SECTION G

THE CLUTCH UNIT

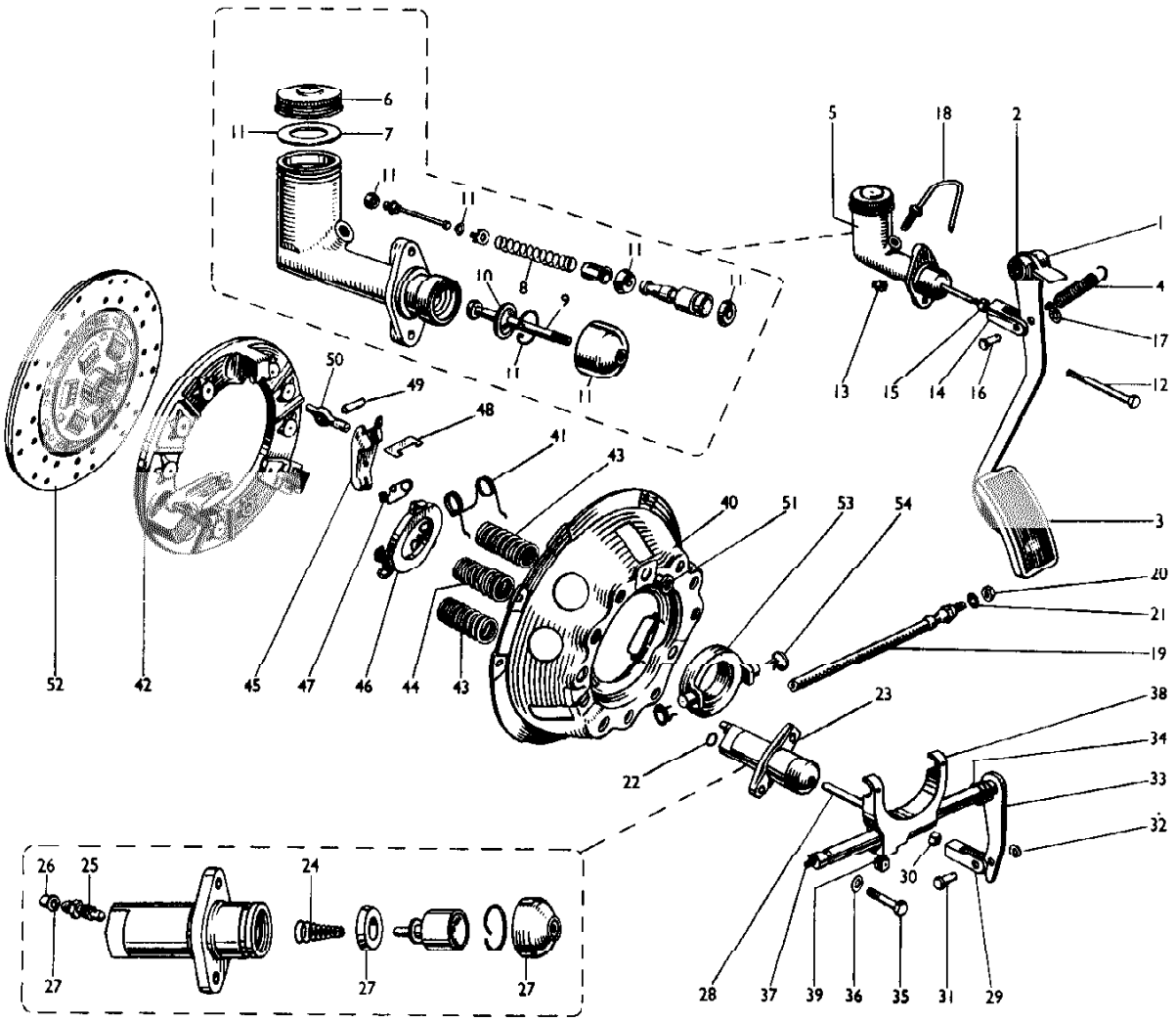

Figure G1.
Exploded view of clutch layout.

1. Clutch operating pedal.
2. Clutch pedal bush bearing.
3. Clutch pedal rubber.
4. Clutch pedal return spring.
5. Clutch master cylinder.
6. Filler cap.
7. Filler cap sealing washer.
8. Plunger return spring.
9. Push rod.
10. Push rod retaining washer.
11. Components contained in master cylinder service kit.
12. Master cylinder attachment bolt.
13. Nyloc nut.
14. Master cylinder push rod fork end.
15. Fork end lock nut.
16. Pedal clevis pin.
17. Plain washer.
18. Bundy pipe assembly, master cylinder to flexible pipe.
19. Flexible hose, Bundy tubing to flexible hose.
20. Flexible hose attachment nut.
21. Shakeproof washer.
22. Sealing washer.
23. Clutch slave cylinder assembly.
24. Slave cylinder piston return spring.
25. Bleed screw.
26. Bleed screw dust cap.
27. Components contained in slave cylinder service kit.
28. Slave cylinder push rod.
29. Slave cylinder push rod fork end.
30. Forkend locknut.
31. Actuating lever clevis pin.
32. Plain washer.
33. Clutch actuating lever and operating shaft.
34. Clutch operating shaft anti rattle spring.
35. Shaft locating bolt.
36. Spring washer.
37. Grease nipple.
38. Release bearing forked lever.
39. Taper ended bolt.

40. Clutch cover assembly
41. Anti rattle springs.
42. Pressure plate.
43.) Thrust springs.
44.)
45. Release lever.
46. Release lever plate.
48. Release lever strut.
49. Floating release lever pin.
50. Release lever eye bolt.
51. Release lever adjusting nut.
52. Clutch driven plate assembly.
53. Carbon release bearing and cup.
54. Release bearing retainer spring clips.

DATA

Make	Borg & Beck.
Model	9A 6G
Size	9" 228.6 mm.
Type	Single dry plate, Belleville washer friction centre.
Operation	Hydraulic, single master cylinder with integral reservoir.
Release bearing	Carbon type.
Hydraulic fluid	Wakefield - Girling Crimson Brake and Clutch Fluid.

DESCRIPTION Fig. G1

The clutch unit is of the Borg & Beck single dry plate type and consists of the following components:-

(i) A spring cushioned driven plate assembly.

(ii) A spring loaded pressure plate and cover assembly.

(iii) A release bearing.

(iv) A hydraulic operating system.

It is operated by pressure on a foot pedal, situated to the L.H. side of the driver's foot well, and is unaffected by relative foot pedal to engine movement.

The clutch master cylinder, which connects with the foot pedal by a push-rod, is inside the engine compartment attached to the rear engine bulkhead. It connects with the clutch slave cylinder mounted on the R.H. side of the clutch bell housing, situated between the engine and gear-box units, by a length of Bundy tubing and a synthetic rubber flexible hose. The operation is hydrostatic and there is no perceptible clearance between the clutch release bearing and release plate.

The hydraulic pressure generated in the clutch master cylinder by the application of the foot pedal is transmitted to the slave cylinder without loss. This effort is transferred from the slave cylinder through a push rod and lever welded on the R.H. side of the clutch actuating shaft to the forked lever and clutch release bearing mounted thereon applying pressure to the release plate in the centre of the cover assembly.

The pressure on the release plate is transferred through three levers to the top side of the spring loaded pressure plate and moves the latter against its spring loading away from the clutch driven plate and engine flywheel; allowing the latter to rotate without having its power transferred to the gearbox as the grip of the pressure plate on the clutch driven plate has now been released.

When the pressure is released from the foot pedal, it will be returned to its stop in the mounting bracket by its return spring and withdraw the push rod from inside the master cylinder.

