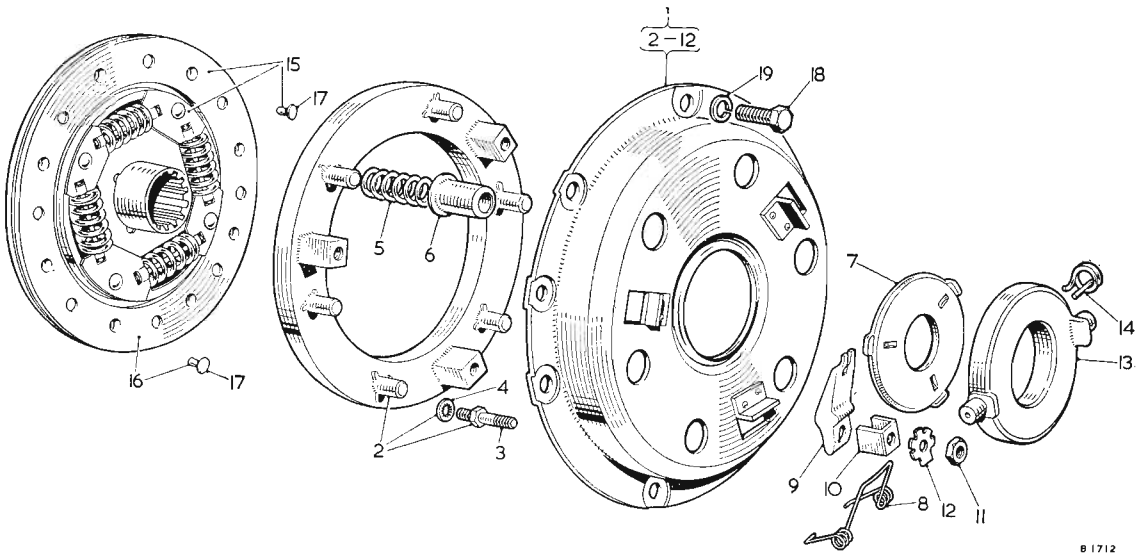
SECTION E

THE CLUTCH

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Clutch	
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Master cylinder	E.3
Service tools	End of Section
Slave cylinder	E.4

THE CLUTCH COMPONENTS
(Early Cars)



No.	*Description*
1.	Cover assembly.
2.	Pressure plate.
3.	Pressure plate stud.
4.	Washer.
5.	Thrust spring.
6.	Thrust spring cup.
7.	Thrust plate.
8.	Thrust plate retainer.
9.	Release lever.
10.	Release lever bearing plate.
11.	Nut.
12.	Tab washer.
13.	Release bearing and cap assembly.
14.	Bearing retainer.
15.	Driven plate.
16.	Linings.
17.	Rivets.
18.	Set screw.
19.	Washer.

SECTION E

THE CLUTCH

	Section
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GENERAL DESCRIPTION

The clutch is a Borg & Beck single dry-plate type operated hydraulically. A steel cover bolted to the flywheel encloses the driven plate, the pressure plate, the pressure springs, and the release levers. The driven plate, to which the friction linings are riveted, incorporates springs assembled around the hub to absorb power shocks and torsional vibration. The pressure springs force the pressure plate against the friction linings, gripping the driven plate between the pressure plate and the engine flywheel. When the clutch pedal is depressed the release bearing is moved forward against the release plate, which bears against the three release levers. The outer or shorter ends of the release levers engage the pressure plate lugs; pressure applied by the release bearing causes the pressure plate to be pulled away from the driven plate, compressing the pressure springs which are assembled between the pressure plate and the clutch cover. As the friction linings wear, the pressure plate moves closer to the flywheel face and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther towards the gearbox and decreases the clearance between the release lever plate and the release bearing. This is automatically compensated unless the master cylinder has been disturbed.

When the clutch pedal is depressed, fluid pressure is transmitted through the master cylinder to the slave cylinder mounted on the clutch housing, moving the slave cylinder piston and push-rod. As the push-rod is connected to the lower arm of the clutch withdrawal lever, thereby the clutch is released. The push-rod is non-adjustable.

The correct amount of free movement between the master cylinder push-rod and piston is set during erection of the vehicle and should never need alteration.

