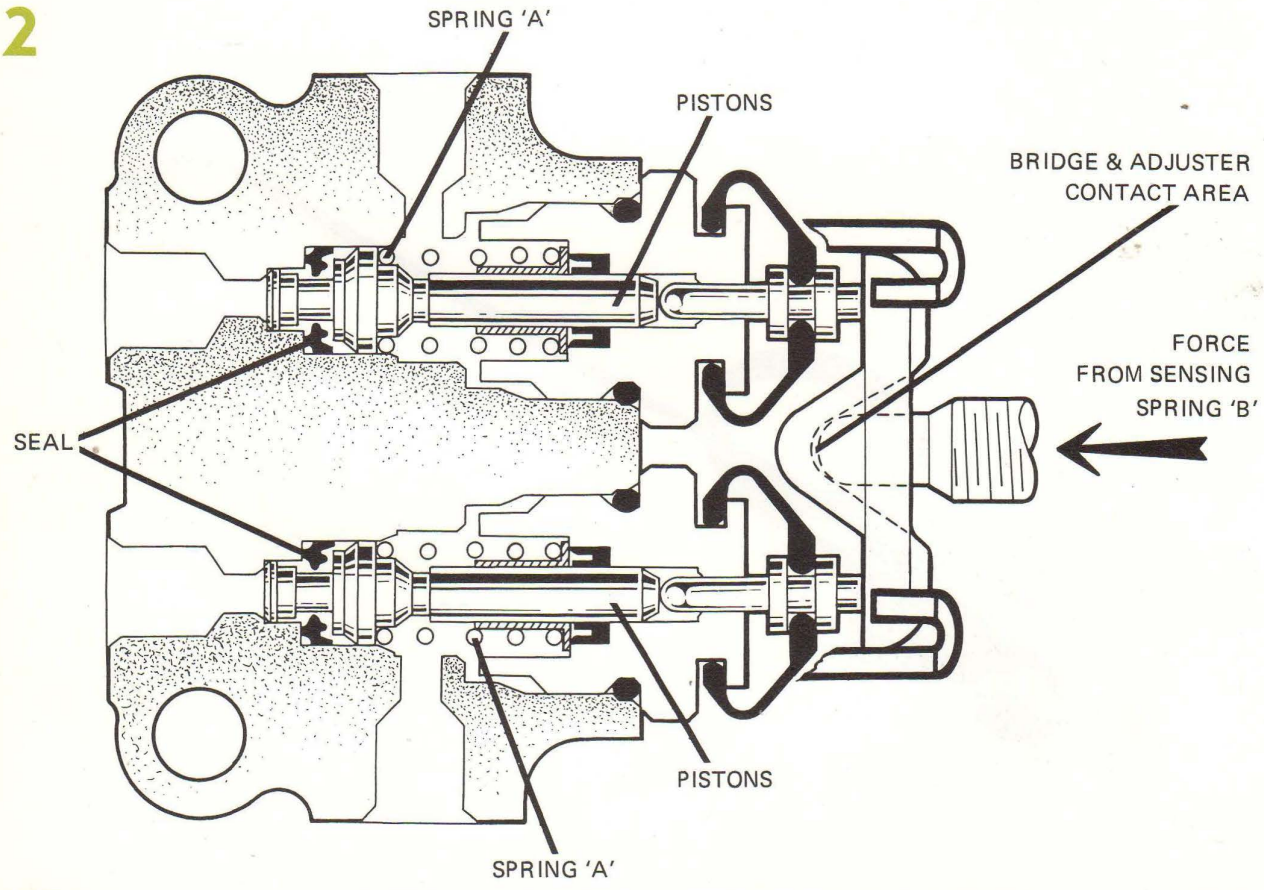
If the unit is to operate efficiently it is essential that the load relationship between the adjusting screw and piston stem bridge (Fig. 2) is checked at intervals recommended by the vehicle manufacturer.

