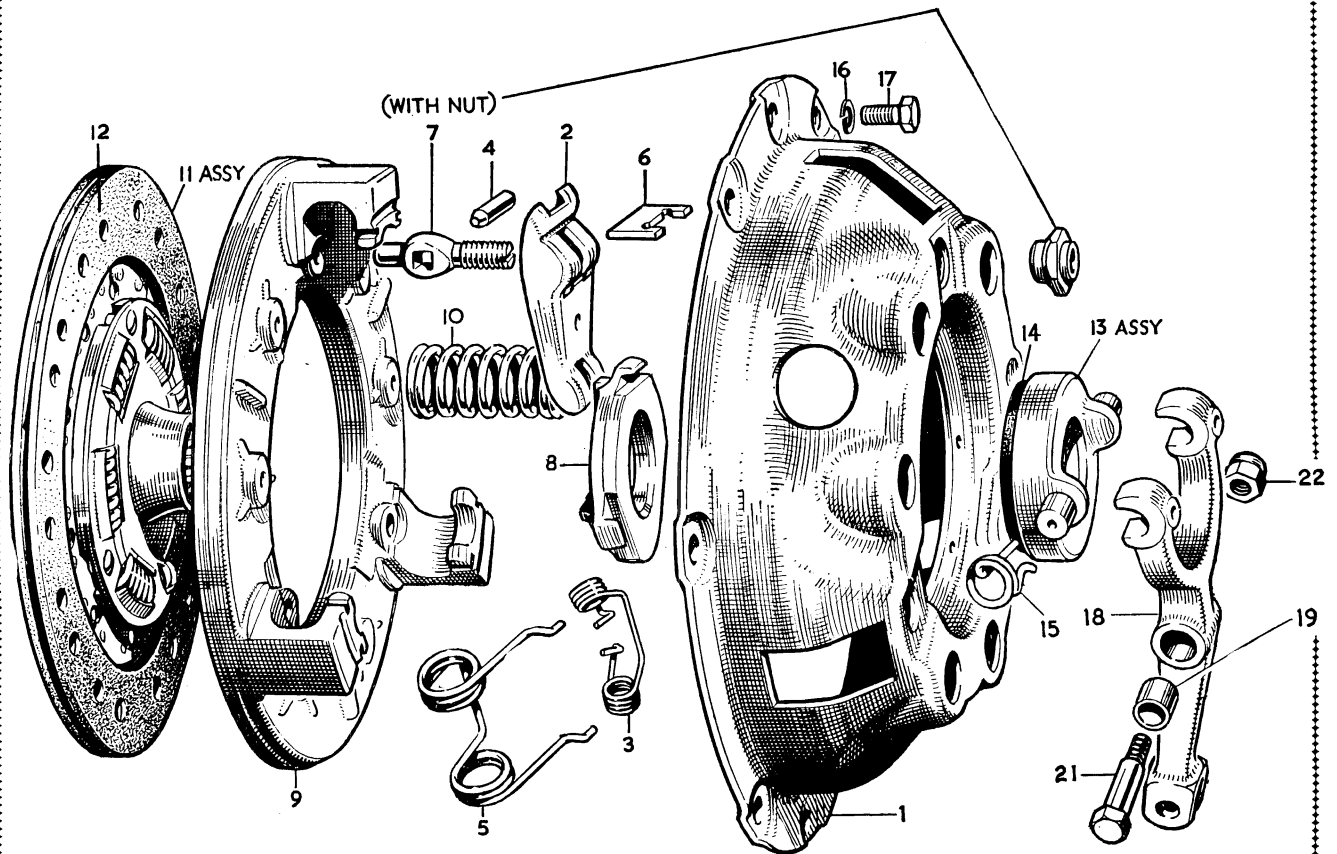


SECTION E
THE CLUTCH

	<i>Section</i>
Description	
Assembling	E.2
Dismantling	E.1
Release lever adjustment	E.3
Tools—special	E.4

For additional information see Section EE

THE CLUTCH COMPONENTS



<i>No.</i>	<i>Description</i>
1.	Cover—clutch.
2.	Lever—release.
3.	Retainer—lever.
4.	Pin—lever.
5.	Spring—anti-rattle.
6.	Strut.
7.	Eyebolt with nut.

