SECTION E

THE FLYWHEEL AND CLUTCH

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GENERAL DESCRIPTION

The clutch is a single dry plate Borg & Beck, Type 7A6G up to Engine No. 9407, Type BB.8/70 from Engine No. 9408 and BB.8/70A from Engine No. 30301 onwards, consisting of a driven plate assembly, a cover assembly and a graphite release bearing assembly.

Driven plate assembly

This has a flexible centre in which the splined hub is indirectly attached to the clutch plate and transmits the power and over-run through a number of coil springs held in position by retaining wires. Two friction facings are riveted to the clutch plate, one on each side.

Cover assembly

The cover assembly consists of a pressed-steel cover (4) and a cast-iron pressure plate (18) loaded by six thrust springs (5). Mounted on the pressure plate are three release levers (12) which pivot on floating pins (16) retained by eyebolts (15). Adjusting nuts (14) are screwed onto the eyebolts and secured by lock pins or staking. Struts (17) are interposed between lugs on the pressure plate and the outer ends of the release levers. Anti-rattle springs (13) load the release levers, and retainer springs (11) connect the levers to the release lever plate (10).

Release bearing

The release bearing consists of a graphite bearing (7) shrunk into a bearing cup (8), the cup being located by the operating fork and release bearing retainer springs (9).

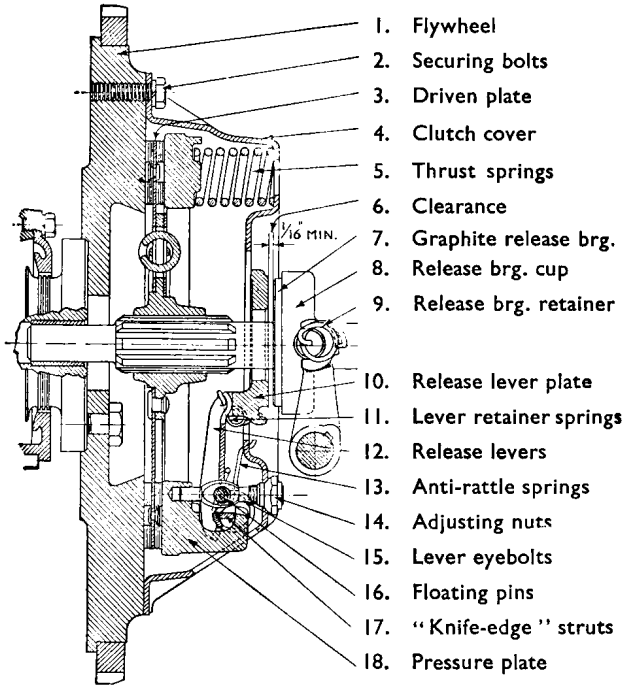
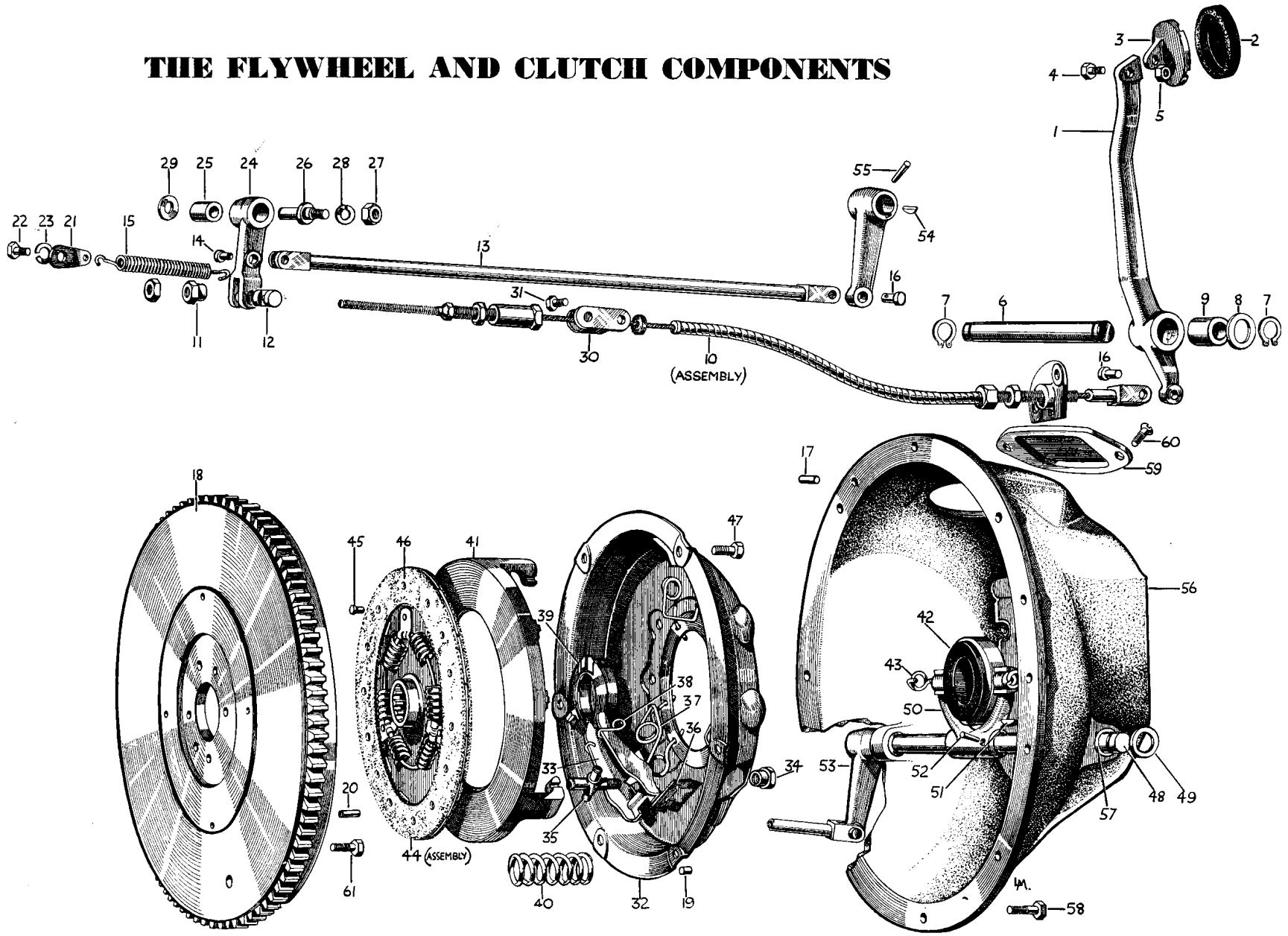