It should also be checked if new road springs are fitted. The required dimension should also be obtained from the vehicle manufacturer's literature as it is impractical to quote the precise measurement for all vehicles in this publication.

The test is made with the valve in position, on the vehicle, and standing on a level surface, over a pit or a hoist. The setting determines the loading of the sensing spring or springs.

No attempt should be made to dismantle the hydraulic valve assembly. If a fault develops a new guaranteed unit should be fitted and dimension "X" be reset. This also applies if a new spring or spring mounted parts are fitted to the valve.

2



A1915

load conscious pressure reducing valve 5D12c
(for private cars & light commercial vehicles)

Setting Procedure
(Vehicle Workshop Manual is Essential)

1. If possible bring the vehicle to the unladen condition, i.e., ensure that the vehicle has all the standard equipment, seats, spare wheel, etc., in situ and with full fuel tank, prior to it being checked.
2. If this is impractical then it will be necessary to establish the load on the rear wheels.
3. Disconnect link from axle bracket and swing it to one side.
4. Load by hand the lever/adjusting screw against the bridge/piston push rods thus earthing lever, screw, piston rods and pistons onto the blind end of the bore.
5. Measure dimension "X" between the underside of the spring arm which passes thro' the bush and the bottom of the hole in the axle bracket.

   DO NOT APPLY ANY LOAD TO THE SPRING WHEN MEASURING DIMENSION "X".

NOTE: Dimension "X" may vary up to 2 mm dependant upon light or heavy hand pressure. This is acceptable.

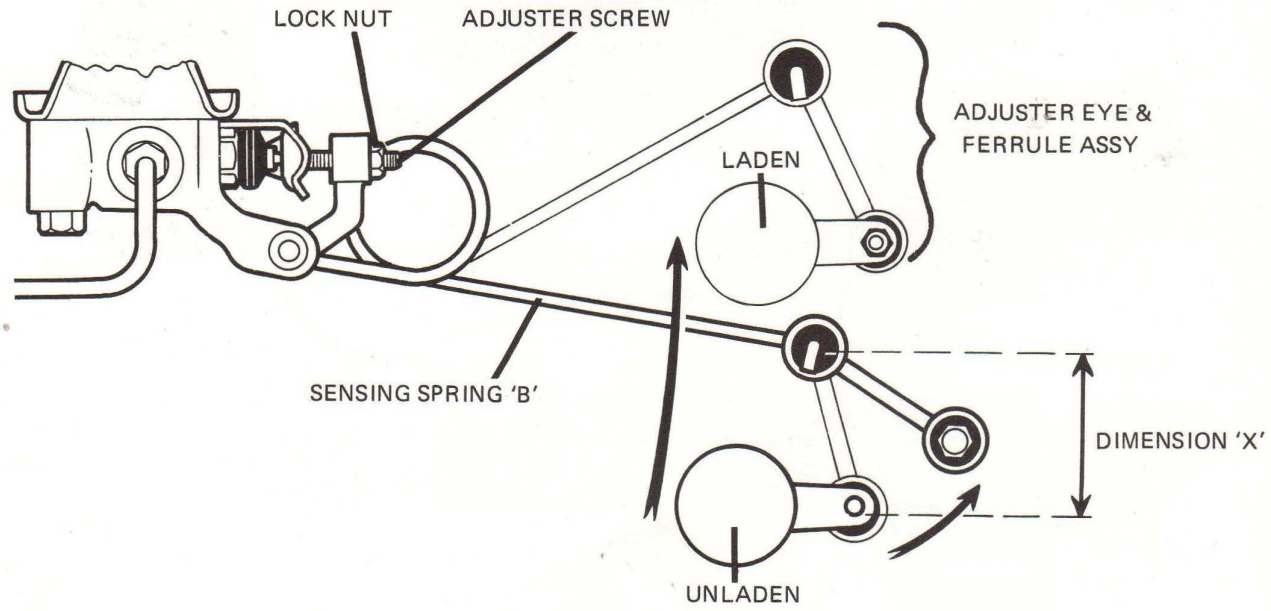
6. Refer to table in vehicle workshop manual. If its measurement is correct refit link to bracket.
7. If measurement is incorrect, slacken adjuster screw lock nut, load lever as in paragraph 4 and turn adjuster screw until correct dimension "X" is achieved relative to vehicle loading.
8. Tighten lock nut 11 to 14 N.m. (8 to 10 lbs. f/ft.) taking care not to disturb the screw setting.
9. Re-check dimension "X" as in paragraph 5.
10. Re-fit link to axle bracket and tighten nut 11 to 14 N.m. (8 to 10 lbs.f/ft.)

