

Service Instruction Manual

Fourth Issue



SERIES I AND II
and
TRIUMPH "RENOWN" MODELS

CLUTCH SECTION D

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CLUTCH

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CLUTCH

MODEL 9A6 - G.

GENERAL DESCRIPTION (See Fig. 1)

The clutch is of the single dry plate type consisting of a driven plate assembly, a cover assembly and a release bearing assembly.

DRIVEN PLATE ASSEMBLY

This is of the Borglite spring type having a splined hub (21) and a disc adaptor (15) fitted with nine cushion segments (14) which carry two facings (23) attached by rivets (24). The hub flange and the disc adaptor are slotted to carry three drive and three over-drive springs (22) positioned by a retaining plate (16) which is secured to the disc adaptor by stop pins (17). The hub flange is drilled to carry three steel balls (20) positioned by two friction plates (18) located by tabs in holes in the hub flanges. A spacer (19) is fitted between the disc adaptor and one friction plate and another spacer is fitted between the retaining plate and the second friction plate.

RELEASE BEARING ASSEMBLY

The release bearing consists of a graphite bearing (5) shrunk into a bearing cup (6), the cup being located by the operating forks and release bearing retainer springs.

COVER ASSEMBLY

The cover assembly consists of a pressed steel cover (1) and a cast-iron pressure plate (2) loaded by nine thrust springs (nine cream, 120-130 lbs.). Mounted on the pressure plate are three release levers (8) which pivot on floating pins (9) retained by eyebolts (10). Adjustment nuts (12) are screwed on to the eyebolts, which pass through the clutch cover and are secured by staking. Struts (13) are interposed between lugs on the pressure plate and the outer ends of the release levers. Anti-rattle springs (11) are fitted between the release levers and the cover and retainer springs (7) connecting the release lever plate (4) to the release levers.

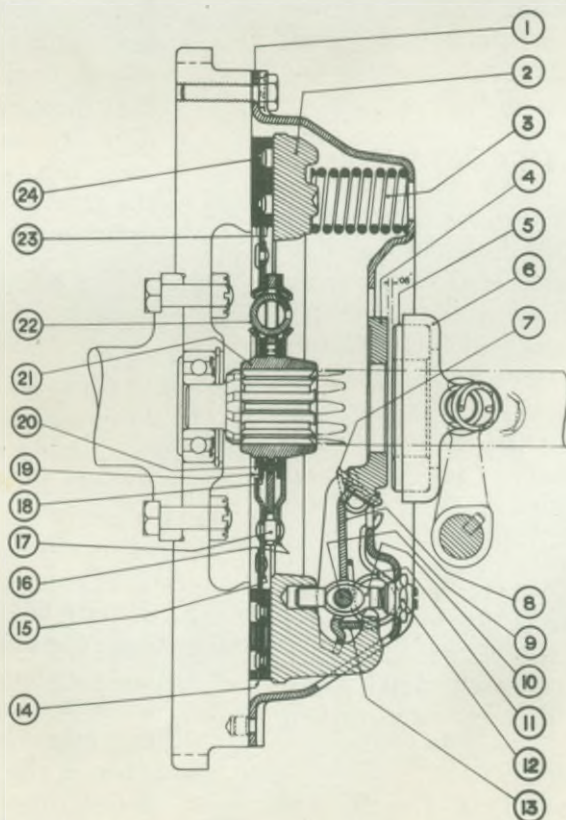


Fig. 1. Sectional view of clutch.

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PEDAL ADJUSTMENT

The only adjustment necessary throughout the life of the driven plate facings is to restore periodically the free movement of the clutch pedal, *i.e.*, movement of the pedal before the release bearing comes in contact with the release levers and commences to withdraw the clutch. To ensure this free movement, a clearance of not less than $\frac{1}{16}$ " must be provided. As the driven plate facings wear, the pressure plate moves closer to the flywheel and the outer ends of the release levers follow.

This causes the inner ends of the release levers to travel further towards the gearbox and decreases the release bearing clearance or free pedal movement.

Adjust the clutch pedal stop until free movement is approximately 1". Press the pedal down and note the distance the release bearing travels after the release bearing clearance has been taken up. To obtain a clean release, the inner ends of the release levers should be pushed towards the flywheel .50". When the inner ends of the release levers have travelled this amount and no more, the clutch pedal should be in contact with the pedal stop. If such is not the case, the stop must be adjusted.

Should excessive pedal movement be made to release the clutch, this leads to close coiling of the thrust springs, after which any pedal pressure exerted only tends to overstress the release gear and internal parts of the clutch.