<i>No.</i>	<i>Description</i>
8.	Plate—bearing thrust.
9.	Plate—pressure.
10.	Spring—pressure plate.
11.	Plate assembly—driven.
12.	Lining.
13.	Ring assembly—thrust.
14.	Ring—carbon.

<i>No.</i>	<i>Description</i>
15.	Retainer.
16.	Washer—spring—cover screw.
17.	Screw—cover to flywheel.
18.	Lever—withdrawal.
19.	Bushes.
21.	Bolt for lever.
22.	Nut for bolt.

DESCRIPTION

The clutch is of the single-plate dry-disc type operated hydraulically. No adjustment for wear is provided in the clutch itself; individual adjustment is provided for locating each lever during initial assembly. The adjusting nuts are locked in place and must never be disturbed unless the clutch is dismantled.

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.

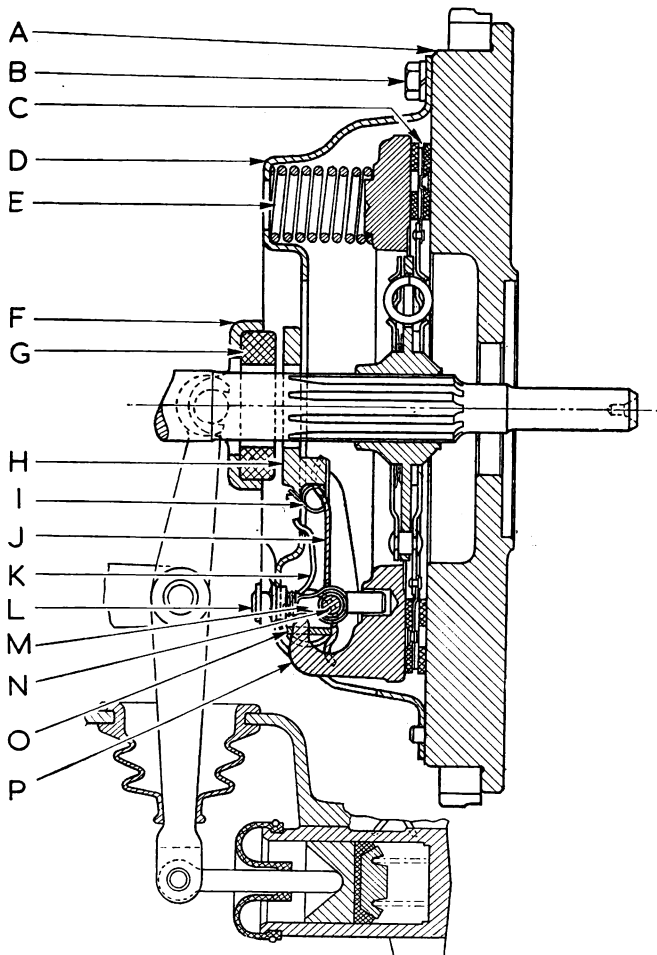


Fig. E.1

- | | |
|------------------------------|----------------------------|
| A. Flywheel. | I. Lever retainer springs. |
| B. Securing bolts. | J. Release levers. |
| C. Driven plate. | K. Anti-rattle springs. |
| D. Clutch cover. | L. Adjusting nuts. |
| E. Thrust coil springs. | M. Eyebolts. |
| F. Release bearing cup. | N. Floating pins. |
| G. Graphite release bearing. | O. Struts. |
| H. Release plate. | P. Pressure plate. |

Withdrawal bearing assembly

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

Cover assembly

Each release lever is pivoted on a floating pin (N), which remains stationary in the lever and rolls across a short flat portion of the enlarged hole in the eyebolts (M) (see Fig. E.1). The outer ends of the eyebolts extend through holes in the clutch cover and are fitted with adjusting nuts (L) 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 (O) 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 (P) is pulled away from the driven plate (C), compressing the six thrust coil springs (E) which are assembled between the pressure plate and the clutch cover (D).

