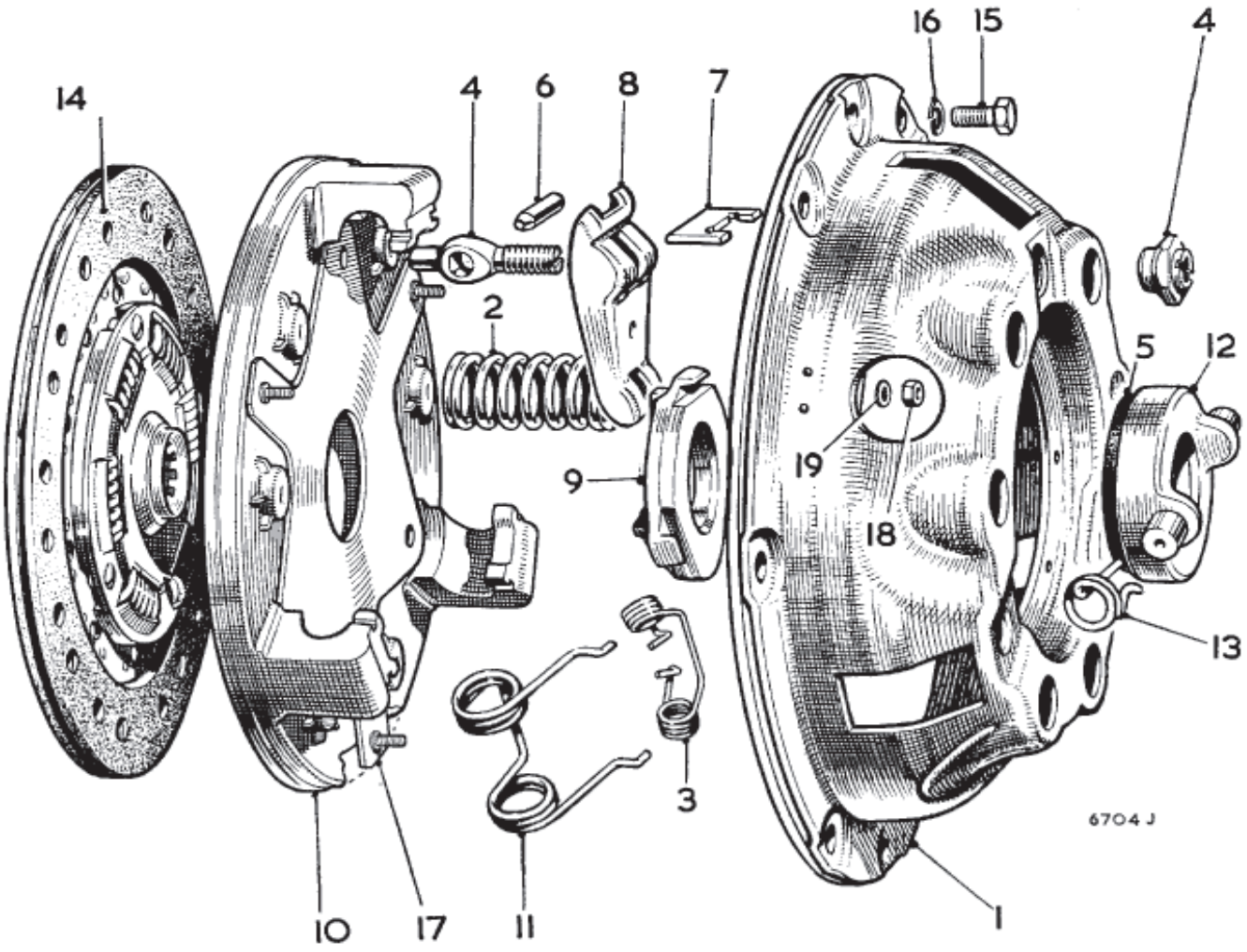
SECTION E

THE CLUTCH

General description.

THE CLUTCH COMPONENTS



No.	*Description*
1.	Clutch cover.
2.	Pressure plate spring.
3.	Lever retainer.
4.	Eyebolt and nut.
5.	Ring (carbon).
6.	Pin for lever.
7.	Strut.

No.	*Description*
8.	Release lever.
9.	Bearing thrust plate.
10.	Pressure plate.
11.	Anti-rattle spring.
12.	Thrust ring assembly.
13.	Retainer.
14.	Driven plate assembly.

No.	*Description*
15.	Screw—cover to flywheel.
16.	Spring washer for cover screw.
17.	Spider.
18.	Nut—spider stud to cover.
19.	Shakeproof washer for spider nut.

GENERAL DESCRIPTION

The clutch is of the single-plate dry-disc type operated hydraulically.

Driven plate assembly

This consists of a splined hub and flexible steel driven plate (C), to the outer diameter of which are fixed the annular friction facings. This plate is attached to the splined hub by a spring mounting which provides a torsional cushion.

