

# **DAVID BROWN**

## **CLUTCH**

**Selectamatic Tractors**

## **REPAIR MANUAL**

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**DAVID BROWN TRACTORS LIMITED  
MELTHAM · YORKSHIRE · ENGLAND HD7 3AR**

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# CONTENTS

SECTION	PAGE
Single Plate Clutch — Non-Livedrive Tractors	
Operation .. .. .	1
Adjustments .. .. .	1
Servicing the Clutch Unit .. .. .	2
Double Clutch — Livedrive Tractors (except 1200)	
Operation .. .. .	5
Adjustments .. .. .	6
Servicing the Borg and Beck Clutch Unit .. .. .	8
Servicing the Laycock Clutch Unit .. .. .	14
Dual Clutch — 1200 Livedrive Tractors	
Operation .. .. .	15
Adjustments .. .. .	16
Servicing the Clutch Unit .. .. .	16
Twin-Plate Clutch	
Adjustments .. .. .	21
Servicing the Clutch Unit .. .. .	22
Refacing Driven Plates .. .. .	24
Clutch Stop .. .. .	25
Overload Release Withdrawal Mechanism (Hand Clutch) .. .. .	26
Clutch Removal and Replacement	
770, 780 and 3800 Tractors .. .. .	27
880 and 990 Tractors .. .. .	28
1200 Tractors .. .. .	31
Clutch Fault Diagnosis .. .. .	37
Clutch Service Tools .. .. .	40
Dimensional Data .. .. .	45
Summary of Design Changes .. .. .	50

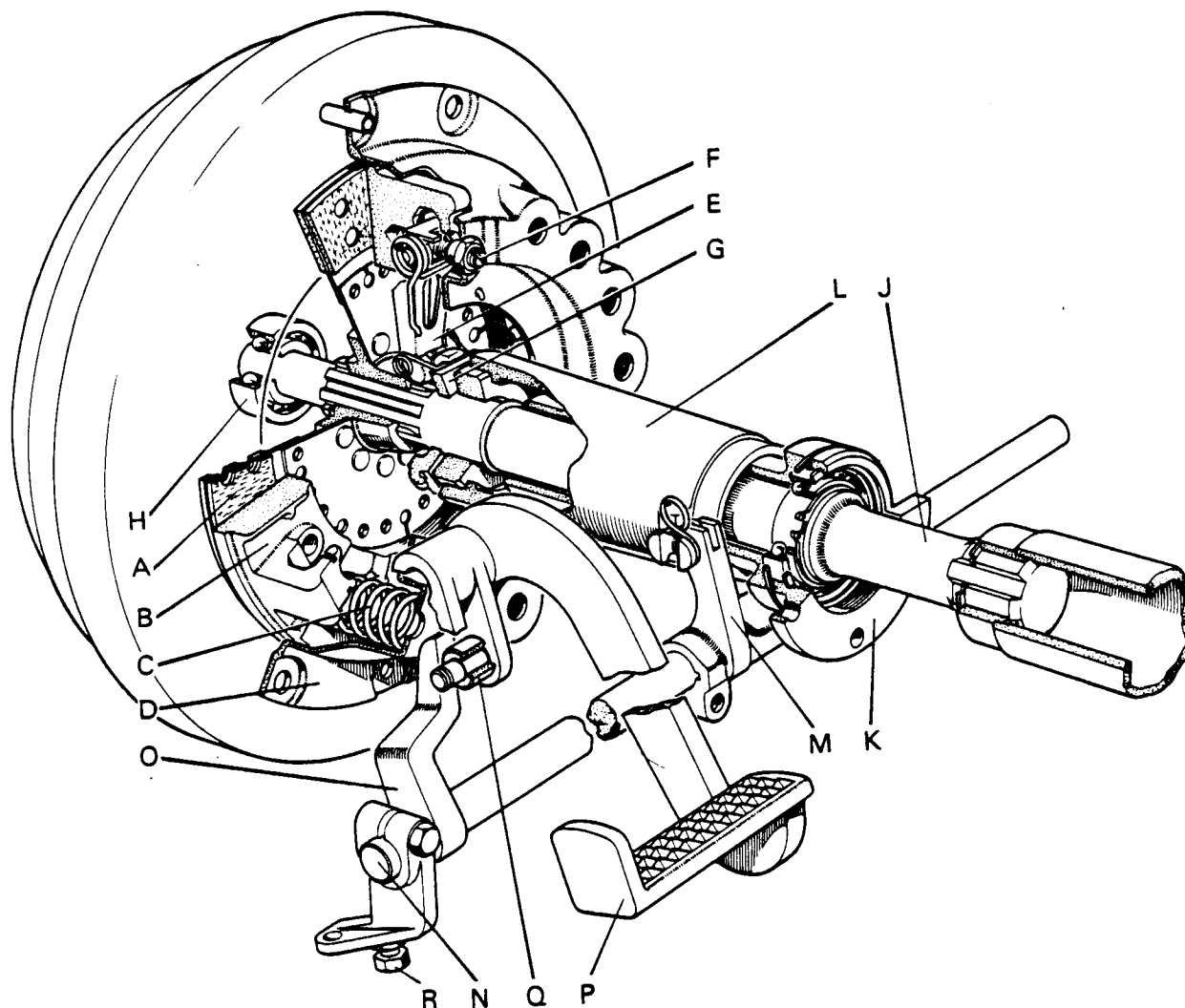


Figure 1 SINGLE PLATE CLUTCH — 990/880 TRACTORS

- |                  |                    |                        |                   |
|------------------|--------------------|------------------------|-------------------|
| A. Driven plate  | B. Pressure plate  | C. Thrust spring       | D. Cover          |
| E. Release lever | F. Eye bolt        | G. Release lever plate | H. Spigot bearing |
| J. Clutch shaft  | K. Support snout   | L. Release bearing     | M. Release fork   |
| N. Cross shaft   | O. Operating lever | P. Pedal               | Q. Roller         |
|                  | R. Adjusting screw |                        |                   |

## SINGLE PLATE CLUTCH — NON-LIVEDRIVE TRACTORS

### Description

The clutch is of the dry plate type and consists of a driven plate, cover assembly and withdrawal mechanism.

The driven plate consists of a thin steel disc with a splined hub riveted to the centre and friction facings riveted to each side of the outer edge. The cover assembly is built up from a steel pressing and incorporates a cast iron pressure plate loaded with thrust springs. Mounted on the pressure plate are three release levers which pivot on floating pins retained in the eyebolts and transmit movement to the pressure plate through struts.

### Operation — 880 and 990 Tractors

The withdrawal mechanism shown in Fig. 1 is that used on 880 and 990 Tractors. As the clutch pedal is depressed, the lever turns the cross shaft which moves the carbon block forward by means of the fork. As movement of the carbon block is transmitted to the release levers by the lever plate, the levers pivot on the pins and draw pressure plate away from flywheel by means of the struts, thus releasing the driven plate and disengaging the drive.

### Adjustment—880 and 990 Tractors

The only adjustment required in service is the maintaining of clutch pedal "free play" from 1 to 1½ in. (2.5 to 3.8 cm). To adjust pedal free-play,

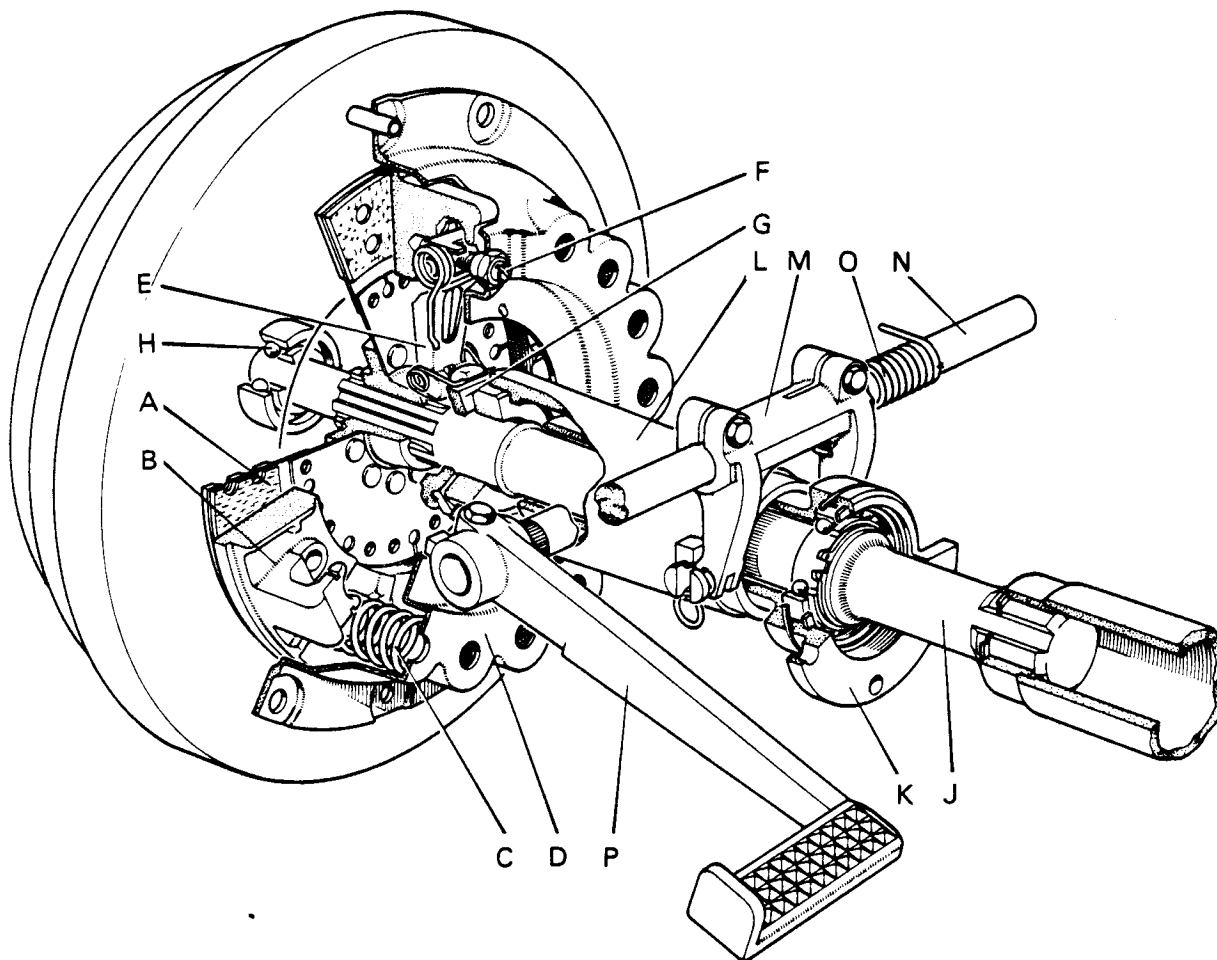


Figure 2 SINGLE PLATE CLUTCH — 770 TRACTOR

- |                  |                        |                        |                   |
|------------------|------------------------|------------------------|-------------------|
| A. Driven plate  | B. Pressure plate      | C. Thrust spring       | D. Cover          |
| E. Release lever | F. Eye bolt            | G. Release lever plate | H. Spigot bearing |
| J. Clutch shaft  | K. Support snout       | L. Release bearing     | M. Release fork   |
| N. Cross shaft   | O. Pedal return spring | P. Pedal               |                   |

release locknut and turn adjusting screw until correct movement is obtained. Retighten locknut.

If hand clutch is fitted (see page 26) the rod adjusting nut should be slackened before adjusting pedal free-play and then reset afterwards to give a clearance of  $\frac{1}{8}$  in. (1.5 mm).

## Operation — 770 Tractors

The clutch pedal on the 770 Tractor is fitted directly on to the cross shaft, which is housed in the gearbox cover and not in the main frame as on the other models (see Fig. 2). Operation of the clutch withdrawal mechanism is, otherwise, the same as on the 880 and 990 Tractors.

## Adjustment — 770 Tractors

The only adjustment required during service is the maintaining of  $\frac{1}{2}$  to  $\frac{3}{4}$  in. (1–2 cm) pedal free-play, to ensure that the withdrawal mechanism is disengaged when the pedal is released.

As the drive plate facings wear, pedal free-play will be reduced and when necessary should be reset by screwing the stop screw further into the main frame. When the pedal has insufficient free-play and the stop screw is screwed fully inwards, the pedal should be removed from its shaft, turned clockwise into the next serration, and refitted on shaft. The adjusting screw can then be screwed outwards until correct free-play is obtained.

As the cross shaft will turn, due to the action of the shaft return spring, when the pedal is removed, it is advisable to mark the original positions of the shaft and pedal so that the new position can be easily found.

## Servicing the Single-Plate Clutch Unit

1. Mark the position of the release levers, cover plate, pressure plate, and eyebolts so that these may be refitted in the same position should new parts be unnecessary.



Figure 3. REMOVING THE RELEASE LEVERS



Figure 4. REPLACING STRUT AND RELEASE LEVER

2. Place the assembly on a press, with a block under the pressure plate positioned so that the cover is free to move down. Place a block or bar across top of the cover, resting on the spring bosses.
3. Compress the cover against pressure plate, unlock and remove eye nuts. Slowly release the pressure on cover until the thrust springs are fully extended.
4. Lift off cover, and remove thrust springs. Remove release levers (Fig. 3), clean and examine all parts.
5. To assemble clutch, place pressure plate on the block and replace release levers and struts (Fig. 4), taking note of the marks made during dismantling and applying a smear of grease to the pivot pins and struts.

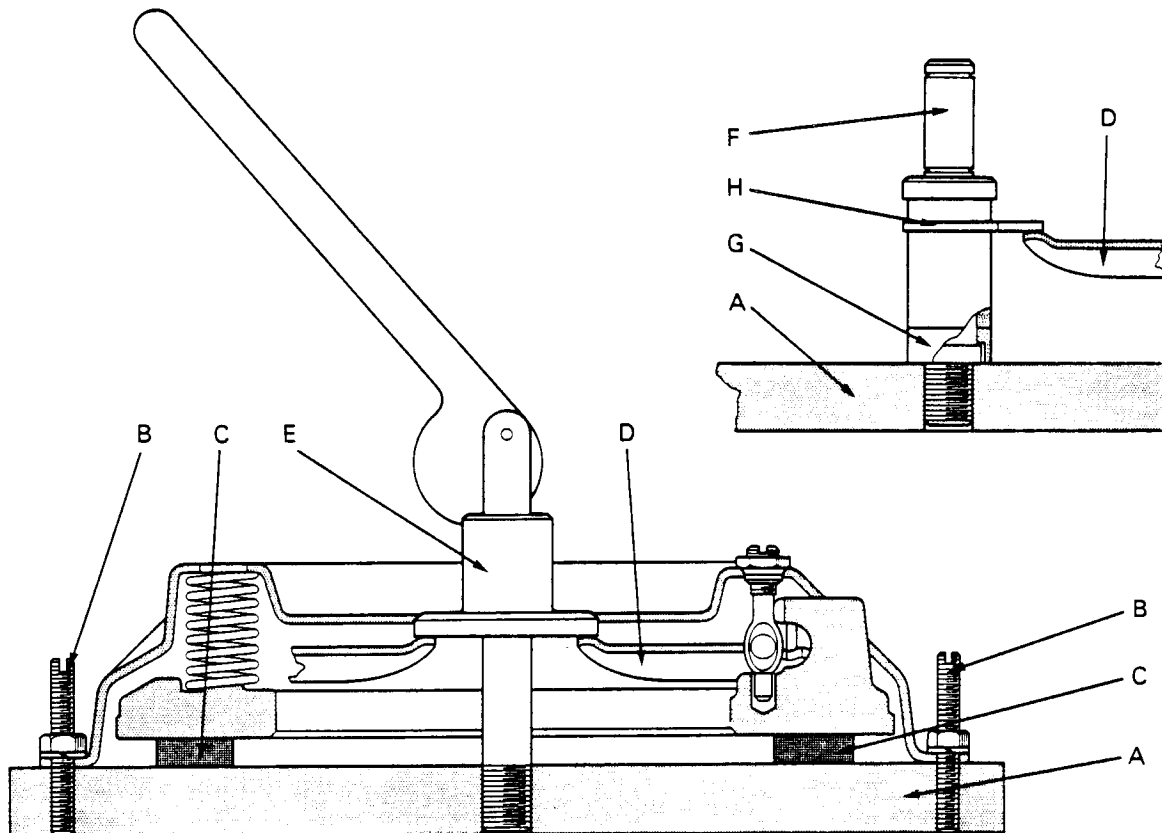


Figure 5 CHECKING RELEASE LEVER HEIGHT

- |               |                  |                             |                   |
|---------------|------------------|-----------------------------|-------------------|
| A. Base plate | B. Studs         | C. Spacers — pressure plate | D. Release lever  |
| E. Actuator   | F. Centre pillar | G. Spacer — centre pillar   | H. Setting finger |

6. Replace thrust springs on the pressure plate bosses and place cover in position on top of the springs, after ensuring that the three anti-rattle springs are in position on cover and the marks made during dismantling are in alignment.
7. With the second block placed across cover, as in dismantling, compress thrust springs until the eyebolt nuts can be replaced.
8. Remove clutch assembly from the press and depress release levers two or three times to settle the working parts.