REMOVAL OF CLUTCH FROM CHASSIS

1. To remove the clutch from the flywheel of an engine, which is fitted in a chassis, it is unnecessary to lift the engine assembly from the frame. The detachment of the clutch can be effected as described below after withdrawing the clutch housing and gearbox backwards, as far as possible, having first removed the propeller shaft to make such backward motion possible. (See "Removal of Gearbox leaving engine in position" on Page 9 of "Gearbox Section.")
2. Slacken the holding screws (2), Fig. 3, a turn at a time by diagonal selection until the thrust spring pressure is relieved. Remove the screws and lift the complete clutch away from the flywheel. Remove the driven plate assembly.

Note: The adjustment nuts (12), Fig. 1, are correctly set and locked when the clutch

is assembled and should not be altered unless the clutch has been dismantled and new parts fitted. Interference with this adjustment will throw the pressure plate out of position and cause the clutch to judder.

DISMANTLING (see Fig. 1)

To dismantle the clutch proceed as follows:—

1. Suitably mark the following parts in such a manner that they can be reassembled in the same relative positions to each other in order to preserve the balance and adjustment: cover (1), pressure plate lugs (2) and the release levers (8).
2. Remove the release lever plate (4) by unhooking it from the retainer springs (7), place the cover assembly under a press with the pressure plate resting on wooden blocks, so arranged that the cover can move downwards when pressure is applied. Place a block of wood across the top of the cover resting on the spring bosses.
3. Compress the cover by means of the ram and, while holding it under compression, remove the adjusting nuts (12) and slowly release the pressure to prevent the thrust springs (3) from flying out. Lift off the cover to expose all parts for inspection.
4. Remove each release lever (8) by holding the lever and eyebolt (10) between fingers and thumb so that the inner end of the lever and the threaded end of the eyebolt are as near together as possible, keeping the release lever pin (9) in position in the lever. Lift the strut (13) over the ridge on the lever and remove the eyebolt from the pressure plate.

ASSEMBLING (see Fig. 1)

Before assembly, thoroughly clean all parts and renew those which show appreciable wear. A very slight smear of grease, such as Duckhams' H.P.2295 or Keenol, should be applied to the following parts during assembly:—

Release lever pins (9), contact faces of struts (13), eyebolt seats in cover (1), drive lugs sides on the pressure plate (2) and the plain end of the eyebolts (10).

1. Assemble the release lever (8), eyebolt (10) and release lever pin (9), 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 (13) in the slots in the pressure plate lug sufficiently to allow the plain end of the eyebolt to be inserted in the hole in the pressure plate (see

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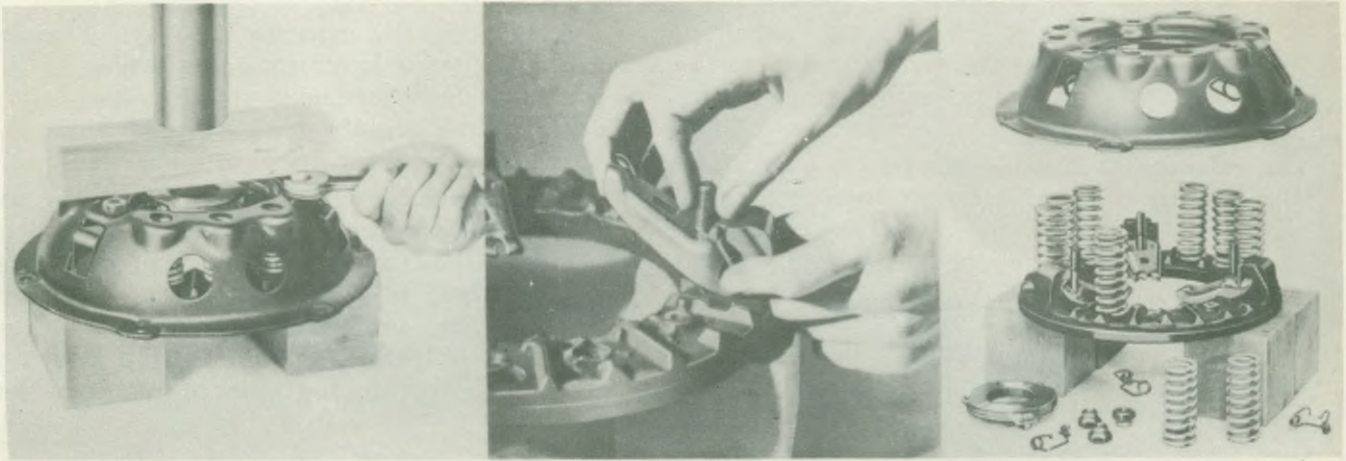


Fig. 2. Dismantling of clutch.