Withdrawal bearing assembly

This comprises the graphite release bearing (D) mounted in a cup attached to the throw-out fork and a release plate (E) attached to the inner ends of the release levers (F) by means of the retainer springs (G). Release is accomplished by moving the release bearing forward into contact with the release plate and thus applying pressure to the release levers.

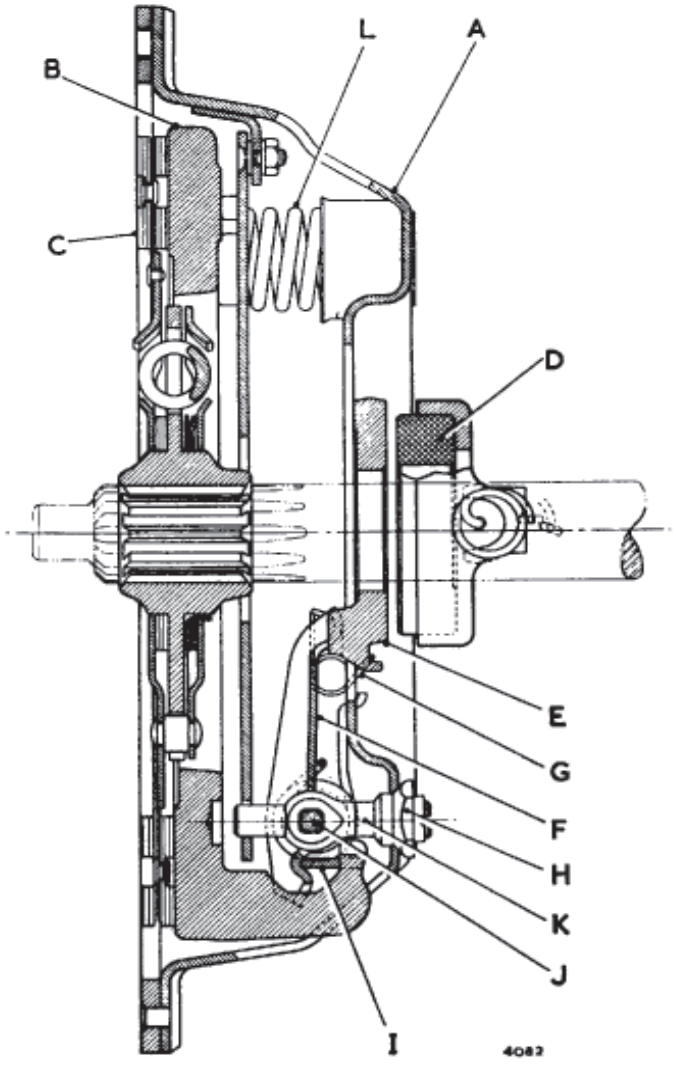


Fig. E.1

A section through the clutch

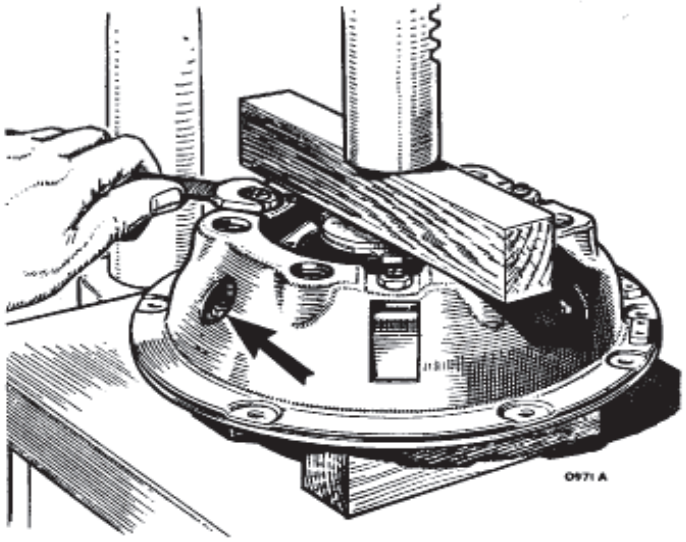


Fig. E.2

Compressing the springs with wood blocks and press. A spider securing nut is indicated by the arrow

Cover assembly

Each release lever is pivoted on a floating pin (J), which remains stationary in the lever and rolls across a short flat portion of the enlarged hole in the eye-bolts (K). The outer ends of the eyebolts extend through holes in the clutch cover and are fitted with adjusting nuts (H) by means of which each lever is located in its correct position. The outer or shorter ends of the release levers engage the pressure plate lugs by means of struts (I) which provide knife-edge contact between the outer ends of the levers and the pressure plate lugs, eliminating friction at this point. Thus the pressure plate (B) is pulled away from the driven plate (C), compressing the six thrust coil springs (L) which are assembled between the pressure plate and the clutch cover (A).