The clutch pressure plate, in the cover plate assembly mounted on the flywheel face also returns to its rest position due to its return or pressure springs gripping the clutch driven plate assembly between itself and the engine flywheel, thus transmitting the rotation of the latter to the gearbox. The clutch release bearing, clutch actuating shaft, and hydraulic system is returned to its rest position by the influence of the pressure plate springs together with the internal springs of the slave and master cylinders.

MAINTENANCE

FIRST 500 MILES (805 kms)

Check the hydraulic fluid level in the clutch master cylinder reservoir.

Lubricate the clutch actuating shaft bearings, the clutch foot pedal, master and slave cylinder push rod fork end assemblies.

EVERY 5,000 MILES (8,050 kms).

Check the hydraulic fluid level in the clutch master cylinder reservoir.

Lubricate the clutch actuating shaft bearings, the clutch foot pedal, master and slave cylinder push rod fork end assemblies.

EVERY 10,000 MILES (16,100 kms)

Check the free travel of clutch foot pedal.

LUBRICATION OF THE CLUTCH OPERATING LINKAGE

The lubrication of the clutch actuating shaft is effected by a hand grease gun through two nipples, one each end of the clutch shaft. The operation is effected from beneath the car and the use of a hand grease gun will prevent over-lubrication.

The lubrication of the foot pedal, master and slave cylinder fork end assemblies is effected by an oil can.

THE HYDRAULIC SYSTEM

THE HYDRAULIC FLUID

CASTROL/GIRLING CRIMSON BRAKE AND CLUTCH FLUID

Always use Castrol/Girling Crimson Brake and Clutch Fluid, NEVER use anything else, since this fluid has been specially prepared and is unaffected by high temperature or freezing.

When assembling the internal components to either the slave or master cylinders apply a liberal coating of clean hydraulic fluid to all components.

NOTE When "topping up" the hydraulic fluid always do so from a fresh supply.

FILLING THE HYDRAULIC RESERVOIR

FLUID LEVEL 0.250" (6.350 mm) FROM TOP OF FILLER ORIFICE

The hydraulic fluid reservoir is integral with the clutch master cylinder and the level of the hydraulic fluid in the reservoir must be to that specified and always topped up from a fresh supply. When the hydraulic system is being bled of air it is a wise plan to fill above this level.

Clean the area around the top of the fluid reservoir and remove the filler cap; replenish the reservoir to the specified level. Ensure the good condition of the seal inside the cap and

the breather holes are unobstructed; then replace the cap.

BLEEDING THE HYDRAULIC SYSTEM OF AIR Fig. G2.

Bleeding the hydraulic system of air is only necessary when a portion has been detached as when fitting new hydraulic components, or when the fluid level has been allowed to fall so low that air has been admitted, due to neglected maintenance, into the hydraulic system.

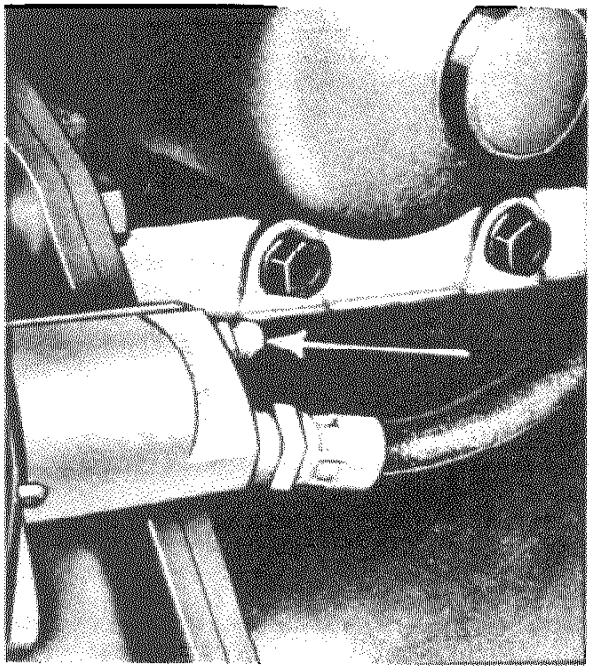

Figure G2.
Location of clutch slave cylinder bleed screw.

The clutch hydraulic system has no resistor valve incorporated in its design and so it will be necessary to tighten the slave cylinder bleed screw before the foot pedal reaches the full limit of its travel. Failure to observe this instruction will result in the hydraulic fluid being pumped in and out of the slave cylinder without expelling air.

Fill the clutch master cylinder reservoir as detailed above, attach a length of flexible tubing to the slave cylinder bleed screw and allow the second end to be submerged in a little hydraulic fluid contained in a glass jar and slacken the bleed screw. Having the assistance of another person depress the clutch foot pedal slowly; before it reaches the limit of its travel, tighten the bleed screw and allow the pedal to return to its rest position unassisted. Repeat this sequence until the hydraulic fluid emitting from the submerged end of the flexible tube is free from air bubbles. Constantly check the level of hydraulic fluid in the clutch master cylinder reservoir and top up frequently from a fresh supply.

THE FOOT PEDAL ASSEMBLY

DESCRIPTION

The clutch foot pedal is incorporated in the same bracket assembly as the brake pedal, but it is possible to remove it and leave the brake pedal in position. The pedal assembly is attached to the top of the driver's foot well by four nuts and bolts, to the rear face of the rear engine bulkhead by two nuts and bolts and the four mounting nuts and bolts of the clutch and brake master cylinder.

The push rods of the master cylinders are attached to the pedal levers by clevis pins and the clearance between master cylinder piston and push rod is set and maintained by the setting of the pedal stop bolts.

REMOVAL AND REPLACEMENT
PEDAL ASSEMBLY

1. MASTER CYLINDERS

Detach the master cylinder push rods from the pedal levers by withdrawing the clevis pins. Remove the four nuts and bolts securing the two master cylinders to the rear engine bulkhead and the pedal bracket assembly but do not dislodge the master cylinders.

2. PEDAL ASSEMBLY

Remove the pedal assembly from the top and front of the driver's foot well by withdrawing four and two nuts and bolts respectively.

3. REPLACEMENT

The replacement of the pedal assembly is the reversal of the removal sequence but particular attention must be given to the following point.

That the free movement of the clutch and brake pedals is set as detailed below and for the brake as detailed in THE BRAKING SYSTEM, SECTION N.

DISMANTLING AND ASSEMBLING
FOOT PEDAL ASSEMBLY

1. DISMANTLING

Detach the two pedal return springs from between the pedal levers and the pedal brackets. Identify and remove the two pedal levers from inside the pedal brackets by ejecting the split pin from the pedal shaft and the pedal shaft from the bracket exercising care to control the run of the brass spacer washer between the two pedals. Eject or remove the pedal bush bearing or rubber pedal pad when they are well worn.

2. ASSEMBLING

The assembling of the foot pedal assembly is the reversal of the removal sequence, but particular attention must be given to the following points:-

(i) That in the instance of L.H. drive cars the clutch operating pedal is the straight pedal and the brake operating pedal is the pedal having the offset to the R.H. side.

(ii) That in the instance of R.H. drive cars the clutch operating pedal is the pedal having the offset to the L.H. side and the brake operating pedal has no offset.

CHECKING FREE TRAVEL OF CLUTCH FOOT PEDAL Fig. G3.

MASTER CYLINDER PUSH ROD CLEARANCE 0.030"-0.065" (0.762-1.651 mm).

CLUTCH FOOT PEDAL FREE TRAVEL NOT MORE THAN 0.250" (6.350 mm).

It is important to provide the specified clearance between the clutch master cylinder push rod and its piston. This becomes the aforementioned free travel of the clutch foot pedal measured at the pedal pad. This clearance is to ensure that the clutch master cylinder piston will return to its stop in the outward end of the cylinder bore and adjustment can be effected by resetting the foot pedal stop bolt situated on the foot pedal mounting bracket inside the cockpit.