Fig. E.1.
The clutch in section, showing the disposition of its components.

THE FLYWHEEL AND CLUTCH COMPONENTS



KEY TO FLYWHEEL AND CLUTCH COMPONENTS

No.	Description
1.	Clutch pedal and bush.
2.	Pad—rubber—clutch pedal.
3.	Pad—brake pedal.
4.	Bolt—pad—brake pedal.
5.	Nut—pad bolt.
6.	Shaft—clutch.
7.	Seager circlip.
8.	Spacing washer—between pedals.
9.	Bush—brake pedal.
10.	Clutch cable assembly.
11.	Nut—clutch adjuster.
12.	Pin—clutch adjuster.
13.	Connecting rod—clutch.
14.	Yoke pin—rod.
15.	Spring—clutch return.
16.	Pin—clutch lever.
17.	Dowel—clutch housing.
18.	Flywheel (with starter ring and dowels).
19.	Dowel—clutch cover.
20.	Dowel—crankshaft.
21.	Bracket—clutch return spring.
22.	Bolt—bracket.
23.	Spring washer—bolt.
24.	Lever—cable and connecting rod.
25.	Bush—lever.
26.	Fulcrum pin—lever.
27.	Nut—fulcrum pin.
28.	Washer—fulcrum pin.
29.	Washer—fulcrum pin—outer.
30.	Abutment bracket—clutch cable.
31.	Bolt—bracket.
32.	Cover—clutch.
33.	Release lever—clutch.
34.	Eyebolt and nut.
35.	Fulcrum pin—release lever.
36.	Strut—release lever.
37.	Spring—anti-rattle—release lever.
38.	Spring—retaining—release lever.
39.	Plate—release lever.
40.	Spring—pressure plate.
41.	Pressure plate—clutch.
42.	Clutch release bearing and cup assembly.
43.	Retainer—clutch release bearing.
44.	Clutch driven plate assembly.
45.	Rivet—clutch driven plate.
46.	Facing.
47.	Bolt—clutch cover.
48.	Clutch withdrawal shaft.
49.	Circlip—withdrawal shaft.
50.	Fork—clutch.
51.	Key—clutch fork.
52.	Taper pin—clutch fork.
53.	Clutch operating lever.
54.	Key—clutch lever.
55.	Taper pin—clutch lever.
56.	Clutch housing (with bushes).
57.	Bush—clutch housing.
58.	Bolt—securing clutch housing.
59.	Clutch inspection cover.
60.	Screw—inspection cover.
61.	Bolt—flywheel securing.

