

CHAPTER 5

THE CLUTCH

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- 5:3 Removing and dismantling clutch

- 5:4 Assembling and refitting clutch
- 5:5 Servicing hydraulic system
- 5:6 Fault diagnosis

5:1 Description

A single dry plate clutch of diaphragm spring type is fitted, the main components being the driven plate, pressure plate assembly and release bearing.

The driven plate consists of a resilient steel disc attached to a hub which slides on the splined gearbox input shaft. The friction linings are riveted to both sides of the disc. The pressure plate assembly consists of the pressure plate, diaphragm spring and housing, this housing being attached to the rear face of the engine flywheel. The release bearing is a ballbearing of special construction with an elongated outer ring that presses directly against the diaphragm spring when the clutch pedal is operated.

The clutch operating mechanism is hydraulic, the clutch pedal actuating a master cylinder where pressure on the fluid is generated, this pressure being transmitted through a hose to the clutch slave cylinder mounted on the clutch housing. Slave cylinder action is transmitted to the release bearing by a release lever. On some models the release lever is fully enclosed inside the clutch housing, on others it operates through a hole in the side of the housing.

When the clutch is fully engaged, the driven plate is nipped between the pressure plate and the flywheel and

transmits torque to the gearbox by turning the splined input shaft. When the clutch pedal is depressed the pressure plate is withdrawn from the driven plate by hydraulic pressure, the driven plate then ceasing to transmit torque.

5:2 Routine maintenance

As the clutch operating mechanism is self-adjusting, no routine maintenance is required apart from a regular check on the level of hydraulic fluid in the system. The clutch and brake hydraulic systems share a common fluid reservoir, topping up being carried out as described in **Chapter 11**.

Checking clutch plate wear:

It is possible to make a simple check on clutch driven plate friction lining wear, without the need for component dismantling.

Models with external release lever:

Working from beneath the car, press the release lever in a forward direction until it touches the stop (see **FIG 5:1**). With a new clutch driven plate, dimension **A**