When the foot pressure is removed from the clutch pedal the clutch springs force the pressure plate forward against the driven plate, gradually and smoothly applying the power of the engine to the rear wheels.

Hydraulic operation

The clutch master cylinder, complete with integral reservoir, is bolted to the chassis frame adjacent to the brake master cylinder. Depression of the clutch pedal causes the piston to move along the polish-finished master cylinder bore. Fluid pressure is transmitted to a slave cylinder bolted to the clutch housing, moving the piston, push-rod, and clutch lever and disengaging the clutch.

Section E.1

ADJUSTMENT

It is essential that there should be a clearance between the master cylinder push-rod and the piston when the clutch pedal is released. This clearance, $\frac{1}{32}$ in. (·8 mm.), is adjusted by slackening the locknut and rotating the push-rod in the appropriate direction. Ensure that the pedal is not obstructed by the toeboard or by the floor covering. The free movement at the pedal pad must be sufficient to allow the piston to return fully in the cylinder and still retain the $\frac{1}{32}$ in. (·8 mm.) clearance at the push-rod.

Excessive movement may indicate lack of fluid or the need for bleeding; whenever the system is drained, bleeding will be required after refilling.

Section E.2

MASTER CYLINDER

Description

The inner assembly of the master cylinder is made up of the push-rod, circlip, dished washer, plunger, end seal, plunger seal, spring thimble, plunger return spring, valve spacer, spring washer, valve stem, and valve seal. The open end of the cylinder is protected by a rubber dust seal.

Removal

Extract the split pin and withdraw the clevis pin from the push-rod yoke. Disconnect the pressure pipe union from the cylinder and remove the two self-locking nuts, washers, and bolts from the master cylinder mounting bracket. The master cylinder may now be withdrawn from the vehicle.

Dismantling

Remove the retaining circlip with a pair of long-nosed pliers and extract the dished washer and push-rod. When the push-rod has been removed the plunger with seals attached will be exposed; remove the plunger assembly complete. The assembly can be separated by lifting the thimble leaf over the shouldered end of the plunger. Depress the plunger return spring, allowing the valve stem to slide through the elongated hole in the thimble, thus releasing the tension on the spring. Remove the thimble, spring, and valve complete. Detach the valve spacer, taking care of the spacer spring washer which is located under the valve head, and remove the seal from the valve head.

Examine all parts, especially the seals, for wear or distortion and fit new parts where necessary.

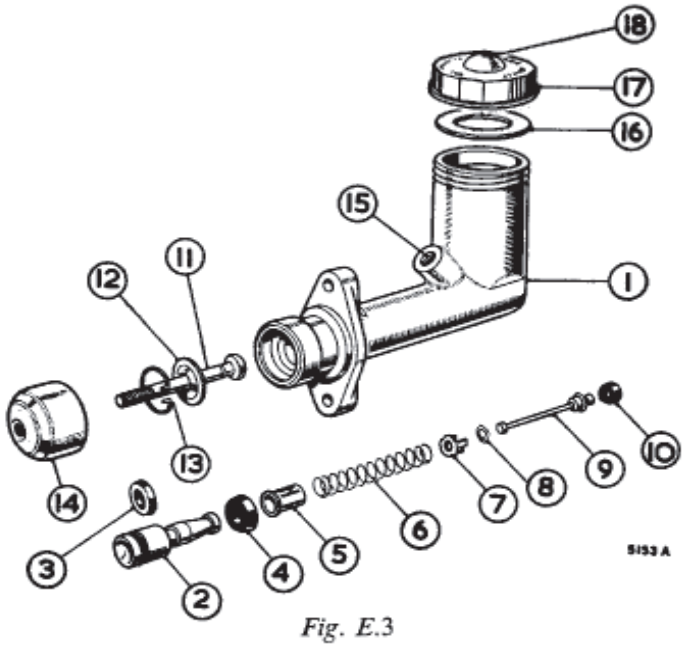


Fig. E.3

The clutch master cylinder components

1. Master cylinder body.
2. Plunger.
3. End seal.
4. Plunger seal.
5. Spring thimble.
6. Spring.
7. Valve spacer.
8. Spring washer.
9. Valve stem.
10. Valve seal.
11. Push-rod.
12. Retaining washer.
13. Circlip.
14. Dust cover.
15. Outlet.
16. Cap washer.
17. Filler cap.
18. Air vent.

Assembly

Replace the valve seal so that the flat side is correctly seated on the valve head. The spring washer should then be located **with the domed side against the under side of the valve head,** and held in position by the valve spacer, the legs of which face towards the valve seal. Replace the plunger return spring centrally on the spacer, insert the thimble into the spring, and depress until the valve stem engages through the elongated hole of the thimble, ensuring that the stem is correctly located in the centre of the thimble. Check that the spring is still central on the spacer. Fit a new plunger seal with the flat face of the seal against the face of the plunger. Refit the plunger end seal, using a new seal if necessary.

