SECTION E

THE CLUTCH

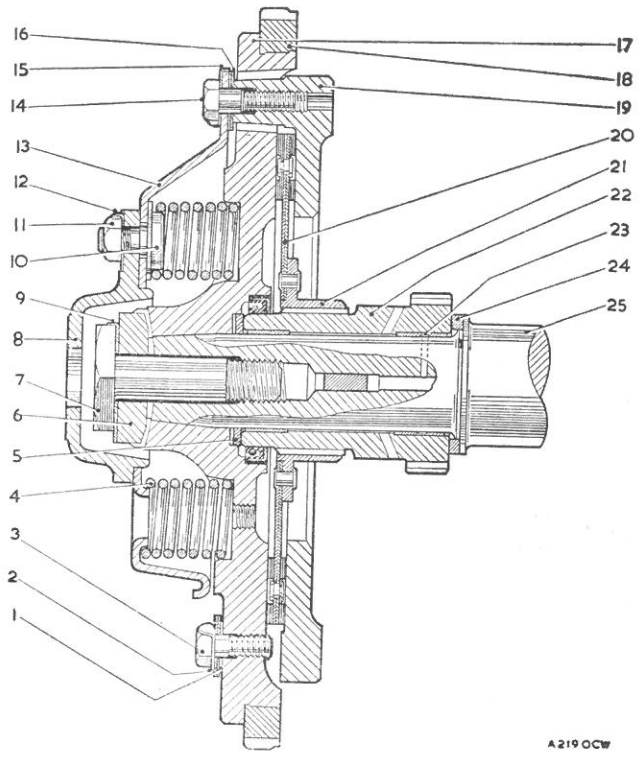


Fig. E.1

A section through the clutch assembly

1. Driving strap.
2. Lock washer.
3. Driving pin.
4. Pressure spring.
5. Circlip.
6. Keyed washer.
7. Flywheel screw.
8. Thrust plate.
9. Locking washer.
10. Pressure spring guides.
11. Guide nut.
12. Lock washer.
13. Pressure spring housing.
14. Driving pin.
15. Lock washer.
16. Driving strap.
17. Flywheel.
18. Starter ring.
19. Pressure plate.
20. Driven plate.
21. Driven plate hub.
22. Crankshaft primary gear.
23. Primary gear bearing.
24. Thrust washer.
25. Crankshaft.

GENERAL DESCRIPTION

The clutch is of the single-plate dry-disc type with the pressure and driven plates operating on the inner face of the flywheel. Lugs on the pressure plate extend through the flywheel and are secured to driving straps on the outer face of the flywheel and the pressure spring housing by three shouldered set pins. The driving straps are themselves anchored to the flywheel by three more shouldered set pins.

A single diaphragm spring or six coil springs assembled in the housing pull the housing and pressure plate rearwards to keep the friction lining of the driven plate in contact with the inner face of the flywheel

The clutch is disengaged by moving the operating lever pressure pad forward against the thrust plate of the pressure spring housing; further pressure will then force the pressure plate away from the driven plate, which will in turn release itself from the flywheel and be permitted to revolve freely on the crankshaft.

Section E.1

CLUTCH

(Coil pressure spring type)

Remove the flywheel and clutch assembly as detailed in Section A.17.

NOTE.—The clutch to flywheel driving straps are laminated, i.e. two straps fitted to each of the three driving points. Mark all components, including both the straps and driving pins, before dismantling in order to identify them for refitting in their original positions.

Dismantling

The clutch pressure springs must be compressed in order that the spring housing can be released from the flywheel. Insert the three screws of Service tool set 18G 304 M through the three recessed holes in the spring housing, screw them fully into the flywheel, and screw the three nuts down finger tight against the housing. Tighten the nuts a turn at a time until the complete load is taken from the three flywheel to clutch driving pins. Remove the pins and gradually release the spring housing from compression until the springs are fully extended.

Examine and renew any worn parts, taking particular note of the pressure spring housing for signs of elongation in the driving pin holes. Should the shoulders of the driving pins show signs of wear or ridging, they must be replaced as a set of three and not as individual pins; this also applies to the three driving straps on the flywheel.

Reassembling

NOTE.—When reassembling, fit the pressure plate to the clutch cover with the marks 'A' adjacent to each other and fit the clutch unit to the flywheel as shown in Fig. E.2.

The remainder is a reversal of the dismantling sequence, with particular attention given to the following points.