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

A master cylinder is mounted on the engine side of the bulkhead and operated directly by the clutch pedal. Fluid pressure is transmitted to the slave cylinder, moving the piston, push-rod, and clutch lever to disengage the clutch.

Master cylinder

The assembly of the clutch master cylinder is similar to that of the brake master cylinder (Section EE) except that no combination inlet and outlet valve is fitted and therefore no pressure is maintained in the fluid line when the pedal is released.

Slave cylinder

This is bolted to the clutch housing and normally requires no maintenance; its assembly is similar to that of the front wheel brake cylinder. If the system is drained of fluid it will be necessary to bleed the cylinder after reassembly and refilling.

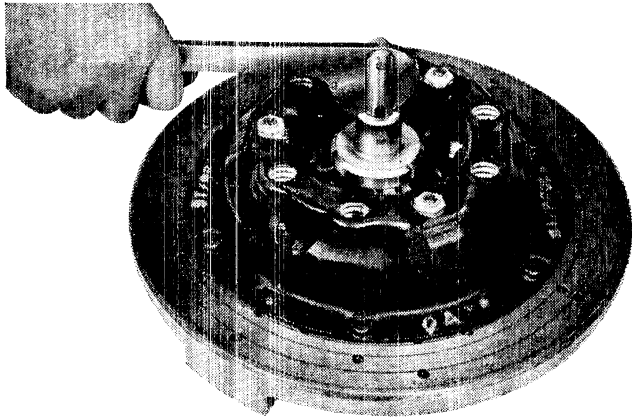


Fig. E.2

Using the actuator to compress the clutch springs for dismantling or setting the assembly

Section E.1

DISMANTLING THE CLUTCH

Two methods are possible in dismantling the clutch: (a) Using the clutch gauging fixture 18G99A, and (b) Using a press and blocks of wood.

Using the clutch gauging fixture (Fig. E.2)

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.

Using a press and wood blocks (Fig. E.3)

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. 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, and 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.

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 pressure plate. It is advisable to renew any parts which show signs of wear.

Section E.2

ASSEMBLING THE CLUTCH

Lay the pressure plate on the wood block on the bed of the press (or on the base plate of the clutch gauging fixture) and place the springs on it in a vertical position, seating them on their small locating bosses. Clean all parts and renew any which show appreciable wear.

Assemble the release levers, eyebolts, and eyebolt pins, holding 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 in the hole in the pressure plate. Move the strut 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.1 and that the springs are directly under the seats in the cover. Also make sure, if using the original parts, that

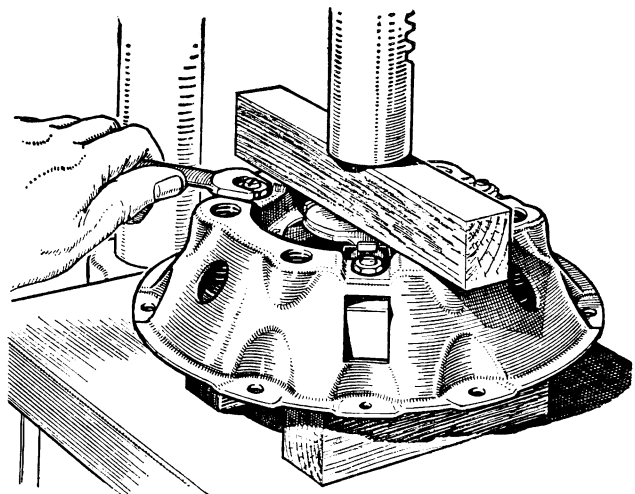


Fig. E.3

Compressing the springs with wood blocks and press

the eyebolts, eyebolt nuts, pressure plate lugs, and cover are fitted in their correct relative positions, as marked when dismantling, to ensure correct balance being maintained.