Section E.1

RUNNING ADJUSTMENTS

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 into contact with the release lever plate and commences to withdraw the clutch). As the driven plate facings wear, the free movement of the pedal will gradually decrease, eventually preventing the clutch fully engaging and permitting too great a movement on withdrawal.

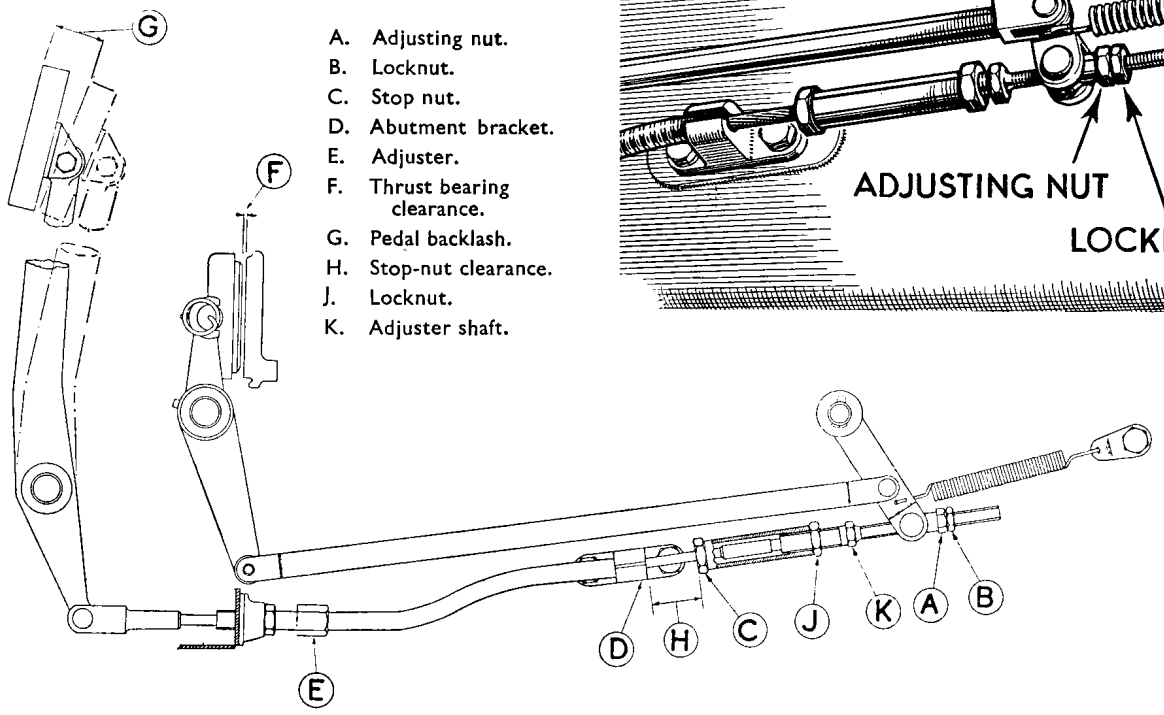


Fig. E.2.
The clutch operating mechanism, showing the pedal adjustment. On later models the clutch cable is replaced by a rod.

The minimum clearance at "F" (see Fig. E.2) between the withdrawal lever plate and the face of the thrust bearing is $\frac{1}{16}$ in. (1·59 mm.), **which gives a free pedal movement "G" of $\frac{3}{4}$ in. or 19 mm. at the clutch pedal which should always be maintained.**

When the clutch pedal free movement becomes less than this, it is essential to make use of the adjustment provided. This consists of an adjusting nut "A" and locknut "B" at the forward end of the clutch operating cable. Care should be taken to tighten up the locknut "B" after adjustment.