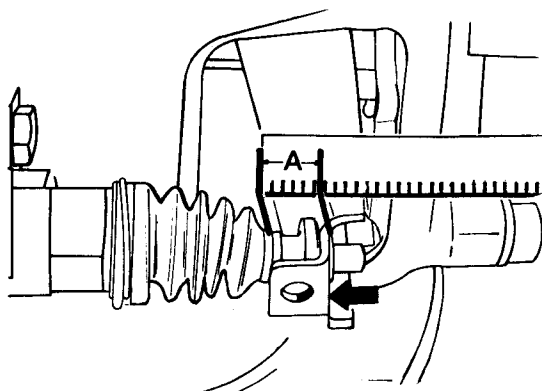


FIG 5:1 Checking friction lining wear, models with external release lever

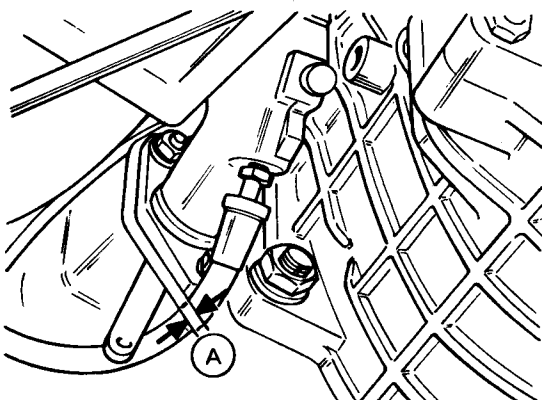


FIG 5:2 Checking friction lining wear, models with internal release lever

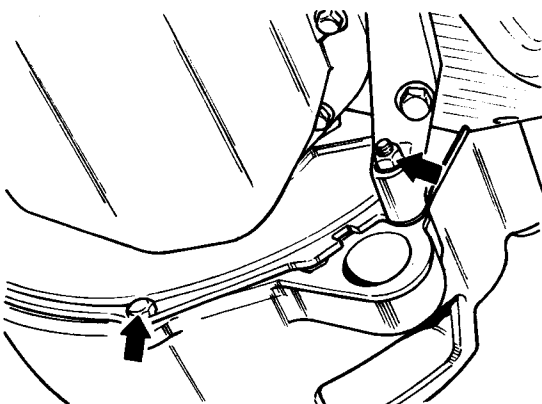


FIG 5:3 Coverplate attachments

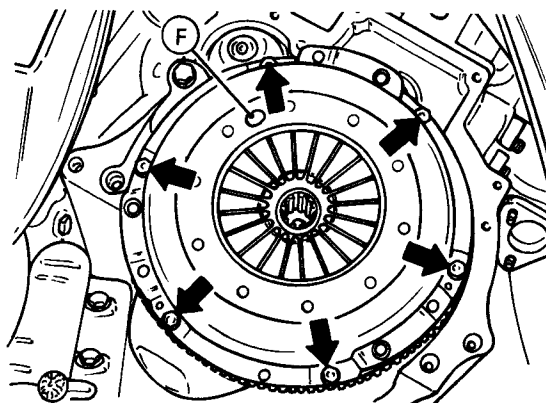


FIG 5:4 Removing clutch assembly from flywheel

should be 17 to 19mm (0.67 to 0.75in), measured at the slave cylinder pushrod. If the dimension is less than 5mm (0.2in), the driven plate should be renewed.

Models with internal release lever:

Checking on these models must be carried out using special tool BMW 7061 (see FIG 5:2). If the tool can be inserted into the opening on the slave cylinder as far as its handle, as shown in the illustration, sufficient driven plate lining thickness exists for further service. If a gap of approximately 5mm (0.2in) remains between the gauge handle and slave cylinder as shown at A, the friction linings are worn to the limit and a new driven plate must be fitted.

5:3 Removing and dismantling clutch

Refer to **Section 5:5** and remove the slave cylinder, but do not disconnect the fluid hose. Wire the slave cylinder to the underbody to prevent strain on the hose. Remove the gearbox as described in **Chapter 6**.

On models fitted with an external clutch release lever, loosen the clutch housing mounting bolts, then refer to FIG 5:3 and remove the coverplate. Remove the clutch housing. On models fitted with an internal clutch release lever, remove the fixing bolts and detach the clutch housing.

Refer to FIG 5:4. Lock the flywheel against rotation using tool BMW 7007 or other suitable means, then mark the relationship of the clutch cover to engine flywheel so that it can be easily realigned to retain the original balance when refitted. Slacken the clutch cover retaining bolts (arrowed) alternately and evenly until spring pressure is released. Remove the bolts and lift off the clutch pressure plate assembly and driven plate, taking care not to get grease or oil on to the friction linings.

To remove the release bearing on models fitted with external release lever, refer to FIG 5:5 and lift the spring ends over spherical pin collar. Take care not to damage angular seal 1. Remove the arm and bearing assembly by pulling to the side as shown in FIG 5:6. Disconnect the bearing from the retaining springs as shown in FIG 5:7.

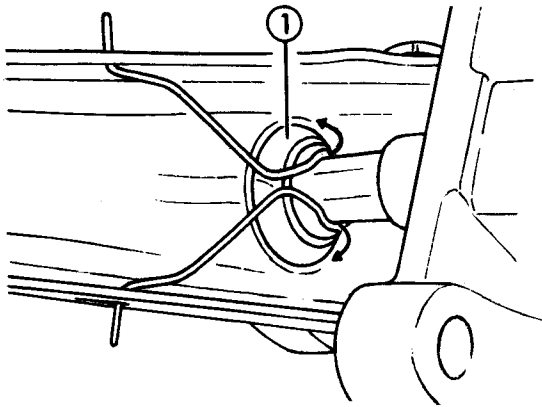


FIG 5:5 Disconnecting retaining spring

To remove the release bearing on models fitted with internal release lever, refer to FIG 5:8 and detach the spring retainer. Detach the release lever, then remove the release bearing (see FIG 5:9).

Servicing:

Inspect the clutch cover for loose rivets and for damage or distortion of the diaphragm spring. Inspect the spring link between pressure plate and cover for distortion or loose rivets (see FIG 5:10). Check the pressure plate for scoring or damage and check that the working surface is flat and true, using a metal straightedge. Make the check at several points. Note that the clutch cover, pressure plate and diaphragm spring assembly must not be dismantled. If any part is faulty the assembly must be renewed complete. Note that the assembly is colour coded with a paint mark for correct renewal, as shown at F in FIG 5:4.