Compress the springs either by the actuator, if the gauging fixture 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. Make sure also that the thrust springs remain correctly in their seats.

Replace the eyebolt nuts on the eyebolts and release the pressure compressing the cover assembly.

Section E.3

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 an accurate adjustment the universal gauging fixture must be used.

Using the gauging fixture

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. It is essential that the correct spacers be used, as indicated on the code card.

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 appropriate adaptor (see code card) 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.

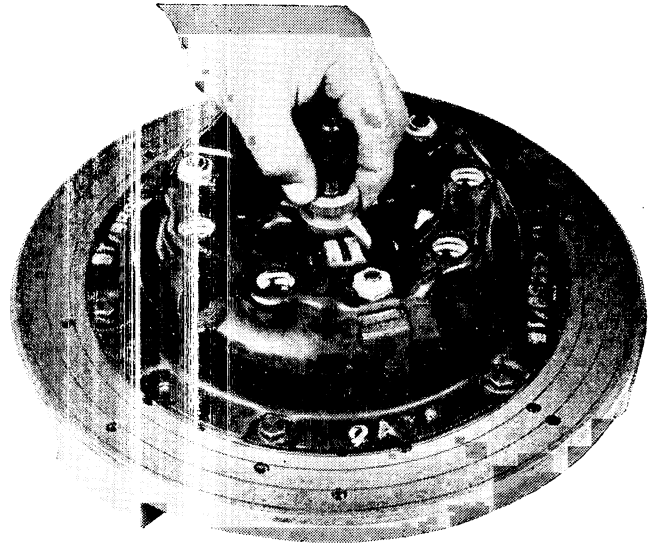


Fig. E.4

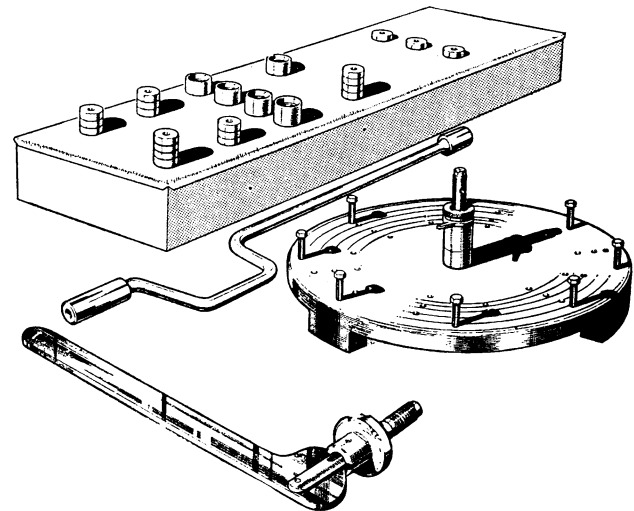
Checking the setting of the release levers

Section E.4

SPECIAL 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 to 11 in. (158 to 279 mm.) diameter.



18G99A

SECTION EE

THE CLUTCH

This Section is a Supplement to Section E

Clutch

Refitting	EE.2
Removing	EE.1
Servicing	EE.3

Master cylinder

Assembling	EE.7
Construction and operation	EE.4
Dismantling	EE.6
Removing and replacing	EE.5

Slave cylinder

Dismantling and assembling	EE.9
Removing and replacing	EE.8
Tools—special	EE.10

Section EE.1

REMOVING THE CLUTCH

Remove the power unit as detailed in Section AA.

Remove the clutch housing bolts and withdraw the gearbox from the engine, taking care to support the gearbox until the first motion shaft is clear of the driven plate and release lever plate.

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 EE.2

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. 18G279) 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 EE.3

SERVICING THE CLUTCH

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.).

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 discussed 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 illustrated by a 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 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 either a complete replacement assembly or a new graphite ring should be fitted. 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.