Operations 1–8 can alternatively be carried out using the Clutch Tool (see Service Tool Leaflet A3). The clutch should be bolted on to the base plate, Part No. 912917, using the long studs and nuts in the kit. The thrust springs are released by gradually unscrewing the nuts on the long studs so allowing clutch cover to lift away from pressure plate.

After reassembly the clutch should be set up as follows, using the clutch tool (Fig. 5, Page 3) :

9. Fit No. 3 Code spacers in place of the driven plate. Position a spacer opposite each release lever, bolt clutch to base plate and fit the

actuator assembly. Operate the actuator lever a few times to "bed in" the release lever mechanism.

10. Remove actuator and fit centre pillar with the correct spacer, recess downwards.

For 9 in. clutch (770 Tractor) use centre pillar spacer Code No. 8

For 10 in. clutch (880 Tractor) use centre pillar spacer Code No. 8

For 11 in. clutch (990 Tractor) use centre pillar spacer Code No. 16x.

Check release lever heights with setting finger and reset if incorrect.

11. Refit actuator and operate clutch a few times, finally rechecking the release lever heights before **locking the adjusting nuts by peening the cylindrical portion of the nut into the eyebolt.**

12. Fit release lever plate and secure by fitting the three retaining springs. Before moving clutch from flywheel or base plate, replace the three nuts used as packing pieces between the cover and release levers.

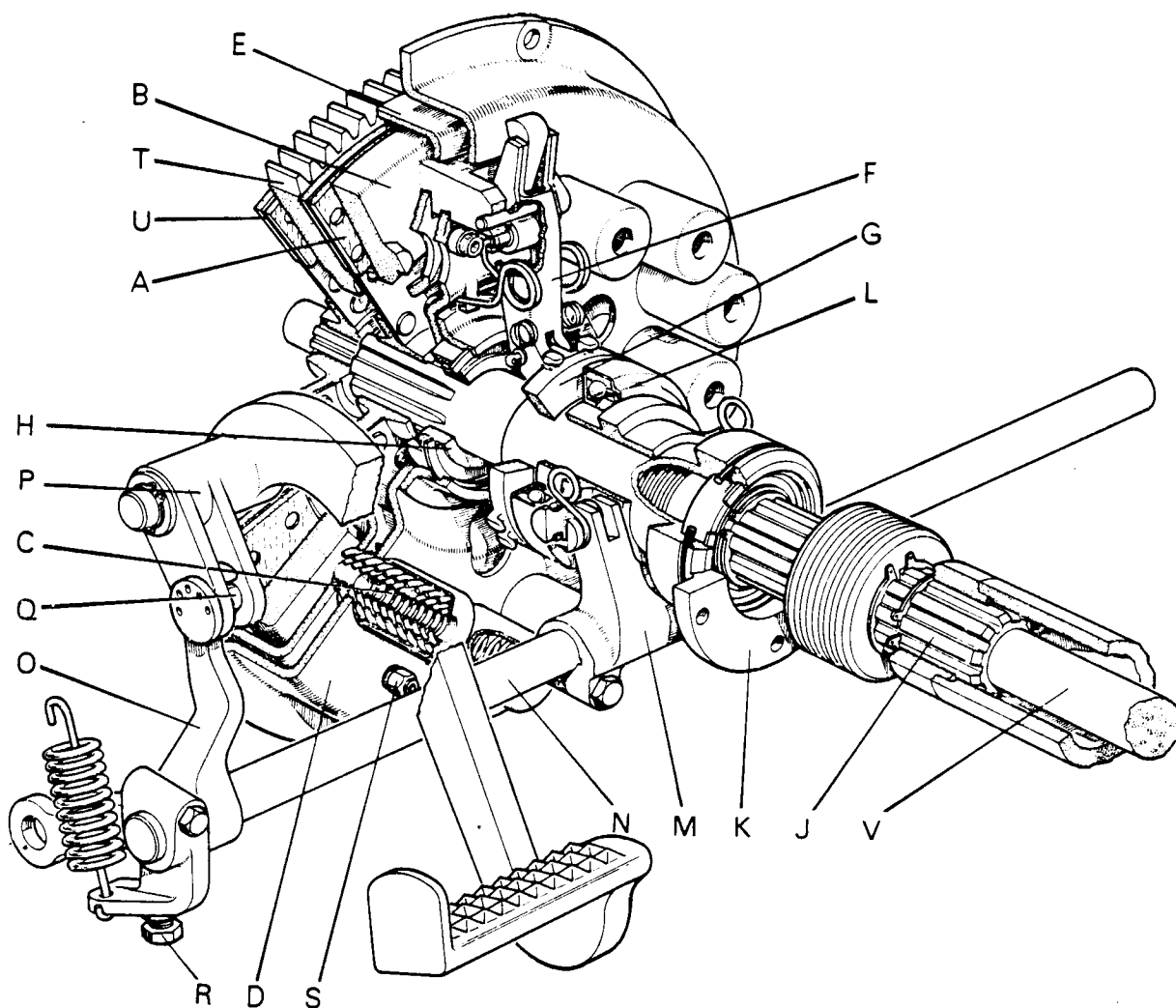


Figure 6 DOUBLE CLUTCH — 880/4600/990 LIVEDRIVE TRACTORS

- |                                |                            |                        |                       |
|--------------------------------|----------------------------|------------------------|-----------------------|
| A. Driven plate — transmission | B. Pressure plate          | C. Thrust springs      | D. Cover — outer      |
| E. Cover — inner               | F. Release lever           | G. Release lever plate | H. Bearing            |
| J. Clutch shaft                | K. Support snout           | L. Release bearing     | M. Release fork       |
| N. Cross shaft                 | O. Operating lever         | P. Pedal               | Q. Roller             |
| R. Adjusting screw — pedal     | S. Adjusting screw — cover | T. Separator plate     | U. Driven plate — PTO |
|                                | V. Driveshaft — PTO        |                        |                       |

## DOUBLE CLUTCH — LIVEDRIVE TRACTORS

**Description:** The double clutch is in effect two separate clutches mounted in tandem and controlled by a common pedal. The inner clutch (which is nearest the flywheel) transmits the drive to the hydraulic lift pump and power take-off and the outer clutch transmits the main drive to the gearbox. Disengagement of the main drive clutch does not, therefore, disengage the drive to the power take-off or hydraulic pump, which remain in operation until the second clutch is disengaged.

## Operation — 880, 4600 and 990 Tractors

The operating mechanism shown in Fig. 6 is used on the 880, 4600 and 990 tractors. As the clutch pedal is depressed the pressure plate is drawn rearwards by the action of the release levers until the rear (transmission) drive plate is free and the adjusting screw clearance is reduced from 0.070 in. (1.78 mm) to 0.009-0.012 in. (0.23-31 mm). During this first stage the pedal roller will have moved along the cross shaft lever until it is in contact with both faces. Further movement of the clutch pedal will cause the roller to continue turning the

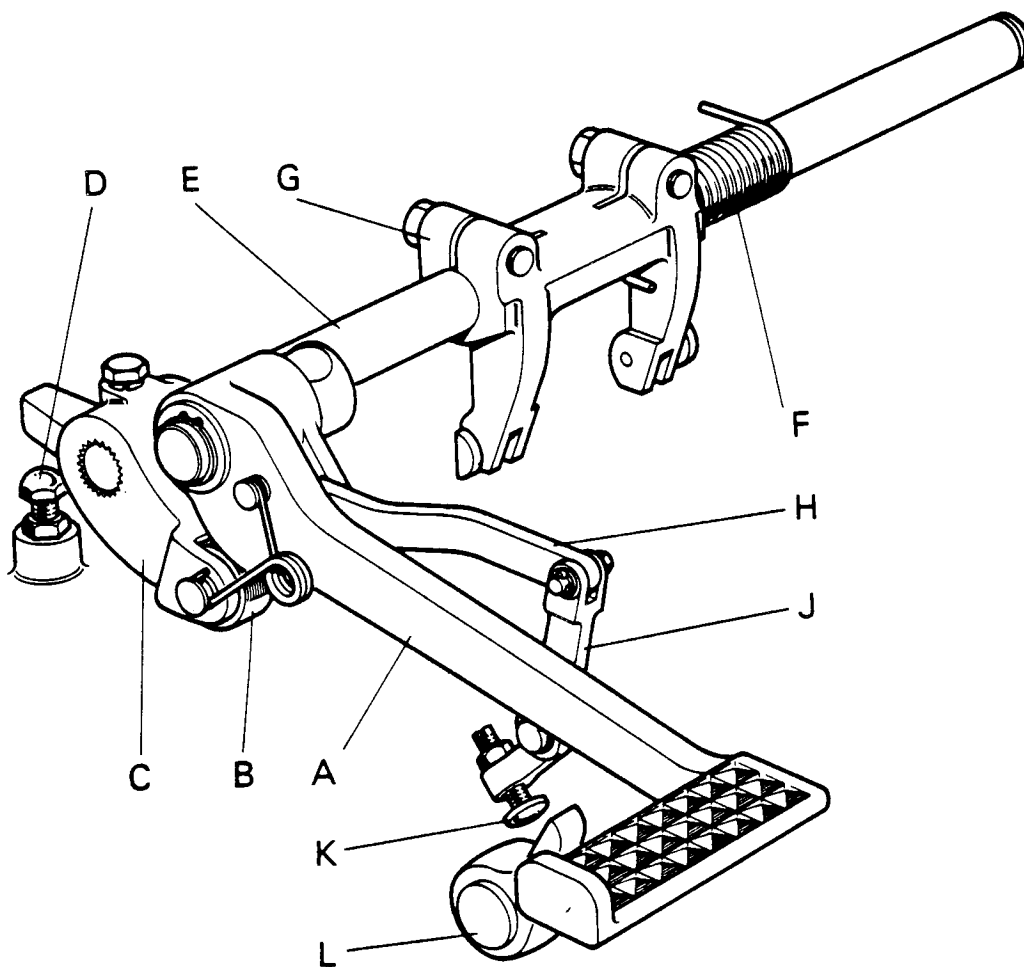


Figure 7. CLUTCH OPERATING MECHANISM — 780/3800 TRACTORS

A. Pedal	B. Roller	C. Operating lever	D. Stop bolt
E. Cross shaft	F. Return spring	G. Fork	H. Connecting link
J. Lever	K. Adjusting screw	L. Shaft — clutch stop	

cross shaft and cause the pressure plate to move further to the rear until the adjusting screw clearance is reduced to zero: this is the second stage movement. Further movement of the pedal beyond this point (third stage) will also move the inner cover to the rear as the pressure plate is now in contact with the adjusting screws. As inner cover is withdrawn the pressure on separator plate is released so that the three flywheel springs move the separator plate rearwards, thus disengaging the PTO clutch plate.

## Adjustment — 880, 4600 and 990 Tractors

As the clutch linings wear during service the separator plate and pressure plate will move closer to the flywheel and reduce the amount of pedal free-play. This should be adjusted by slackening the locknut and turning the adjusting screw until free-play is 1 to 1½ in. (2.5 to 3.8 cm). If a hand clutch is fitted (see page 26) the adjusting nut on the connecting rod should be slackened before adjusting free-play and then reset afterwards to give a clearance of 1/8 in. (1.5 mm). (Fig. 6.)

**Note:** The eccentric roller pin is set during manufacture and should not normally require resetting, unless new parts are fitted to the operating mechanism.

If difficulty is experienced in freeing PTO clutch, or if clutch unit has been removed, proceed as follows:

1. With the clutch housing fully tightened down, adjust the pedal free-play from 1 to 1½ in. (2.5 to 3.8 cm).
2. Set the three inner cover adjusting screws to give 0.070 in. (1.78 mm) clearance between the pressure plate and the end of the screws. The adjusting screw clearance can be checked by inserting a feeler gauge through the holes in the outer cover. If clutch housing is in position the adjusting screws are accessible when clutch pit cover (919568) is removed and engine turned to bring the screws opposite the cover aperture.
3. Depress clutch pedal until pedal roller is in contact with both faces on cross shaft lever then check the cover adjusting screw clear-



ance. If the adjusting screw clearance is not 0.009–0.012 in. (0.23–0.31 mm) adjust by rotating the eccentric pin to the next position. (Move clockwise to increase the clearance and anti-clockwise to decrease it.) One hole movement gives approximately 0.005 in. (0.13 mm) adjustment.

4. If the correct clearance still cannot be obtained, reset the three adjusting screws to within the limits 0.065–0.072 in. (1.65–1.83 mm) to obtain correct clearance.
5. Reset pedal free-play to 1–1½ in. (2.5–3.8 cm) If new facings have been fitted set free-play to 1½ in. (3.8 cm.) to allow for bedding in.

**Adjustment — Laycock Clutch:** A number of 880 Tractors are fitted with a Laycock clutch, and pedal free-play adjustment on these tractors is exactly the same as the pedal adjustment previously described for tractors fitted with a Borg and Beck clutch. The internal adjustment is, however, different and if the power take-off clutch does not fully disengage when the pedal is fully depressed the adjusting screws on the three release levers should be adjusted as described in next column for 780 Tractors.

## Operation — 780 and 3800 Tractors

The operating mechanism used on 780 and 3800 Tractors is shown in Fig. 7. As the clutch pedal is depressed the roller in the cross shaft fork rolls along the pedal cam and turns the cross shaft. When the pedal is depressed approximately halfway the cross shaft is only turned sufficiently to withdraw the pressure plate, far enough to release the main drive plate but not far enough to contact the three adjusting screws on the inner cover. The power take-off clutch therefore remains engaged and only the drive to the transmission is disconnected.

When the clutch pedal is fully depressed the cross shaft is turned so far that the pressure plate is drawn past the point where it contacts the three inner cover screws. The inner cover is thus also withdrawn and both transmission and power take-off clutches are disengaged.

## Adjustment — 780 and 3800 Tractors

As the clutch linings wear during service the separator plate and pressure plate will move closer to the flywheel and reduce the amount of pedal free-play, thus pedal adjustment should be checked frequently and, when necessary, adjusted by means of the stop bolt in the main frame. This bolt determines position of pedal when clutch is engaged; screwing the bolt further into frame will increase pedal travel and also increase the amount of free-play. The screw should be set so that pedal free-play is ¾ to 1 in. (1.9 to 2.5 cm) and if this amount of free-play cannot be obtained because the screw head is screwed right down on to the locknut more adjustment can be obtained by repositioning the operating lever on cross shaft. First scribe a line across the

lever and cross shaft end (this will enable the new position to be checked against the original position), then remove the two pedal springs and operating lever clamp bolt. Slide operating lever towards the end of shaft so that the splines are exposed behind the lever then firmly grip cross shaft with a pair of pliers and, whilst holding shaft clockwise against return spring inside the cover, remove lever and refit on the next clockwise spline. Check scribe marks to make sure the lever has been moved only one spline and in the correct (clockwise) direction, then refit the clamp bolt and springs and re-adjust the stop bolt.