In the event of the adjustment having been disturbed, reset the effective length of the rod connecting the piston to the pedal until the pedal pad can be depressed approximately $\frac{5}{32}$ in. (4 mm.) before the piston begins to move. The clearance can be felt if the pedal is depressed by hand. It is very important that the push-rod should have a minimum free movement of $\frac{1}{32}$ in. (·8 mm.) before the piston starts to move.

Section E.1

CLUTCH

Removing

Remove the gearbox and the clutch assembly as described in Sections F and A respectively.

Dismantling

The clutch tool No. 18G99A provides an efficient and speedy means of dismantling, reassembling, and adjusting the clutch with a high degree of accuracy. The tool is universal, and a chart detailing the sizes of spacing washers and distance pieces for particular types of clutch is provided on the inside of the metal container lid.

Detach the retaining springs from the release lever plate and remove the springs and plate. Place the tool base plate on a flat surface. Select three spacing washers for a $6\frac{1}{4}$ in. (15·88 cm.) clutch and place them in position (A) on the base plate.

Position the clutch on the three spacing washers so that the hole in the clutch cover aligns with the tapped holes in the base plate with the release levers as close to the spring washers as possible. Insert the tool set screws, tightening them a little at a time in a diagonal pattern until the cover is firmly and evenly secured to the base plate. This is most important if the best results are to be achieved.

Knock back the tab washers and remove the shoulder stud adjusting nuts. Lift off the washers, bearing plates, and release levers.

Unscrew the set screws securing the clutch cover to the base plate in a diagonal pattern, releasing the pressure on the clutch springs gradually and evenly. Lift off the cover and remove the pressure springs.

Clean the clutch parts carefully. If the linings are to be used again they should not be allowed to come in contact with cleaning fluids.

Examine the friction linings for wear or loose rivets and check the driven plate for uneven or worn splines, distortion, or signs of fatigue cracks.

It is essential to install a complete driven plate assembly when renewal of the friction surfaces is required. If the facings have worn to such an extent as to warrant renewal, then slight wear will have taken place on the splines and also on the torque reaction springs and their seatings. The question of balance and concentricity is also involved. Under no circumstances is it satisfactory to repair or rectify faults in clutch driven plate centres, and we do not countenance this as manufacturers.

Examine the machined face of the pressure plate; if this is badly grooved and rough, the surface may be reground until the grooves disappear.

Examine the machined surface of the release lever plate. If this is badly grooved, renew the plate. A new plate will also be necessary if the surfaces on the reverse side of the plate, which are in contact with the tips of the release levers, are worn down.

Examine the tips of the release levers which bear on the back of the release lever plate. A small amount of worn flat surface is permissible, but if this is excessive the lever should be renewed. Check for excessive wear in the groove in which the fulcrum bears. If the metal here has worn at all thin, the lever must be renewed as there is a danger of it breaking under load, with disastrous results to the whole clutch mechanism.

Examine the release bearing for cracks or bad pitting, also measure the amount of bearing standing proud of the metal cup. If the bearing is cracked or badly pitted, or there is $\frac{1}{16}$ in. (1·6 mm.) or less of bearing standing proud of the cup, the cup and bearing must be renewed.

Examine the pressure springs for weakness or distortion, and renew if necessary. Renew in sets only.

Examine the clutch withdrawal shaft for slackness in the bushes. Renew the bushes if necessary.

GENERAL DESCRIPTION

The clutch is a Borg & Beck single dry-plate type operated hydraulically. A steel cover bolted to the flywheel encloses the driven plate, the pressure plate, the pressure springs, and the release levers. The driven plate, to which the friction linings are riveted, incorporates springs assembled around the hub to absorb power shocks and torsional vibration. The pressure springs force the pressure plate against the friction linings, gripping the driven plate between the pressure plate and the engine flywheel. When the clutch pedal is depressed the release bearing is moved forward against the release plate, which bears against the three release levers. The outer or shorter ends of the release levers engage the pressure plate lugs; pressure applied by the release bearing causes the pressure plate to be pulled away from the driven plate, compressing the pressure springs which are assembled between the pressure plate and the clutch cover. As the friction linings wear, the pressure plate moves closer to the flywheel face and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther towards the gearbox and decreases the clearance between the release lever plate and the release bearing. This is automatically compensated unless the master cylinder has been disturbed.

When the clutch pedal is depressed, fluid pressure is transmitted through the master cylinder to the slave cylinder mounted on the clutch housing, moving the slave cylinder piston and push-rod. As the push-rod is connected to the lower arm of the clutch withdrawal lever, thereby the clutch is released. The push-rod is non-adjustable.