The servicing periods for hydraulic equipment fitted to private cars and light commercial vehicles is 40,000 miles (64,000 kms) or three years.

When the mileage is recorded or the time schedule expires, whichever is the sooner all hydraulic cylinders should be replaced by new guaranteed units.

The mechanical external parts of the valve assembly should be serviced when necessary with Girling kits of new springs and spring mounted parts.

3



A1916

load conscious pressure reducing valve
(for private cars & light commercial vehicles)

Fitting New Valve Assembly

This is simply a case of replacing one unit with another, re-setting Dimension "X" (Fig.3.), bleeding the system and road testing.

Fitting New Springs and Spring Mounted Parts

The illustrations (Fig. 2 & 3) show the general arrangement of parts for the assembly.

NOTE: Lucas Girling grease Part No. 33770000 should be smeared inside the boots and also in the pocket of the bridge piece where the adjusting screw sits. Under no circumstances should any other grease be used.

Fitting New Adjuster Eye and Ferrule Assembly

Unscrew the adjuster eye and ferrule assembly from the axle bracket.

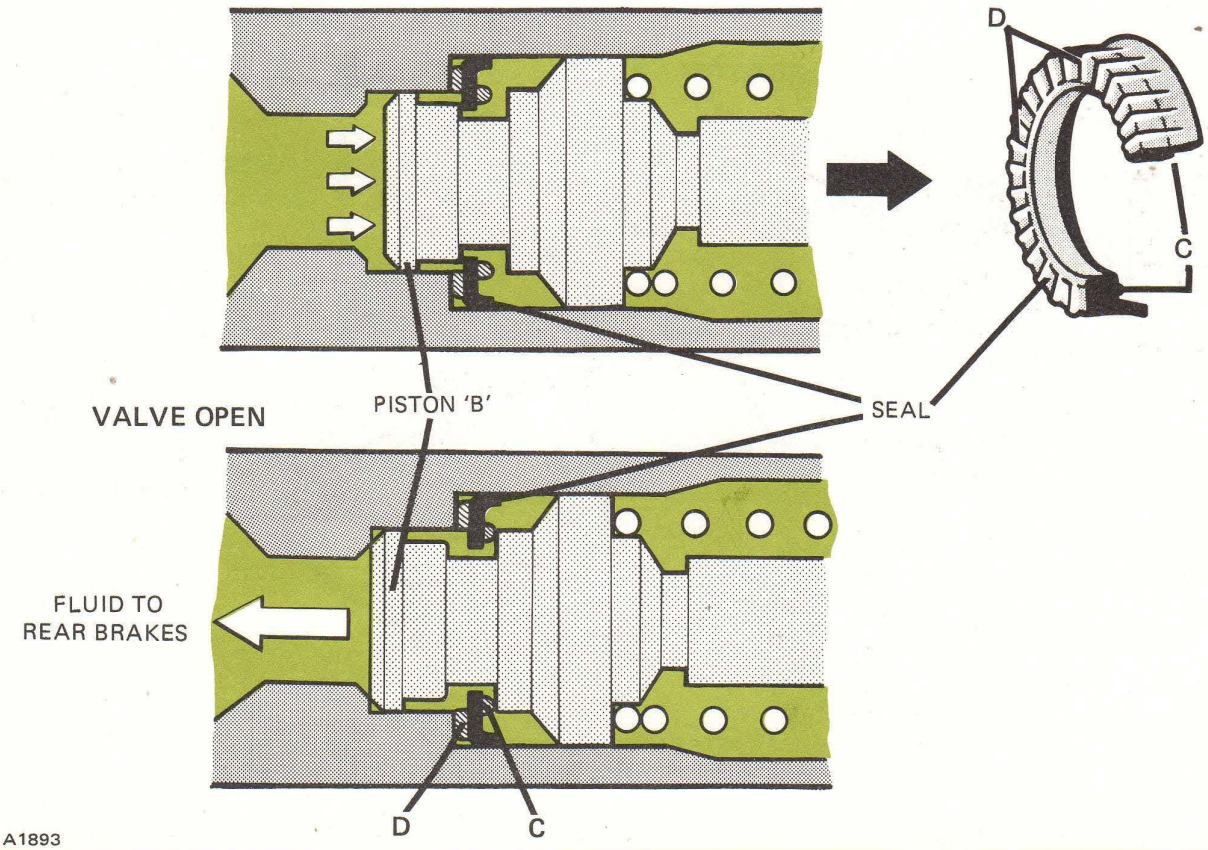
Lubricate the end of the spring with water and gradually work the assembly off the spring.