If the amount of pedal free-play is correct, but the power take-off clutch does not fully disengage when the pedal is fully depressed, this is probably due to excessive clearance between pressure plate and inner cover adjusting screws.

To reset inner cover adjusting screws, remove cover plate from right-hand side of clutch housing and turn engine until a screw is opposite the cover aperture. Insert a feeler gauge through hole in outer cover and set adjusting screw so that it has 0.070 in. (1.78 mm) clearance then *firmly tighten the locknut*. Mark the screw with chalk so that if the engine is turned too far the same screw is not adjusted twice, then turn the engine and reset the other two screws. Finally, recheck pedal free-play and replace cover plate.

**Adjustment — Laycock Clutch:** A certain number of 780 Tractors are fitted with a Laycock clutch and pedal free-play adjustment on these tractors is exactly the same as the pedal adjustment previously described for tractors fitted with a Borg and Beck clutch. The internal adjustment is, however, different and if the power take-off clutch does not fully disengage when pedal is fully depressed the adjusting screws on the three clutch levers should be reset as follows:

1. Check that the clutch housing bolts are fully tightened and the pedal free-play is correct.

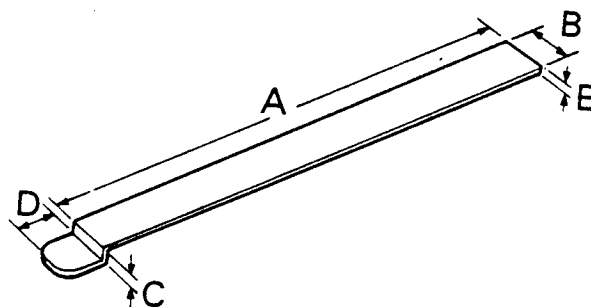


Figure 8. FEELER GAUGE — LAYCOCK CLUTCH

- |                       |                  |
|-----------------------|------------------|
| A. 4 in (101.6 mm)    | B. ¾ in (9.5 mm) |
| C. ⅜ in (2.4 mm)      | D. ¾ in (9.5 mm) |
| E. 0.056 in (1.42 mm) |                  |

2. Make a feeler gauge to the dimensions shown in Fig. 8 and remove cover plate from right-hand side of the clutch housing.

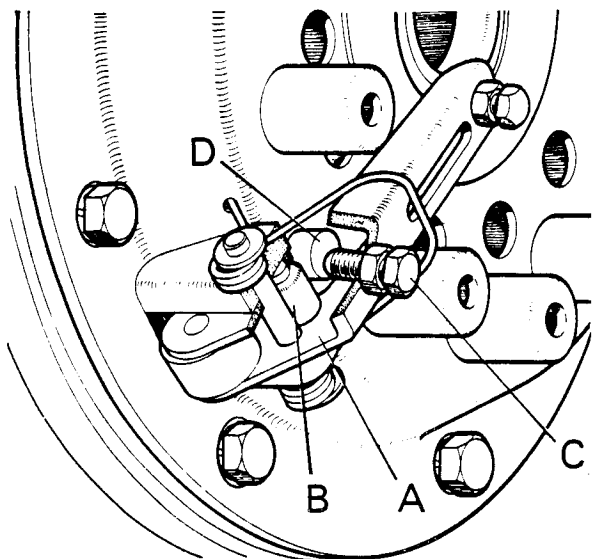


Figure 9.

#### INTERNAL ADJUSTMENT — LAYCOCK CLUTCH

- |                    |                        |
|--------------------|------------------------|
| A. Release lever   | B. Roller              |
| C. Adjusting screw | D. Cover thrust button |

- Turn engine until a release lever is opposite cover aperture then insert cranked end of feeler gauge through open heel of lever. (Fig. 9.) Pass end of gauge over roller and pin until it goes under the adjusting screw, then release locknut and, *taking care to note the number of flats the screw is turned*, tighten screw until it just commences to hold the gauge. Firmly tighten locknut, whilst holding screw stationary, and mark lever with chalk, so that it is not adjusted again if engine is turned too far. Reset remaining screws, *not by using the gauge but by turning the screws exactly the same amount as it was necessary to turn the first screw*. This is important as it ensures the plates and facings remain parallel.

### Operation — 770 Tractors

As the clutch pedal is fitted directly on the cross shaft, and does not operate the cross shaft via a roller and double-faced lever as on 880 Tractors, the pedal has only two stages of movement. (Fig. 10.)

Depressing the pedal until the pressure plate is drawn rearwards and touches the three inner cover adjusting screws gives the first stage and disengages the transmission drive plate. Depressing pedal fully into the second stage withdraws the inner cover, due to the pressure plate pushing the three adjusting screws, and releases pressure on the separator plate. The three flywheel springs then push separator plate from flywheel and release the power take-off drive plate.

### Adjustment — 770 Tractors

As the linings wear during service, pedal free-play will be reduced and this must be restored by adjusting the pedal-stop bolt. Screw the adjusting screw into main frame until pedal has  $\frac{1}{2}$  to  $\frac{3}{4}$  in. (1.3–2 cm) free-play. When the adjusting screw is fully screwed into main frame a further range of adjustment may be obtained by removing pedal from cross shaft and refitting on the next clockwise serration. This will give pedal a large amount of free-play and allow the adjusting screw to be screwed outwards until the correct amount of free-play is obtained. As the cross shaft will turn, due to action of the shaft return spring, when the pedal is removed, it is advisable to mark the original positions of the shaft and pedal so that the new position can be easily found.

When pedal free-play is being adjusted, after the clutch unit has been serviced, it may be necessary to remove pedal from cross shaft and refit on the next clockwise serration, to allow for the change in pedal position, due to the new plate facings.

If difficulty is experienced in freeing PTO clutch, or if clutch unit has been removed from the flywheel, the three adjusting screws in the inner clutch cover should be adjusted to give 0.070 in. (1.78 mm) clearance between the pressure plate and the end of the screw.

The adjusting screw clearance can be checked by inserting a feeler gauge through the holes in the outer cover. If gearbox top is in position the adjusting screws are accessible when the cover plate is removed from right-hand side of clutch compartment and the engine turned to bring the screws opposite the cover aperture. Ensure that the locknuts are firmly tightened after setting the adjusting screws and finally set pedal free-play.

### Servicing Borg and Beck Clutch

The clutch can be dismantled by using the base plate, Service Tool 912917. (See Service Tool Leaflet A4.)

- To ensure reassembly of the parts in the same relative position, thereby preserving the balance and adjustment of the clutch, mark the following parts:
  - pressure plate and inner and outer clutch covers.
  - release levers and pressure plate lugs.
  - separator plate and flywheel.
- Remove three adjuster screws and nuts.
- Screw the long studs into the appropriate holes in the base plate — the studs have a screwdriver slot in the end for this purpose — and fit a cover spacer (912724) on each stud. Place three Code 14 spacers on the base plate, equally spaced and positioned so that the pressure plate will rest on them. Place the clutch assembly on the studs, fit the stud nuts, and tighten down progressively and by diametrical selection.

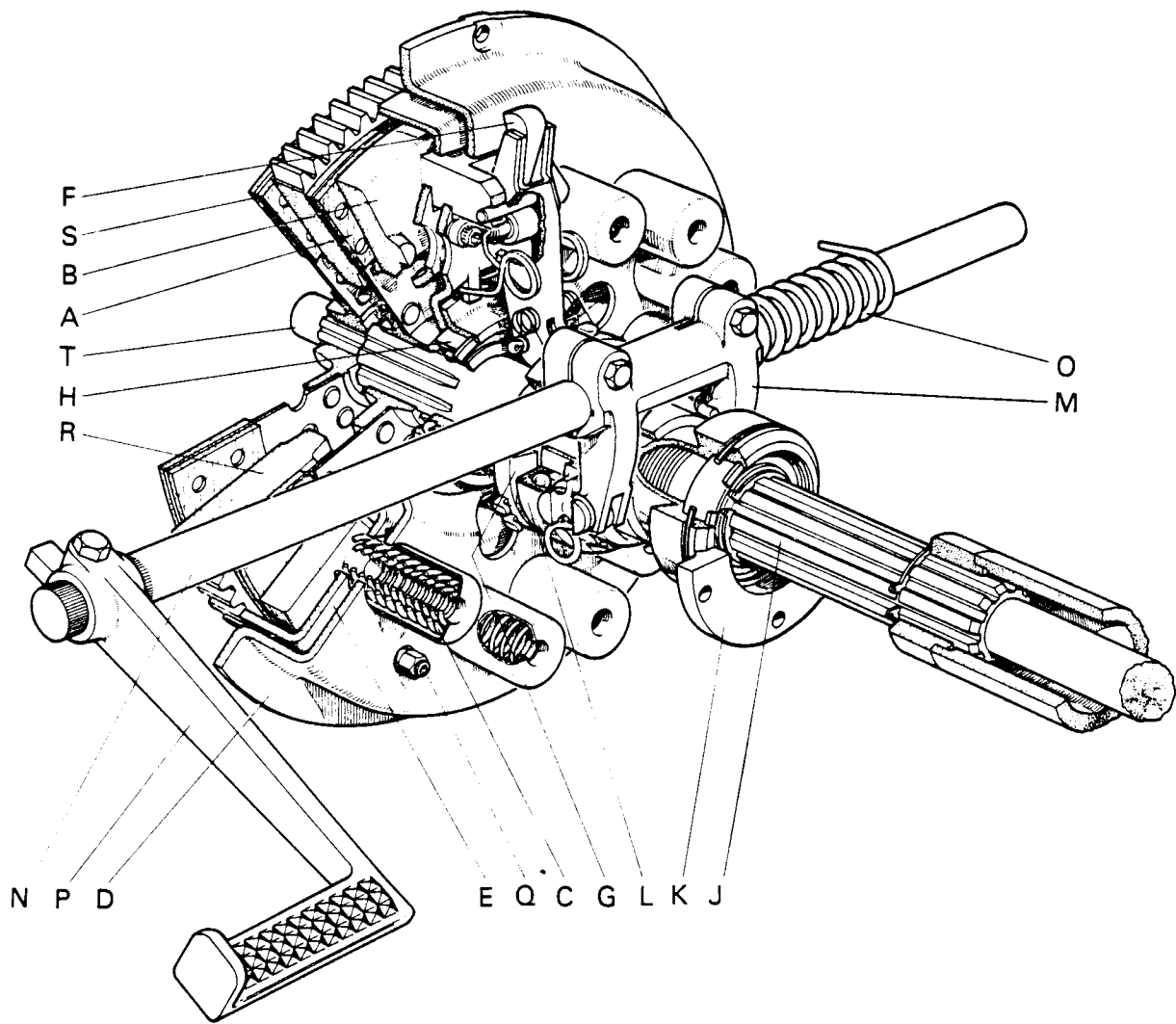


Figure 10 DOUBLE CLUTCH — 770 TRACTOR

- |                                |                       |                        |                            |
|--------------------------------|-----------------------|------------------------|----------------------------|
| A. Driven plate — transmission | B. Pressure plate     | C. Thrust springs      | D. Cover — outer           |
| E. Cover — inner               | F. Release lever      | G. Release lever plate | H. Bearing                 |
| J. Clutch shaft                | K. Support snout      | L. Release bearing     | M. Release fork            |
| N. Cross shaft                 | O. Return spring      | P. Pedal               | Q. Adjusting screw — cover |
| R. Separator plate             | S. Driven plate — PTO | T. Cardan shaft — PTO  |                            |

4. Disengage release lever plate by removing the retaining springs from each release lever.
5. Remove split pins from the release lever fulcrum pins; withdraw the pins and remove release levers after removing the anti-rattle springs.
6. If required, extract the pin securing the roller bearing in each release lever, preparing to catch the 19 needle rollers as each pin is removed.
7. Slowly, and by diametrical selection, unscrew nuts on the long studs securing clutch cover to base plate so that the thrust springs are under control as the cover is released. Separate the various parts of clutch.

## Checking the Clutch Parts

Before reassembling the clutch unit all parts should be thoroughly cleaned and then checked over as below.

1. Check release levers for wear. Renew if flats are worn on the tips or fulcrum points. If necessary fit new roller assemblies and lubricate with anti-scuffing paste.
2. Examine the outer cover bearing and renew if tight or dry. When fitting a new bearing ensure that it is a sliding fit in the housing otherwise the bearing will not run freely and may cause clutch spin. If necessary scrape out the housing until the bearing can be pushed freely into position.

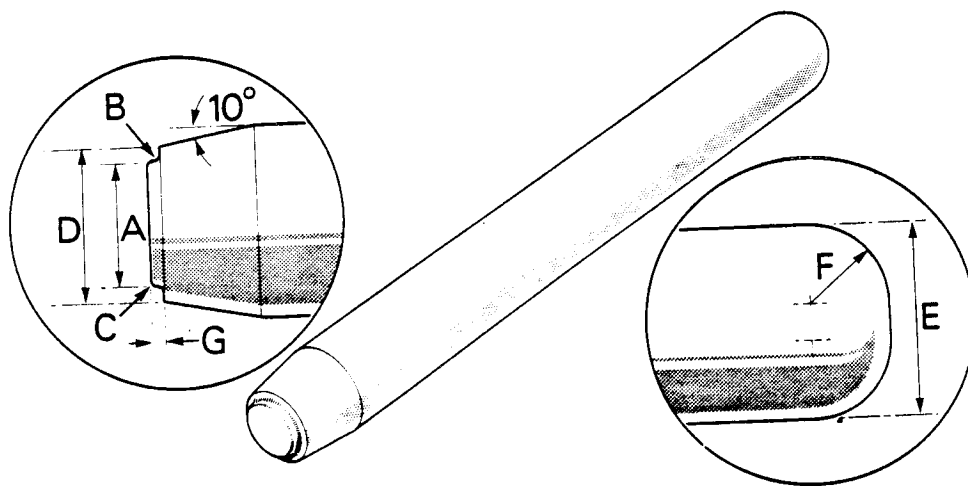


Figure 11. INSERT SWAGING TOOL

A. 0.438 in (11.11 mm)  
D. 0.609 in (15.47 mm)

B. 0.040 in (1.016 mm)  
E. 0.75 in. (19.05 mm)  
G. 0.065 in (1.65 mm)

C. 0.025 in (0.635 mm)  
F. 0.312 in (7.93 mm)

3. Check all the clutch springs. Replace if discoloured, rusty or weak. (See Page 50.)
4. Examine pressure plate and replace if badly scored, cracked or blued. Slight scores or cracks may be removed by resurfacing. Maximum amount which can be removed — 0.015 in. (0.38 mm.)
5. Check the condition of the separator plate. If it is only worn on the transmission side, further life may be obtained by reversing it. If badly cracked or blued, it should be replaced as the maximum which can be removed by resurfacing is 0.030 in. (0.75 mm) (total both sides). Also check that the plate is a free sliding fit in the flywheel teeth: a tight plate will cause power take-off clutch spin and a very slack plate may rattle when the pedal is fully depressed. Separator plate rattle is not, however, detrimental to clutch operation.
6. Fit the pressure plate into each cover in turn and check that the clearance between the three lugs and their respective slots is sufficient to give the covers 0.006–0.012 in. (0.15–0.30 mm) total side play on the pressure plate. If not increase the clearance by filing the cover slots. If the cover slots are filed to increase the clearance, also open out the three adjusting screw-holes in the outer cover to  $\frac{1}{8}$  in. (17.5 mm) to prevent any possibility of the locknuts fouling the cover and breaking the screws.
7. Examine threaded bushes in inner cover and fit new bushes if the threads are worn or if the bushes are loose. New bushes are available under Part No. 962449, and as these are threaded  $\frac{1}{8}$  UNF a set of three must be

fitted, with new screws and nuts, if they are replacing  $\frac{1}{8}$  UNF nuts used on earlier clutches, otherwise the clutch would be out of balance. It will also be necessary to enlarge the three outer cover holes to  $\frac{1}{4}$  in. (17.5 mm) diameter, to allow sufficient clearance for the larger adjusting nuts.