The correct amount of free movement between the master cylinder push-rod and piston is set during erection of the vehicle and should never need alteration.

In the event of the adjustment having been disturbed, reset the effective length of the rod connecting the piston to the pedal until the pedal pad can be depressed approximately $\frac{5}{32}$ in. (4 mm.) before the piston begins to move. The clearance can be felt if the pedal is depressed by hand. It is very important that the push-rod should have a minimum free movement of $\frac{1}{32}$ in. (·8 mm.) before the piston starts to move.

Section E.1

CLUTCH
(Early Cars)

Removing

Remove the gearbox and the clutch assembly as described in Sections F and A respectively.

Dismantling

The clutch tool 18G 99 A provides an efficient and speedy means of dismantling, reassembling, and adjusting the clutch with a high degree of accuracy. The tool is universal, and a chart detailing the sizes of spacing washers and distance pieces for particular types of clutch is provided on the inside of the metal container lid.

Detach the retaining springs from the release lever plate and remove the springs and plate. Place the tool base plate on a flat surface. Select three spacing washers for the particular clutch and place them in position on the base plate.

Position the clutch on the three spacing washers so that the holes in the clutch cover align with the tapped holes in the base plate with the release levers as close to the spacing washers as possible. Insert the tool set screws, tightening them a little at a time in a diagonal pattern until the cover is firmly and evenly secured to the base plate. This is most important if the best results are to be achieved.

Knock back the tab washers and remove the shoulder stud adjusting nuts. Lift off the washers, bearing plates, and release levers.

Unscrew the set screws securing the clutch cover to the base plate in a diagonal pattern, releasing the pressure on the clutch springs gradually and evenly. Lift off the cover and remove the pressure springs.

Clean the clutch parts carefully. If the linings are to be used again they should not be allowed to come in contact with cleaning fluids.

Examine the friction linings for wear or loose rivets and check the driven plate for uneven or worn splines, distortion, or signs of fatigue cracks.

It is essential to install a complete driven plate assembly when renewal of the friction surfaces is required. If the facings have worn to such an extent as to warrant renewal, then slight wear will have taken place on the splines and also on the torque reaction springs and their seatings. The question of balance and concentricity is also involved. Under no circumstances is it satisfactory to repair or rectify faults in clutch driven plate centres, and we do not countenance this as manufacturers.

Examine the machined face of the pressure plate; if this is badly grooved and rough, the surface may be reground until the grooves disappear.

Examine the machined surface of the release lever plate. If this is badly grooved, renew the plate. A new plate will also be necessary if the surfaces on the reverse side of the plate, which are in contact with the tips of the release levers, are worn down.

Examine the tips of the release levers which bear on the back of the release lever plate. A small amount of worn flat surface is permissible, but if this is excessive the lever should be renewed. Check for excessive wear in the groove in which the fulcrum bears. If the metal here has worn at all thin, the lever must be renewed as there is a danger of it breaking under load, with disastrous results to the whole clutch mechanism.

Examine the release bearing for cracks or bad pitting, also measure the amount of bearing standing proud of the metal cup. If the bearing is cracked or badly pitted, or there is $\frac{1}{16}$ in. (1·6 mm.) or less of bearing standing proud of the cup, the cup and bearing must be renewed.

Examine the pressure springs for weakness or distortion, and renew if necessary. Renew in sets only.

Examine the clutch withdrawal shaft for slackness in the bushes. Renew the bushes if necessary.

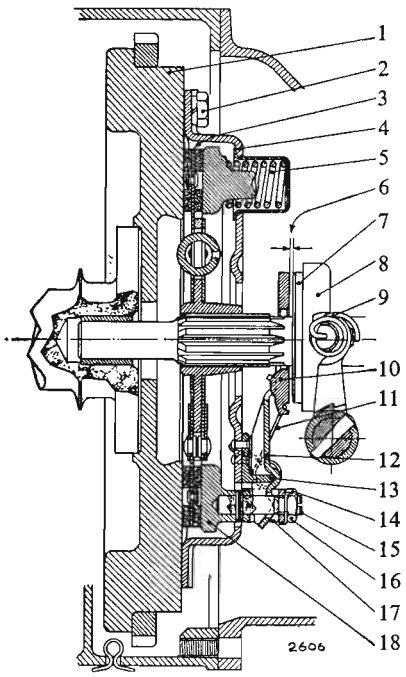


Fig. E.1

The clutch unit in section (early cars)

1. Flywheel.
2. Holding screw.
3. Driven plate.
4. Cover.
5. Thrust spring.
6. Clearance ·0625 in. (1·58 mm.).
7. Graphite release bearing.
8. Release bearing cup.
9. Release bearing carrier.
10. Release lever plate.
11. Lever retainer and anti-rattle spring.
12. Release lever.
13. Knife-edge fulcrum.
14. Tag lock washer.
15. Stud.
16. Adjusting nut.
17. Bearing plate.
18. Pressure plate.