Section EE.4

THE CLUTCH MASTER CYLINDER CONSTRUCTION AND OPERATION

The master cylinder piston is backed by a rubber cup and is normally held in the 'off' position by a return spring. Immediately in front of the cup, when it is in the 'off' position, is a compensating orifice connecting the cylinder with the fluid supply. This port allows free compensation for any expansion or contraction of fluid, thus ensuring that the system is constantly filled; it also serves as a release for additional fluid drawn into the cylinder during clutch applications.

Pressure is applied to the piston by means of the push-rod attached to the clutch pedal.

The reduced skirt of the piston forms an annular space which is filled with fluid from the supply tank via the feed hole. Leakage of fluid from the open end of the cylinder is prevented by the secondary cup fitted to the flange end of the piston.

By releasing the clutch pedal after application the piston is returned quickly to its stop by the return spring, thus creating a vacuum in the cylinder; this vacuum causes the main cup to collapse and pass fluid through the small holes in the piston head from the annular space formed by the piston skirt. This additional fluid finds its way back to the reserve supply through the compensating orifice.

No pressure is maintained in the clutch line when the pressure is released.

Maintenance is confined to periodical inspection of the hydraulic fluid level in the master cylinder supply tank. This level must be maintained at $\frac{1}{2}$ in. (13 mm.) below the bottom of the filler neck.

Lockheed Genuine Brake Fluid or fluid to specification S.A.E. 70 R.1 only must be used in the clutch hydraulic system—this is important; filling or topping up with fluid other than Lockheed fluid or fluid to specification S.A.E. 70 R.1 will lead to piston cup failure.

Section EE.5

REMOVING AND REPLACING THE MASTER CYLINDER

Remove the split pin and withdraw the clevis pin securing the master cylinder push-rod to the clutch pedal lever.

Disconnect the pressure pipe union from the cylinder, remove the two bolts securing the cylinder to the bulkhead, and withdraw the assembly complete from the car.

Replacement is a reversal of the removal instructions, but it will be necessary to bleed the system after re-assembly and refilling (see Section EE.8).

Section EE.6

DISMANTLING THE CLUTCH MASTER CYLINDER

Remove the master cylinder as in Section EE.5. Remove the filler cap and drain out the fluid.

Pull back the rubber dust cover and remove the circlip with a pair of long-nosed pliers; the push-rod and dished washer can then be removed.

Withdraw the remaining parts shown in Fig. EE.1 from the cylinder barrel.

To remove the secondary cup from the piston carefully stretch the cup over the end flange of the piston, using only the fingers.

Section EE.7

ASSEMBLING THE CLUTCH MASTER CYLINDER

Clean all parts thoroughly, using Lockheed Genuine Brake Fluid for all rubber components. All traces of petrol (gasoline), paraffin (kerosene), or trichlor-ethylene used for cleaning the metal parts must be removed before assembly.

Examine all rubber parts for damage or distortion. It is usually advisable to renew the rubbers when rebuilding the cylinder. Dip all the internal parts in brake fluid and assemble them wet.

Stretch the secondary cup over the end flange of the piston with the lip of the cup facing towards the opposite end of the piston. When the cup is in its groove work it round gently with the fingers to make sure it is correctly seated.