In addition, care must be taken to see that the pedal travel is not excessive, as this will apply an excessive load on the carbon thrust block, leading to its early failure. There should be approximately $1\frac{1}{8}$ in. or 29 mm clearance at "H" between the stop nut "C" and the abutment bracket "D" when the pedal is lightly held with the carbon block in contact with the thrust ring by pushing lightly on the clutch pedal by hand. To obtain adjustment, grip the nut "C" and slack off the locknut "J"; grip the adjuster shaft hexagon "K" and adjust the stop nut "C" to the required position. Re-tighten the locknut "J" after adjustment. Need for this adjustment will be indicated when there is a tendency for the clutch not to free when the pedal is fully depressed.

Adjuster "E" is only for the initial adjusting of the outer cable length to give the correct flexibility between the pedal box and floating engine, and should require no subsequent setting.

Note.—*The adjustment nuts (Item 14, Fig. E.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.*

Section E.2

REMOVAL OF THE CLUTCH

Remove the gearbox as detailed on page F.1. The gearbox should be supported during this operation to prevent strain on the shaft and distortion of the driven plate assembly.

Slacken the securing bolts (2) (see Fig. E.1) a turn at a time by diagonal selection until the spring pressure is completely relieved.

Remove the securing bolts and lift the complete clutch pressure plate and cover assembly away from the flywheel (1).

Remove the driven plate assembly.

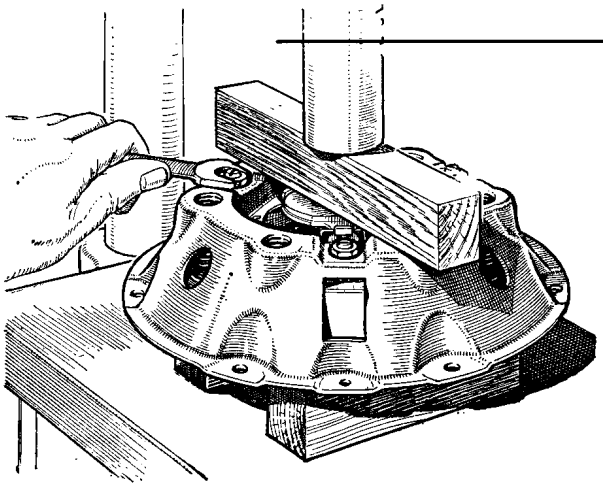


Fig. E.3.

The correct procedure to adopt when dismantling the clutch cover assembly. Note the two wood blocks supporting the pressure plate on the bed of the press. These must not project beyond the pressure plate to ensure that they do not foul the cover-plate when this is depressed by the press.

Section E.3

DISMANTLING THE CLUTCH

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 (4), pressure plate lugs (18) and release levers (12).

Detach the release lever plate (10) from the retainer springs (11) and place the cover assembly under a press with the pressure plate (18) resting on blocks of such a size that the cover is free to move downwards when pressure is applied. (See Fig. E.3.)

Place a block of wood across the top of the cover, resting on the spring bosses.

Compress the cover, by means of the spindle of the press, and, while holding it under compression, remove the adjusting nuts (14) and slowly release the pressure to prevent the thrust springs (5) from flying out.

Lift off the cover to expose all parts for inspection.

Remove each release lever (12) by grasping the lever and eyebolt (15) between finger and thumb so

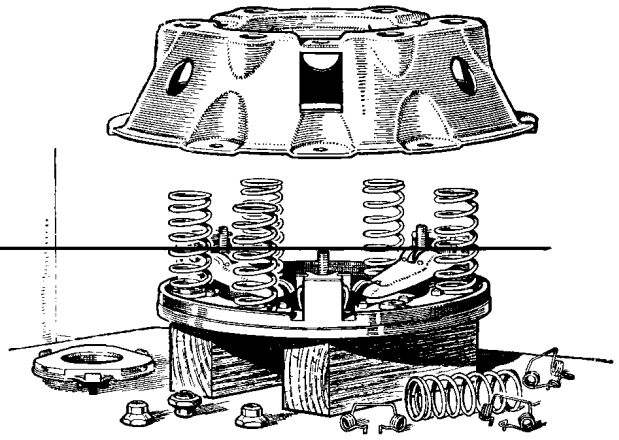


Fig. E.4.