Insert the reduced end of the plunger into the thimble until the thimble leaf engages under the shoulder of the plunger. Press home the thimble leaf.

Smear the plunger assembly with the recommended fluid, and insert the assembly into the cylinder bore, valve end first, carefully easing the plunger seal lips into the bore. Replace the push-rod, with the dished side of the washer under the spherical head, into the cylinder, followed by the circlip, which engages in the groove machined in the cylinder body.

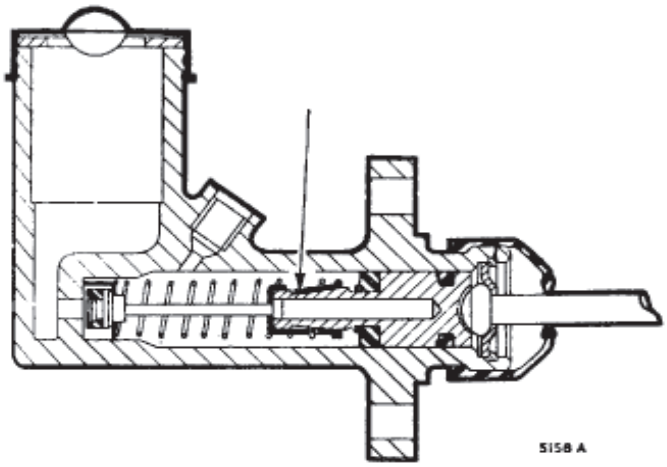


Fig. E.4

The master cylinder. The arrow indicates the thimble leaf

Replacement

Locate the master cylinder on the mounting bracket on the bulkhead and fit the bolts, washers, and self-locking nuts. Replace the rubber dust cover. Line up the push-rod fork with the hole in the clutch pedal lever, insert the clevis pin, and secure it with a new split pin. Finally, bleed the system as detailed in Section E.4.

Section E.3

SLAVE CYLINDER

Description

The slave cylinder is of simple construction, consisting of an alloy body, piston with seal, spring, and bleed screw. The open end is protected by a rubber dust cover. Two bolts with spring washers secure the slave cylinder to the clutch housing.

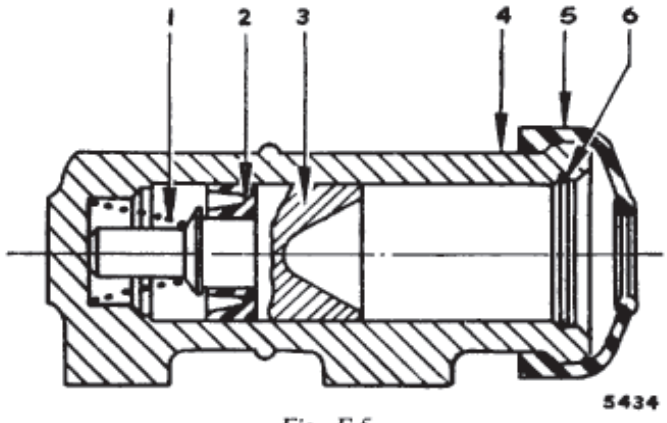


Fig. E.5

The clutch slave cylinder components

1. Spring.
2. Seal.
3. Piston.
4. Body.
5. Dust cover.
6. Circlip.

Removal

Attach a rubber tube to the bleed screw and open the screw three-quarters of a turn. Pump the clutch pedal until all the fluid has been drained into a clean container. Unscrew the pressure pipe union and remove the two bolts and spring washers securing the cylinder to the clutch housing. The cylinder may now be removed from the vehicle, leaving the push-rod attached to the clutch fork.

Dismantling

Remove the rubber dust cover, and with an air-line blow out the piston and seal. Extract the spring. Examine all parts, especially the seal, and renew if worn or damaged.

Assembly

Place the seal on the stem of the piston with the back of the seal against the piston (see Fig. E.5). Replace the spring with the small end on the stem, smear well with the recommended fluid, and insert into the cylinder.

Replacement

Replace the rubber dust cover on the cylinder and locate the cylinder in its correct position on the clutch housing, ensuring that the push-rod enters the hole in the rubber boot. Replace the two mounting bolts and spring washers. Refit the pressure pipe union, taking care to fit the copper washers correctly, and bleed the system as described in Section E.4.

Section E.4

BLEEDING THE CLUTCH SYSTEM

Open the bleed screw on the slave cylinder three-quarters of a turn and attach a tube, immersing the open end in a clean receptacle containing a small quantity of the recommended hydraulic fluid. Fill the master cylinder reservoir with fluid. The use of Girling Hydraulic Brake Fluid is recommended, but if this is not available an alternative fluid conforming to Specification S.A.E. 70.R1 should be used. Using slow, full strokes, pump the clutch pedal until the fluid entering the container is completely free from air bubbles. On a downstroke of the pedal tighten the bleed screw and remove the bleed tube.