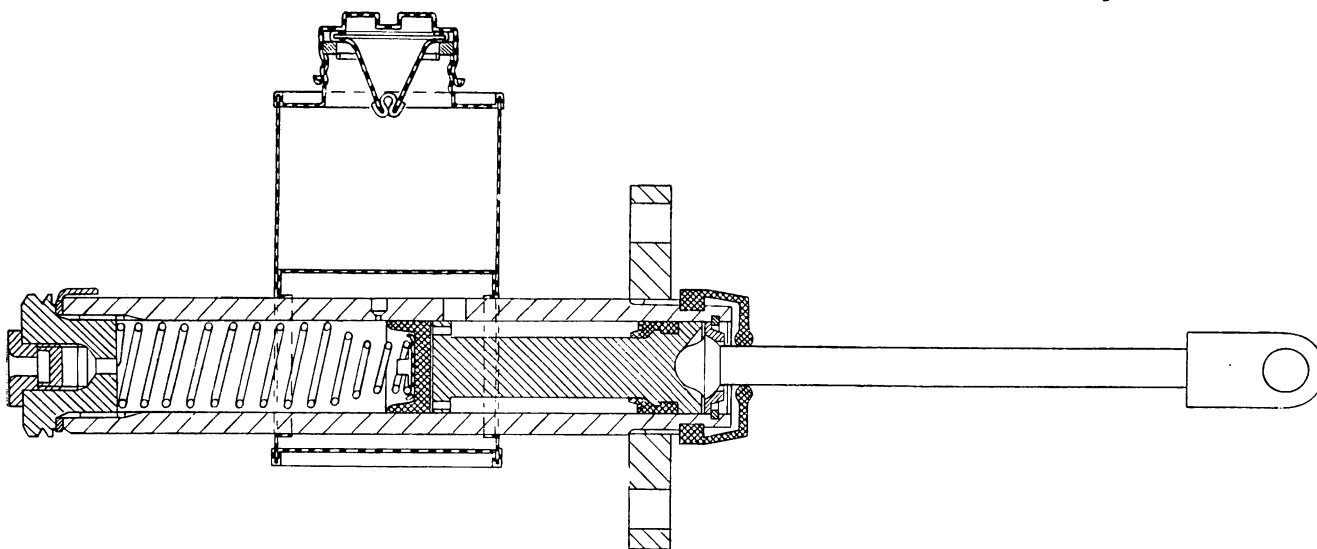


Fig. EE.1

A sectional view of the clutch master cylinder

Insert the return spring, largest-diameter coils first, into the barrel. Make sure the spring seat is positioned on the small-diameter end of the spring.

Insert the master cup, lip first, taking care not to damage or turn back the lip, and press it down onto the spring seat.

Insert the piston, taking care not to damage or turn back the lip of the secondary cup.

Push the piston down the bore and replace the push-rod, retaining circlip, and rubber dust cover.

Test the master cylinder by filling the tank with fluid and pushing the piston down the bore and allowing it to return; after one or two applications fluid should flow from the outlet.

Section EE.8

REMOVING AND REPLACING THE SLAVE CYLINDER

Attach a bleed tube to the nipple on the body of the slave cylinder and open the bleed 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 from the cylinder, remove the two bolts securing the cylinder body to the clutch housing, and remove the clevis pin to release the cylinder push-rod from the clutch lever.

Replacement is a reversal of the dismantling procedure, but the system must be bled to expel any air from the fluid lines.

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 operations until clear fluid free from air bubbles is delivered into the container.

Section EE.9

DISMANTLING AND ASSEMBLING THE CLUTCH SLAVE CYLINDER

Clean the exterior of the assembly thoroughly before dismantling. Withdraw the push-rod and remove the rubber dust seal; use only the fingers to displace the seal retaining ring.

The piston, piston cup, cup filler, and the return spring can be removed in that order.

Examine the parts, especially the seal, and renew them if they are worn or damaged; it is usually advisable to renew all rubber parts when rebuilding the cylinder.

Reassembly

Insert the return spring, largest-diameter coils first, into the barrel with the piston cup filler attached to the small-diameter end of the spring.

Replace the piston cup, lip first, taking care not to damage or turn back the lip, and press it down onto the cup filler.

Push the piston down the bore and replace the rubber dust seal, first making sure that the retaining ring is in position on the centre flange of the seal. Secure the seal to the cylinder body with the large steel retaining ring.

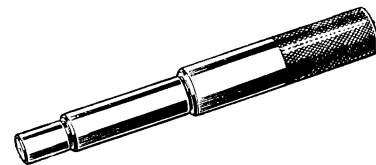
Replace the operating plunger.

Section EE.10

SPECIAL TOOLS

18G279. Clutch Plate Centralizer

This tool is essential 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.



18G279