When reassembling the clutch the pressure plate should be supported on the wood blocks used for dismantling and the levers assembled on their shoulder studs. The thrust springs should be placed in position on their seatings, making sure that they remain correctly located when the clutch cover is placed in position. Make sure also that the lever anti-rattle springs are properly located.

that the inner end of the lever and the threaded end of the eyebolt are as near together as possible, keeping the eyebolt pin in position in the lever. (See Fig. E.5.)

Lift the strut (17) over the ridge on the lever and remove the eyebolt (15) from the pressure plate.

Section E.4

ASSEMBLING THE CLUTCH

Before assembly, thoroughly clean all parts and renew those which show appreciable wear.

Place the pressure plate on the blocks under the press and place the thrust springs (5) in a vertical position on the plate, seating them on the bosses provided. (See Fig. E.4.)

Assemble the release levers (12), eyebolts (15) and eyebolt pins (16), holding the threaded end of the eyebolt and inner end of the lever as close together as possible. With the other hand insert the strut (17) in the slots on the pressure plate lug 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 slot 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 lever. Fit the remaining levers in a similar manner, taking care that they are being refitted into their original positions.

Lay the cover (4) over the assembled parts, ensuring that the anti-rattle springs (13) are in position and that the tops of the clutch springs are directly under the seats in the cover, also that the machined portions of the pressure plate lugs are directly under the slots in the cover through which they have to pass. Also ensure that the parts marked before dismantling are in their correct relative position to maintain correct balance.

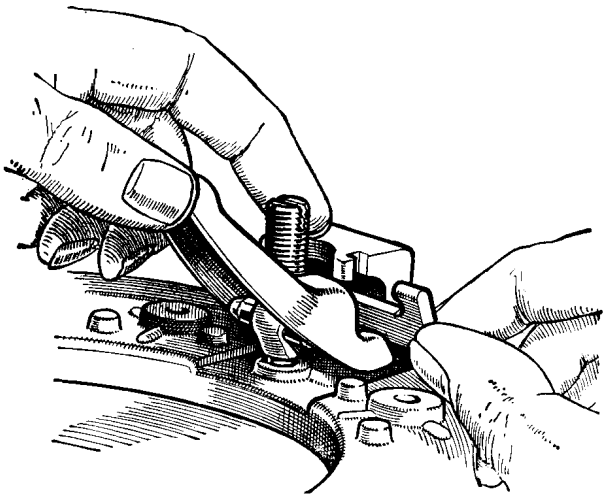


Fig. E.5.
To assemble the levers hold the threaded end of the eyebolt and lever close together as shown and with the other hand insert the strut in the slot of the pressure plate lug sufficiently to permit the plain end of the eyebolt to be inserted in the hole in the pressure plate.

Place the block of wood across the cover as in Fig. E.3, and compress the clutch springs by means of the press spindle, guiding the eyebolts and pressure plate lugs through the holes in the cover.

Screw the adjusting nuts (14) on the eyebolts (15) and secure by staking or split pins in accordance with the system originally used by the makers.

Remove the clutch from the press, and assemble the lever plate (10) on the tips of the levers (12) and retainer springs (11).

Note.—*If new parts have been fitted, which may affect the adjustment, the levers should be set, using the gauge plate, Part No. 68885, as indicated in Section E.6.*

Section E.5

REFITTING THE CLUTCH

To refit the clutch to the flywheel proceed as follows :—

Assemble the driven plate assembly in the flywheel (1), taking care to place the larger chamfered spline end of the driven plate hub towards the gearbox or the rear of the vehicle.

Centralise the driven plate by means of the special clutch alignment bar T.124, which fits the splined bore of the driven plate hub and the pilot bearing in the flywheel. As an alternative a spare gearbox driving gear and shaft can be used.