Section E.5

REMOVING THE CLUTCH

Remove the gearbox as detailed in Section F.1.

Loosen each of the hexagon bolts securing the clutch to the flywheel by slackening them a turn at a time until

spring pressure is released. The clutch cover can now be disengaged from the flywheel dowels and the whole assembly lifted from the flywheel.

Section E.6

DISMANTLING THE CLUTCH

Two methods are possible in dismantling the clutch: (*a*) Using the clutch gauging fixture, and (*b*) Using a press and blocks of wood.

Using the clutch gauging fixture (Fig. E.8)

Remove the three release plate retaining springs and lift off the release plate. 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 set bolts firmly into the base plate to secure the cover.

Remove the three adjuster nuts gradually to relieve the load of the thrust springs. Remove the three 2 BA nuts and shakeproof washers (see Fig. E.2) securing the spider to the cover.

Unscrew the set bolts from the base plate and lift off the clutch cover.

Any additional dismantling that may be necessary can now be carried out.

Using a press and wood blocks (Fig. E.2)

Place the cover on the bed of a press with the pressure plate resting on wood blocks so arranged that the cover is left free to move downwards. Place a block or bar across the top of the cover, resting it on the spring bosses.

Apply pressure to the cover with the spindle of the press and, holding it under compression, remove the three adjusting nuts. Remove the three 2 BA nuts and shakeproof washers securing the spider to the clutch cover (see Fig. E.2). The pressure from the press may now be released gradually until the clutch springs are fully extended.

While stripping down the cover-plate assembly the parts should be marked so that they may be reassembled in the same relative position to each other, to ensure that the correct balance is maintained. When a new pressure plate is fitted it is essential that the complete cover and pressure plate assembly be accurately balanced, for which reason it is not a practical proposition to fit new pressure plates unless balancing facilities are available.

All parts are available for inspection when the cover is lifted off.

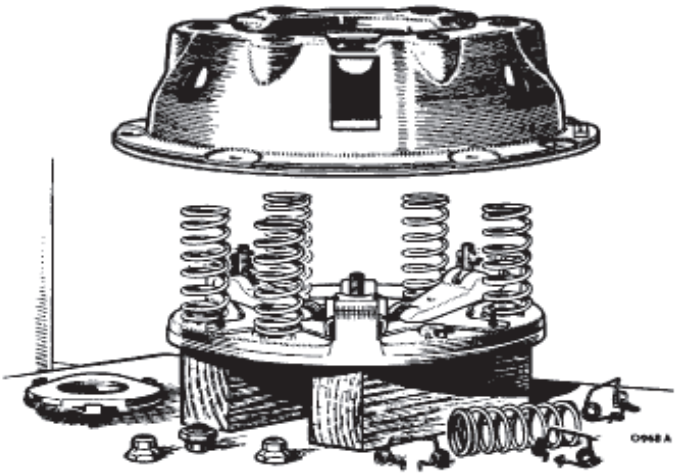


Fig. E.6

The clutch dismantled

To remove the release levers, grasp the lever and eyebolt between the thumb and fingers so that the inner end of the lever and the threaded end of the eyebolt are as near together as possible, keeping the eyebolt pin seated in its socket in the lever. The strut can then be lifted over the ridge on the end of the lever, making it possible to lift the eyebolt off the spider. It is advisable to renew any parts which show signs of wear.

Section E.7

ASSEMBLING THE CLUTCH

Lay the pressure plate on the wood block on the bed of the press (or on the base plate of the special tool with the three adaptors in position). Place the spider on the pressure plate in its correct position and seat the springs on their small locating bosses on the pressure plate. Thoroughly clean all parts and renew any which show excessive wear.

Assemble the release levers, eyebolts, and eyebolt pins. Hold the threaded end of the eyebolt and the inner end of the lever as close together as possible. With the other hand insert the strut in the slots of the pressure plate lug just sufficiently to allow the plain end of the eyebolt to be inserted through the hole in the spider and into the hole in the pressure plate. Move the struts upwards into the slots in the pressure plate lugs, over the ridge on the short end of the lever, and drop it into the grooves formed in the lever.

Lay the cover over the parts, taking care that the anti-rattle springs are in position as shown in Fig. E.6 and that the springs are located in the cups provided in the cover. Also make sure, if using the original parts, that the eyebolts, eyebolt nuts, pressure plate lugs, and cover are fitted in their correct relative positions, as