- Fig. 2). Move the strut upwards into the slots in the pressure plate lug and over the ridge on the short end of the lever and drop it into the groove formed in the latter. Fit the remaining release levers in a similar manner.
2. Place the pressure plate on the blocks under the press and arrange the thrust springs (3) in a vertical position on the plate, seating them on the bosses provided (Figs. 1 and 2).
 3. Lay the cover over the assembled parts, ensuring that the anti-rattle springs (11) are in position and that the tops of the springs are directly under the seats in the cover; also that the machined portions of the pressure plate lugs are under the slots in the cover through which they have to pass. Care should be taken that the parts marked before dismantling are in their correct relative positions.
 4. Place the block of wood across the cover, resting it on the spring bosses, and compress the cover by means of the ram, guiding the eyebolts and pressure plate lugs through the holes in the cover.
 5. Screw the adjusting nuts (12) on to the eyebolts (10) and secure by staking. Operate the clutch a few times by means of the ram to ensure that the working parts have settled into their correct positions. Connect the release lever plate (4) to the release levers (8) by means of the retainer springs (7).

Note: If new parts have been fitted, which would affect the adjustment, the release levers should be set by using the Borg and Beck Gauge Plate, Part No. CG.192.

REFITTING THE CLUTCH

To reassemble the clutch on the flywheel proceed as follows:—

1. Assemble the driven plate in the flywheel, taking care to place the larger chamfered spline end of the driven plate hub towards the gearbox or rear of the vehicle. Centralize the driven plate by means of a dummy shaft which fits the splined bore of the driven plate hub and the pilot bearing in the flywheel.
2. Fit the cover assembly to the flywheel by means of the holding screws (2), Fig. 3, tightening them a turn at a time by diagonal selection. Do not remove the dummy shaft until all the screws are securely tightened. Remove the dummy shaft.

ADJUSTING THE RELEASE LEVERS

(See Fig. 3)

Satisfactory operation of the clutch is dependent on accurate adjustment of the release levers (5). This must be carried out before the clutch has been assembled to the flywheel and should only be necessary if new parts have been fitted. The maximum difference allowed in the height of the release levers is .015". To obtain this accuracy use the special gauge plate in conjunction with the flywheel which may be mounted on the engine or lying on the bench, whichever is the more convenient.

1. Place the gauge plate (4) centrally in the flywheel in place of the driven plate assembly.
2. Fit the cover assembly to the flywheel by tightening the holding screws (2) a turn at a time by diagonal selection, until fully secured.
3. Place a straight edge across the gauge plate boss and the top of one release lever (5) and adjust the release lever, if necessary, by turning the eyebolt nut (6) until the top of the lever is exactly level with the top of the

CLUTCH

gauge plate boss. Adjust the remaining levers in a similar manner.

The setting should be within .005" if carefully carried out.

4. Slacken the holding screws (2) a turn at a time by diagonal selection, then remove the holding screws and the clutch from the flywheel. Remove the gauge plate.

REFACING THE DRIVEN PLATE

When removing old worn facings, the rivets must be drilled, not punched out. Each rivet attaches one facing only. Using a $\frac{5}{32}$ " dia. drill, inserted through the clearance hole in the opposite facing, drill out the rivets. After removing the facings, thoroughly examine the segments for cracks; if cracks are found a new driven plate assembly should be used.

1. Place one facing in position with the countersunk holes coinciding with the ones located on the crown or longer side of each segment.
2. Insert the rivets with their heads in the countersunk holes of the facing, and roll the shanks over securely against the segments. If a rolling tool is not available a blunt ended punch will prove satisfactory.
3. Secure the opposite facing in a similar manner, matching the countersunk holes with the remaining holes in the segments. Rivet heads should always face outwards.
4. Place the assembly on a mandrel between lathe centres and spin for run-out; if more than .015", prise over as necessary.

The possibility of further use of the friction facings of the Borg and Beck clutches is sometimes raised, because they have a polished appearance after considerable service. It is natural to assume that a rough surface will give a higher frictional value against slipping, but this is not correct.

Since the introduction of non-metallic facings of the moulded asbestos type, in service, a polished surface is a common experience, but it must not be confused with a glazed surface which is sometimes encountered due to conditions discussed below.