Inspect the surfaces of the flywheel where the driven plate makes contact. Small scratches on the surface are unimportant, but if there are deep scratches the flywheel must be machined smooth or renewed.

Check the release bearing for roughness when it is pressed and turned by hand. Clean the release bearing by wiping with a cloth only. Do not use solvents for this purpose as they would wash the internal lubricant from the bearing. If a new bearing is to be installed, note that height H (see FIG 5:11) of installed bearing must be $38 \pm 0.050 - 0.075\text{mm}$ ($1.496 \pm 0.002 - 0.003\text{in}$).

Check the driven plate for loose rivets and broken or very loose torsional springs. Check the plate for distortion, preferably by mounting the plate between centres and using a dial gauge. Alternatively, hold the plate in position against the pressure plate surface and use feeler gauges at several points around the circumference. Distortion should not exceed 0.6mm (0.024in) at the periphery. The friction linings should be well proud of the rivets and have a polished glaze through which the grain of the material is clearly visible. A dark, glazed deposit indicates oil on the linings and, as this condition cannot be rectified, a new or relined plate will be required. Any sign of oil in the clutch indicates leakage from the engine or gearbox which must be traced and rectified. Check the

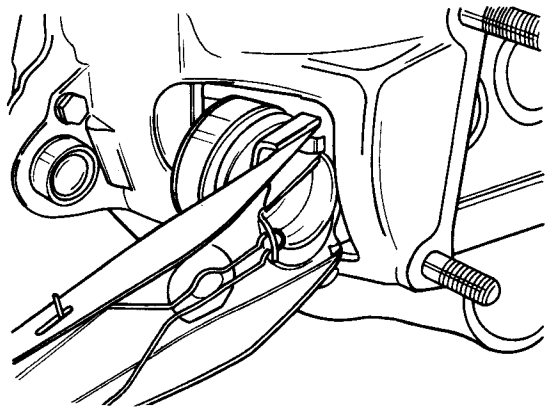


FIG 5:6 External release lever and bearing removal

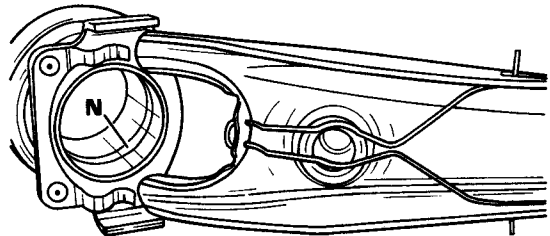


FIG 5:7 Detaching bearing from lever

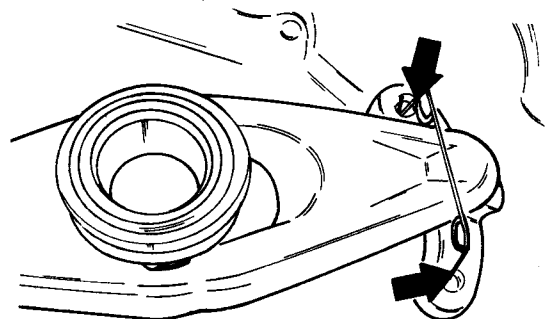


FIG 5:8 Detaching spring retainer, internal release lever

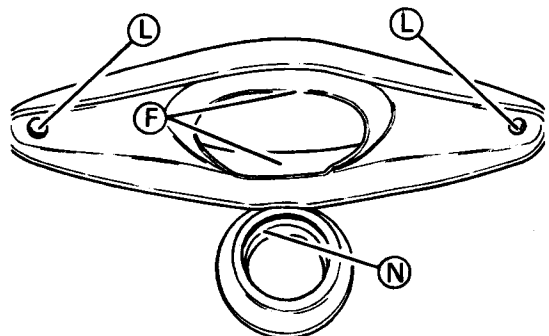


FIG 5:9 Internal release lever and bearing

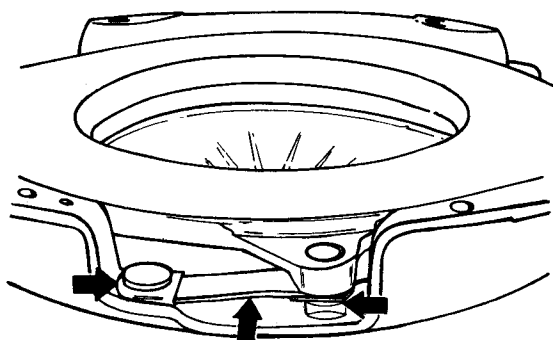


FIG 5:10 Inspecting spring link and rivets

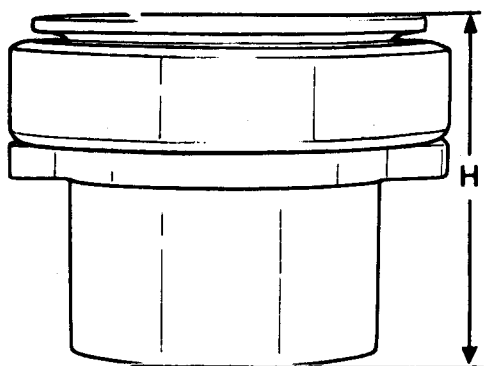


FIG 5:11 Release bearing installed height

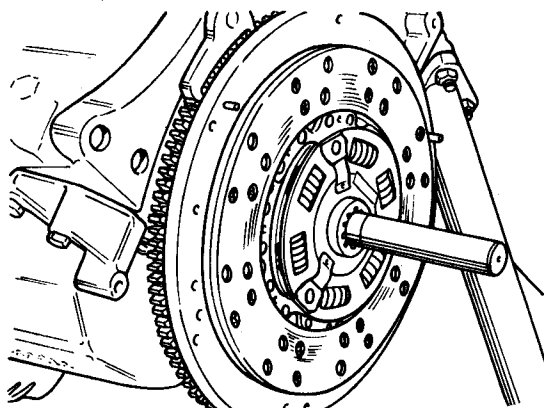


FIG 5:12 Driven plate installation