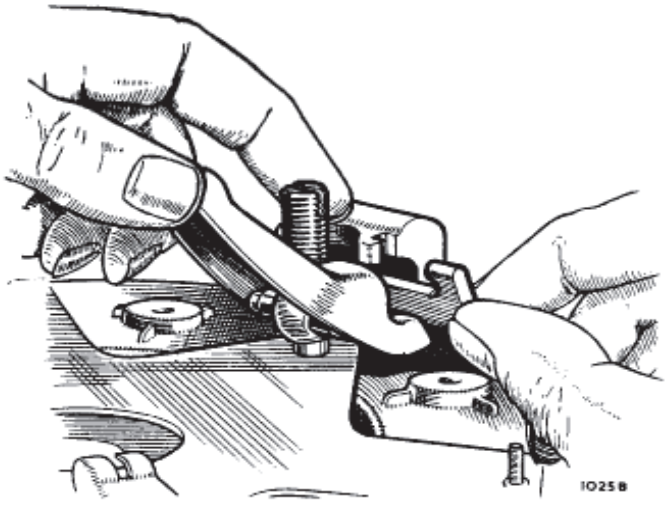


Fig. E.7
Assembling the release levers

marked when dismantling, to ensure the correct balance being maintained.

Compress the springs either by fitting and tightening evenly the six clutch cover bolts (if the special tool is being used), or by the use of a wooden block across the cover and a press. Take care to guide the eyebolts and the pressure plate lugs through the correct holes in the cover. The three studs on the spider must also be lined up to pass through their locations in the cover when the pressure is applied. Make certain that the thrust springs remain correctly in their seats on the pressure plate and the cups in the cover.

Replace the eyebolt nuts on the eyebolts and secure the spider to the clutch cover with the three 2 BA nuts and shakeproof washers.

Release the pressure compressing the cover assembly and adjust the release levers (Section E.8).

Section E.8

ADJUSTING THE RELEASE LEVERS

Satisfactory operation of the clutch is dependent upon accurate adjustment of the release levers, so that the pressure plate face is maintained parallel to the flywheel face. This cannot be accomplished by setting the levers parallel to the face of the release bearings after the clutch has been assembled to the flywheel because of the variations in the thickness of the driven plate.

For accurate adjustment the universal gauging fixture must be used.

After carrying out any necessary servicing reassemble the parts on the clutch pressure plate, and place the cover on it and the whole assembly on the base plate of the gauging fixture. The release plate should not be fitted at this stage. It is essential that the correct spacers (see note) be used.

Bolt the cover to the base plate and screw the adjusting nuts onto the bolts until the tops of the nuts are flush with the tops of the bolts. Screw the actuator into the base plate and work the handle a dozen times to settle the mechanism. Remove the actuator. Screw the pillar firmly into the base plate and place the special adaptor (see note) on the pillar with the recessed side downwards; place the gauge finger in position.

Turn the adjusting nuts until the finger just touches each release lever, pressing downwards on the finger assembly to ensure that it is bearing squarely on the adaptor. Remove the finger and the pillar and replace the actuator; operate the actuator several times. Re-check with the finger assembly and make any necessary further adjustments.

Lock the adjusting nuts.

NOTE.—The clutch used on this vehicle differs from the normal 8″ type and a special adaptor (Part No. 18G99B) must be used in conjunction with the gauge plate in place of the adaptor (code No. 6) shown on the code card. The three spacers to be used with this adaptor are the same as those indicated for use on the standard 8″ clutch (code No. 2).

Section E.9

REFITTING THE CLUTCH

Position the driven plate assembly on the flywheel, taking care to place the larger-chamfered spline end of the driven plate hub away from the flywheel.

Centralize the driven plate by means of the special alignment bar (Part No. 18G39) which fits the splined bore of the driven plate hub and the pilot bearing in the flywheel. As an alternative a spare first motion shaft can be used.

Locate the cover assembly on the flywheel dowels and secure with the bolts, tightening them a turn at a time by diagonal selection. Do not remove the clutch alignment bar until all the bolts are securely tightened.

Remove the clutch alignment bar and refit the gearbox. The weight of the gearbox must be supported during refitting in order to avoid strain on the shaft and distortion or displacement of the release plate or driven plate assembly.

Section E.10

SERVICING THE CLUTCH

As the clutch facings 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. As the release bearing moves rearwards it must result in pushing the piston in the clutch slave cylinder inwards. The piston then forces the excess fluid back into the master cylinder via the compensating orifice.

Provided that the minimum $\frac{1}{32}$ in. (·8 mm.) free movement is maintained between the clutch pedal push-rod and the master cylinder piston, this automatic compensation for wear will always take place.

Should there be no free movement at this point, the master cylinder piston will not be allowed to return fully to its stop and therefore the compensating orifice will be cut off.

Excessive pedal movement causes coil binding of the springs and imposes an undue load on the bearing and on the crankshaft, causing excessive and rapid bearing wear. It therefore follows that the required pedal travel is the sum of the two movements:

(1) *The free movement*, or travel necessary to take up the clearance between the master cylinder push-rod and the master cylinder piston, provided to ensure that the clutch is fully engaged when the foot is removed from the pedal. (See Section E.1.)

(2) *The effective movement*, or travel necessary to release the clutch, i.e. the amount of effective pedal movement necessary to move the release plate the distance required to free the clutch completely.