To fit the bushes successfully it is necessary to make a swaging tool to the dimensions shown in Fig. 11. Make the tool from silver steel (good quality tool steel with approximately 1% carbon) and heat treat after machining. Heat to a bright red colour then quench in oil. Polish the spigot end, reheat it to a purple colour and allow to cool naturally in air.

To fit new bushes:

- a. Drill out the existing bushes with a  $\frac{1}{2}$  in. (12.7 mm) diameter drill.
- b. Countersink the holes on outside of cover to  $\frac{3}{8}$  in. (15.48 mm) diameter at 90° included angle.
- c. Press or drive the new bushes in from inside the cover until the bush shoulder is pressed firmly against inside of cover.
- d. Turn cover over and whilst supporting the bush on an anvil use the round end of the tool to flare the hollow end of the bush.
- e. Reverse the tool and use the spigot end to firmly swage the bush in position.
- f. With a smooth file "dress" the bush flush with the outside of the cover.

The cover and bush must be supported on an anvil during the flaring and swaging

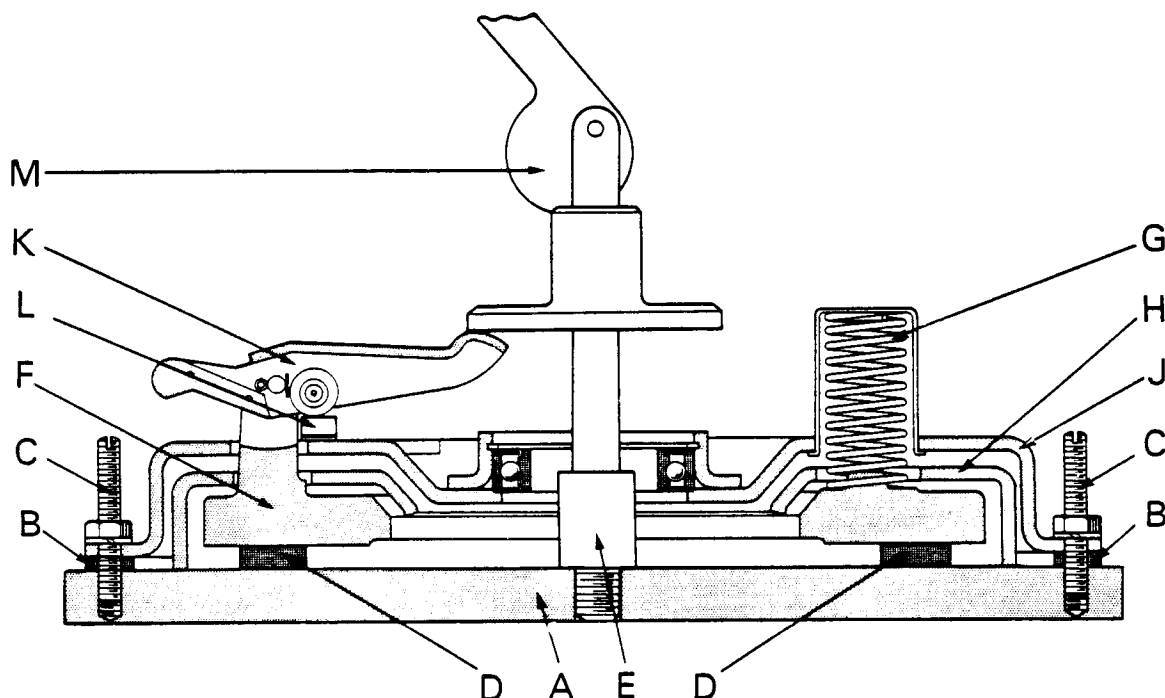


Figure 12. ASSEMBLING A DOUBLE CLUTCH

A. Baseplate	B. Spacers — cover	C. Studs	D. Spacers — pressure plate
E. Adaptor — centre pillar	F. Pressure plate	G. Thrust spring	H. Inner cover
J. Outer cover	K. Release lever	L. Adjuster pad	M. Actuator

operation. If a press is used this must be of at least 5 tons (5080 kg) capacity, and if carried out by hand use a 2 lb (1 kg) copper hammer to avoid damaging the tool.

- Check the three "push-off" springs in fly-wheel.
- Examine the drive plates (see page 24) and check that the plates slide freely on the shaft splines.

## Assembling and Setting a Borg and Beck Double Clutch

- Place the base plate Service Tool 912917 on the bench and clean the face.
- Screw the long studs into the appropriate holes in the base plate; the screws have a screw-driver slot at one end for this purpose.
- Screw the pillar adaptor (912723) into the centre of the base plate and place Code 14 spacers on the base plate, equally spaced and positioned so that they are under the release levers. Fit a cover spacer (912724) on each stud, so that when the stud nuts are tightened the spacers will be clamped between the cover flange and base plate.
- Fit pressure plate on top of the spacers and, after lightly coating the lugs with anti-scuffing paste, fit the inner cover, springs, spring covers and outer cover. Tighten down the cover using the long studs and nuts. Check that all marks made when dismantling are re-aligned and tighten the nuts progressively and by diametrical selection to avoid

distorting the cover.

- Fit release levers.
- Screw the actuator into the adaptor and depress the handle about twelve times to settle the release mechanism. This is essential, otherwise the release lever setting may change when the clutch is put into operation. It is also important to bear in mind that the purpose of this is to operate the release levers in their normal working position, and the actuator must only be screwed into the adaptor far enough to bring the handle horizontal. If the actuator is screwed fully into the adaptor and the handle operated in an almost vertical position, damage to the actuator may occur.
- Remove actuator and fit centre pillar in its place. Place the appropriate spacer, Code 8 on a 10/10 in. clutch and Code 16 on a 11/10 in. clutch, on the centre pillar, with the recess downwards, and then fit the single checking finger. (Fig. 13.)
- Set release levers, by shimming the adjuster pads, to finger height, checking with a set of feeler gauges. A variation of 0.001 in. shim thickness will give a 0.0045 in. variation at the lever tip and the lever tips should be adjusted to within 0.002 in. (0.05 mm) of each other. Operate clutch after changing the shims to settle the parts, and hold the release levers down firmly by hand when checking the height.

Shims for release lever roller pads:

0.002 in. thick	Part No. 900258
0.003 in. thick	Part No. 901723

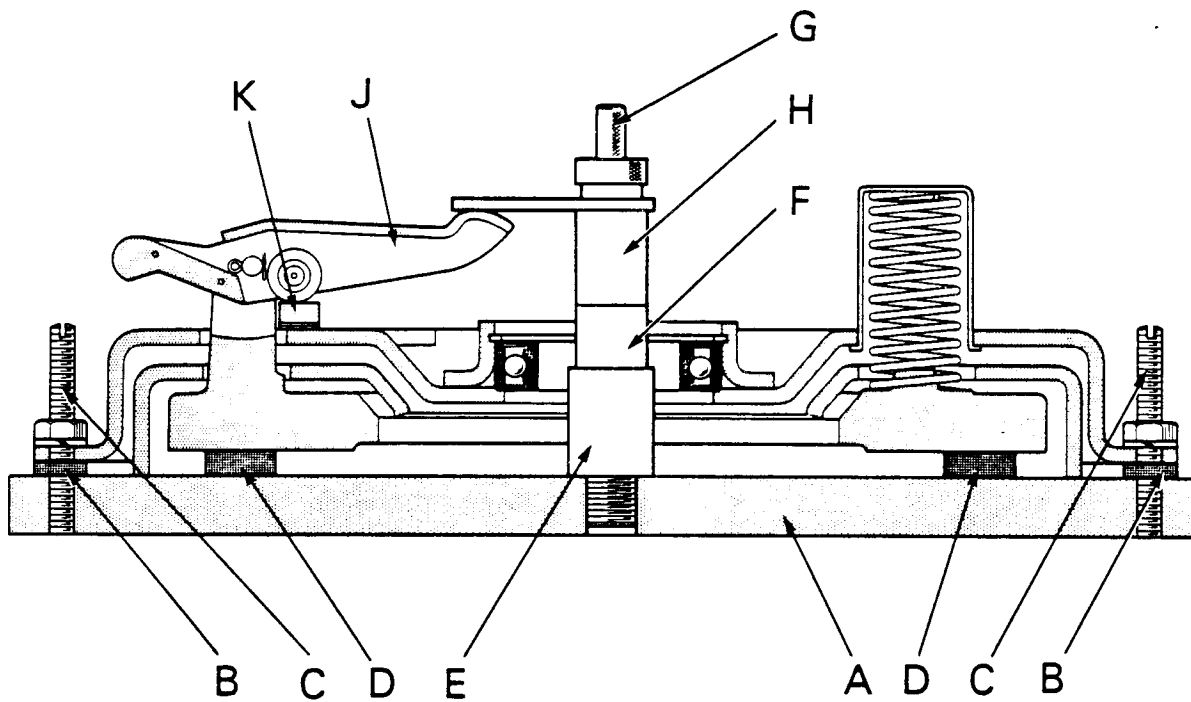


Figure 13. CHECKING RELEASE LEVER HEIGHT — BORG AND BECK

- |                            |                           |                  |                             |
|----------------------------|---------------------------|------------------|-----------------------------|
| A. Baseplate               | B. Spacers — cover        | C. Studs         | D. Spacers — pressure plate |
| E. Adaptor — centre pillar | F. Spacer — centre pillar | G. Centre pillar | H. Setting finger           |
|                            | J. Release lever          | K. Adjuster pad  |                             |

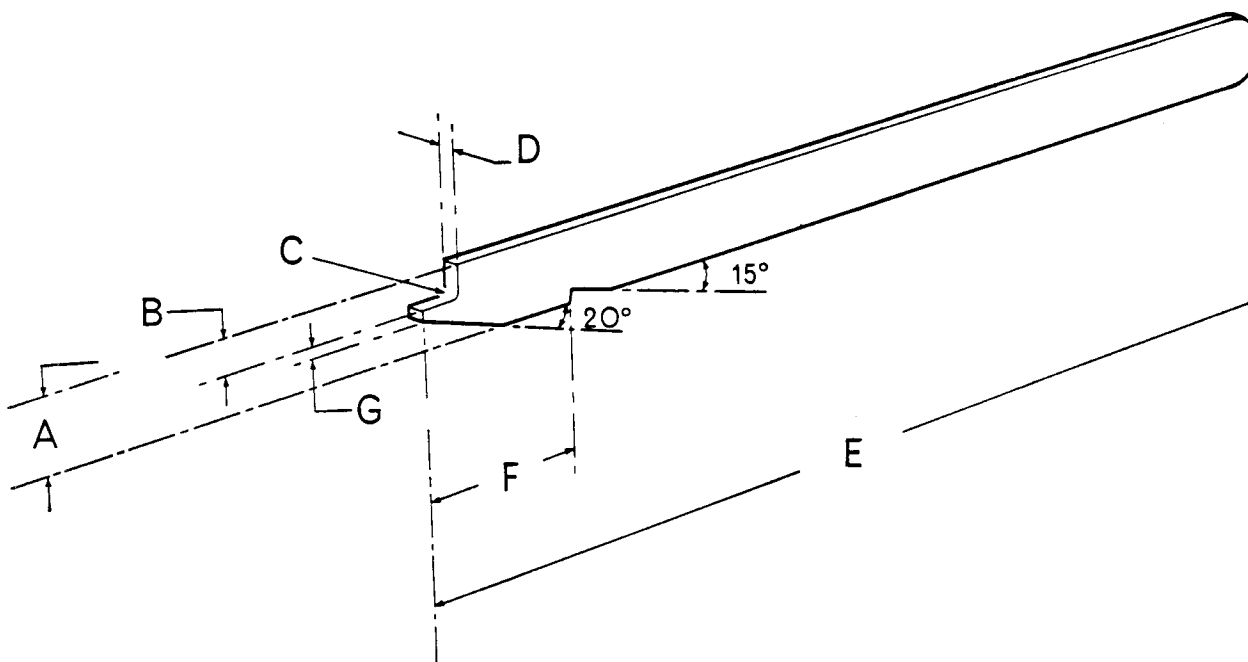


Figure 14. ANTI-RATTLE SPRING REPLACING TOOL

- |                               |                                |                                     |
|-------------------------------|--------------------------------|-------------------------------------|
| A. $\frac{3}{4}$ in (19.0 mm) | B. $\frac{5}{8}$ in (9.5 mm)   | C. $\frac{3}{4}$ in (2.4 mm) radius |
| D. $\frac{1}{8}$ in (3.2 mm)  | E. $11\frac{1}{2}$ in (292 mm) | F. $1\frac{1}{2}$ in (38.1 mm)      |
|                               | G. $\frac{3}{4}$ in (2.4 mm)   |                                     |

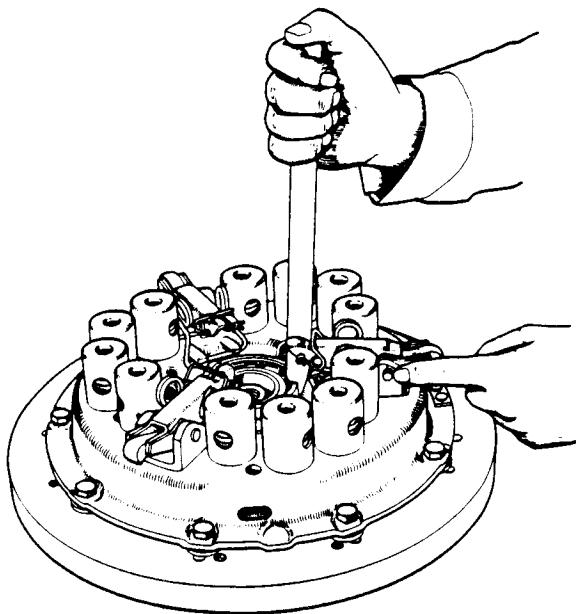


Figure 15. FITTING ANTI-RATTLE SPRINGS

0.010 in. thick Part No. 904138  
0.020 in. thick Part No. 904193

9. Refit the release lever anti-rattle springs. These are of the double coil type and quite strong. The easiest way of fitting them is to make a simple tool as shown in Fig. 14. If the pins attaching the release levers to the pressure plate lugs are removed, and the springs fitted in position, the tool can be rested against the cover bearing housing and used as a lever to push the release lever outwards, against the spring, until the retaining pin can be refitted.

10. Fit the three adjusting screws and nuts into the inner cover and set them to a clearance of 0.070 in. (1.78 mm). (Note that this clearance will require resetting after the clutch is assembled on the tractor flywheel.) Refit release lever plate, securing with the spring clips.
11. Before removing the clutch from base plate, replace the  $\frac{7}{8}$  in. nuts under the release levers, to prevent the thrust springs expanding too far.

## Laycock Double Clutch

The Laycock double clutch is fitted to a number of 880 and 780 Tractors and as this clutch does not use the same release bearing and carrier as the Borg and Beck clutch they are not directly interchangeable.

As the clutch pedal is depressed the release levers (Fig. 16) pivot first about the fulcrum rollers and then, when the adjusting screw contacts the cover thrust button, on the outer cover. When release lever is pivoting on fulcrum roller the pressure plate is drawn rearwards to release the transmission plate but the pressure of the thrust springs is transferred to the three plungers, which are pressed against the separator plate and therefore hold the power take-off driven plate firmly in engagement. Pressing the release levers so far that they pivot on the cover thrust button withdraws pressure plate and also releases the three plungers, so that the three springs in flywheel push the separator plate away from flywheel and release the power take-off plate. Both clutches are therefore disengaged when pedal is fully depressed but only the transmission clutch is disengaged if pedal is not depressed past the point where the adjusting screw contacts cover thrust button.