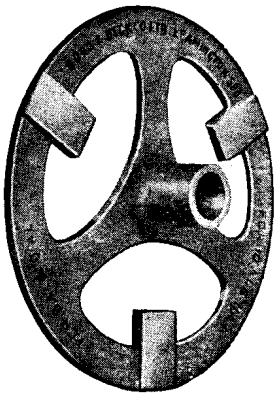


Fig. E.6.
The special Borg & Beck lever adjusting gauge plate for setting the levers correctly.

Fit the cover assembly to the flywheel by means of the securing bolts (2), 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 withdrawal bearing and 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 driven plate assembly.

(Reference numbers apply to Fig. E.1.)

Section E.6

ADJUSTING THE RELEASE LEVERS

Satisfactory operation of the clutch is dependent on accurate adjustment of the release levers (12). 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 levers is ·015 in. (·38 mm.). To obtain a setting within this limit use the special gauge plate in conjunction with the rest of

the clutch assembly and the flywheel. The latter may be mounted on the engine or lying on the bench, whichever is most convenient. Proceed as follows :—

Place the gauge plate, Part No. 68885 (Fig. E.6), centrally in the flywheel in place of the driven plate.

Fit the cover assembly to the flywheel by tightening the securing bolts (2) a turn at a time by diagonal selection until fully secured.

Place a straight-edge across the gauge plate boss and the tip of one release lever (Fig. E.7).

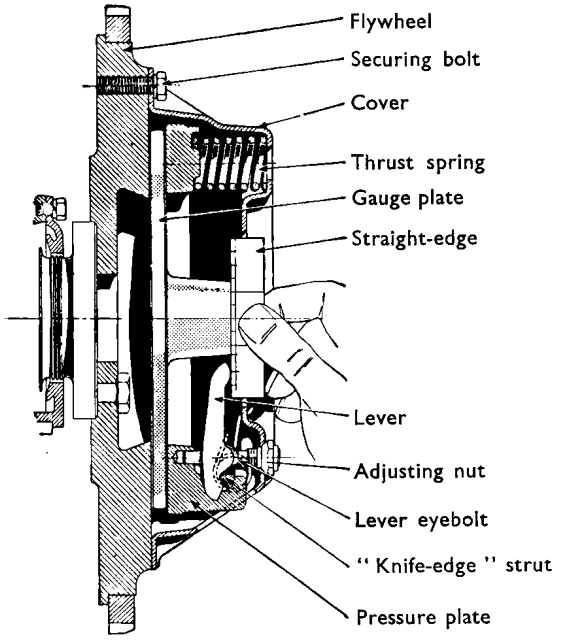


Fig. E.7.
Setting the release levers by means of the special gauge plate, Part No. 68885, and a short straight-edge.

Adjust the release lever, if necessary, by turning the adjusting nut (14) until the tip of the lever is exactly level with the top of the gauge boss.

Adjust the remaining levers in a similar manner. The setting should be within ·005 in. (·13 mm.) if carefully carried out.

Re-lock the eyebolt nuts by the same method used by the makers (split pin or staking).

Slacken the securing bolts (2) a turn at a time by diagonal selection, then remove the holding screws and the clutch from the flywheel (1). Remove the gauge plate and reassemble with the actual driven plate.

Section E.7

REFACING THE DRIVEN PLATE

To renew the facings on the driven plate, proceed as follows :—

Do not punch out the rivets.

Using a $\frac{5}{32}$ in. or 4 mm. drill, remove each rivet.

Rivet one new facing in position, using a blunt-ended centre punch if the correct tool is not available to roll the rivet shanks against the plate.

Rivet the second facing onto the opposite side of the plate with the clearance holes over the rivet heads already formed in fitting the first facing.

Mount the plate on a mandrel between centres and check for run-out as near the edge as possible ; if error is more than ·015 in. (·38 mm.) dress over the high spots until true within this figure.

Section E.8

SERVICING THE CLUTCH

As the clutch facings wear, the pressure plate moves closer to the flywheel face, and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther towards the gearbox, and decreases the clearance between the release lever plate and the release bearing. The effect on the clutch pedal is to decrease the clearance or free travel ; in other words it reduces the distance the clutch pedal moves forward, away from the back stop, before the release bearing comes into contact with the release lever plate. Some free movement must always be maintained here to prevent the clutch pedal riding against the back stop and thus causing the clutch to slip. This essential free movement is restored by adjusting the clutch pedal position.