Press the clutch foot pedal down lightly until the push rod just contacts the master cylinder piston and utilizing a ruler, measure the distance between this point and the fully released position of the pedal pad. Slacken off the stop bolt locknut and adjust the clearance by:

(i) turning the stop bolt clockwise to increase the clearance.

(ii) turning the stop bolt anti-clockwise to decrease the clearance and then tighten the locknut.

When the clearance is correct it will be possible to rotate the push rod clevis pin freely in its bore.

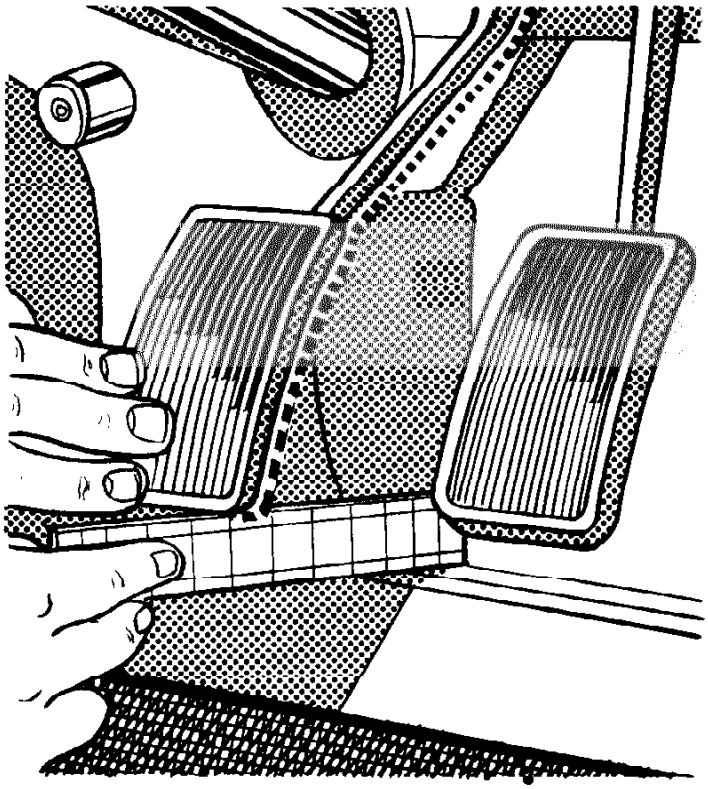

Figure G3
Measuring free travel of clutch pedal pad.

THE CLUTCH MASTER CYLINDER

DESCRIPTION

The clutch master cylinder is of the centre valve type and has a fluid reservoir integrally cast in its front end. The reservoir is connected to the main bore of the cylinder by a central drilling and the face is machined to seat the small centre valve seal. The inner assembly is made up, front to rear, of the centre valve seal, valve stem, spring washer, valve spacer, plunger return spring, spring thimble, plunger seal, plunger. These components are followed by the clutch pedal push rod, dished washer and circlip, the open end of the cylinder bore is closed by a rubber dust cover through which the push rod passes. The closed end of the clutch master cylinder is known as the front end and the open end of the cylinder bore known as the rear or back end.

OPERATION

When pressure is applied to the clutch foot pedal the plunger moves down the cylinder bore and the centre valve seal closes the port from the fluid reservoir. As the plunger continues to move down the cylinder bore, the hydraulic fluid is forced through the rigid and flexible pipes to the clutch slave cylinder attached to the R.H. side of the gearbox.

When the pressure is removed from the clutch foot pedal, the returning fluid together with the plunger return spring moves the plunger in the opposite direction to its stop at the rear end of the cylinder bore. At the end of this return stroke, the spring washer allows the centre valve seal to lift from its seat at the front end of the cylinder bore, thus allowing a free flow of hydraulic fluid between the reservoir and clutch hydraulic system.

DISMANTLING AND ASSEMBLING CLUTCH MASTER CYLINDER Fig. G4.

1. DISMANTLING

Ease back the rubber dust cover from the rear end of the clutch master cylinder, remove the push rod assembly by withdrawing the circlip positioned in the open end of the cylinder bore,

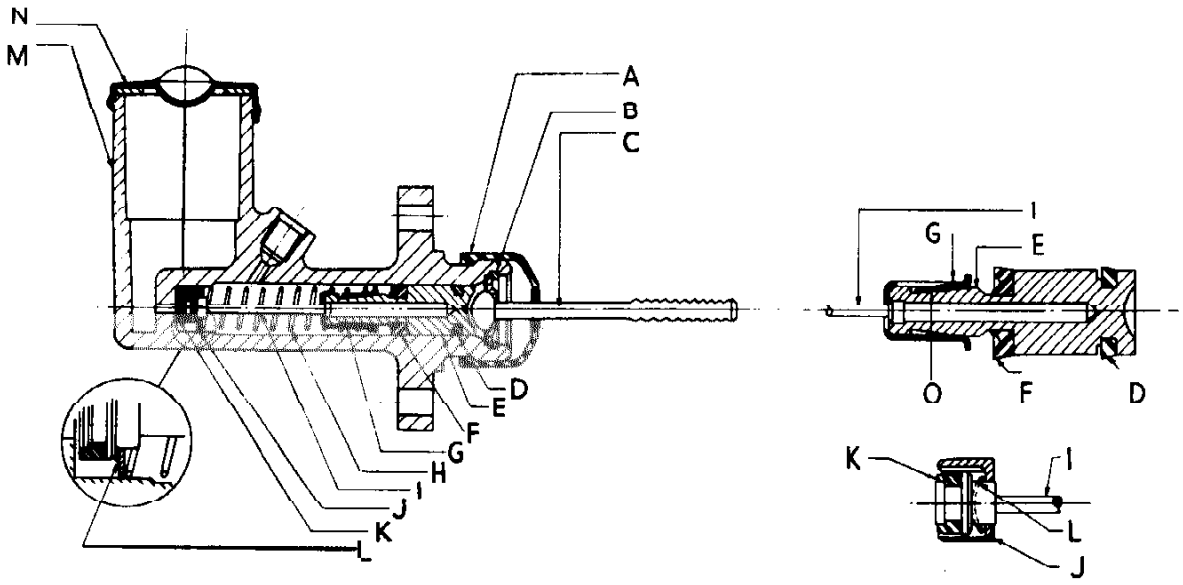

Figure G4.
Cross Section through Clutch Master Cylinder.

A. Rubber dust cover.
B. Circlip.
C. Push rod and washer.
D. Plunger back end seal. (Not fitted in later types).
E. Plunger.
F. Plunger seal.
G. Spring thimble.
H. Plunger return spring.
I. Valve stem.
J. Valve spacer.
K. Centre valve seal.
L. Spring washer.
M. Clutch master cylinder body.
N. Clutch master cylinder cap.
O. Leaf of spring thimble.

and remove the internal components by applying a low pressure air line into the fluid reservoir. Separate the plunger with its seals from the remainder of the assembly by lifting the leaf in the spring thimble over the shoulder of the plunger, ease the back end seal from the body of the plunger and the plunger seal from the shouldered end of the plunger. Compress the plunger return spring allowing the valve stem to slide through the elongated hole in the spring thimble, thus releasing the tension of the plunger return spring. Detach the valve spacer from the valve stem exercising care to control the run of the spring washer located inside the valve spacer. Remove the centre valve seal from the front of the valve stem head.

2. ASSEMBLING

The assembling of the clutch master cylinder is the reversal of the dismantling sequence, but particular attention must be given to the following points:-

(i) That the internal components are all assembled with a liberal coating of Castrol Girling Crimson Brake Fluid.

(ii) That the centre valve seal is fitted so that its flat face is adjacent to the valve stem head.

(iii) That the spring washer is located, domed face first, against the rear face of the valve stem head and held in this position with the legs of the valve spacer which point toward the valve stem head.