Re-wet the end of the spring to fit the new assembly and re-connect to the axle bracket.

Check Dimension "X" (as in paragraph 5). re-set if necessary.

Road Test Vehicle.

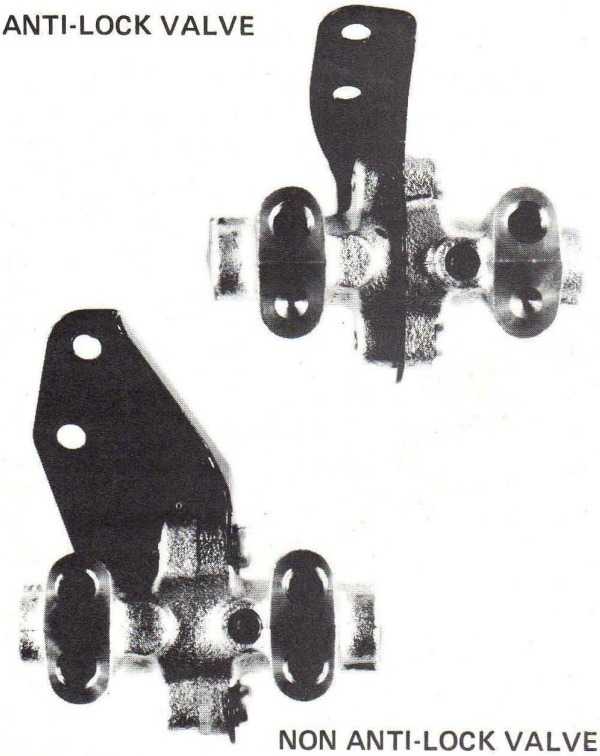
4 VALVE CLOSED



Twin P.C.R.V.
(pressure conscious reducing valve)

1

ANTI-LOCK VALVE



NON ANTI-LOCK VALVE

A2190

Introduction

The twin P.C.R.V. is produced in two forms, for vehicles fitted with or without anti-lock braking. The difference between the two is that the valve fitted to anti-lock vehicles has its mounting bracket fitted through the centre of the valve, preventing it from shuttling during a part system failure.