Reassembling

Parts not being replaced by new ones must be refitted in their original positions.

Reassembly is the reverse of the dismantling procedure.

Adjusting the clutch

The clutch must now be adjusted, still using the clutch assembly tool. With the clutch bolted to the tool base plate, as on completion of assembly, proceed as follows. Screw the actuator into the base plate and pump the handle a dozen times to settle the clutch mechanism. Remove the actuator. Screw the tool centre pillar into the base plate and select a distance piece, as shown on the chart. Place the distance piece over the centre pillar with its recessed face downwards. Place the gauge height finger over the centre pillar. Adjust the height of the release levers by tightening or loosening the adjusting nuts until the height finger, when rotated, just contacts the highest point on the tip of each release lever. Press downwards on the height finger to ensure that it bears squarely on the adaptor while rotating. Remove the height finger and pillar, and screw the actuator into the base plate. Operate the clutch several times to enable the components to settle on their knife-edges. Remove the actuator and replace the centre pillar, distance piece, and height finger. Readjust the release levers if necessary. Repeat the procedure to ensure that the release levers are finally seated, and gauge once more. Remove the centre pillar, distance piece, and height finger and secure the adjusting nuts. Fit the release lever plate on the tips of the release levers and secure it by the three retaining springs. Release the tool set screws in diagonal sequence a little at a time, relieving pressure slowly and evenly. Remove the clutch assembly from the base plate.

Refitting

Refitting is a reverse of the removal procedure. Use Service tool 18G 139 for clutch centralization.

Section E.2

CLUTCH PEDAL

Removing

Working beneath the bonnet, disconnect the clutch and brake pedal levers from the master cylinder push-rods by removing the spring clips and withdrawing the clevis pins. From within the car, remove the nut and spring washer and withdraw the fulcrum pin; note that a distance piece separates the two pedals. The pedals can now be removed.

The pedals together with the master cylinder assembly can be removed as one unit. This operation is described in the master cylinder removal section.

Refitting

When refitting reverse the removal procedure.

Section E.3

MASTER CYLINDER

Construction

The master cylinder caters for operation of both brakes and clutch. It has two bores side by side and, except for the fact that one has no check valve, each bore accommodates normal master cylinder parts. The bore with the check valve serves the brakes, the other serves the clutch slave cylinder.

Removing

The following removal procedure allows the withdrawal of the master cylinder unit complete with clutch and brake pedals.

NOTE.—Before disconnecting the master cylinder ascertain, for assembly purposes, which bore communicates with the clutch slave cylinder.

Remove the heater blower unit (if fitted) by first releasing the two electrical connections. Remove the set screws securing the heater blower bracket to the bulkhead. Remove the set screws securing the master cylinder mounting plate to the engine bulkhead. Disconnect the two hydraulic pipes at their unions with the rear of the master cylinder unit.

Withdraw the master cylinder unit upwards and at the same time manipulate the clutch and brake pedals through the aperture in the bulkhead.