(iv) That the front end of the plunger return spring is located centrally on the rear face of the valve spacer.

(v) That the plunger seal is fitted over the reduced end of the plunger so its flat face contacts the main body of the plunger.

(vi) That the back seal is fitted to the main body of the plunger so its lip is toward the reduced end of the plunger.

(vii) That the reduced end of the plunger is fed into the rear end of the spring thimble and is retained by depressing the leaf of the spring thimble.

THE PIPE LINE

DESCRIPTION

The clutch pipe line on the R.H. drive cars consist of two types of pipes, a rigid small bore Bundy piping and a flexible hose. The rigid pipe connects with the outlet port in the top of the clutch master cylinder and passes down the wing valance, to which it is attached by a clip to a welded bracket on the top face of the R.H. chassis side member and connects with one end of the flexible hose which is attached to the bracket. The flexible hose then passes rearward to the bottom connection of the clutch slave cylinder mounted in its bracket on the side face of the clutch bell housing.

On the L.H. drive cars the pipe line is similar. The rigid pipe is longer and passes along the rear engine bulkhead, to which it is attached by clips, before passing downward to the welded bracket holding the flexible hose.

REMOVAL AND REPLACEMENT
CLUTCH RIGID PIPE

1. REMOVAL

Drain the clutch hydraulic system and detach the rigid pipe from the clutch master cylinder and the forward end of the flexible hose by removing the two union nuts. Withdraw the rigid pipe from inside the engine compartment by detaching the clips from the wing valance and in the instance of L.H. drive cars from the rear engine bulkhead.

2. REPLACEMENT

The replacement of the rigid pipe assembly is the reversal of the removal sequence, but particular attention must be given to the following points:-

(i) That the union nuts are tightened only sufficiently to effect an oil seal and not until they bottom.

(ii) That when tightening the bottom union hold the hexagon of the flexible hose adjacent to the bracket with a second spanner.

REMOVAL AND REPLACEMENT
FLEXIBLE HOSE

To ensure the long life of the flexible hose it must be realised that its whole length must be turned while removing it from the inlet port of the slave cylinder. This can only be effected by first, detaching the flexible hose from the Bundy tubing and then the slave cylinder.

1. REMOVAL

Hold the hexagon on the flexible hose adjacent to the body bracket with one spanner and detach the Bundy tubing union nut from the flexible hose on the second side of the bracket with a second spanner. While still holding the flexible hose with the spanner, remove the securing nut on the second side of the bracket with a second spanner. Identify the bore of the slave cylinder to which the flexible hose is fitted and unscrew the hose from the slave cylinder.

2. REPLACEMENT

The replacement of the flexible hose is the reversal of the removal sequence but particular attention must be given to the following points:

(i) That the flexible hose is attached to the bottom bore of the slave cylinder.

(ii) That the run of the flexible hose is clear of any chafing by setting it clear of any obstructions or moving components by turning the hexagon on the second end of the flexible hose and holding it in that position until the securing nut and Bundy tubing unions are fully tightened.

THE SLAVE CYLINDER

DESCRIPTION

The clutch slave cylinder consists of an alloy body having two threaded connections, one for the incoming hydraulic fluid and the second is closed by the bleed screw; a piston and seal assembly, spring and the outward travel of these components are limited by a circlip fitted in the mouth of the cylinder bore. The open end of the slave cylinder is closed by a rubber cover which has a central aperture for the push rod assembly.

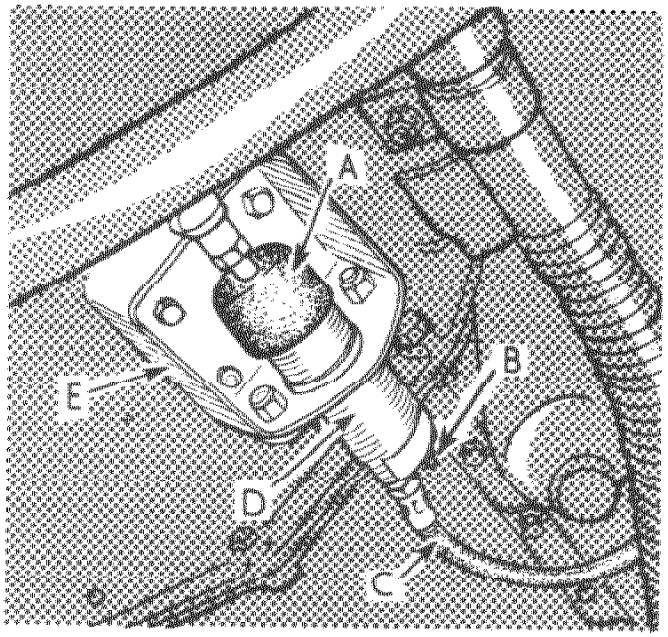

Figure G5

Clutch slave cylinder and mounting bracket.
A. Rubber boot on end of slave cylinder.
B. Bleed screw.
C. Flexible hose of hydraulic system.
D. Clutch slave cylinder
E. Slave cylinder mounting bracket.

REMOVAL AND REPLACEMENT
CLUTCH SLAVE CYLINDER AND BRACKET Fig. G5.

To facilitate gearbox removal, the clutch slave cylinder bracket is attached to a spot facing on the R.H. side of the clutch bell housing; this bracket with the clutch slave cylinder attached can be removed without disturbing any hydraulic connections. As the hydraulic system remains fully operative, despite this detachment. it is suggested that the clutch foot pedal is tied in its upper position so that it cannot be inadvertantly depressed.

DISMANTLING AND ASSEMBLING
CLUTCH SLAVE CYLINDER Fig. G6.

1. DISMANTLING

Withdraw the push rod from the rubber covered end of the slave cylinder and remove the

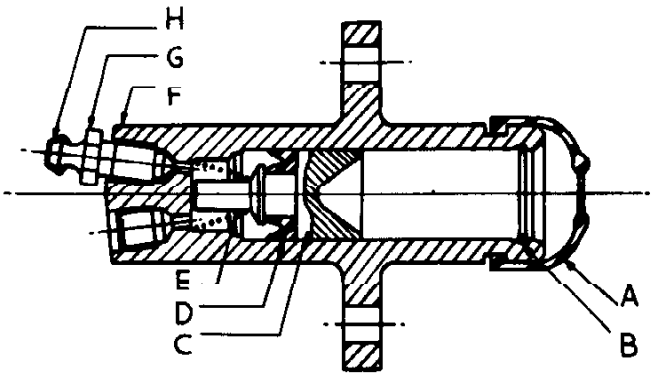

Figure G6.
Cross section through clutch slave cylinder.

A. Rubber cover.
B. Piston stop circlip.
C. Piston.
D. Rubber seal.
E. Conical shaped spring.
F. Slave cylinder body.
G. Bleed screw.
H. Rubber cap.

rubber cover. Prise out the piston stop circlip and utilizing a low pressure air line in the inlet port eject the piston, seal and spring.

2. ASSEMBLING

The assembling of the clutch slave cylinder is the reversal of the dismantling sequence but particular attention must be given to the following points:-

(i) That the rubber seal is fitted to the stem of the piston so that their two flat surfaces make contact.

(ii) That the small end of the coil spring locates the stem of the piston.

(iii) That the piston stop circlip is located positively in its groove at the mouth of the slave cylinder.

THE CLUTCH UNIT

REMOVAL AND REPLACEMENT
CLUTCH UNIT Fig. G7.

1. GEARBOX UNIT

Remove the gearbox unit from the rear of the engine unit as detailed in THE GEARBOX UNIT, SECTION H.

2. CLUTCH COVER AND DRIVEN PLATE ASSEMBLY

Identify and remove the clutch cover and driven plate assemblies from the rear face of the engine flywheel by withdrawing six bolts. It must be realised that these bolts are slackened off only a turn at a time by diagonal selection to release the loading of the cover plate thrust springs progressively.