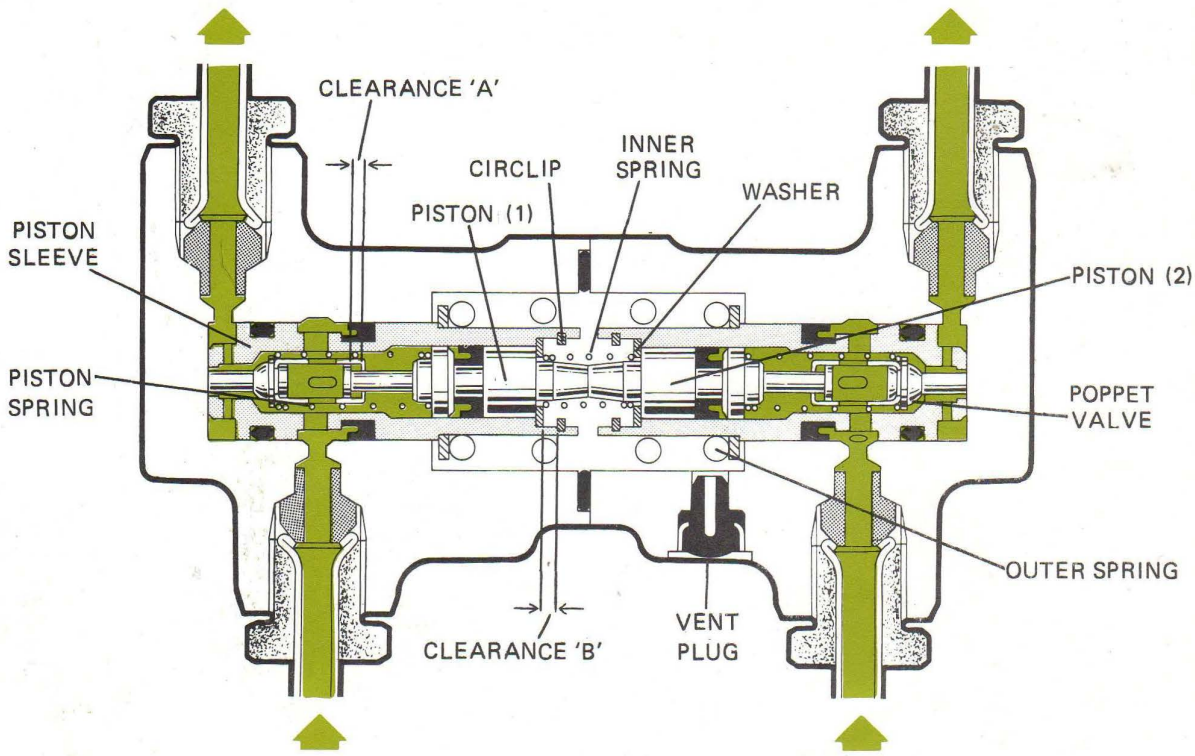
The valve (Fig. 1) is designed for fitting into the rear hydraulic pipe line of private cars to reduce any tendency for the rear wheels to lock and skid under heavy braking. It allows a free passage of fluid in both directions until a certain braking pressure is reached when the valve closes. From this point the valve allows only a proportion of the increasing pressure to reach the rear brakes so that at normal braking there is equal pressure all round, but at heavy braking there is considerably less pressure in the rear brakes than there is in the front.

On vehicles with none anti-lock valves, should a part system failure occur, the valve will allow unrestricted brake pressure to the other part of the system.

How it works (Non anti-lock valve) Fig. 2.

Fluid enters from the master cylinder and passes through the piston sleeve, past the poppet, out to the rear brakes. Pressure acting on the pistons causes the piston sleeve to move towards the valve centre, opposed by springs within the valve, until the piston sleeve contacts the poppet. As the master cylinder pressure increases it is opposed by the output pressure.