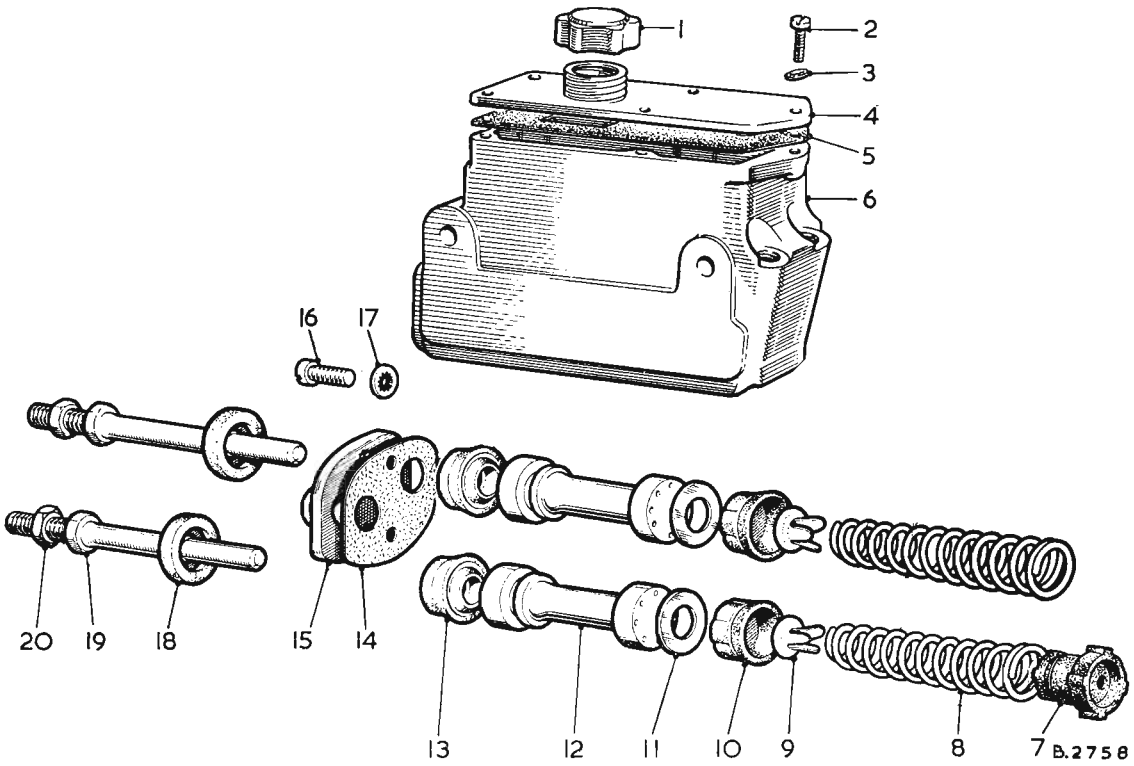


Fig. E.2

Master cylinder (exploded)

1. Filler cap.
2. Fixing screw.
3. Shakeproof washer.
4. Tank cover.
5. Tank cover gasket.
6. Cylinder barrel and tank.
7. Valve (brake bore only).
8. Return spring.
9. Spring retainer.
10. Main cup.
11. Piston washer.
12. Piston.
13. Secondary cup.
14. Gasket.
15. Boot fixing plate.
16. Fixing washer.
17. Shakeproof washer.
18. Boot.
19. Push rod.
20. Push rod adjuster.

Dismantling

Disconnect each pedal from its master cylinder push-rod by removing the spring clips and withdrawing the clevis pins.

Remove the bolts securing the master cylinder unit to its mounting plate and withdraw the complete unit.

Remove the set screws securing the boot fixing plate to the master cylinder body.

Detach the fixing plate from the master cylinder, and remove the boots and push-rods.

Remove the common filler cap and drain the fluid into a clean container.

Withdraw the piston, piston washer, main cup, spring retainer, and the return spring.

Remove the secondary cup by stretching it over the end flange of the piston.

Examine all parts, especially the washers, for wear or distortion, and replace with new parts where necessary.

Reassembling

Reassembly is the reverse of the removal procedure, with particular attention being paid to the fitting of the rubber boots. The vent hole in each boot should be at the bottom when the cylinder is mounted on the vehicle.

Refitting

The installation of the master cylinder unit is the reversal of the removal procedure.

If no further maintenance is necessary, remember to bleed the system.

Section E.4

SLAVE CYLINDER

Construction

The cylinder is bolted to the under side of the clutch housing and comprises a piston, rubber cup, cup filler, spring, push-rod, and bleeder screw.