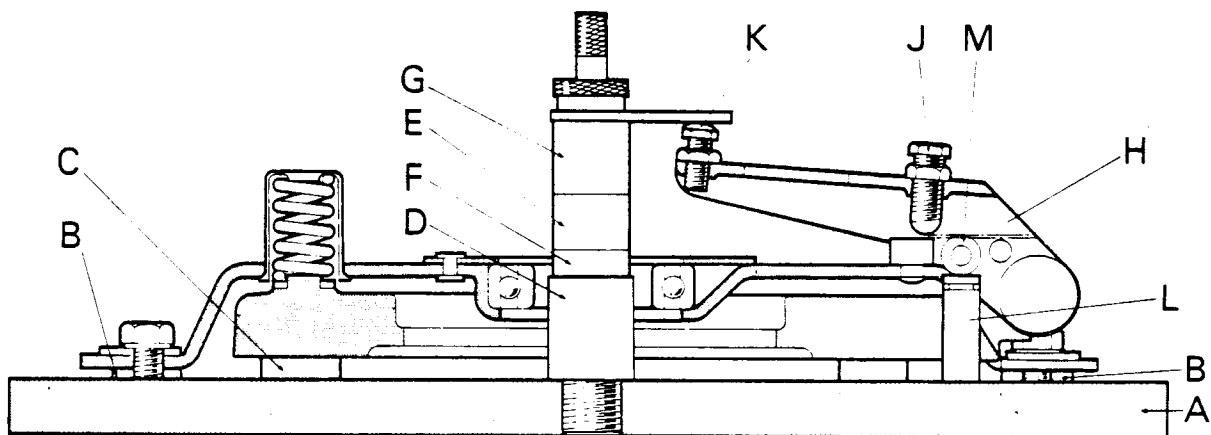


Figure 16. SETTING RELEASE LEVER HEIGHT — LAYCOCK

- |                                   |                             |                                |
|-----------------------------------|-----------------------------|--------------------------------|
| A. Baseplate                      | B. Spacer — cover           | C. Spacers — pressure plate    |
| D. Adaptor — centre pillar        | E. Spacer — 961853          | F. Spacer — 962577             |
| G. Setting finger                 | H. Release lever            | J. Adjusting screw — PTO stage |
| K. Adjusting screw — lever height | L. Plunger — pressure plate | M. Roller — release lever      |

## Servicing the Laycock Double Clutch Unit

The clutch unit can be dismantled by using clutch tool kits 961850 (Kit No. 1) and 961856 (Kit No. 2) which include base plate 912917 (see Service Tool Leaflet A4 or C1). The parts of the tool are identical to those for Borg and Beck clutch except that a centre pillar adaptor 962577 will also be required.

1. To ensure assembly of parts in the same relative position, thereby preserving the balance of the clutch, mark the following parts.
  - a. pressure plate and outer cover
  - b. release levers and plungers
  - c. separator plate and flywheel
2. Screw long studs into appropriate holes in baseplate — the studs have a screwdriver slot for this purpose — and fit a cover spacer 912724 on each stud. Place three code 14 spacers on baseplate, equally spaced and positioned so that the pressure plate will rest on them. Place clutch assembly on studs with release levers opposite the spacers. Fit stud nuts and tighten down progressively by diametrical selection.
3. Slacken off the adjusting screws, remove release lever pivots and spring anchor pins, remove release levers and withdraw roller pins and rollers, and extract plungers.
4. Slowly, and by diametrical selection, unscrew nuts on long studs securing cover to base plate so that thrust springs are under control as cover is released. Separate the various parts of the clutch.

**Checking Clutch Parts:** Before re-assembling clutch all parts should be thoroughly cleaned and then checked as below.

1. Check release levers for wear. Renew if main pivot pin holes are worn, replace adjusting screws if any flats are worn on fulcrum points. Where new adjusting screws are being fitted check that the spherical end is smooth. If there is a pip on end this should be polished away with emery cloth.
2. Examine release lever rollers and renew if any flats are apparent, fit new roller assemblies and lightly lubricate with anti-scuffing paste.
3. Examine thrust buttons (for the PTO stage). If these are excessively worn the cover should be replaced. It is not recommended that the buttons be changed in service.
4. Examine clutch cover bearing and renew if tight or dry. A new bearing should be a light push fit in cover otherwise clutch may spin because outer track will be deformed. If necessary, scrape the three housing locations until bearing can be pushed freely into

position. *It is important that an equal amount is removed from each of the locating faces.* To change the bearing it will be necessary to carefully cut the three rivets, remove retaining plate and punch the rivets out of clutch cover. On re-assembly retaining plate may be secured with three round head  $\frac{3}{8}$  in. diameter rivets or alternatively three round head  $\frac{3}{8}$  BSF screws and nuts, the heads of the screws should be on outer face of clutch cover and the nuts should be treated with Loctite to ensure that they do not work loose.

5. Check clutch springs, replace if discoloured or rusty. It should be noted that the free length of springs may vary up to  $\frac{1}{8}$  in. (1.5 mm) and this is no indication of weak springs. It is the loaded length of the spring that is important. (See Page 50.)
6. Examine spring seat insulating washers and replace if damaged or broken.
7. Examine pressure plate and replace if badly scored, cracked or blued. Slight scores or cracks may be removed by re-surfacing. Do not reduce the thickness by more than 0.015 in. (0.38 mm).
8. Fit pressure plate into cover and check that the clearance between the three lugs and their respective slots is sufficient to give cover 0.006 to 0.010 in. (0.15 to 0.25 mm) total side play on the pressure plate. If not, increase the clearance by filing cover slots.
9. Check the condition of separator plate. If it is only worn on the transmission side, further life may be obtained by reversing it. If badly cracked or blued it should be replaced as the maximum which can be removed by re-surfacing is 0.015 in. (0.38 mm) per side.

**NOTE:** It is inadvisable to re-use clutch springs if any re-surfacing of pressure or separator plate has been carried out. New springs and insulating washers should be fitted to ensure the clutch clamping load is maintained.

Check that separator plate is a sliding fit in flywheel; a tight plate will cause the PTO drive plate to spin and a slack plate may rattle when pedal is fully depressed. Separator plate rattle is not, however, detrimental to the operation of clutch.

10. Check the three push-off springs in flywheel and renew if necessary. These should be of equal length.
11. Examine driven plates (see Page 24) and check that the plates slide freely on shaft splines.

## Assembling and Setting Clutch Unit

1. Place baseplate 912917 on bench and clean the face.



2. Screw long studs into appropriate holes in base plate; the screws have a screwdriver slot at one end for this purpose.
3. Screw pillar adaptor (912723) into centre of baseplate and place three Code 14 spacers on baseplate equally spaced and positioned so that pressure plate will rest on them. Fit a cover spacer (912724) on each stud so that when stud nuts are tightened the spacers will be clamped between cover flange and baseplate.
4. Fit pressure plate on top of spacers and lightly coat lugs with anti-scuffing paste. Fit plungers (also lightly coated with anti-scuffing paste), springs and spring insulating washers, spring covers and then the cover. Tighten down cover using long studs and nuts. Check that all identification marks made when dismantling are aligned and tighten nuts progressively and by diametrical selection to avoid distorting cover.
5. Fit release levers.
6. Screw actuator into adaptor and depress handle about twelve times to settle release mechanism. This is essential, otherwise the release lever setting may change when clutch is put into operation. It is also important to bear in mind that the purpose of this is to operate release levers in their normal working position, and actuator must only be screwed into adaptor far enough to bring the handle horizontal. If actuator is screwed fully into adaptor and handle operated in an almost vertical position, damage to actuator may occur.
7. Remove actuator and fit centre pillar in its place. Place the spacer (Code 8) and a Laycock adaptor spacer 962577, on centre pillar with the recess downwards, and then fit setting finger.
8. Set release levers with adjuster screws K, Fig. 16, to finger height. The height of adjuster screws must be alike. Operate clutch again with actuator lever and recheck height. The release levers should be held down firmly by hand so that roller is in contact with plunger.
9. Refit release lever anti-rattle springs. These are of double coil type and can be easily fitted by hand. The tails of spring fit in the two anchor holes in cover, the hoop of spring fits over lever and the two eyes mount on release lever pivot pin.
10. Fit the three adjusting screws and nuts into release levers and set them to a clearance of 0.048 in. (1.22 mm). *(NOTE that this clearance must not be altered after clutch is assembled on tractor flywheel as due allowance has been made for the use of Borg & Beck equipment when setting the Laycock clutch.)*

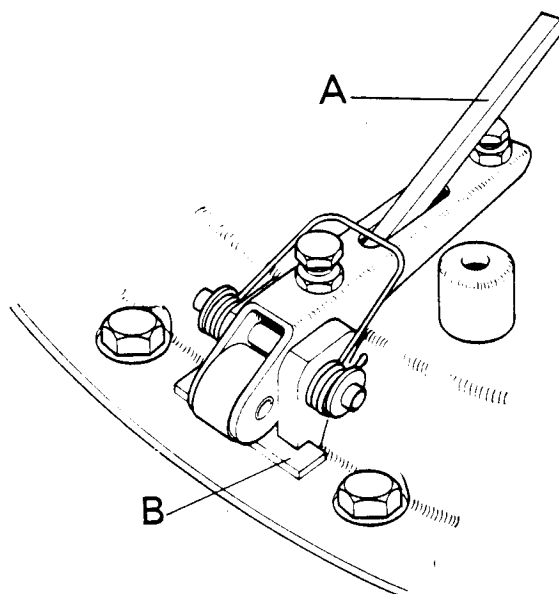


Figure 17.

#### FITTING TRANSIT BLOCK TO LAYCOCK CLUTCH

A. Lever

B. Transit block

11. Before removing clutch from baseplate, replace transit blocks —  $\frac{3}{4}$  in.  $\times$   $\frac{1}{2}$  in.  $\times$  2 in. (2.38  $\times$  12.7  $\times$  50.8 mm) — between cover and pressure plate at the heel of release levers to prevent thrust springs expanding too far as shown in Fig. 17.

**Driven Plates:** When fitting the driven plates it is essential that the flanged side of plate hub faces towards flywheel. On new Borglute plate the appropriate facing will be stamped "Flywheel this Side" in red.

If for service purposes it is necessary to fit a Borg & Beck transmission drive plate, the clearance of release lever adjusting screws on baseplate must be set to 0.057 in. (1.447 mm) because the Borg & Beck drive plate is thicker than the Laycock plate.

## DUAL CLUTCH — 1200 LIVEDRIVE TRACTORS

**Operation:** The dual clutch fitted in 1200 Livedrive Tractors has two 11 in. (27.9 cm) diameter plates assembled into a single unit but each fitted with its own release mechanism. The transmission clutch is controlled by a foot pedal and the power take-off clutch controlled by a hand lever. Each clutch can therefore be disengaged, or engaged, independently of the other clutch. (Fig. 18.)

The power take-off hand lever is fitted with a catch so that the lever can be locked in the disengaged position for temporarily disengaging drive to power-driven implements. The lever should not, however, remain in the disengaged position for long periods as this would place unnecessary strain on the release mechanism. Always put the power take-off gear lever in neutral and engage the power take-off clutch when not using the power take-off.

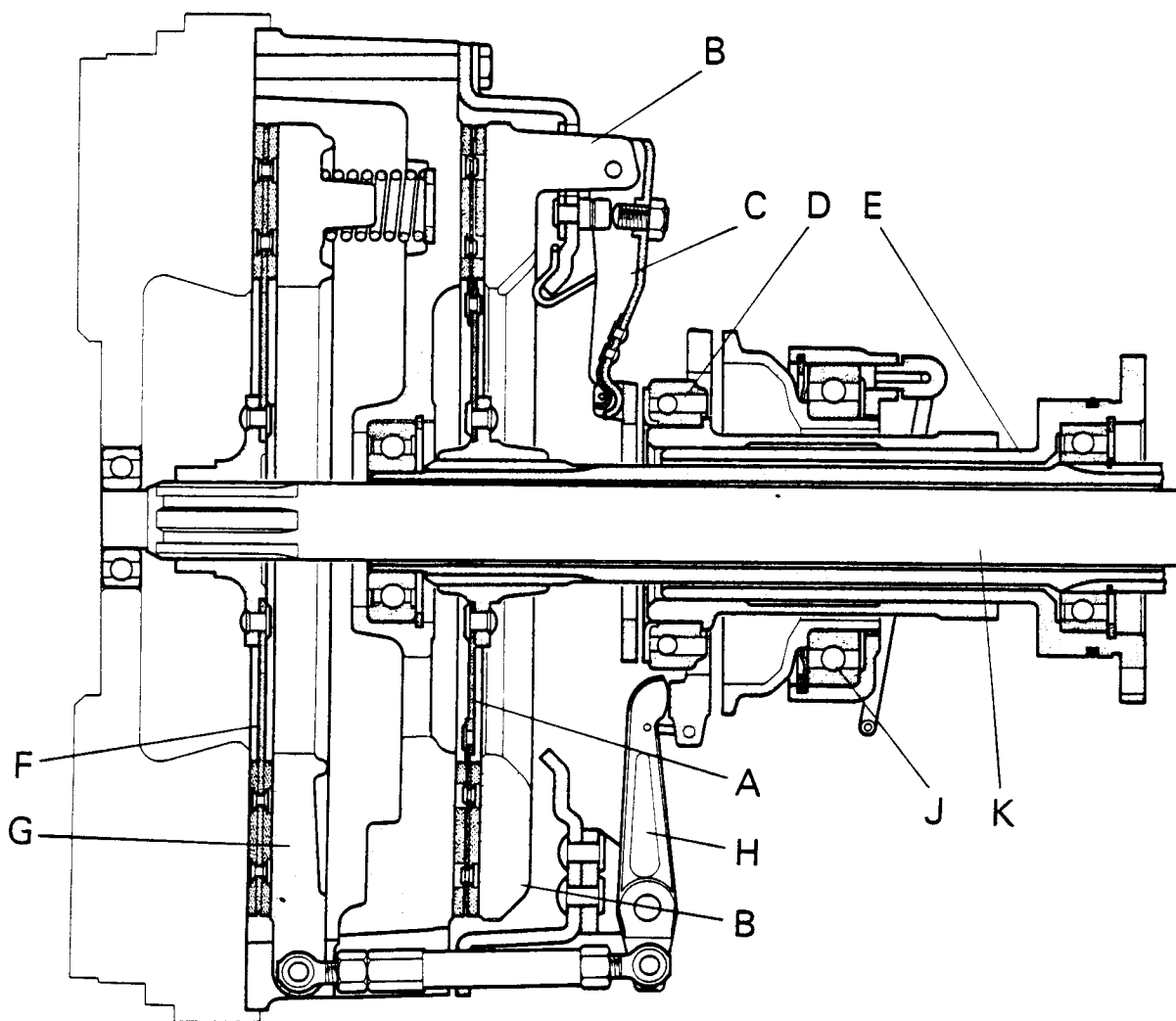


Figure 18. SECTIONAL ARRANGEMENT OF DUAL CLUTCH

A. Driven plate	} Transmission clutch	F. Driven plate	} PTO clutch
B. Pressure plate		G. Pressure plate	
C. Release lever		H. Release lever	
D. Release bearing		J. Release bearing	
E. Support snout		K. Driveshaft	

**Adjustments:** As the clutch facings wear during service the amount of free-play in the operating linkage will be reduced and the maintaining of sufficient free-play is the only adjustment required in the field.

*Failure to maintain sufficient free-play in either the transmission or power take-off clutch linkage will cause premature wear of the release mechanism and ultimate clutch failure.*

**Transmission Clutch Adjustment:** If the pedal free-play is less than  $\frac{1}{2}$  in. (12 mm) release the locknut and unscrew the adjusting nut, to lengthen the rod, until the free-play is increased to  $\frac{3}{4}$ –1 in. (1.9–2.5 cm) then tighten the locknut. (Fig. 19.)