3. REPLACEMENT

The replacement of the clutch cover and driven plate assemblies is the reversal of the removal sequence, but particular attention must be given to the following points:-

(i) That the clutch driven plate assembly is offered up to the clutch cover assembly with the larger portion of the splined hub located towards the gearbox.

(ii) That the clutch cover and driven plate assemblies are offered up to the rear face of the flywheel in accordance with the identification marks.

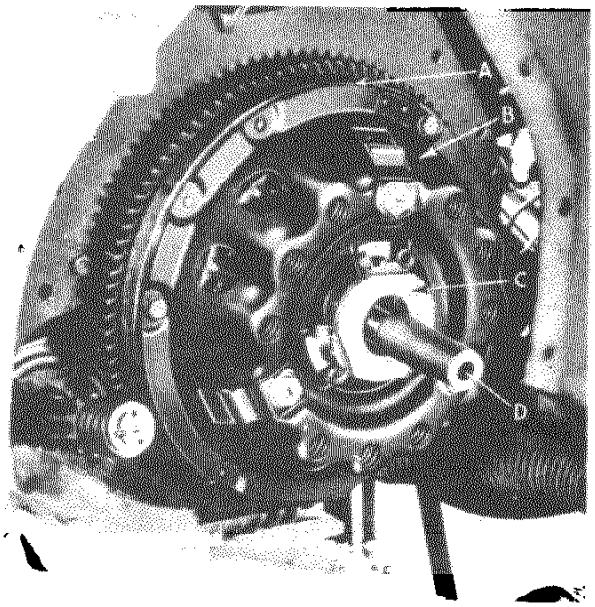

Figure G7.
Clutch unit mounted on flywheel with clutch driven plate centralising mandrel in position.

A. Flywheel.
B. Cover assembly.
C. Release plate.
D. Clutch driven plate centralising mandrel.

(iii) That a mandrel fabricated to the dimensions specified is inserted inside the splined hub of the clutch driven plate assembly and into the bearing situated in the rear end of the crankshaft to centralise the clutch driven plate assembly while the clutch cover plate assembly attachment details are tightened.

THE CLUTCH DRIVEN PLATE CENTRALISING MANDREL

To facilitate the fitting of the gearbox unit, the splined hub of the clutch driven plate assembly must be centrally positioned to allow the free passage of the gearbox primary shaft through the splined hub into the front primary shaft bearing positioned in the rear end of the crankshaft.

The mandrel, fabricated to the specified dimensions, should remain in the clutch driven plate assembly with complete freedom while the clutch cover plate assembly is being attached to the rear face of the flywheel.

	ENGLISH	METRIC
Diameter of spigot for front primary shaft bearing	0.7486" 0.7475"	10.0118 mm. 18.9865 mm.
Length of spigot for front primary shaft bearing	1.750" 1.745"	44.45 mm. 44.323 mm.
Diameter of spigot for clutch driven plate splined hub	1.247" 1.245"	31.6738 mm. 31.6230 mm.
Length of spigot for clutch driven plate splined hub	2.000" 1.995"	50.800 mm. 50.673 mm.
Overall length of centraliser mandrel.	6.000"	152.4 mm.

THE CLUTCH COVER ASSEMBLY

DESCRIPTION Fig. G8

The clutch cover assembly consists of a pressed steel cover and a cast iron pressure plate loaded by nine thrust springs, three release levers, anti-rattle springs and a release plate.

Mounted beneath the lugs, cast in one face of the pressure plate, are three release levers with struts interposed between their hidden end and the underside of the pressure plate lugs. These release levers pivot on floating pins fitted transversely in the eye bolts. Nuts which facilitate the adjustment of the release lever height are screwed on the ends of the eye bolts protruding through the outer face of the cover pressing and after the adjustment has been effected they are staked over to the eye bolts for security. The release plate is located in the slotted ends of the three release levers by small lugs machined in the hidden face and is retained in position with springs.

The release bearing which contacts the release plate and actuates the clutch is mounted in the top end of a forked lever by two spring clips and consists of a graphite impregnated carbon ring shrunk into a cast iron cup. This type of bearing requires no lubrication.

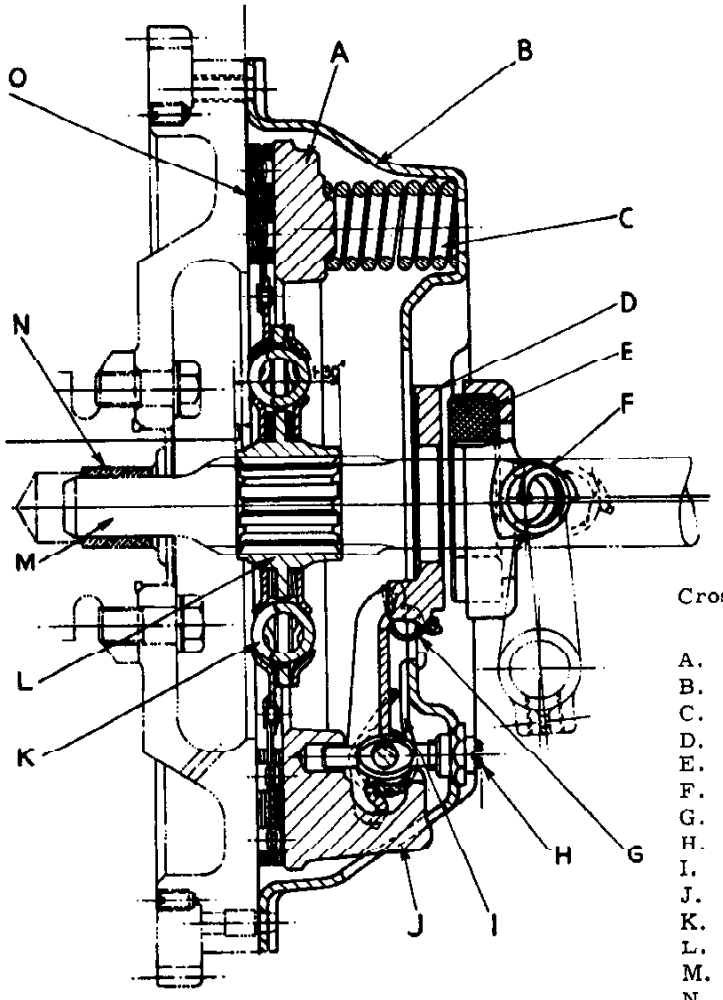

Figure G8

Cross section through flywheel and clutch unit.

A. Pressure plate.
B. Cover pressing.
C. Thrust spring.
D. Release plate.
E. Carbon thrust bearing.
F. Release bearing locating springs.
G. Release plate retaining springs.
H. Adjusting nut.
I. Anti rattle spring.
J. Lug of pressure plate.
K. Clutch driven plate cushioning spring.
L. Hub of clutch driven plate.
M. Gearbox primary shaft.
N. Rear crankshaft bearing.

DISMANTLING AND ASSEMBLING CLUTCH COVER PLATE ASSEMBLY Fig. G9.

The use of the Churchill Clutch Assembly and Dismantling Fixture No. 99A will be required to dismantle the clutch cover plate assembly. The Daimler Company Limited together with the clutch manufacturer recommends its use and the following procedure adopted.

1. DISMANTLING Fig. G10.

Identify the following components relative to one another so that on assembly the unit will retain its balance.

(i) Cover pressing
(ii) Lugs on the pressure plate.