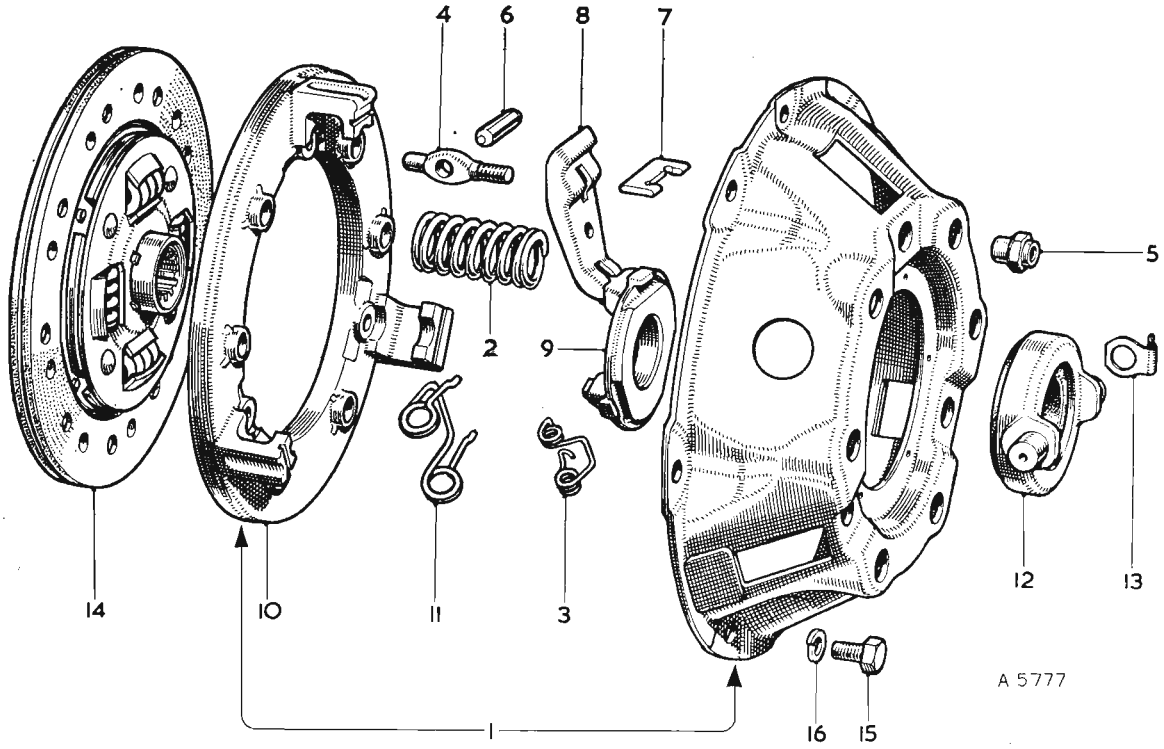
Removing

Place a receptacle to catch the fluid and remove the pipe union on the slave cylinder. Remove the split pin and clevis pin from the clutch withdrawal lever yoke. Remove the bolts securing the cylinder to the clutch housing and lift off the slave cylinder assembly.

Dismantling

Remove the rubber cover, push-rod, and circlip, and if a compressed-air line is available blow out the piston and seal. The spring can also be removed. The main casting can be cleaned with any of the normal cleansing fluids, but slave cylinder components should be cleaned in hydraulic fluid. All traces of cleansing fluid should be removed before reassembly. Lubricate the slave cylinder bore and components with hydraulic fluid and renew any rubbers before assembling the slave cylinders.

THE CLUTCH COMPONENTS
(Later Cars)



No.	*Description*	*No.*	*Description*	*No.*	*Description*
1.	Clutch assembly.	7.	Strut.	12.	Release bearing.
2.	Thrust spring.	8.	Release lever.	13.	Retainer.
3.	Release lever retainer.	9.	Bearing thrust plate.	14.	Driven plate assembly.
4.	Eyebolt.	10.	Pressure plate.	15.	Clutch to flywheel screw.
5.	Eyebolt nut.	11.	Anti-rattle spring.	16.	Spring washer.
6.	Release lever pin.				

Reassembling

Reassembling is the reverse of the removal procedure.

Refitting

For refitting reverse the removal procedure. The clutch hydraulic system should always be bled after an overhaul operation.

Bleeding

Fill the master cylinder reservoir with the recommended fluid and attach a rubber tube to the slave cylinder bleed valve; immerse the open end of the tube in a clean receptacle containing a small amount of fluid. With a second operator to pump the clutch pedal, open the bleed screw on the slave cylinder approximately three-quarters of a turn; at the end of the down stroke on the clutch pedal close the bleed screw before allowing the pedal to return to the 'off' position.

Continue this series of operation until clear fluid free from air bubbles is delivered into the container.

Section E.5

CLUTCH
(Later Cars)

Removing

Remove the gearbox and the clutch assembly as described in Sections F and A respectively.