Use Service tool 18G 571 to make certain that the hub of the driven plate is centralized with the hub of the flywheel, and remains so during assembly. Insert the tool

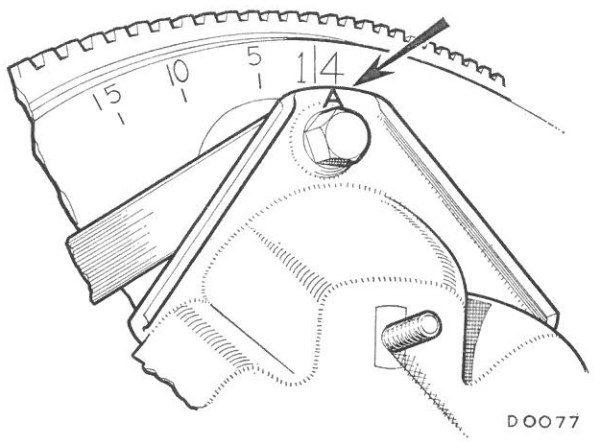


Fig. E.2

The fitted position of the clutch cover, with the balance mark 'A' adjacent the 1/4 *timing mark on the flywheel*

through the hub of the driven plate and the bore of the flywheel, and secure it in position with the screw and retaining plate against the flywheel boss.

Ensure that the pressure spring locating guides are seating correctly in their slots in the spring housing. Make certain that all the components marked during the dismantling are refitted in their original positions.

When reassembling the clutch to the flywheel use Service tool 18G 304 M to compress the pressure springs. This tool will also ensure that the holes in the pressure spring housing and the driving straps are lined up with the tapped holes of the clutch pressure plate lugs. If these holes are not lined up correctly difficulty will be experienced when inserting the shouldered driving pins. Screw the driving pins into position, making certain that the shoulders of the driving pins are through the driving straps. Tighten up, and knock up the locking washers.

Make certain that two driving straps are fitted to each of the three driving points, at the same time ensuring that the straps and pins are returned to their original positions.

Refit the flywheel and clutch as in Section A.17.

Adjusting

It is important that a clearance exists between the clutch thrust race and the thrust ring. As wear takes place this clearance will diminish, and if neglected clutch slip will result.

An adjustable stop is provided on the transmission casing just forward of the clutch operating lever. Pull the operating lever outwards until all free movement is taken up and then check with a feeler gauge that there is a clearance of ·020 in. (·50 mm.) between the operating lever and the head of the adjustment bolt. Correct if necessary.

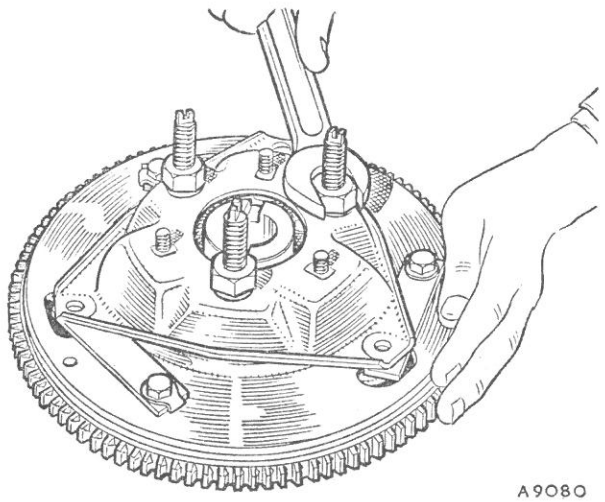


Fig. E.3

The clutch pressure springs being compressed with the aid of Service tool 18G 304 M, with Service tool 18G 571 used to keep the driven plate and flywheel hubs centralized during the operation

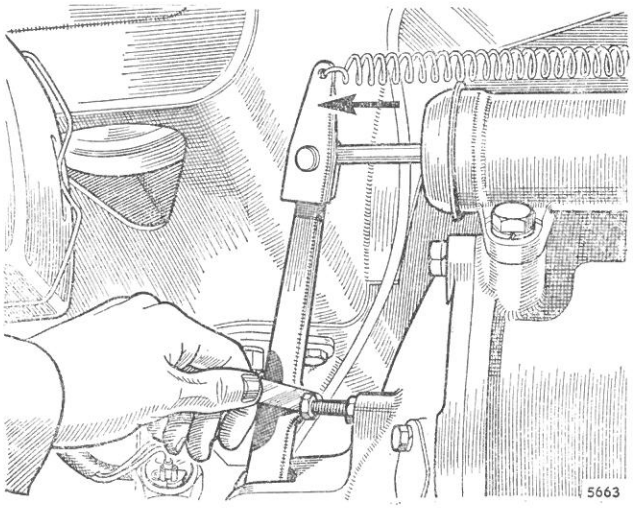


Fig. E.4

A clearance of ·020 in. (·50 mm.) must exist between the adjustable clutch return stop and the operating lever

Section E.2

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.