**Power Take-off Clutch Adjustment:** The power take-off lever should have  $1\frac{1}{2}$  in. (3.2 cm)

free-play when in the forward — engaged — position, and to increase the amount of free-play release the locknut and unscrew the adjusting nut to lengthen the rod then tighten the locknut.

When adjusting the power take-off clutch always check that the hand lever return spring has sufficient tension to hold the rod fully forward when in the engaged position. If necessary renew the pull-off spring, or fit an additional spring, to hold the lever firmly against the front of the slot. *Failure to carry out this check may result in premature wear of the release mechanism.*

## Servicing the Clutch Unit

To service the dual clutch unit it is necessary to use either a baseplate kit or a flywheel kit of Service Tools. (See Page 40.)

Figure 19. CLUTCH LINKAGE — 1200 TRACTORS

- |                                  |                       |
|----------------------------------|-----------------------|
| A. Free play                     | } Transmission clutch |
| B. Connecting rod                |                       |
| C. Adjusting nut                 |                       |
| D. Adjusting screw — clutch stop |                       |
| E. Free play                     | } PTO clutch          |
| F. Connecting rod                |                       |
| G. Adjusting nut                 |                       |

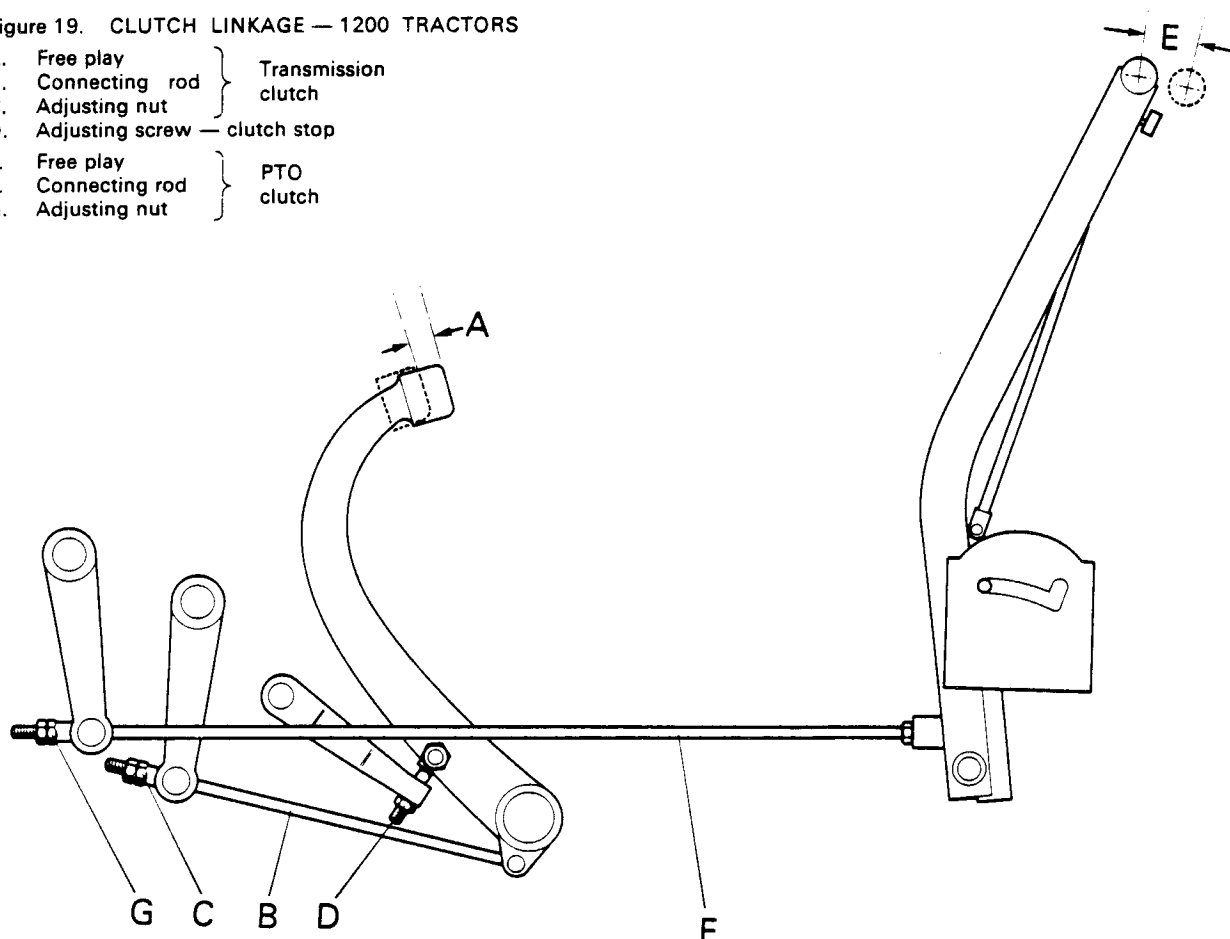
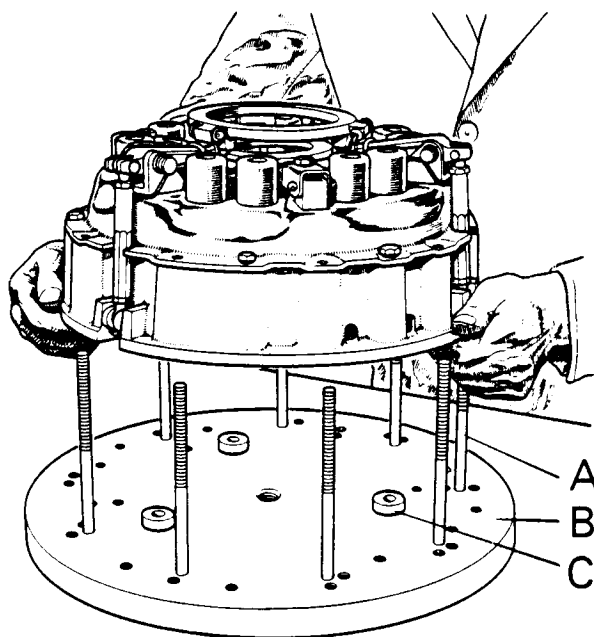


Figure 20.

PLACING DUAL CLUTCH ON BASEPLATE

- |              |
|--------------|
| A. Studs     |
| B. Baseplate |
| C. Spacer    |

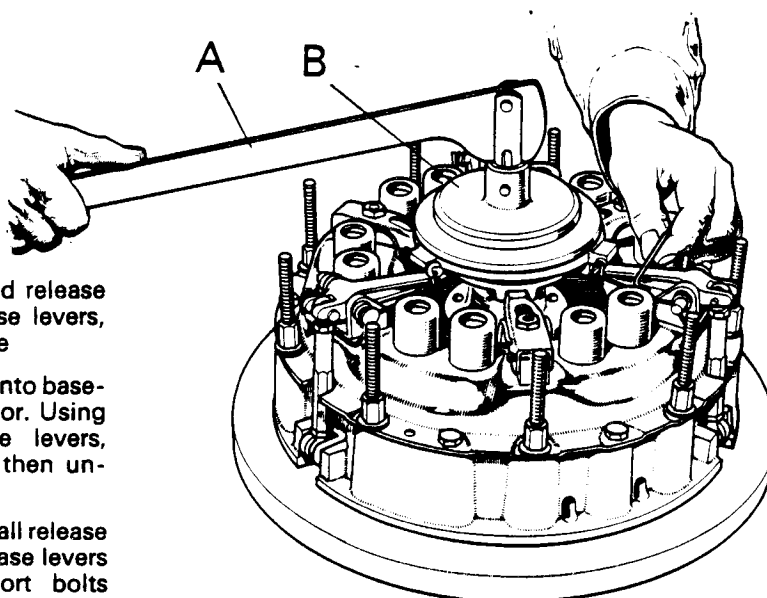


**Dismantling the Clutch:**

1. Screw the nine special long bolts in the appropriate holes in baseplate, tighten firmly and lightly smear the long threaded portion with anti-scuffing paste.
2. Place three Code 3 spacers, evenly spaced, on the baseplate. Slide clutch assembly on the bolts and position the three spacers so that they are adjacent to the three PTO pressure-plate toggle lugs. (Fig. 20.) Fit a flat washer and nut on each bolt. Tighten the nuts evenly, and by diametrical selection, until clutch and baseplate are clamped firmly together.
3. To maintain balance when re-assembled mark the following components (a felt-tipped pen is ideal for this purpose): PTO and main

Figure 21.  
REMOVING RETAINING  
STAPLES

- A. Actuator
- B. Adaptor plate



drive covers, pressure plate lugs and release levers, PTO cover yokes and release levers, main drive cover and pressure plate

4. Screw the long centre pillar adaptor into base-plate and screw actuator into adaptor. Using actuator to depress PTO release levers, remove the three retaining staples then unscrew actuator. (Fig. 21.)
5. Remove clevis pins from the ends of all release levers and remove transmission release levers from cover. Remove the six short bolts attaching cover to main housing.
6. Remove nuts from the nine long bolts. Unscrew nuts evenly, and by diametrical selection, until the thrust springs are fully expanded, then dismantle clutch from baseplate. (Fig. 22.)

**Thrust Springs:** Renew springs that are rusted, damaged or weak. As the free length varies, even on new springs, the use of a spring tester is recommended. (See Page 50.)

## Inspection of Parts

Examine all parts after cleaning, paying special attention to the following:

**Transmission and PTO Pressure Plates and Separator Housing:** The friction surfaces must be smooth and free from blueing or cracks and the pivot points not excessively worn. The friction surfaces may be reground provided that not more than 0.015 in. (0.38 mm) of metal is removed from any one face. Excessive removal of metal will reduce pressure and affect clutch operation.

**Separator Housing Bearing:** Renew bearing if it is tight, affected by dust, or if the lubricant has dried out.

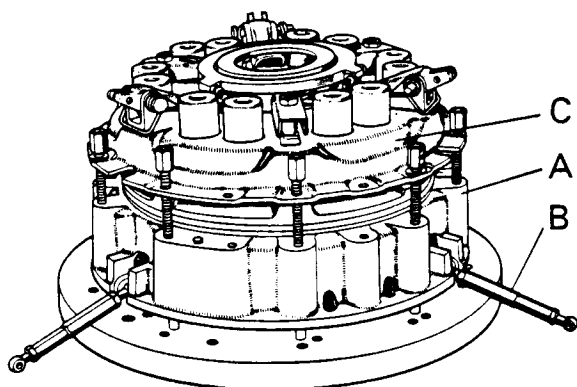


Figure 22. DISMANTLING CLUTCH

- A. Separator housing
- B. PTO toggles
- C. Cover assembly

Spring colour	Transmission Dark blue/ light green	Power Take-off Red
Minimum load	130 lb (58 kg)	131 lb (59 kg)
Checking length	1.69 in. (43 mm)	1.41 in. (36 mm)

Renew springs whose load is below the minimum. Some early clutches were fitted with lavender/black springs on the transmission plate and these should be replaced by a set of dark blue/light green springs.

**Insulating Washers:** Renew any broken, or damaged, insulating washers. Fix any loose washers in place on the housing with adhesive.

**Transmission Cover:** Renew if release lever pivots are distorted or loose. Place the pressure plate inside the cover, assembly marks aligned, to ensure plate lugs slide freely through cover holes. File plate lugs if there is insufficient clearance.

**Release Levers:** Damaged or worn levers should be renewed, together with any bent or worn pivot pins.

**Release Lever Springs:** Check thickness of transmission release lever springs and if they are 0.104 in. (2.64 mm) diameter replace these with stronger springs, Part No. 923989, which are 0.128 in. (3.25 mm) thick.

**Release Lever Adjusting Screws:** If hexagonal-headed adjusting screws are fitted in the transmission release levers, replace these with socket-headed screws, Part No. 923990, which are lighter. If lighter screws are not available reduce the

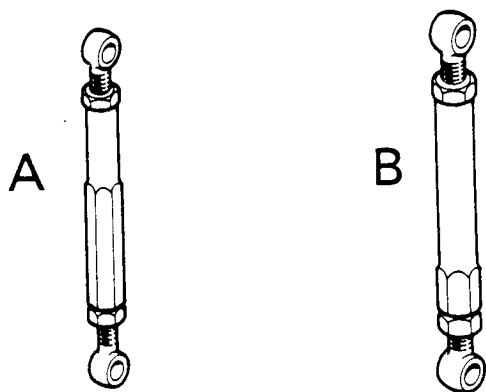


Figure 23. PTO CLUTCH TOGGLE LEVERS

- A. Early toggle,  $\frac{7}{8}$  UNF threads
- B. Later toggle,  $\frac{3}{4}$  UNF threads

weight of the original screws, by sawing off the hexagon head and cutting a screwdriver slot in the screw end.

**Release Lever Plates:** Renew these if they are worn on the surface or lever tip register.

**Release Lever Toggles:** If the PTO lever toggles are being renewed ensure that the correct toggles are being used. A number of early clutches were fitted with  $\frac{7}{8}$  UNF toggles and these must not be replaced by  $\frac{3}{4}$  UNF toggles, which are thicker and would not operate freely. (Fig. 23.)

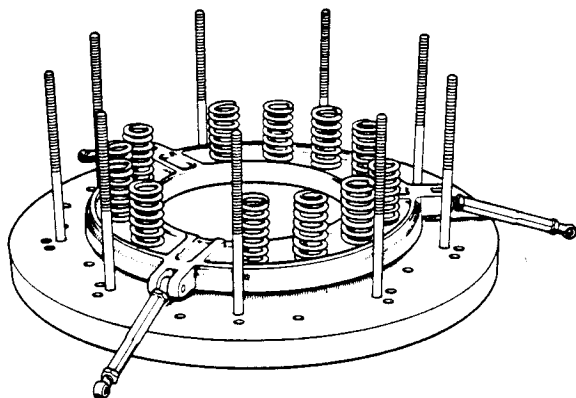


Figure 24. ASSEMBLING PTO PRESSURE PLATE

## Assembly and Setting

1. Clean and dry all clutch components, baseplate and spacers. Check that adaptors screw freely into baseplate and lightly lubricate threads.
2. Place Code 3 spacers on baseplate and place PTO pressure plate on spacers; position plate so the spacers are adjacent to plate lugs. (Fig. 24.) Fit red springs on pressure plate and, after smearing plate lugs with anti-scuffing paste, place separator housing in position. Align the assembly marks and ensure that no insulating washers fall out as the housing is inverted. (Fig. 25.)

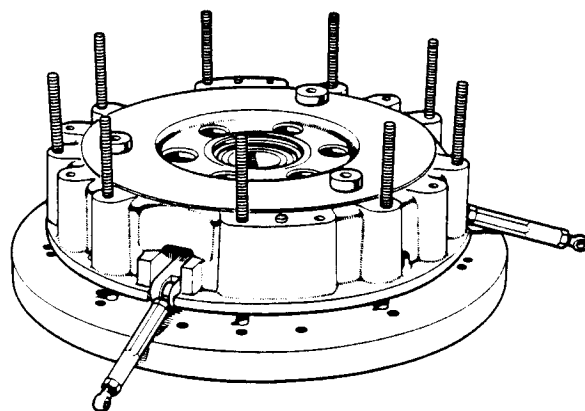


Figure 25. FITTING SEPARATOR HOUSING

An alternative method of assembling PTO pressure plate is to lay separator housing on bench, fit thrust springs and pressure plate in housing then turn assembly over whilst holding housing and plate together and place on baseplate.

3. Place three Code 13 spacers on friction surface of separator housing then fit transmission pressure plate on the spacers. Position pressure plate so that assembly marks are aligned and place the spacers below plate lugs. Temporarily fit cover to ensure pressure plate is centralised on housing.