If any difficulty is experienced in freeing the clutch when the correct release movement is provided, on no account should efforts be made to improve matters by attempting to increase the effective pedal travel. The actual cause of the trouble must be ascertained and rectified.

To obtain a clean release the release lever plate should move a distance of $\frac{5}{16}$ in. (8 mm.) towards the flywheel.

Spring pressure

A tolerance of not more than 10 to 15 lb. (4·5 to 6·8 kg.) pressure is allowable on the compression load of the operating springs when at their assembled height, and all clutch springs are tested for this before assembly.

The clutch operating springs are not affected by high clutch temperatures, as the pressure plate absorbs heat rapidly, the springs have only line contact, and a draught is continually passing under them when the engine is running.

Tolerances

Wear on the working faces of the driven plate is about ·001 in. (·02 mm.) per 1,000 miles (1600 km.) under normal running conditions. The accuracy of the alignment of the face of the driven plate must be within ·015 in. (·38 mm.).

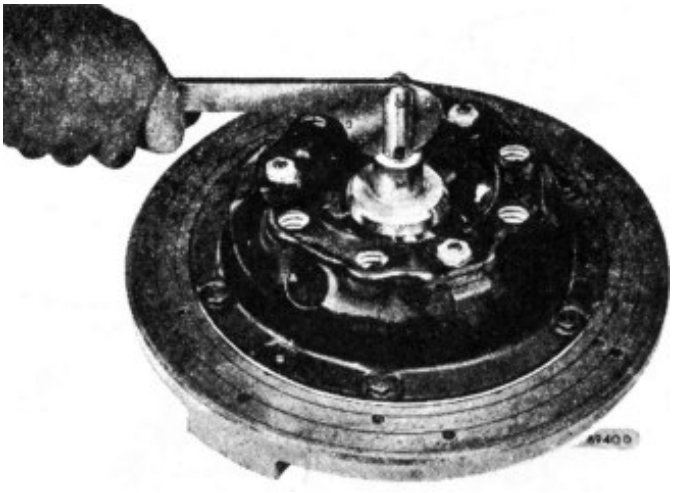


Fig. E.8

The use of the actuator to compress the clutch springs

Driven plates

It is important that neither oil nor grease should contact the clutch facings.

Lubrication of the splines of the driven plate is provided at assembly only, when CS881 graphite grease or zinc-based Keenol is used.

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.

Condition of clutch facings in service

It is natural to assume that a rough surface will give a higher frictional value against slipping than a polished one, but this is not necessarily correct. A roughened surface consists of small hills and dales, only the 'high-spots' of which make contact. As the amount of useful friction for the purpose of taking up the drive is dependent upon the area in actual contact, it is obvious that a perfectly smooth face is required to transmit the maximum amount of power for a given surface area.

Since non-metallic facings of the moulded asbestos type have been introduced in service the polished surface is common, but it must not be confused with the glazed surface which is sometimes encountered due to conditions to be detailed subsequently. The ideally smooth or polished condition will therefore provide proper surface contact, but a glazed surface entirely alters the frictional value of the facing and will result in excessive clutch slip. These two conditions might be simply

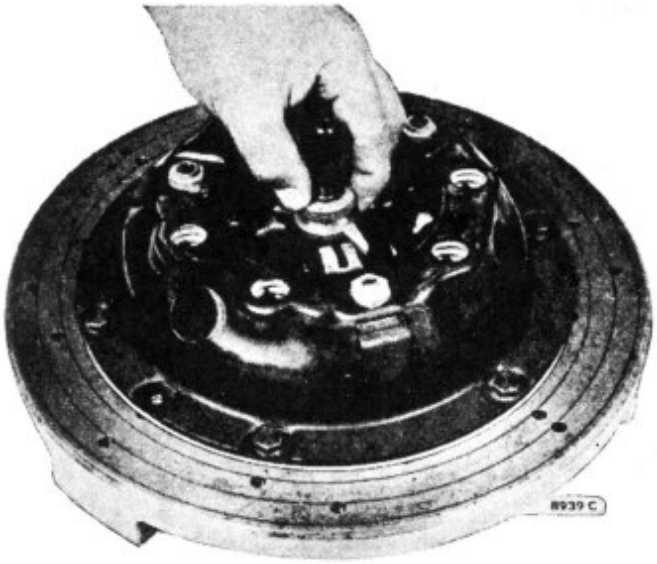


Fig. E.9
Checking the setting of the release levers

illustrated by comparison between a piece of smoothly finished wood and one with a varnished surface; in the former the contact is made directly by the original material, whereas in the latter instance a film of dry varnish is interposed between the contact surfaces and actual contact is made by the varnish.

If the clutch has been in use for some little time under satisfactory conditions the surface of the facings assumes a high polish through which the grain of the material can be seen clearly. This polished facing is of light colour when in perfect condition.