(iii) **Release levers.**

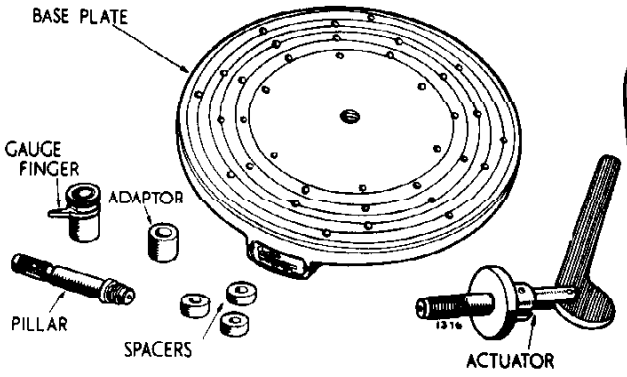

Figure G9

Churchill Clutch Fixture No. 99A

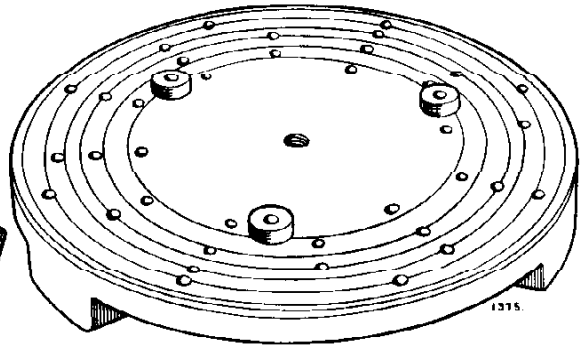

Figure G10

Spacers positioned on Churchill base plate.

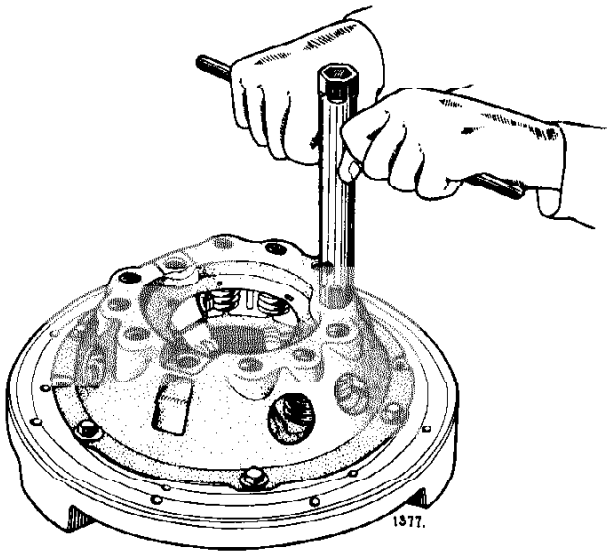

Figure G11
Removing adjusting screws.

Select the No. 3 spacers, positioning them on the base plate of Churchill Fixture indicated as "D" and follow with the cover plate assembly so that the release lever bosses on the pressure plate are above the spacers and the holes in the rim of the cover pressing align with the ring of tappings in the base plate below. Fit the actuator lever into the centre base plate tapping, press down the lever so gripping the cover plate assembly to the base plate; secure with six bolts and remove the actuator lever. Remove the release plate from the tips of the three release levers by detaching the three springs.

Withdraw the three adjusting nuts protruding through the top of the cover pressing; considerable torque will be necessary to overcome the staking. Remove the cover pressing from the top of the thrust springs and pressure plate by withdrawing the six cover pressing securing bolts by diagonal selection to release the load of the thrust springs evenly. Collect the nine thrust springs from the pressure plate and the three anti-rattle springs from the cover pressing, lift the inner ends of each release lever upward and disengage each strut in turn. Grip the lip of the release levers and eye bolts in turn and remove from the pressure plate, withdraw the eyebolts from the release levers and the pins from the eye bolts.

Select the No. 3 spacers, positioning them on the base plate of the Churchill Fixture 99A indicated as "D" and follow with the cover plate assembly so that the release lever bosses on the pressure plate are above the spacers and the holes in the rim of the cover pressing align with the ring of tappings in the base plate below. Fit the actuator lever into the centre base plate tapping,

press down the lever so gripping the cover plate assembly to the base plate; secure with six bolts and remove the actuator lever. Remove the release plate from the tips of the three release levers by detaching the three springs.

Withdraw the three adjusting nuts protruding through the top of the cover pressing; considerable torque will be necessary to overcome the staking. Remove the cover pressing from the top of the thrust springs and pressure plate by withdrawing the six cover pressing securing bolts by diagonal selection to release the load of the thrust springs evenly.

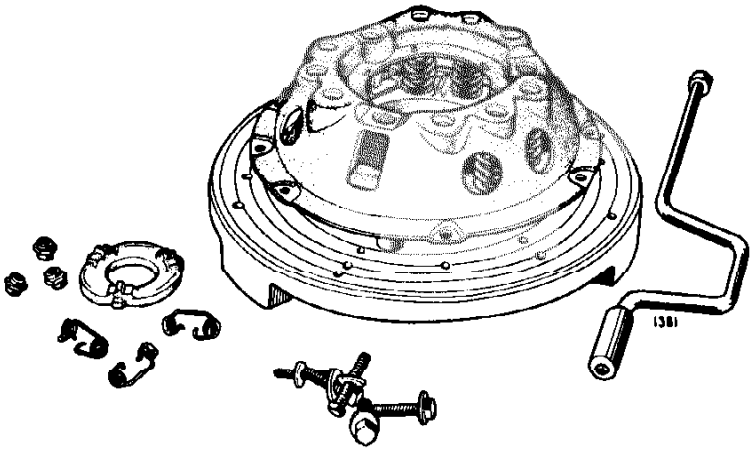

Figure G12.
Clutch cover assembly with load of thrust springs removed.

Collect the nine thrust springs from the pressure plate and the three anti-rattle springs from the cover pressing, lift the inner ends of each release lever upward and disengage each strut in turn. Grip the lip of the release levers and eye bolts in turn and remove from the pressure plate, withdraw the eye bolts from the release levers and the pins from the eye bolts.

2. ASSEMBLING

The assembling of the cover plate assembly is the reversal of the dismantling sequence, but particular attention must be given to the following points:-

(i) That the pressure plate thrust springs are positioned on the pressure plate.

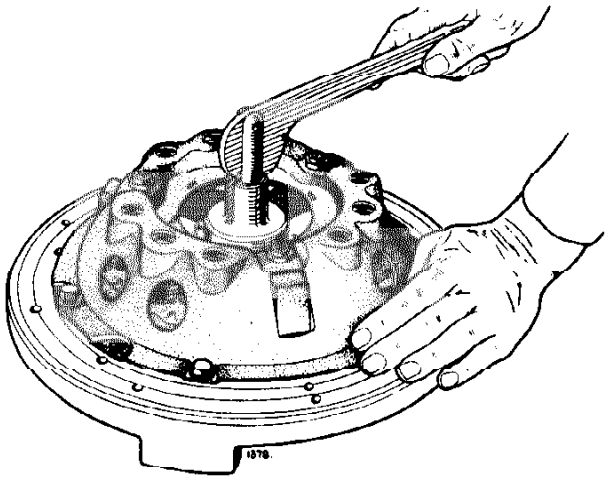

Figure G13.
Actuating the handle to settle the internal components.

(ii) That a smear of Lockheed Expander lubricant or Duckham's Keenol K.O.12 is applied to the frictional surfaces of the release lever pins and eye bolt seatings in the cover pressing, the sides of the pressure plate drive lugs and the plain end of the eye bolts.

(iii) That all components are replaced relative to their identification markings to ensure that the cover assembly remains in balance.

(iv) That the three adjusting nuts are fitted to the eye bolts so their faces are flush with the protruding threaded ends of the eye bolts and after the actuator lever has been fitted to the centre base plate tapping it is "pumped" up and down ten or more times to settle the internal components and then removed.

(v) That the height of the release levers is set and detailed on page G14.

SETTING THE RELEASE LEVER HEIGHT CHURCHILL FIXTURE No. 99A

THIS ADJUSTMENT IS OF VITAL IMPORTANCE TO SMOOTH CLUTCH OPERATION.