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

1. *The free movement*, or travel necessary to take up the clearance between the release bearing and the release lever plate, provided to ensure that the clutch is fully engaged when the foot is removed from the pedal.
2. *The effective movement*, or travel necessary to release the clutch, i.e. the amount of effective pedal movement necessary to move the release plate the distance required to free the clutch completely.

The pedal travel should be limited by the front and back stops of the clutch pedal, to the correct amount indicated. It is essential that these clearances be adhered to, to allow the clutch to be completely freed, and at the same time prevent the possibility of damage to the clutch bearing, due to over-travel.

If any difficulty is experienced in freeing the clutch when the correct release movement is provided, on no account should efforts be made to improve matters by attempting to increase the effective pedal travel.

The actual cause of the trouble must be ascertained and rectified.

The free pedal movement, measured at the pedal pad, should be $\frac{3}{4}$ in. (19 mm.), and the clearance between the stop on the clutch withdrawal lever and the stop on the flywheel housing should not be more than $\frac{1}{2}$ in. (13 mm.). (See " G," Fig. E.2, page E.4.)

To obtain a clean release, the release lever plate should move a distance of $\frac{5}{16}$ in. (7·9 mm.) towards the flywheel.

Spring pressure

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

The clutch operation 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 the clutch facings are not touched with greasy hands, nor any oil or grease allowed to come into contact with them.

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

If the clutch has been in use for some little time under satisfactory conditions, the surface of the facings assumes a high polish through which the nature 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 nature of the material can be distinguished clearly it has little effect on clutch performance.

Should increased quantities of oil obtain access to the facings, 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 clutch 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 "

on engagement, according to the severity of the conditions.

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

Where the graphite release bearing ring is badly worn in service, a complete replacement assembly should be fitted, returning the old assembly for salvage of the metal cup. These graphite rings are inserted into their metal cups by heating the metal cup to a cherry red, then forcing the graphite ring into position. This is a specialised job, but it can be carried out satisfactorily provided the necessary care is exercised. 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, to determine any possible misalignment. The dial reading should not vary more than ·003 in. (·07 mm.) anywhere on the flywheel face.

Section E.9

INTRODUCTION OF 8 in. DIAMETER CLUTCH

Commencing at Engine No. 9408, an 8 in. diameter clutch has been introduced. This has been done to alleviate the synchro noise condition and to improve the torque carrying capacity.

The engine type description has been altered from XPAG/TD to XPAG/TD/2. This has been done for the reason that while the power unit with gearbox complete is interchangeable, neither the engine unit nor the gearbox unit separately is interchangeable with previous engines, because the clutch thrust race is in a different position relative to the engine bell housing, and the clutch shaft and thrust face position is also different in the gearbox bell housing. This means that the old type XPAG/TD engine and the corresponding gearbox will have to continue to be serviced.

The XPAG/TD gearbox can be identified by the clutch fork shaft, which has a diameter of $\frac{5}{8}$ in. (15·9 mm.) and the Part No. SA.1906/9, whereas the XPAG/TD/2 has a clutch with a fork shaft having a diameter of $\frac{3}{4}$ in. (19 mm.) and the Part No. SA.1906/10.