CONDITION OF CLUTCH FACINGS

The ideal smooth or polished condition will provide a normal contact, but a glazed surface may be due to a film or a condition introduced, which entirely alters the frictional value of the facings. These two conditions might be simply illustrated by the comparison between a polished wood, and a varnished surface. In the former

the contact is still made by the original material, whereas in the latter instance, a film of dried varnish is interposed between the contact surfaces.

The following notes are issued with a view to giving useful information on this subject:—

1. After the clutch has been in use for some little time, under perfect conditions (*i.e.*, with the clutch facings working on true and polished or ground surfaces of correct material, without the presence of oil, and with only that amount of slip which the clutch provides for under normal conditions)

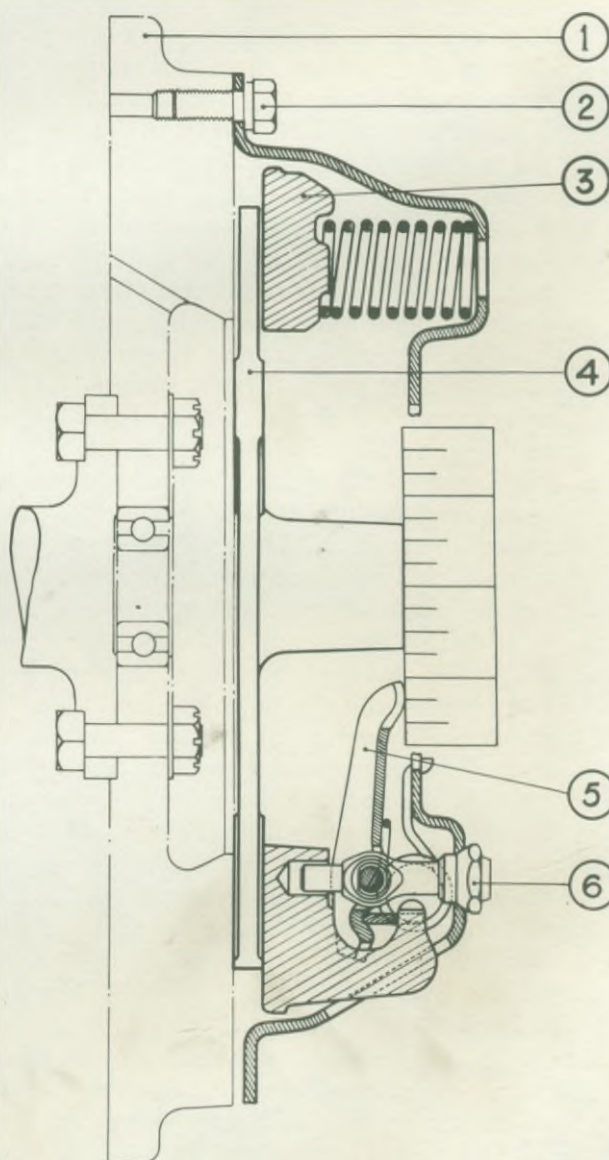


Fig. 3. Adjusting release levers.

CLUTCH

then the surface of the facing assumes a high polish, through which the grain of the material can be clearly seen. This polished facing is of a mid-brown colour and is then in a perfect condition, the coefficient of friction and the capacity for transmitting power being up to Borg and Beck standard.

Note : The appearance of wound or woven type facings is slightly different but similar in character.

2. Should oil in small quantities gain access to the clutch in such a manner as to come in contact with the facings it will burn off, due to the heat generated by slip which occurs under normal starting conditions. The burning off of this small amount of lubricant has the effect of gradually darkening the facings, but, provided the polish on the facings remains such that the grain of the material can be clearly distinguished, it has very little effect on clutch performance.
3. Should increased quantities of oil or grease obtain access to the facings, one or two conditions, or a combination of the two, may arise, depending upon the nature of oil, etc.
 - (a) The oil may burn off and leave on the

surface facings a carbon deposit which assumes a high glaze and causes slip. This is a very definite, though very thin deposit, and in general it hides the grain of the material.

- (b) The oil may partially burn and leave a resinous deposit on the facings, which frequently produces a fierce clutch, and may also cause a "spinning" clutch due to a tendency of the facings to adhere to the flywheel or pressure plate face.
 - (c) There may be a combination of (a) and (b) conditions, which is likely to produce a judder during clutch engagement.
4. Still greater quantities of oil produce a black soaked appearance of the facings, and the effect may be slip, fierceness, or judder in engagement, etc., according to the conditions.