2 BRAKES OFF – NON ANTI-LOCK VALVE



A2136

This causes the piston sleeve to move a small amount outwards breaking the seal with the poppet thus allowing sufficient fluid to meter through to cause the forces on the piston sleeve to re-balance, at which point the piston sleeve moves back and re-seals. As the master cylinder pressure is lowered, the decreasing force results in a force imbalance causing the piston sleeve to move inwards against the valve springs, taking the poppet valve with it. Dependant upon the rear brake system and master cylinder pressure, the piston sleeve continues to move until either A:- the lowered output pressure is balanced by the increase in force of the internal valve springs plus the master cylinder pressure, B:- the differential pressure acting on the poppet is sufficient to overcome the spring pressure and break the seal between the poppet and piston sleeve. Once this happens the master cylinder and output pressures rapidly equalise and the piston sleeve is moved outwards by spring pressure, to its rest position.
The output pressure can then drop with the master cylinder pressure to zero.

How it works (Anti-lock valve) Fig. 3.

The anti-lock valve operates in a similar manner to that explained above, however, during an anti-lock application, where high pressure and low pressure could be sensed simultaneously in the two halves, the valve would incorrectly sense a part system failure; see below, and cause the anti-lock control on the rear brakes to receive incorrect pressure signals. It is therefore necessary to prevent the valve from shuttling and the mounting bracket plate, Fig. 3, which passes through the body, effectively prevents the shuttle action.

Part System Failure (Non anti-lock valve) Fig. 4.

Fluid enters from the master cylinder, as the pressure is built up the force on piston 1 is un-opposed by an equivalent force from piston 2. This causes piston 1 to move across pushing piston 2 with it against the inner spring and the piston springs. When the clearance 'A' has been taken up the poppet valve is also pulled across until the clearance 'B' has been taken up and the washer is abutting against the circlip. Any further pressure increase eventually causes the piston sleeve, piston 1 and the poppet valve to move further across against the outer spring pressure. A direct fluid passageway to the rear brakes is thus maintained at all times.

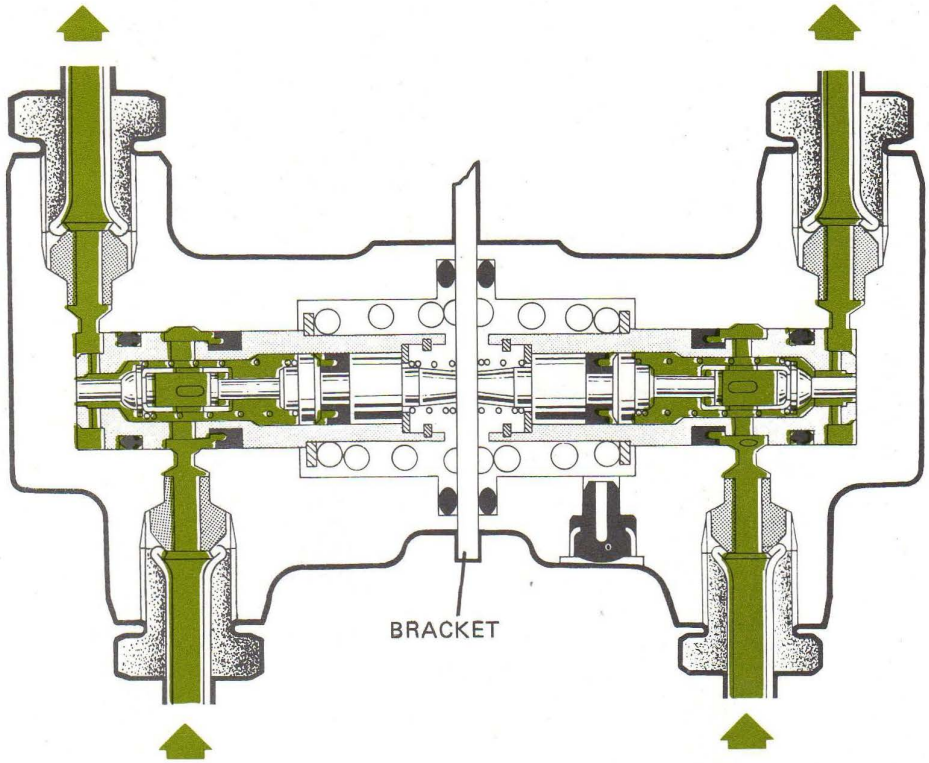
Part System Failure (Anti-lock valve)

In the event of a part system failure, the valve can be considered as being two independent units, separated by the mounting bracket plate, and the failure mode, explained above, is not allowed to operate, thus the anti-lock system can continue to effectively control the brake pressures.