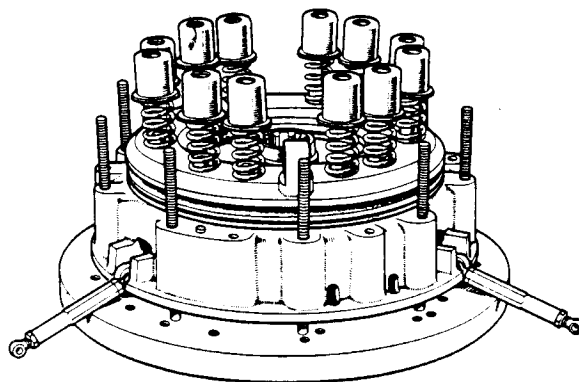


Figure 26. ASSEMBLING TRANSMISSION CLUTCH

4. Fit the dark blue/light green thrust springs on pressure plate and, after lightly smearing the inside of cover apertures with anti-scuffing paste, align assembly marks and place cover over springs, taking care that the cover does not bind on the pressure plate lugs. Screw a nut, with a flat washer underneath, on each of the nine long bolts. Tighten nuts evenly and by diametrical selection, until the assembly is clamped firmly against baseplate. Replace and fully tighten the short bolts attaching cover to separator housing. (Fig. 26.)

5. Fit transmission release levers and retaining springs. Smear pivot pins and contact points of release levers with anti-scuffing paste and take care not to overstretch the springs. Secure the pivot pins with split pins. Fit release lever plate and retain in position by fitting split pins: the small leaf spring in end of lever must be pressed in towards lever and the split pin fitted underneath it, so that the plate is held against the lever tips.

6. Fit PTO release lever but do not fit split pins in lever pivot pins. Temporarily fit the release lever plate on ends of lever.

7. Screw the short adaptor into baseplate and screw actuator into adaptor. Do not screw actuator too far into adaptor but screw it in so that when actuator lever is horizontal the release lever plate is depressed  $\frac{1}{8}$  in. (3.2 mm). Operate actuator handle rapidly about a dozen times: this is essential to settle the moving parts, otherwise the lever settings will change when the clutch is used.

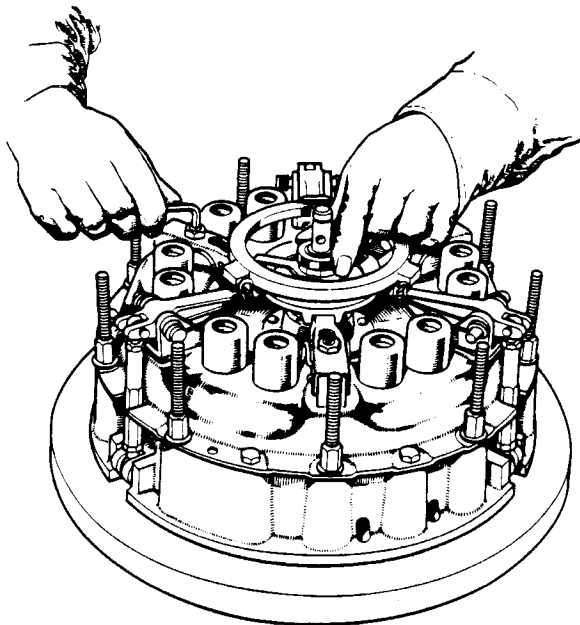


Figure 27.

#### SETTING TRANSMISSION RELEASE LEVER HEIGHT

8. Remove actuator and screw centre pillar firmly into adaptor. Place a spacer, Code 16X (some early spacers were marked "Code 16" only), on centre pillar—recess in spacer towards adaptor. Fit short setting finger on centre pillar and set adjusting screws on transmission levers so that when finger is rotated, whilst being held firmly and squarely against spacer, it just touches lever plate all the way round. (Fig. 27.) When the levers are correctly set, hold screws stationary and firmly tighten locknuts.

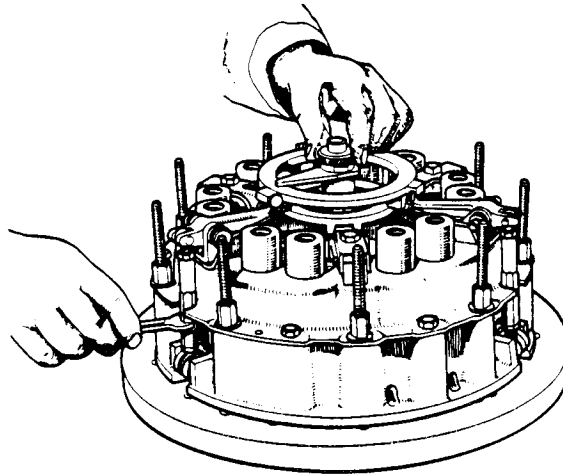


Figure 28. SETTING PTO RELEASE LEVER HEIGHT

9. Remove gauge finger and centre pillar. Screw actuator into adaptor and repeat Operation 7, then refit spacer and gauge finger to recheck lever adjustment. Reset lever screws if necessary, but ensure that locknuts are fully tightened.

10. Remove short adaptor from baseplate and screw long adaptor in its place. Fit circular plate on actuator and screw actuator into adaptor until the release lever plate is pushed down  $\frac{1}{8}$  in. (3.2 mm) when the lever is horizontal. Operate actuator rapidly about a dozen times: this is essential to settle the moving parts and ensure the lever setting does not alter when clutch is used.

11. Remove actuator, screw centre pillar into adaptor and fit spacer, Code 16X (some early spacers were marked "Code 16" only), on pillar—recess in spacer towards adaptor. Fit the long setting finger on centre pillar and set the three toggles so that when setting finger is rotated, whilst being held firmly and squarely against spacer, it just touches the lever plate all the way round. (Fig. 28.) When the lever setting is correct, lock toggles by firmly tightening all six locknuts.

12. Remove gauge and centre pillar. Screw actuator, with plate, into adaptor and operate actuator a dozen times, as described in Operation 10, then replace spacer and gauge to recheck lever setting. Reset toggles if necessary, but ensure that all locknuts are fully tightened.

13. Remove PTO release lever plate and withdraw lever pivot pins, so that levers and toggles can be swung outwards clear of clutch. Make three stiff wire staples, similar to the PTO retaining staples but shorter, and hook these over the transmission levers, so that when the cover is removed from separator housing the staples will prevent thrust springs pushing levers away from cover.

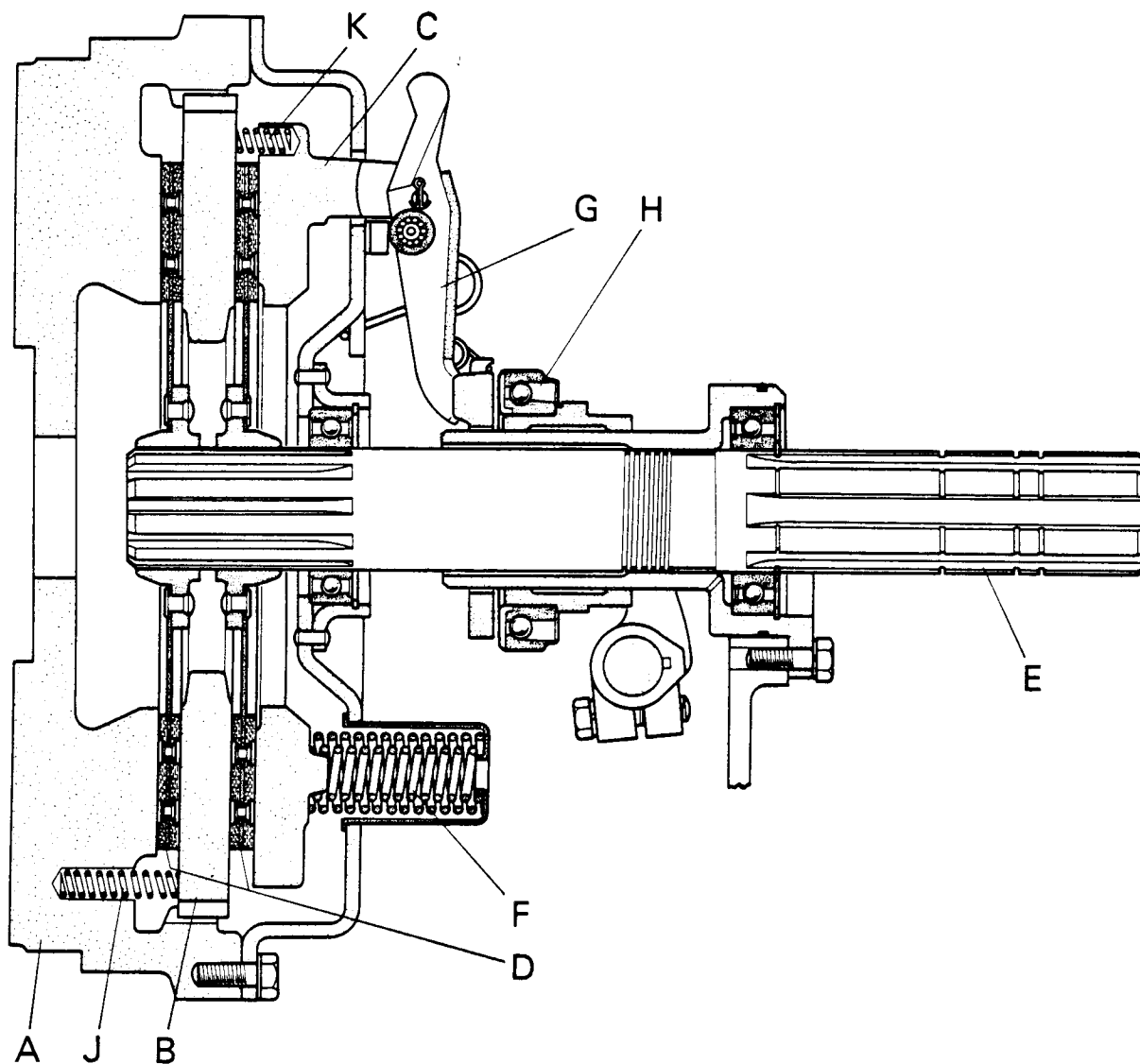


Figure 29. TWIN-PLATE CLUTCH

- |                  |                            |                      |
|------------------|----------------------------|----------------------|
| A. Flywheel      | B. Separator plate         | C. Pressure plate    |
| D. Driven plates | E. Driveshaft              | F. Thrust springs    |
| G. Release lever | H. Release bearing         | J. Spring — flywheel |
|                  | K. Spring — pressure plate |                      |

14. Remove short bolts from cover then unscrew nuts from long bolts evenly until spring tension is released. Lift cover from separator housing and remove spacers, centre pillar and adaptor. Place transmission driven plate on separator housing — side marked "Flywheel" towards housing — then refit cover assembly. Use pilot tool (Fig. 44), or a clutch driveshaft, to align driven plate with separator housing bearing and fit three nuts, *with flat washers underneath*, spaced evenly round the housing. Tighten the three nuts evenly to clamp cover down, then replace and firmly tighten the six short cover bolts.

15. Remove staples from transmission levers, refit PTO release levers and release plate. Fit

retaining staples on PTO levers, check that all split pins are securely locked, then remove the three nuts and lift from baseplate.

## TWIN-PLATE CLUTCH

The twin-plate clutch is an optional fitting on 880 and 990 Non-Livedrive Tractors and is of similar construction to the Livedrive clutch but has both inner and outer driven plates mounted on the same driveshaft. The clutch therefore functions as a single clutch but the twin plates give it twice the facing area of a single plate unit.

**Adjustment:** Clutch pedal adjustment is by means of the adjusting screw on the cross shaft operating lever (Fig. 6) and this should be set to

give 1 to 1½ in. (2.5 to 3.8 cm) free-play. As no intermediate stage is required, the pedal roller has no eccentric adjustment and the cross shaft lever is not equipped with two angled faces. The maintaining of sufficient free-play is the only adjustment normally required during service.

On early clutches there are three adjusting screws on the inner cover — the screws used for PTO clutch adjustment on the Livedrive clutch and shown in Fig. 6 — and if the driven plates fail to stop when the pedal is fully depressed, this may be caused by excessive clearance between the screws and pressure plate. To set the adjusting screws, remove vent cover from clutch housing and turn engine so that one of the screws is opposite cover aperture. Release locknut, insert a 0.050 in. (1.27 mm) feeler gauge through hole in clutch cover and between screw end and pressure plate. After adjusting screw so that it just holds feeler gauge, hold screw stationary and firmly tighten locknut. Turn engine and adjust the two remaining screws in the same manner. Ensure that the locknuts are fully tightened before replacing cover.

## Servicing the Twin-Plate Clutch

1. To ensure re-assembly of parts in the same relative position, mark the pressure plate, release levers and covers (a felt-tipped pen is ideal for this purpose).
2. Screw long studs into appropriate holes in clutch tool baseplate, using screwdriver slots in studs. Fit a cover spacer (912724) on each stud and place three spacers, Code 14, on baseplate — equally spaced and positioned so that the pressure plate will rest on them. Slide clutch assembly on studs. Fit nuts on studs and tighten down evenly, and by diametrical selection, until the clutch is clamped firmly against baseplate.
3. Remove release lever thrust plate and if clutch is fitted with an inner cover, remove the three inner cover adjusting springs.
4. Remove split pins from release lever fulcrum pins. Withdraw pins and remove anti-rattle springs and release levers.
5. If required, extract pin securing roller bearing in each release lever, preparing to catch the 19 needle rollers as each pin is removed.
6. Evenly, and by diametrical selection, unscrew nuts from the long studs until thrust springs are released then remove cover and separate the various parts.

## Checking the Clutch Parts

Examine all parts after cleaning, paying special attention to the following:

**Release Levers:** Renew if flats are worn on tips of fulcrum points. If necessary, fit new roller assemblies and lubricate with anti-scuffing paste.

**Cover Bearing:** Renew if bearing is tight or dry. When fitting a new bearing ensure that it is a sliding fit in housing. If necessary scrape out the housing until bearing can be pushed freely into position.

**Thrust Springs:** Renew any springs that are weak, damaged or rusty. As the free-length varies, even on new springs, the use of a spring tester is recommended. (Page 50.)

**Pressure Plate:** If surface is cracked, blued or badly scored renew. If slightly scored the surface may be refaced provided that not more than 0.015 in. (0.38 mm) of metal is removed.

If a new pressure plate is fitted it is recommended that the latest type plate (962573) and three springs (625232) are fitted. The clutch can then be converted to the latest type unit by discarding the inner cover and fitting two new driven plates (928288). (Fig. 29.)

**Separator Plate:** If plate is cracked, blued or badly scored it should be renewed. If slightly scored the surfaces may be reground if thickness of plate is not reduced by more than 0.030 in. (0.75 mm). Also check that plate is a free sliding fit in the flywheel teeth: a tight plate will cause clutch drag and a very slack plate may rattle when the pedal is fully depressed, although separator plate rattle is not detrimental to clutch operation.

**Covers:** Fit pressure plate into cover and check that release lever lugs have sufficient clearance to allow 0.006 to 0.012 in. (0.15 to 0.30 mm) movement of cover; if not, file cover slots, where required, to increase clearance. On early clutches with an inner cover also check that the adjusting screw inserts are in good condition; renew these if necessary (see Page 10).

**Separator Plate Springs:** Clean out the three holes in flywheel and check springs. Clutches without inner cover also have three compression springs in pressure plate and it is important that these operate freely, otherwise clutch will spin when disengaged.

**Driven Plates:** Examine drive plates (see Page 24) and check that plates slide freely on shaft splines.

## Assembling and Setting a Twin-Plate Clutch

1. Place baseplate (Service Tool 961696) on bench and clean face. Screw long studs into appropriate holes in baseplate, using screwdriver slot in stud ends. Screw adaptor (912723) into centre of baseplate and place a cover spacer (912724) on each stud.