splines in the driven plate hub and on the gearbox input shaft, removing any burrs or, if there are signs of heavy wear, renewing parts as necessary.

It is not recommended that owners attempt to relined the clutch driven plate themselves, as the linings must be riveted and trued on the disc and the whole checked under a press. For this reason the driven plate should be relined at a service station or an exchange unit obtained and fitted.

5:4 Assembling and refitting clutch

When the clutch is refitted to the engine flywheel, the driven plate must be centralised before the cover is tightened down, using the special tool BMW 603 or a spare gearbox input shaft, as shown in FIG 5:12.

Place the driven plate in position on the flywheel and centralise by passing the special tool through the hub and into the pilot bearing in the crankshaft. Fit the clutch cover and pressure plate assembly, aligning the reference marks made during dismantling. Engage the locating pegs on the cover into the holes in the flywheel, then fit the retaining bolts finger tight (see FIG 5:4). Tighten the bolts alternately, one turn at a time, to the specified final torque.

On models with an external clutch release lever, install the release bearing in the reverse order of removal, filling the lubricating groove shown at N in FIG 5:7 with Molykote Longterm 2. It is essential to lubricate correctly, otherwise the release bearing may seize in service. When installing the release lever, make sure that the angular seal 1 is between the spherical pin and release lever (see FIG 5:5).

On models with an internal clutch release lever, fit the release bearing to the lever in the reverse order of removal. Refer to FIG 5:9 and pack lubricating groove N with Molykote Longterm 2 and coat guides F in release lever and bearing points L with similar lubricant. It is essential that lubrication is carried out as specified otherwise the release bearing may seize in service.

On models with external clutch release lever, install the clutch housing then refit the gearbox as described in Chapter 6. Refit the slave cylinder as described in Section 5:5.