Dismantling

The clutch tool 18G 99 A proves an efficient and speedy means of dismantling, reassembling, and adjusting the clutch with a high degree of accuracy. The tool is universal and a chart detailing the sizes of spacing washers and distance pieces for particular types of clutch is provided on the inside of the metal container lid.

Consult the code card to determine the correct spacers for the particular clutch. Place the spacers on the base plate in the positions indicated on the code card and place the clutch on the spacers. Screw the actuator into the central hole in the base plate and press the handle to clamp the clutch. Screw the set bolts firmly into the base plate. The clutch can now be compressed or released as required.

Compress the clutch with the actuator and remove the adjusting nuts gradually to relieve the load of the thrust springs. Lift the cover off the clutch and carry out whatever additional dismantling may be necessary.

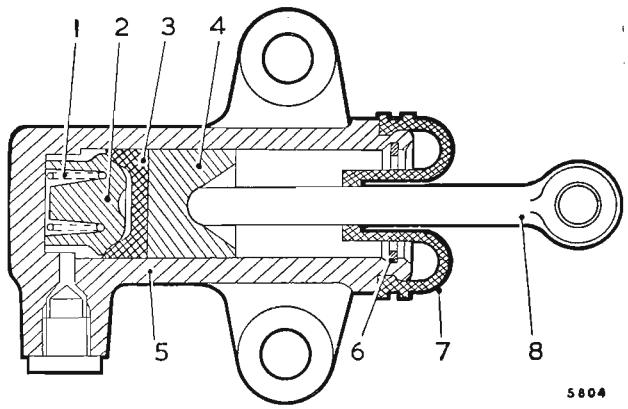


Fig. E.3

A section through a clutch slave cylinder

1. Spring.
2. Cup filler.
3. Cup.
4. Piston.
5. Body.
6. Circlip.
7. Rubber boot.
8. Push-rod.

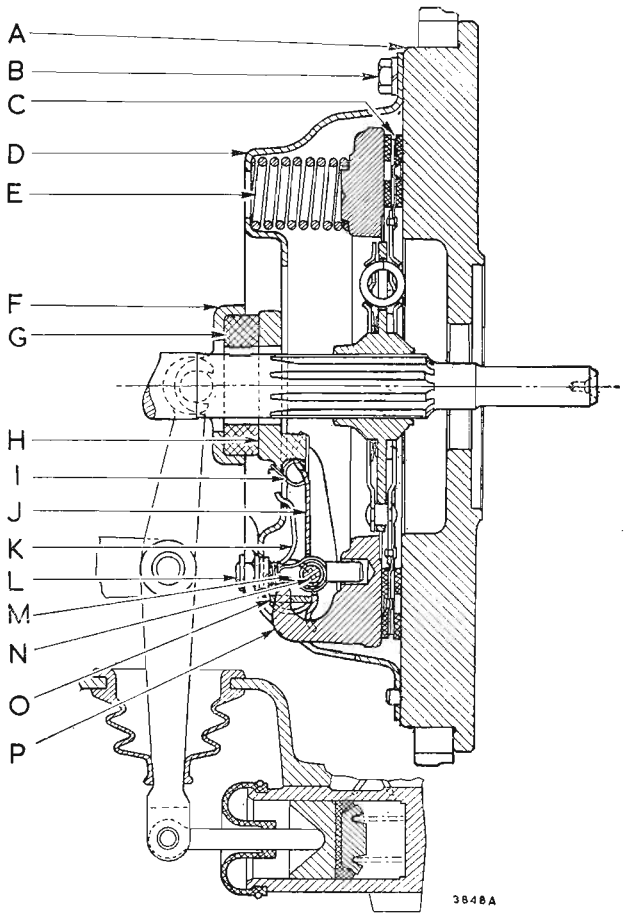


Fig. E.4

A section through the clutch (later cars)

A. Flywheel
B. Securing bolt.
C. Driven plate.
D. Clutch cover.
E. Thrust coil spring.
F. Release bearing cup.
G. Graphite release bearing.
H. Release plate.
I. Lever retainer spring.
J. Release lever.
K. Anti-rattle spring.
L. Adjusting nut.
M. Eyebolt.
N. Floating pin (release lever).
O. Strut.
P. Pressure plate.

Reassembling

Parts not being replaced by new ones must be refitted in their original positions.

Reassembly is the reverse of the dismantling procedure.

Adjusting the clutch

See end of Section E.1.

Refitting

Refitting is a reverse of the removal procedure. Use Service tool 18G 139 for clutch centralization.