Listed below are the parts affected by this change :—

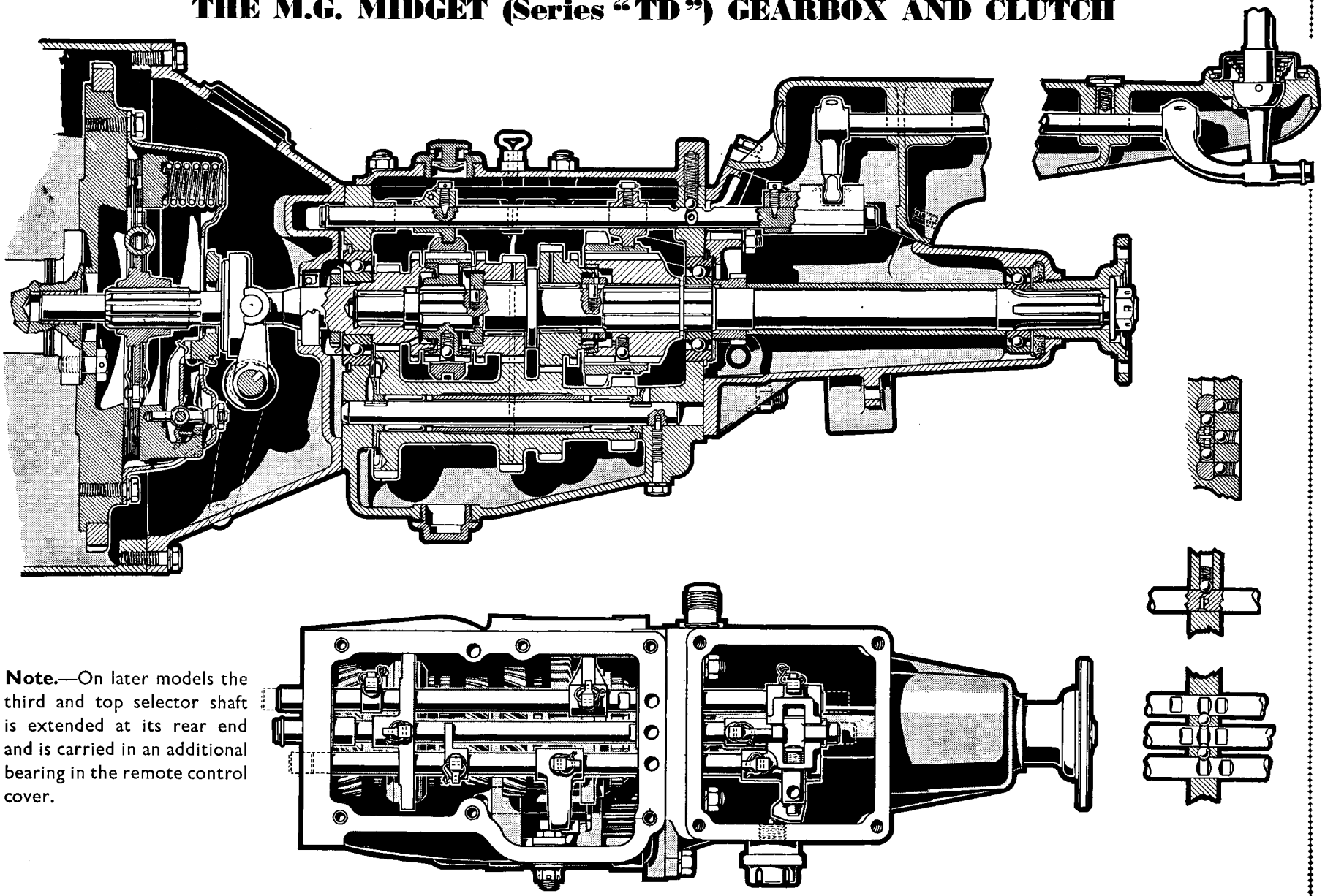
Part No.	Replaced by	Description	No. Off
XPAG/TD	XPAG/TD/2	Engine and Gearbox Unit	1
SA.2445	SA.2445/1	Power Unit with Clutch, less Gearbox, Electrical Equipment, Carburetter and Manifolds	1
SA.1906/9	SA.1906/10	Gearbox complete	1
SA.2252/1	SA.2252/2	Flywheel with Starter Ring and Dowels	1
X.22418	168020	Starter Ring	1
X.24436	168124	Clutch Assembly	1
MG.900/14	SA.2239/4	Clutch Housing with Bush	1
MG.862/335	MG.660/104	Bush for Clutch Housing	2
MG.862/300	MG.795/146	Clutch Fork	1
MG.917/117	168023	Clutch Fork Shaft	1
MG.862/456	MG.795/145	Circlip	1
P.151/185	X.151/8	Key	1
MG.900/146	168021	Clutch Lever	1

Section E.10

INTRODUCTION OF A CLUTCH CONTROL ROD

Commencing at Chassis No. TD22251, a clutch control rod has been fitted in place of a clutch cable. On such cars the free pedal movement "G" (see Fig. E.2) must also be maintained at $\frac{3}{4}$ in. (19 mm.).

THE M.G. MIDGET (Series "TD") GEARBOX AND CLUTCH



Note.—On later models the third and top selector shaft is extended at its rear end and is carried in an additional bearing in the remote control cover.