On models with an internal clutch release lever, move the release lever to its correct installed position with the aid of the clutch slave cylinder. When slave cylinder pushrod and release lever are correctly positioned, align the thrust bearing to accept the gearbox input shaft. Make sure that sufficient lubricant is applied to the thrust bearing groove, as described previously. Operate the linkage to engage a gear. Supporting the weight of the gearbox, insert the input shaft and guide sleeve carefully into the thrust bearing. Turn the gearbox output flange until the input shaft slides through the driven plate hub and into the pilot bearing at the rear of the engine crankshaft. Remove the clutch slave cylinder again, attach the gearbox firmly to the clutch housing, then finally refit the slave cylinder as described in Section 5:5.

5:5 Servicing hydraulic system

Master cylinder:

Removal:

Siphon sufficient fluid from the reservoir to bring the level just below the pipe connection on the reservoir

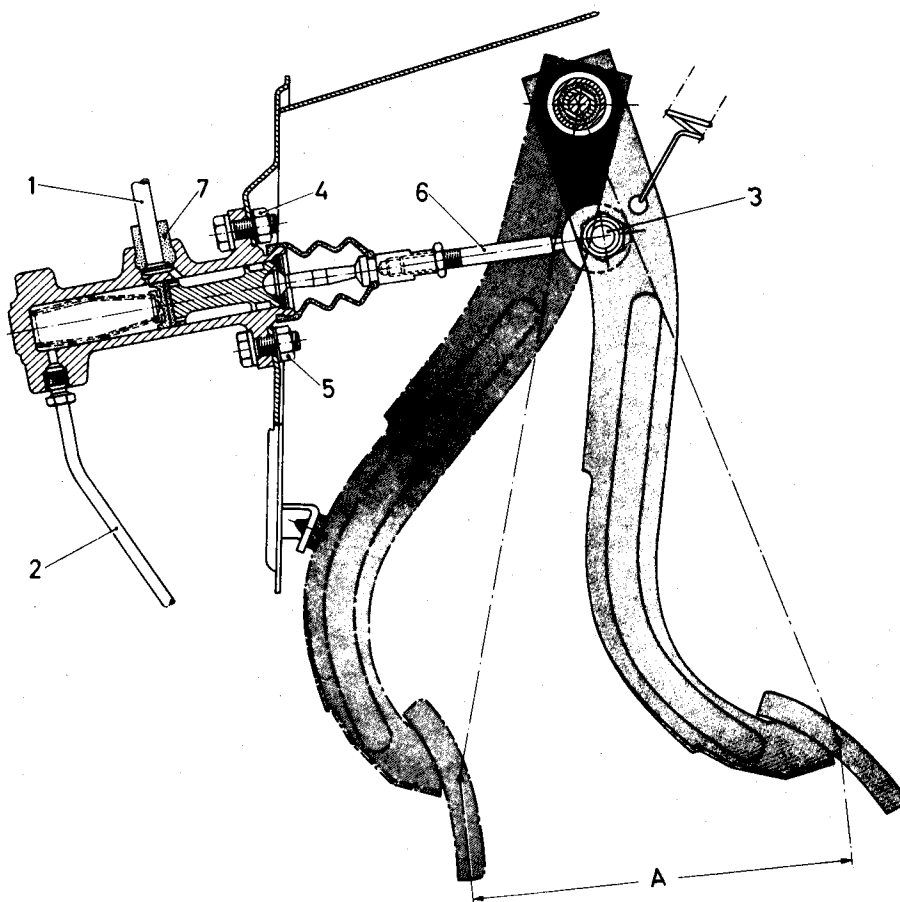


FIG 5:13 Section through master cylinder and pedal assembly

which supplies the clutch master cylinder. Note that brake fluid is poisonous and that it can damage paintwork. Keep fluid perfectly clean if it is to be re-used. Detach the lower dashboard panelling on the driver's side for access to the master cylinder attachment points.

Refer to FIG 5:13. Pull out pipe 1 with sealing plug 7. Disconnect pipe 2 at the master cylinder. Plug the open ends of pipes to prevent the entry of dirt. Remove bolt 3 to detach pushrod 6 from clutch pedal, then remove nuts 4 and 5 and remove the master cylinder assembly.

Servicing:

Carefully pull back the rubber boot then remove the circlip from the master cylinder bore. Withdraw the pushrod and washer, then extract the internal parts. Gentle air pressure may be used at the outlet port to remove the internal parts, but take care to avoid damage due to parts being ejected at high speed. Remove the rubber seal from the piston.