The cover plate assembly is fitted to the base plate and the release plate removed as detailed on page G11. Utilizing the actuator lever fitted in the centre tapping of the base plate, actuate the cover plate ten or more times and then remove the actuator.

Fit the gauge finger post to the centre tapping of the base plate, followed by the No. 7 adaptor, recessed side downward, and the gauge finger. Swing the gauge finger round while keeping it in contact with the adaptor and observe its relationship with the tips of the release levers.

When the release lever tip is level with the tip of the gauge finger, the height of the release lever is correct.

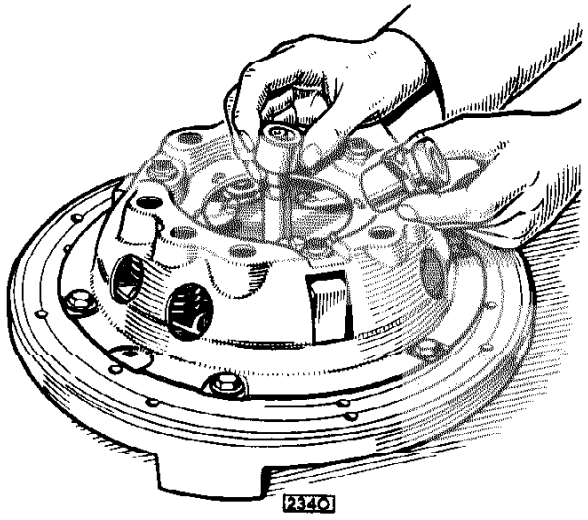

Figure G14
Fitting the adaptor and gauge finger to pillar.

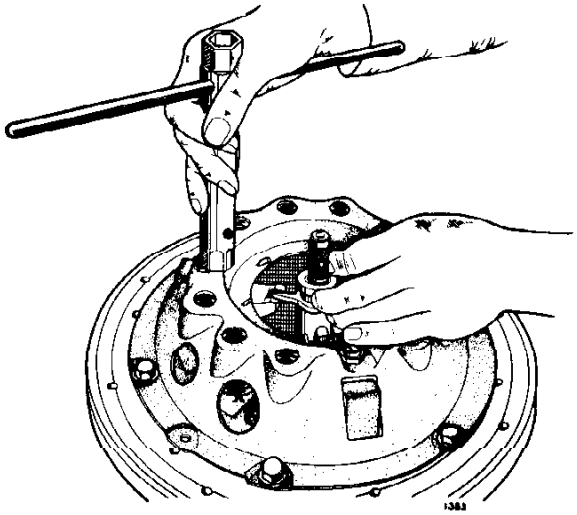

Figure G15
Adjusting height of release levers.

When the release lever tip is below the level of the gauge finger, the height is too little and the adjuster nut must be tightened.

When the release lever tip is above the level of the gauge finger, the height is too great and the adjuster nut must be slackened.

It must be realised that when the cover plate assembly has just been removed from a car for adjustment only, considerable torque will be required to overcome the "staking" of the adjuster nuts.

When the adjustment has been effected the gauge finger, adaptor and post must be exchanged for the actuator lever which must be used ten or more times and then a check made to ensure that the adjustment is perfectly satisfactory. The adjusting nuts are then "staked" into the cuts in the eye bolt shanks.

THE CLUTCH DRIVEN PLATE

DESCRIPTION

The clutch driven plate assembly is of the "Belleville" Washer type having a splined hub and disc adaptor fitted with nine cushioned segments that carries the two clutch facings attached by rivets. The flange of the splined hub and disc adaptor are slotted to carry six damper springs positioned by a retaining plate, which is secured to the disc adaptor by the stop pins.

The purpose of the "Belleville" Washer is to create a load on a friction disc assembled between the splined hub and the disc adaptor in order to give a controlled rate of recovery for the damper springs.

CONDITION OF CLUTCH FACING

The serviceability of a clutch driven plate is often questioned because of the polished condition of the friction surfaces as it is a popular belief that a rougher surface would offer more resistance to slipping.

However, this polished surface must not be confused with a glazed surface caused by burnt off oil which results in altering the friction values of the clutch facings. These conditions are comparable with polished or varnished wood; in the first instance contact is still made with the original material but in the second instance contact is made with the varnish or glaze.

When the clutch driven plate has been in service some considerable time under perfect condition, with the clutch facings working on a true polished or ground surface of the correct material with only the amount of slip which the clutch provides during normal working conditions, the facings will adopt a high polish through which the grain of the material will clearly be seen. This polish is of a mild colour and is then in perfect condition with the coefficient of friction and the capacity for transmitting power up to a very high standard.

If small quantities of oil come into contact with the clutch facings it will burn off due to the heat generated under normal starting conditions. The burning off has the effect of darkening the clutch facings but providing the grain of the material is still clearly distinguished very little change in clutch performance will be determined.

However, if the quantities of escaping oil increase, one or two conditions, or a combination of both may arise, depending on the nature of the oil.

(i) The oil can burn off and leave a carbon deposit producing a high glaze, cause slip and hide the grain of the clutch facing.

(ii) The oil is only partly burnt off and leaves a resinous deposit producing a fierce clutch action, and may, in some instances, cause a "spinning" clutch, due to a tendency for the facings to adhere to the flywheel or pressure plate surface.

Greater quantities of oil produce a black soaked appearance resulting in slip, fierceness or judder in engagement according to quantity and working conditions.

Should any of these conditions be experienced the cause of the oil presence must be removed, the clutch cover assembly thoroughly cleaned and a replacement driven plate assembly fitted.

THE CLUTCH ACTUATING SHAFT

DESCRIPTION

The clutch actuating shaft having a lever welded at one end is mounted on two bush bearings, one in each side of the clutch bell housing and retained in position by a locating bolt at its L.H. end; the shank of this bolt locates an annular groove in the diameter of the shaft. Between the lever and the R.H. side of the clutch bell housing, a spring steadies the shaft and prevents any rattle.

Mounted on the actuating shaft inside the clutch bell housing is a forked shaped lever with the clutch release bearing attached thereto by two spring clips, one at each side.

The actuating shaft is lubricated by two grease nipples, one fitted at each end.

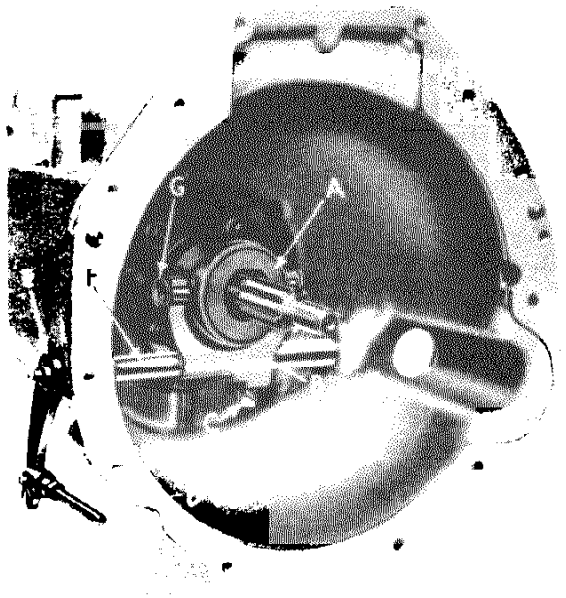

Figure G15
The clutch actuating shaft and carbon release bearing.

A. Carbon release bearing.
B. Bearing forked lever.
C. Tapered pin, locked by wire.
D. Slave cylinder push rod.
E. Clutch actuating lever.
F. Clutch actuating shaft.
G. Clutch release bearing retaining spring.

REMOVAL AND REPLACEMENT
CLUTCH RELEASE BEARING, CLUTCH ACTUATING SHAFT AND BUSH BEARINGS Fig. G16.