Internal Seal Failure (Vent Plug).

Failure of any one of the internal lip seals or leakage past them causes fluid to accumulate in the central chamber. Brake

3 BRAKES OFF – ANTI-LOCK VALVE



A2135

application causes pressure in the chamber to increase due to either, direct connection to a brake circuit past a lip seal, or due to movement of the piston sleeve compressing the fluid. A pressure increase causes the vent plug to rupture, letting fluid escape until the field level warning indicator in the fluid reservoir indicates a part system failure to the driver. Should the vent plug blow out a new unit must be fitted.

Servicing

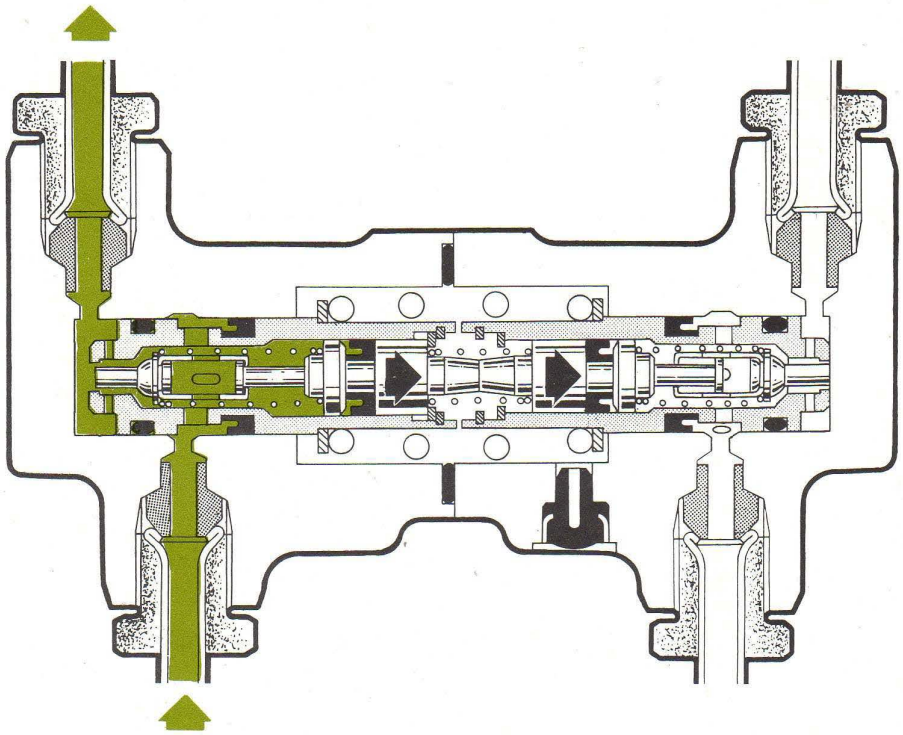
No attempt should be made to dismantle the unit. If a fault develops a new guaranteed unit should be fitted.

The recommended overhaul time for Private Car and Light Commercial Vehicles hydraulic parts is 64,000 km (40,000 miles) or three years, whichever is reached first. At this juncture all hydraulic cylinders including the Pressure Reducing Valve should be replaced by new guaranteed units.

Bleeding the System

Bleed the system as described in Section 1, Page 1D1.

4 BRAKES APPLIED-PART SYSTEM FAILURE-NON ANTI-LOCK VALVE



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