Examine the rubber boot and feed pipe seal and renew if not in perfect condition. Always renew piston seals. Wash the remaining parts in the correct grade of brake fluid or methylated spirits only. Examine the parts,

checking the piston and cylinder bore for scoring, damage or corrosion. Renew any faulty parts.

Observe absolute cleanliness during assembly to prevent oil or dirt from contacting internal parts. Dip piston and seals into clean brake fluid when installing. Fit the secondary seal over the piston using the fingers only, making sure that it is correctly seated. Insert the spring small end first, making sure that the retainer is in place. Insert the main seal with the lip first, taking care not to turn back the lip. Press the seal down the bore on to the spring retainer. Fit the washer followed by the piston, then install pushrod, dished washer and circlip followed by the rubber boot.

Refitting:

This is a reversal of the removal procedure. Make sure that the sealing plug 7 is installed correctly so that no air can enter the system (see FIG 5:13). Lubricate pivot bolt 3 with Molykote Longterm 2. When master cylinder is installed and connected, check clutch pedal travel A. This should be 160mm (6.3in) for models with external clutch release lever, or 155mm (6.1in) for models with internal clutch release lever. If pedal travel is incorrect,

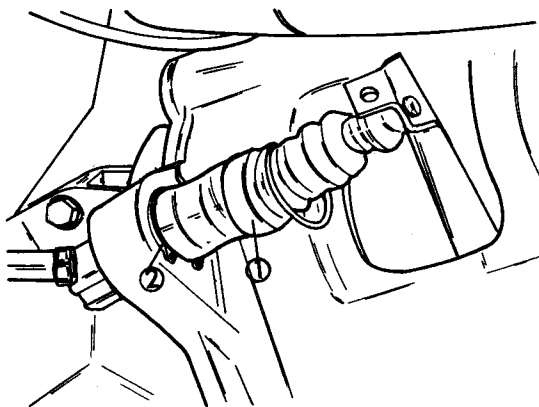


FIG 5:14 Slave cylinder used with external release lever

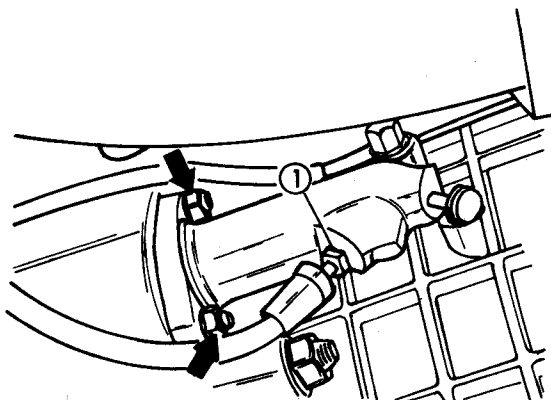


FIG 5:15 Slave cylinder used with internal release lever

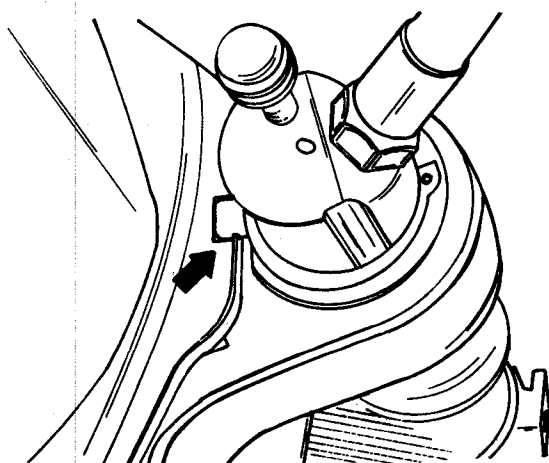


FIG 5:16 Location of anti-rotation lock

slacken the locknut then turn the sleeve which is threaded to pushrod 6. When correct travel is obtained, tighten locknut and recheck.

On completion, refill the fluid reservoir to the correct level and bleed the system as described later.