1. GEARBOX UNIT

Remove the gearbox unit from the rear end of the engine unit as detailed in THE GEARBOX UNIT, SECTION H.

2. CLUTCH RELEASE BEARING

Remove the clutch release bearing from the forked lever in the clutch bell housing by removing the two locating springs, one at each side.

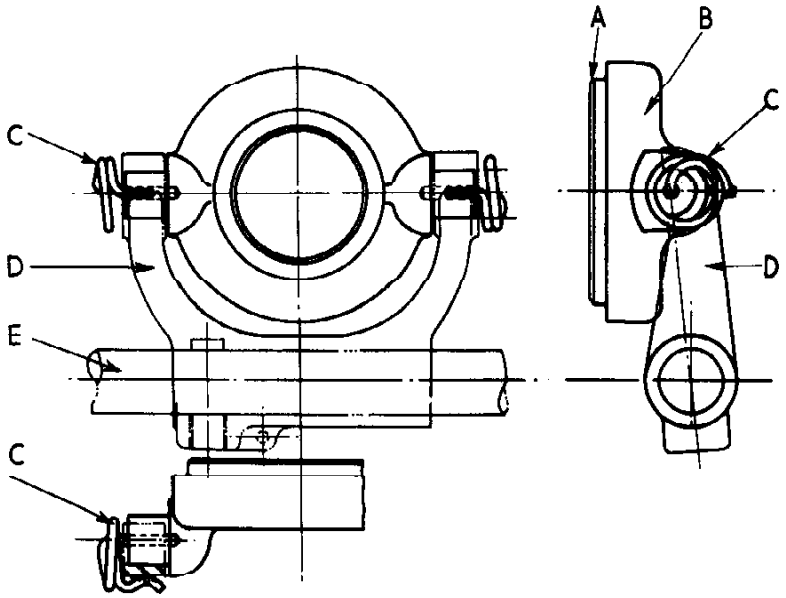

Figure G17
Cross section through clutch release bearing.

A. Carbon ring.
B. Carbon ring casing.
C. Locating spring.
D. Forked lever.
E. Clutch actuating shaft.

3. CLUTCH ACTUATING SHAFT

Detach the release bearing lever from the clutch actuating shaft by cutting the locking wire and withdrawing the taper ended bolt. Withdraw the clutch actuating shaft from the R.H. side

of the clutch bell housing, collecting the release bearing lever from inside the bell housing, withdrawing the bolt at the L.H. side. Remove the anti-rattle spring from the shaft and withdraw the two grease nipples one at each end.

4. CLUTCH ACTUATING SHAFT BUSH BEARING

Eject the two clutch actuating shaft bush bearings, one from each side of the clutch bell housing when they are well worn.

5. REPLACEMENT

The replacement of the clutch release bearing, clutch actuating fork and bush bearings is the reversal of the removal sequence, but particular attention must be given to the following points:-

(i) That the L.H. clutch actuating shaft bush bearing is pressed in so its groove aligns with the bore of the locating screw in the clutch bell housing and the outside edge of the R.H. bush bearing is flush with the outside face of the clutch bell housing.

(ii) That the anti-rattle spring is fitted on the clutch actuating shaft and fed into the clutch bell housing from the R.H. side and the release bearing fed onto the actuating shaft inside the bell housing so its attachment bolt is toward the L.H. side of the clutch bell housing.

(iii) That the clutch release bearing is fitted to the top of the forked lever with two spring clips, one each side, so the centre and straight shank of the spring clip locates the spigot of the release bearing and the outside and curved shank of the spring clip locates the dimpled surface in the rear face of release bearing lever tips.

REMOVAL AND REPLACEMENT, FLYWHEEL

1. CLUTCH UNIT

Remove the clutch unit from the engine flywheel as detailed on page G9.

2. FLYWHEEL

Remove the flywheel from the rear end of the crankshaft by withdrawing six bolts.

3. REPLACEMENT

The replacement of the flywheel is the reversal of the removal sequence, but particular attention must be given to the following point:

That before the flywheel attachment bolt locking plates are turned up, the run-out at 5.000" (127.000 mm.) radius does not exceed 0.003" (0.076 mm.)

THE REAR CRANKSHAFT BUSH BEARINGS

DESCRIPTION Fig. G18

The rear crankshaft bush bearing is known by its position rather than by its true purpose. It supports the splined end of the gearbox primary shaft on which is mounted the clutch driven plate assembly, and so steadies the front end of the shaft and keeps the clutch driven plate parallel between its two contacting faces, the flywheel itself and the surface of the pressure plate included in the clutch cover plate assembly.

When the clutch unit is removed from the flywheel this bearing must be examined for wear and a replacement fitted if necessary. Failure to observe this instruction can lead to inefficient clutch operation resulting in undue wear of the clutch unit and make gear selection difficult.

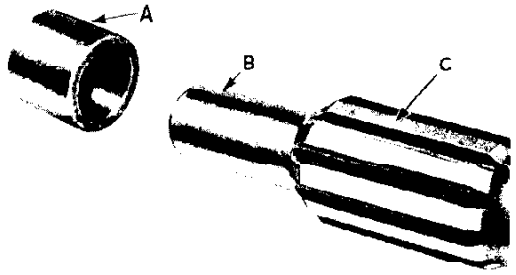

Figure G18
The gearbox primary shaft and rear crankshaft bearing.

A. Rear crankshaft bearing.
B. Spigotted end of gearbox primary shaft.
C. Splines for hub of clutch driven plate.

REMOVAL AND REPLACEMENT
CRANKSHAFT BEARING

1. GEARBOX AND CLUTCH UNIT

Remove the gearbox and clutch unit from the rear of the engine unit as detailed on page G9.

2. REAR CRANKSHAFT BUSH BEARING

Withdraw the bush bearing from the rear end of the crankshaft. This can be effected by determining the internal diameter of the bush bearing and turning a rod on a lathe so its end makes a very tight fit inside the bush bearing. The cavity inside the end of the crankshaft containing the bush bearing is packed with grease to just over half full, the turned rod inserted and the bush bearing "hydrauliced" out with hammer blows.

3. REPLACEMENT

The replacement of the crankshaft bush bearing is the reversal of the removal sequence but particular attention must be given to the following point:-

That the crankshaft bush bearing is first fitted to the end of the gearbox primary shaft to check its fit, and then fitted to the rear end of the crankshaft utilizing the rear crankshaft bearing fitting tool fabricated locally as detailed below, so that it bottoms in the crankshaft.

REAR CRANKSHAFT BEARING EJECTING AND FITTING TOOLS

	English	Metric
BUSH BEARING EJECTING TOOL		
Diameter of ejecting spigot	Largest possible	
Length of ejecting spigot	1.000"	25.400 mm.
Overall length of tool	4.000"	101.600 mm.
BUSH BEARING FITTING TOOL		
Diameter of fitting spigot	0.7485" 0.7475"	19.0119 mm. 18.9865 mm.
Length of fitting spigot	0.8750"	22.2250 mm.
Blinding radius		
Overall diameter of tool shank	1.000"	25.400 mm.
Overall length of tool	4.000"	101.600 mm.
Bore in rear end of crankshaft	1.0006" 0.9994"	25.4152 mm. 25.3847 mm.

Diameter of crankshaft bush bearing	1.0006" 0.9994"	25.4152 mm. 25.3847 mm.
Depth of bore in rear end of crankshaft	1.0500"	26.6700 mm.
Length of crankshaft bush bearing	0.8750"	22.2250 mm.
Bore of crankshaft bush bearing	0.7505" 0.7495"	19.0627 mm. 19.0373 mm.
Diameter of spigot on front end of primary shaft	0.7485" 0.7475"	19.0119 mm. 18.9865 mm.