If the conditions under (3) or (4) are experienced, the clutch driven plate should be replaced by one fitted with new facings, the cause of the presence of the oil removed and the clutch and flywheel face thoroughly cleaned.

FAULTS AND THEIR REMEDY

SYMPTOM	CAUSE	REMEDY
1. Drag or Spin.	(a) Oil or grease on the driven plate facings.	Fit new facings.
	(b) Misalignment between the engine and splined clutch shaft.	Check over and correct the alignment.
	(c) Improper pedal adjustment not allowing full movement to release bearing.	Correct pedal adjustment.
	(d) Warped or damaged pressure plate or clutch cover.	Renew defective part.
	(e) Driven plate hub binding on splined shaft.	Clean up splines and lubricate with small quantity of high melting point grease such as Duckham's Keenol.
	(f) Pilot bearing or bushing of clutch shaft binding.	Renew or lubricate pilot bearing.
	(g) Distorted driven plate due to the weight of the gearbox being allowed to hang in clutch plate during erection.	Fit new driven plate assembly using a jack to take the overhanging weight of the gearbox.
	(h) Broken facings of driven plate.	Fit new facings.
	(j) Dirt or foreign matter in the clutch.	Dismantle clutch from flywheel and clean the unit, see that all working parts are free. Caution —Never use petrol or paraffin for cleaning out clutch.
	2. Fierceness or Snatch.	(a) Oil or grease on driven plate facings.
(b) Misalignment.		Check over and correct the alignment.
(c) Binding of clutch pedal mechanism.		Free and lubricate journals.
(d) Worn out driven plate facings.		New facings required.
3. Slip.	(a) Oil or grease on the driven plate facings.	Fit new facings and eliminate cause of foreign presence.
	(b) Binding of clutch pedal mechanism.	Free and lubricate journals.
	(c) Improper pedal adjustment indicated by lack of the requisite 1" free or unloaded foot pedal movement. Incorrectly replaced floorboards preventing complete rearward movement of the pedal.	Correct pedal adjustment and/or clearances.

FAULTS AND THEIR REMEDY—Continued

SYMPTON	CAUSE	REMEDY
4. Judder.	<ul style="list-style-type: none"> (a) Oil, grease or foreign matter on the driven plate facings. (b) Misalignment. (c) Pressure plate out of parallel with flywheel face in excess of the permissible tolerance. (d) Contact area of friction facings not evenly distributed. Note that friction facing surface will not show 100% contact until the clutch has been in use for some time, but the contact area actually showing should be evenly distributed round the friction facings. (e) Bent splined shaft or buckled driven plate. (f) Unstable or ineffective rubber engine mountings. (g) Chassis to engine tie bar out of adjustment. 	<p>Fit new facings and eliminate cause of foreign presence.</p> <p>Check over and correct alignment.</p> <p>Re-adjust levers in plane and, if necessary, fit new eyebolts.</p> <p>This may be due to distortion, if so fit new driven plate assembly.</p> <p>Fit new shaft or driven plate assembly.</p> <p>Replace and ensure elimination of endwise movement of power unit.</p> <p>Correct to ensure that power unit is held against endwise travel.</p>
5. Rattle.	<ul style="list-style-type: none"> (a) Damaged driven plate, <i>i.e.</i>, broken springs, etc. (b) Worn parts in release mechanism. (c) Excessive back lash in transmission. (d) Wear in transmission bearings. (e) Bent or worn splined shaft. (f) Graphite release bearing loose on throw-out fork. 	<p>Fit new parts as necessary.</p>
6. Tick or Knock.	<ul style="list-style-type: none"> (a) Hub splines badly worn due to misalignment. (b) Worn pilot bearing. 	<p>Check and correct alignment, then fit new driven plate.</p> <p>Pilot bearing should be renewed.</p>
7. Fracture of Driven Plate.	<ul style="list-style-type: none"> (a) Misalignment distorts the plate and causes it to break or tear round the hub or at segment necks in the case of Borglite type. (b) If the gearbox during assembly be allowed to hang with the shaft in the hub, the driven plate may be distorted, leading to drag, metal fatigue and breakage. 	<p>Check and correct alignment and introduce new driven plate.</p> <p>Fit new driven plate assembly and ensure satisfactory reassembly.</p>
8. Abnormal Facing Wear.	<p>Usually produced by overloading and by the excessive slip starting associated with overloading.</p>	<p>In the hands of the operator.</p>

"VANGUARD"—SERIES II

CLUTCH

SUPPLEMENT

CLUTCH SLAVE CYLINDER

Descriptive and maintenance notes.