Slave cylinder:

Removal:

If the slave cylinder is to be removed for access to other components only, the fluid hose can be left connected and the assembly wired to the underbody to prevent strain on the hose. As the hose remains connected it will not be necessary to bleed the system when the slave cylinder is refitted.

If the slave cylinder is to be removed for servicing, siphon fluid from the supply reservoir as described previously for master cylinder removal.

On models with external clutch release lever, refer to **FIG 5:14**. Remove the spring clip and pull back rubber boot 1. Remove circlip 2 and remove slave cylinder towards the front of the car. If necessary, disconnect the fluid pipe to remove the cylinder completely.

On models with internal clutch release lever, refer to **FIG 5:15** and remove the two securing nuts arrowed. If necessary, disconnect hose union 1 to detach the slave cylinder completely.

Servicing:

Remove the rubber boot, if fitted. Remove the circlip from the bore and extract the internal components. Remove the piston seal and discard. Clean all internal parts with approved brake fluid or methylated spirits only. Examine all parts for wear or damage and renew as necessary. Always fit a new piston seal.

Carefully ease the new seal on to the piston and insert the assembly into the bore, taking care not to turn back the seal lip. Refit the remaining components in the reverse order of removal, taking care to avoid dirt or oil contamination.

Refitting:

This is a reversal of the removal procedure. On models with external clutch release lever, make sure that the anti-rotation lock is correctly located as shown by the arrow in **FIG 5:16**. In all cases, lubricate the ball end of the slave cylinder pushrod which contacts the clutch release lever using Molykote Longterm 2.

If the fluid hose was disconnected, reconnect and carefully tighten, then fill the reservoir with fluid to the correct level and bleed the hydraulic system as described next.

Bleeding the system:

This operation is necessary to remove any air which may have entered the system, due to the removal of components, or if the fluid level in the supply tank has been allowed to drop too low and air has entered through the fluid supply passage.

A need for bleeding can be indicated if the clutch drags and cannot be fully released with the pedal pushed to the floor.

Remove the rubber dust cap from the bleed screw on the clutch slave cylinder. Attach a length of rubber or plastic tubing to the bleed screw and lead the free end of

the tube into a clean glass jar, into which sufficient fluid of the correct type has been added to cover the end of the tube. Have an assistant operate the clutch pedal through a full stroke approximately 10 times, holding the pedal to the floor at the end of a down stroke. With the pedal held down, open the bleed screw about half a turn and allow fluid to flow into the jar. When the flow stops, tighten the bleed screw and allow the pedal to return. Repeat this operation until no air bubbles are seen in the fluid entering the jar. Replenish the fluid in the supply tank frequently during this operation. If the level falls too low, air may be drawn into the system and the operation will have to be restarted.

On completion, top up the fluid to the correct level. It is not advisable to use fluid drained from the system for refilling purposes, unless it is new and perfectly clean. If so, allow it to stand for at least 24hr before re-use to ensure that it is free from air bubbles. Always store fluid in clean, sealed containers.

5:6 Fault diagnosis

(a) Drag or spin

- 1 Oil or grease on driven plate linings
- 2 Misalignment between engine and splined shaft
- 3 Driven plate hub binding on splined shaft
- 4 Distorted driven plate
- 5 Warped or damaged pressure plate or clutch cover

- 6 Broken driven plate linings
- 7 Dirt or foreign matter in the clutch
- 8 Air in hydraulic system

(b) Fierceness or snatch

- 1 Check 1, 2 and 3 in (a)
- 2 Worn driven plate linings

(c) Slip

- 1 Check 1 and 2 in (a) and 2 in (b)
- 2 Weak diaphragm spring
- 3 Seized piston in master or slave cylinder

(d) Judder

- 1 Check 1 and 2 in (a)
- 2 Pressure plate not parallel with flywheel face
- 3 Contact area of driven plate linings unevenly worn
- 4 Bent or worn splined shaft
- 5 Badly worn splines in driven plate hub
- 6 Buckled driven plate
- 7 Faulty engine or gearbox mountings

(e) Tick or knock

- 1 Badly worn driven plate hub splines
- 2 Worn release bearing
- 3 Bent or worn splined shaft
- 4 Loose flywheel

NOTES