Should oil in small quantities gain access to the clutch and find its way onto the facings, it will be burnt off as a result of the heat generated by the slipping occurring under normal starting conditions. The burning of this small quantity of lubricant has the effect of gradually darkening the facings, but, provided the polish of the facing remains such that the grain of the material can be distinguished clearly, it has little effect on clutch performance.

Should increased quantities of oil obtain access to the facing, then one of two conditions, or a combination of these, may arise, depending upon the nature of the oil.

(1) The oil may burn off and leave a carbon deposit on the surface of the facings, which assume a high glaze, producing further slip. This is a very definite, though very thin, deposit, and in general it hides the grain of the material.
(2) The oil may partially burn and leave a resinous deposit on the facings. This has a tendency to produce a fierce clutch, and may also cause excessive 'spinning' due to the tendency of the face of the linings to adhere to the surface of the flywheel or pressure plate.
(3) There may be a combination of conditions (1) and (2) which produces a tendency to 'judder' on such engagement.

Still greater quantities of oil produce a dark and soaked appearance of the facings, and the result will be further slip, accompanied by fierceness or 'juddering'.

If the conditions enumerated above are experienced, the clutch driven plate should be replaced by a new one. **The cause of the presence of the oil must be traced and removed.** It is, of course, necessary for the clutch and flywheel to be cleaned out thoroughly before assembly.

Where the graphite release bearing ring is badly worn in service a complete replacement assembly should be fitted, returning the old assembly for salvage of the metal cup. These graphite rings are inserted into their metal cup by heating the metal cup to a cherry red, then forcing the graphite ring into position. Immediately the ring is forced into position the whole should be quenched in oil. Alignment of the thrust pad in relation to its face and the trunnions should be within ·005 in. (·12 mm.).

In almost every case of rapid wear on the splines of the clutch driven plate misalignment is responsible.

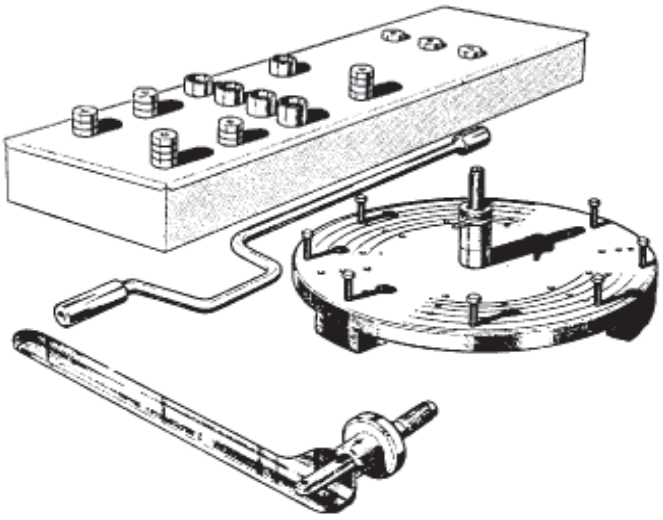
Looseness of the driven plate on the splined shaft results in noticeable backlash in the clutch. Misalignment also puts undue stress on the driven member, and may result in the hub breaking loose from the plate, with consequent total failure of the clutch.

It may also be responsible for a fierce chattering or dragging of the clutch, which makes gear changing difficult. In cases of persistent difficulty it is advisable to check the flywheel for truth with a dial indicator. The dial reading should not vary more than ·003 in. (·07 mm.) anywhere on the flywheel face.

SERVICE TOOLS

18G99A. Clutch Dismantling, Reassembling and Gauging Fixture

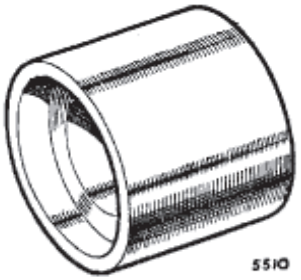
With the use of this tool a clutch assembly can be quickly dismantled, rebuilt and finally adjusted with a high degree of accuracy. This is a universal tool for clutch assemblies from 6¼ in. to 11 in. (158 to 279 mm.) diameter.



18G99A

18G99B. Adaptor

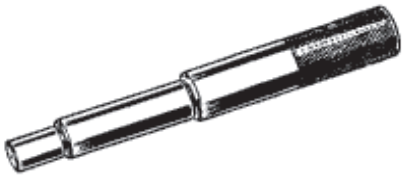
This adaptor is essential when carrying out adjustments to the 8-in. sports clutch as fitted to the MGA (Twin Cam). It is used in conjunction with the gauging fixture (18G99A) in place of the adaptor (Code No. 6) shown on the code card for use on the standard type 8-in. clutch.



18G99B

18G39 . **Clutch Plate Centralizer**

This tool is used when bolting the clutch cover assembly to the flywheel to centralize the driven plate. It ensures that when fitting the gearbox to the engine that the first motion shaft passes easily through the clutch driven plate hub and locates in the spigot bearing in the end of the crankshaft.



18G39