Removing

Remove the circlip 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.

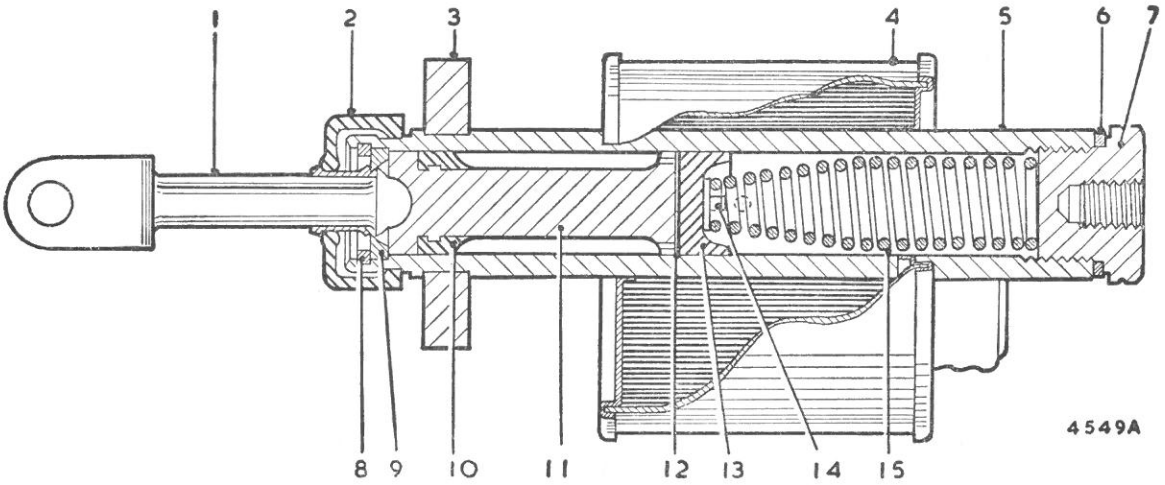


Fig. E.5

A section through the clutch master cylinder

1. Push-rod.
2. Rubber boot.
3. Mounting flange.
4. Supply tank.
5. Body.
6. Washer.
7. End plug.
8. Circlip.
9. Stop washer.
10. Secondary cup.
11. Piston.
12. Piston washer.
13. Main cup.
14. Spring retainer.
15. Return spring.

Dismantling

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. E.5 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.

Reassembling

Clean all parts thoroughly, using Lockheed Super Heavy Duty Brake Fluid for all rubber components. All traces of fuel, paraffin (kerosene), or trichlorethylene 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 ensure correct seating.

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 main 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.

Refitting

Secure the master cylinder by means of the two bolts to the bulkhead cross-member. Refit the pressure pipe to the cylinder barrel.

Line up the push-rod yoke with the pedal lever and reconnect them with the clevis pin and split pin.

Refill the supply tank with hydraulic fluid to within $\frac{1}{4}$ in. (6 mm.) of the bottom of the filler neck and bleed the system as in Section E.3.

Section E.3

SLAVE CYLINDER

Removing

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.

Dismantling

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. Remove the circlip from the mouth of the cylinder bore.

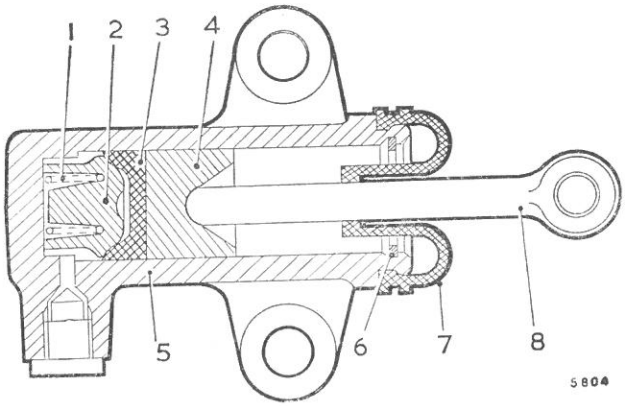


Fig. E.6

A section through a clutch slave cylinder

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

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.