A convenient way to expel the internal parts of the unit, after removal from the vehicle, is to blank off one connection and to apply a low air pressure to the other.

The rubber cup (1) and the boot (2) must be in good condition or replaced by new ones.

Bleeding the slave cylinder.

"Bleeding," or expelling air, is not a routine operation and should only be necessary when some portion of the hydraulic equipment has been disconnected or when fluid has been drained off.

1. Fill the supply tank with fluid and keep at least a quarter full throughout the operation, otherwise air will be drawn in, necessitating a fresh start.
2. Attach a rubber tube to the bleeder screw and allow the free end to be submerged in a little Lockheed brake fluid in a clean glass jar. Open the bleeder screw one complete turn.
3. Depress the clutch pedal slowly and whilst fluid issues and before the pedal reaches the end of its stroke, tighten the bleeder screw securely.
4. Repeat (3) until air bubbles cease to appear from the tube in the jar.

MASTER CYLINDER ASSEMBLY

See instructions and Fig. 1 in Brakes Section Supplement.

FITTING TWIN TYPE MASTER CYLINDER

When fitting this type of Master Cylinder to a car, it is important to provide .030" clearance between each push rod and the piston which operates it. This clearance is necessary to allow

each piston to return to its stop on its cylinder and thus prevent the possibility of the lip of the main cup covering the by-pass port.

If such a condition were to arise, the excess fluid drawn into the cylinder during the return stroke of the piston will find no outlet and pressure will build up in the system, causing all brakes to drag or remain "on" and the clutch to "slip".

The correct pedal adjustment is set when the vehicle is assembled and should never need alteration unless it is necessary to replace the cylinder or brake assembly.

FITTING SLAVE CYLINDER ASSEMBLY

This assembly is connected to the appropriate cylinder in the Master Cylinder Assembly (see details above) by a pipe through which fluid is fed.

The assembly is mounted on a plate which is attached to two of the bottom clutch housing bolts on the left of the engine unit. A steady bracket also is supplied which is attached to an engine sump bolt.

When attaching the push rod to the clutch pedal, it is particularly important that a certain amount of lost movement exists between the rod and the piston. This is necessary to provide clearance at the release bearing.

The lost movement required in the push rod is .075", which provides the necessary $\frac{1}{16}$ " clearance at the release bearing face.

The method to adopt when setting this push rod is to force the piston to the bottom of the cylinder with the push rod and, with any lost movement in the operating lever on the cross shaft used up, screw the fork end on the rod until the hole in this is aligned with the top (three holes exist) hole in the operating lever. Screw the clevis pin into fork end leaving the locknut loose on the rod.

The adjuster nut should next be screwed back until a gap of $.075''$ exists between this nut and the fork end. The rod and nut should then be screwed into the fork end, thus using up the $.075''$ and providing that amount of lost movement. The locknut should then be tightened and a final check of lost movement carried out with a short rule resting on the slave cylinder attachment flange, at right angles to this face, with its graduations aligned with the shoulder of the push rod fork end.

A convenient method of measuring the $.075''$ on the rod is to make up a fork gauge that thickness which can be inserted between the nut and fork end.

As the clutch plates wear, the inner ends of the toggle levers will move towards the release bearing, thus reducing the clearance at this point. It will consequently be necessary to restore this clearance by suitably shortening the push rod as lost movement is decreased.

It is most important that the lost movement in the clutch should be maintained. The combined free movement in the master and slave cylinders will give an approximate lost movement of $\frac{7}{8}''$ at the pedal pad. Owing to the light pedal pressure required with this system, it is difficult to estimate the free movement at the pedal pad and this is best checked by measuring the $.075''$ on the Slave Cylinder push rod as already described.

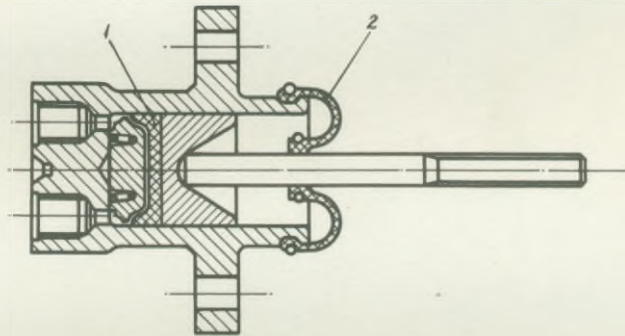


Fig. 1. Slave cylinder assembly