Reassembling

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 refit the retaining circlip. 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.

Refitting

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

Bleeding

Fill the master cylinder reservoir to the correct level 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.

Ensure that the fluid level is maintained in the reservoir throughout the operation.

Section E.4

CLUTCH THROW-OUT STOP

A shouldered stop is fitted to the clutch throw-out plunger operating against the central boss of the clutch cover. This stop is set and locked in its correct position during initial assembly and should not be disturbed during normal servicing. Clutch free pedal adjustment is only undertaken at the lever stop screw as detailed in Section E.1. If it is found necessary to remove the throw-out plunger during overhaul the stop must be reset. Screw the stop and locknut away from the cover boss to the limit of its travel. Depress the clutch pedal to fully release the clutch, hold it in this position and screw the stop up against the cover boss, release the clutch pedal to fully engage the clutch, screw the stop up a further ·007 to ·010 in. (·2 to ·25 mm.) (equivalent to approximately one flat of the hexagon locknut), and fully tighten the locknut.

Re-check the clearance at the lever stop screw, and adjust if necessary.

Section E.5

CLUTCH OVERTHROW

The design of the clutch calls for only sufficient movement of the clutch mechanism to free the driven plate. Should overthrow of the clutch occur the excess movement will impose a load on the crankshaft thrust washers far beyond that for which they were designed. This overload will certainly cause abnormal wear of the thrust washers, and may result in their complete disintegration, with serious damage to the transmission from the particles of metal thus introduced.

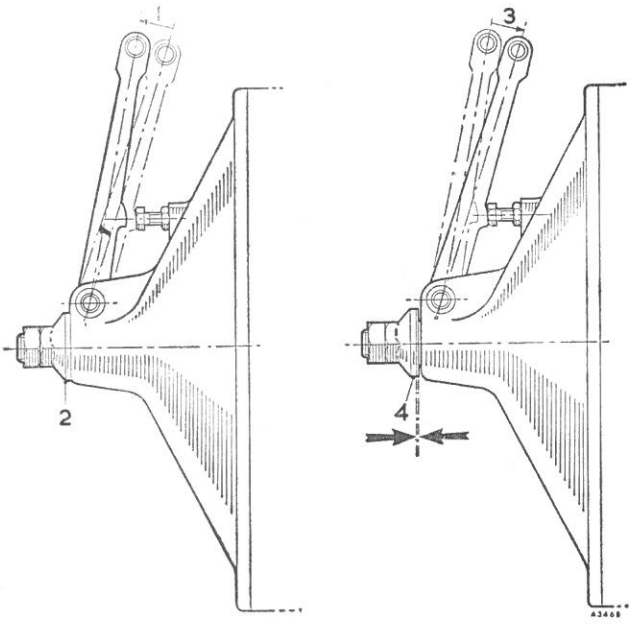


Fig. E.7

(1) *The clutch fully released, with* (2) *the throw-out stop screwed up to the cover boss.* (3) *The clutch fully engaged and the stop* (4) *screwed up a further* ·007 *to* ·010 *in.* (·2 *to* ·25 *mm.*) *towards the cover boss*

The amount of throw is controlled under normal circumstances by the clearance between the clutch operating lever and the adjustable clutch return stop (Fig. E.4).

There are, however, two conditions in which overthrow of the clutch can take place, even though the clearance between the clutch operating lever and the clutch return stop is correct, i.e. (1) stiffness of operation in the operating mechanism preventing the operating lever from returning fully, or (2) incorrect clutch pressure springs becoming coil-bound.

To test for clutch overthrow, warm up the engine to its normal running temperature and allow it to tick over at a speed not exceeding 500 r.p.m.

Depress the clutch pedal fully and release it normally, repeating this action three or four times without pause. If the engine slows down appreciably or stalls, clutch overthrow is occurring.

In this case proceed as follows.

Check the external operating mechanism for stiffness of operation, and rectify where necessary. Fit a new operating lever return spring (Part No. 1G 5999); the fitting of the new spring and the rectification of any stiffness will almost certainly overcome any tendency to clutch overthrow from stiffness of operation (1).

Repeat the test for stalling, and if a cure has not been effected the clutch pressure springs must be suspected (2).

Increase the clearance between the operating lever and the return stop to a maximum of ·075 in. (1·9 mm.) and re-test.

If this adjustment is of no avail the clutch must be dismantled (Section E.1) and a new set of correct pressure springs fitted.

Section E.6

CLUTCH DRAG

Because of the type of clutch layout, cold and congealed oil between the crankshaft primary gear bushes and the crankshaft in cars with lubricated primary gear bushes can create a condition of clutch drag.

Movement between these components will restore normal conditions; therefore, if clutch drag is experienced, hold the car at rest in gear with the clutch released and the engine running for several seconds.

If clutch drag still persists after this operation check for the following possible faults:

Air in the hydraulic operating system.
Incorrect adjustment of the operating lever stop.
Excessive crankshaft end-float.
Flywheel oil seal displaced.

If air is present in the hydraulic system, check for leakage of fluid and ingress of air and rectify as necessary. Bleed the system thoroughly as described in Section E.3. Check the clearance at the operating lever stop (Fig. E.4), and adjust as necessary; crankshaft end-float must be taken into account when setting this clearance.

Measure the crankshaft end-float externally by mounting a clock gauge at the pulley end of the shaft. Prise the crankshaft in the direction of the flywheel and set the gauge at zero. Disengage the clutch by operating the clutch pedal and observe the reading on the gauge. Should this reading indicate an excessive crankshaft end-float, attention must be given to the crankshaft thrust washers.

When adjusting the clearance at the clutch operating lever stop the crankshaft must be held in its most forward position, i.e. away from the clutch.

If a damaged flywheel oil seal is suspected the clutch must be dismantled and the condition of the oil seal inspected.

If a new seal is necessary ensure that the replacement seal is of the type with a metal outer case. Coat the bore of the seal housing with jointing compound before fitting the oil seal but ensure that the jointing compound is confined to the seal housing only.

Section E.7

CLUTCH

(Diaphragm spring type)

A diaphragm spring replaces the six conventional coil pressure springs on this clutch assembly.

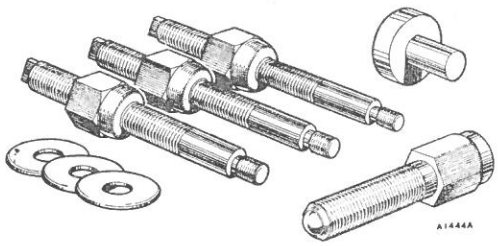
Remove and refit the flywheel and clutch as detailed in Section A.43.

SERVICE TOOLS

18G 304 M. Flywheel and Clutch Remover Adaptors

A set of four screws, three designed to screw into the flywheel and hold the clutch cover and pressure springs under compression in order to dismantle and reassemble the clutch. The fourth screw is used to replace the centre screw of the removing tool 18G 304 when this tool is used to remove the clutch and flywheel from the crankshaft.

Do not use the three black adaptor screws on cars fitted with a diaphragm spring clutch.

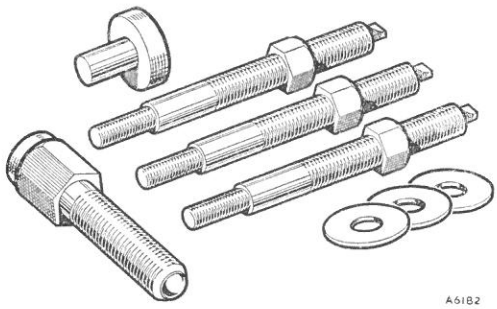


18G 304 M

18G 304 N. Flywheel and Clutch Remover Adaptors

A set of adaptors which must be used when pulling a flywheel fitted with a diaphragm clutch. Use with tool 18G 304.

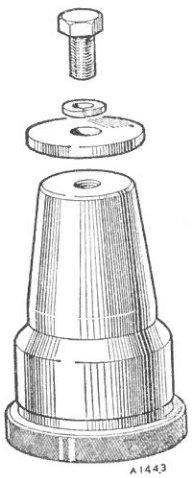
Do not use these adaptor screws on cars fitted with coil pressure spring clutch assemblies.



18G 304 N

18G571. Clutch Centralizer

The use of this tool will ensure that the clutch pressure plate and the flywheel remain centralized throughout the reassembly operation. Insert the tapered centralizer through the hub of the clutch plate and the bore of the flywheel, and secure it firmly in position with its retaining plate, spring washer, and set screw.



18G 571