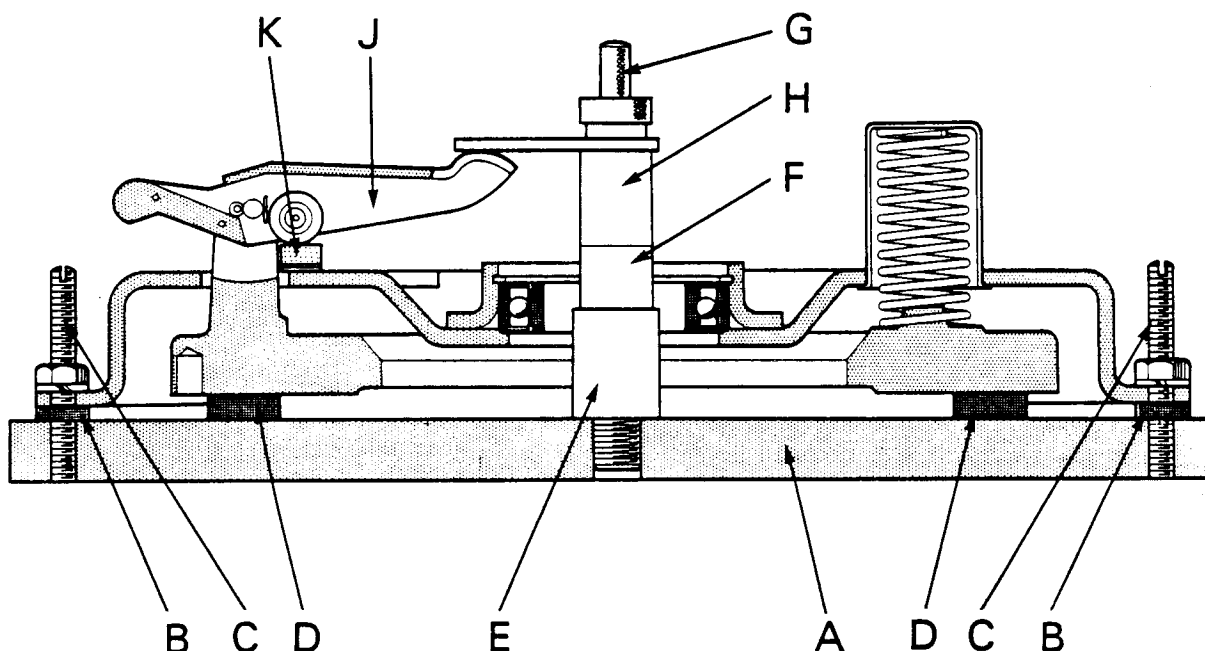


Figure 30. SETTING RELEASE LEVER HEIGHT

A. Baseplate	B. Spacer — cover	C. Studs
D. Spacer — pressure plate	E. Adaptor — centre pillar	F. Spacer — centre pillar
G. Centre pillar	H. Setting finger	J. Release lever
	K. Adjuster pad	

2. Position three spacers, Code 14, on baseplate and fit pressure plate on top of spacers: ensure that spacers are equally spaced under pressure plate and plate is central with studs.

3. Lightly smear pressure plate lugs with anti-scuffing paste and place thrust springs in position. If the clutch incorporates an inner cover, replace this and the six light springs. Replace outer cover and fit a nut on each baseplate stud. Check that assembly marks are aligned then tighten nuts down, evenly and by diametrical selection, until cover is firmly clamped against spacers on stud.

4. Replace release levers, but not lever plates, and screw actuator into adaptor. Do not screw actuator too far into adaptor: screw it in so that when actuator lever is horizontal the release lever tips are depressed  $\frac{1}{8}$  in. (3.2 mm). Operate actuator rapidly about a dozen times to settle working parts. This is essential otherwise release lever setting may change when clutch is put into operation.

5. Remove actuator and screw centre pillar into adaptor. Place the appropriate spacer, Code 8 if early 10/10 clutch but Code 16X if a 10/10 clutch without inner cover, or an 11/10 in. clutch, on the centre pillar — recess in spacer downwards — then fit checking finger. Set release levers, by shimming adjuster pads, so that lever tips are within 0.002 in. (0.05 mm) of gauge finger. Hold levers down firmly by hand when checking height setting and use a feeler gauge to measure the clearance

between lever and gauge finger: a 0.001 in. variation in shim thickness gives 0.0045 in. variation at lever tip. (Fig. 30.)

Shims for release lever roller pads:

0.002 in. thick	Part No. 900258
0.003 in. thick	Part No. 901723
0.010 in. thick	Part No. 904138
0.020 in. thick	Part No. 904193

6. Remove gauge, spacer and centre pillar. Screw actuator into adaptor, as in Operation 4, and operate actuator rapidly a dozen times. Remove actuator, refit centre pillar, spacer and gauge finger, then recheck that all release levers are correctly set. Re-adjust if necessary, ensuring that adjuster pad screws are firmly tightened.

7. Fit anti-rattle springs on release levers: these are quite strong and the easiest way of fitting them is to make a simple lever as shown in Fig. 14. If the pins attaching release levers to pressure plate lugs are removed and springs fitted in position, the lever can be rested against cover bearing housing and used to push release lever outward against spring until retaining pin can be fitted. (Fig. 15.)

8. If clutch incorporates an inner cover, replace the three adjusting screws and locknuts. Insert feeler gauge through cover holes and set screws so that they are 0.050 in. (1.270 mm) clear of pressure plate then firmly tighten locknuts. Note that these screws will require resetting when clutch is assembled in tractor.

9. Smear release lever tips with anti-scuffing paste then replace lever thrust plate and secure with spring clips. Fit a  $\frac{7}{8}$  in. nut under outer end of each release lever, to prevent thrust springs expanding too far, then unscrew the stud nuts evenly and remove clutch from baseplate.

## Refacing Driven Plates

To remove the old facings drill out the rivets using a  $\frac{5}{32}$  in. (4 mm) diameter drill inserted through the clearance hole in the opposite side facing.

The open portion of the rivet readily centres the drill enabling a speedy and clear removal to be effected.

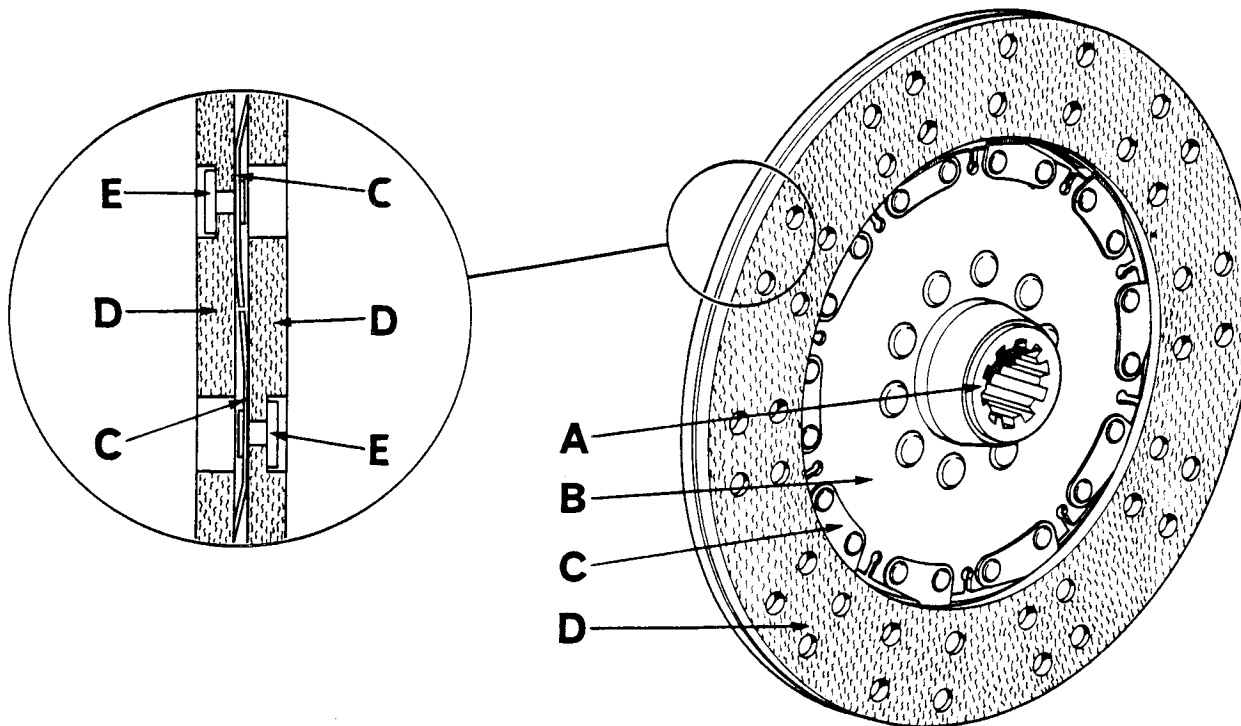


Figure 31. BORGLITE DRIVEN PLATE

A. Hub      B. Disc      C. Segment      D. Facing      E. Rivet

## Driven Plates

An examination of the various driven plates will show that they are of either the rigid or the Borglite type. The Borglite type consists of a series of segments, set alternately concave and convex, riveted to a centre plate which is itself riveted to a splined hub. The facings are riveted to the segments, each rivet being attached to only one facing. The alternate hole in each facing is drilled to give access to the rivet securing the facing on the opposite side of the plate. It is important that the side of the plate marked "Flywheel" should always be fitted towards the flywheel.

The rigid type plate is a one-piece steel disc which is cut to form segments. The disc is riveted to a centre hub and the facings are connected to alternate segments, as described above for the Borglite plate.

As rigid plates have 24 facing rivets and Borglite plates have 40 facing rivets, facings are not interchangeable, but facings are available to suit either type of plate.

When the facings have been removed examine the plate carefully. If any signs of cracking are apparent, or if the hub is loose on the rivets or worn in the splines, a new plate complete with facings is required. Also check the plate for distortion and discard it if more than 0.015 in. (0.38 mm) out of true when spun on a mandrel between centres.

Place one of the new facings in position on the disc, noting that the convex side of the plate segments are against the rivet holes in the facing.

Insert hollow steel rivets with their heads against the metal disc segment and roll rivet shank securely against the facing counterbore: this is the opposite procedure to that used with brass rivets. If a rolling tool is not available a blunt-ended punch will prove satisfactory.

Insert brass rivets, with their heads in counter-bored holes in facing, and roll the shanks securely against plate disc. If a rolling tool is not available a blunt-ended punch will prove satisfactory.

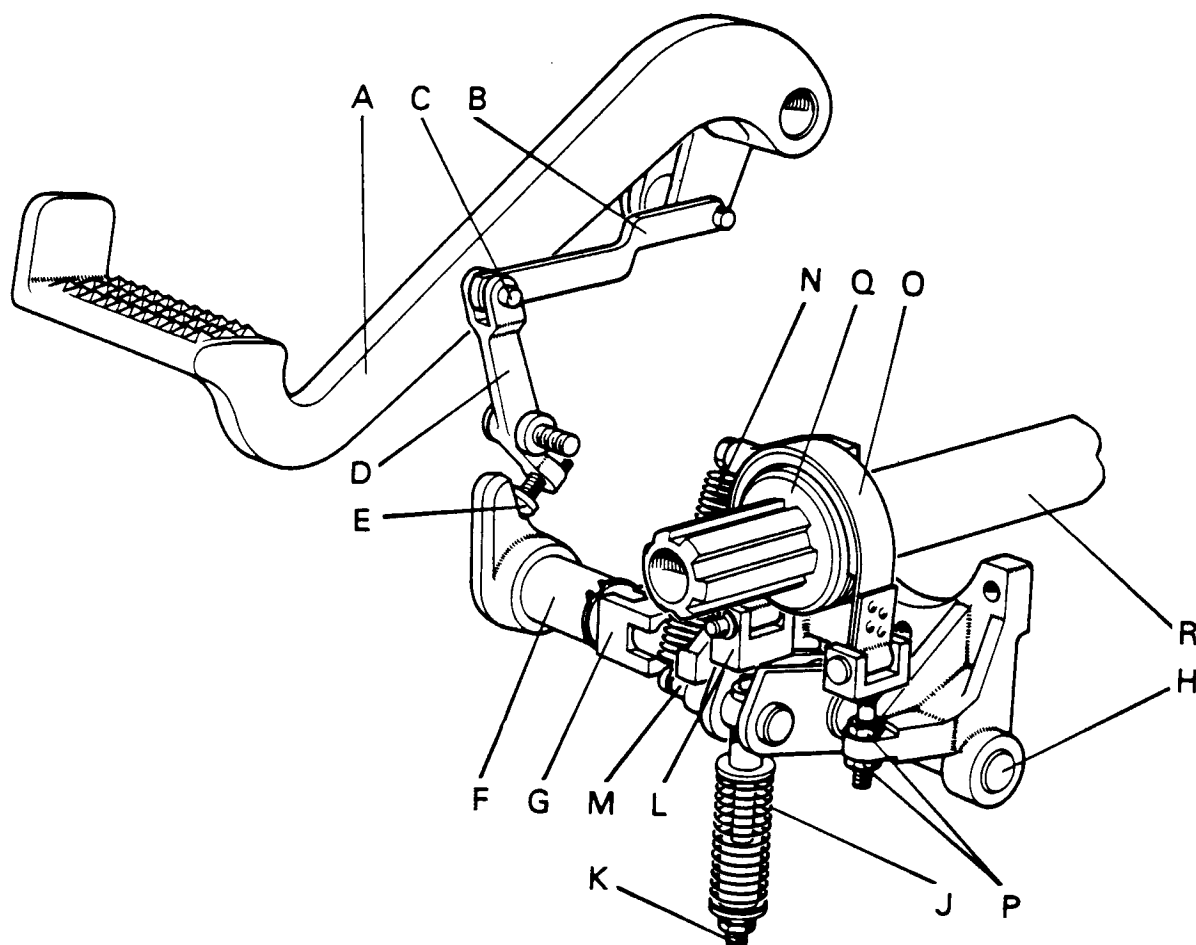


Figure 32. CLUTCH STOP — 990/880/780 LIVEDRIVE TRACTORS

- |                       |                      |               |               |
|-----------------------|----------------------|---------------|---------------|
| A. Clutch pedal       | B. Connecting link   | C. Clevis pin | D. Lever      |
| E. Adjusting screw    | F. Operating lever   | G. Coupling   | H. Shaft      |
| J. Compression spring | K. Stud              | L. Fork       | M. Anchor pin |
| N. Tension spring     | O. Brake band        | P. Locknuts   | Q. Drum       |
|                       | R. Clutch driveshaft |               |               |

Secure the opposite side facing in a similar manner, when it will be noted that counter-bored holes in one facing coincide with clearance holes in the other facing.

## Clutch Stop

With the exception of 770 Tractors, all Livedrive models are fitted with a small brake band which operates on a drum on clutch driveshaft. When clutch pedal is depressed to disengage transmission clutch the band is tightened round the drum and stops shaft revolving, thus allowing gears to be engaged without noise or damage.

All Non-Livedrive Tractors and 770 Livedrive models have a spring-loaded friction pad attached to inside of gearbox cover. The pad is in permanent contact with the muff coupling and when clutch is disengaged the slight drag of the pad brings clutch driveshaft to a standstill. There is no adjustment or setting required and the only maintenance necessary

is examination of pad whenever gearbox top is removed.

**Adjustment:** The only external adjustment available is by means of the operating lever adjusting screw and this should be set so that when pedal is depressed sufficiently to take up all the free-play and operating lever is turned clockwise until brake-band touches drum — this only requires light hand pressure — head of adjusting screw is  $\frac{1}{8}$  in. (1.6 mm) clear of operating lever or, on 1200 Tractors, pedal pin.

**Examination:** This should be carried out whenever gearbox cover is removed. Examine brake band lining and renew if more than half worn. New linings are  $\frac{1}{8}$  in. (3.2 mm) thick and are bonded to the band. New linings should be soaked in oil before fitting.

**Internal Setting (except 1200):** Disconnect pedal linkage by removing clevis pin C (Fig. 32) from connecting link and check that long stud K is nearly flush with internal face of large fork-end L.

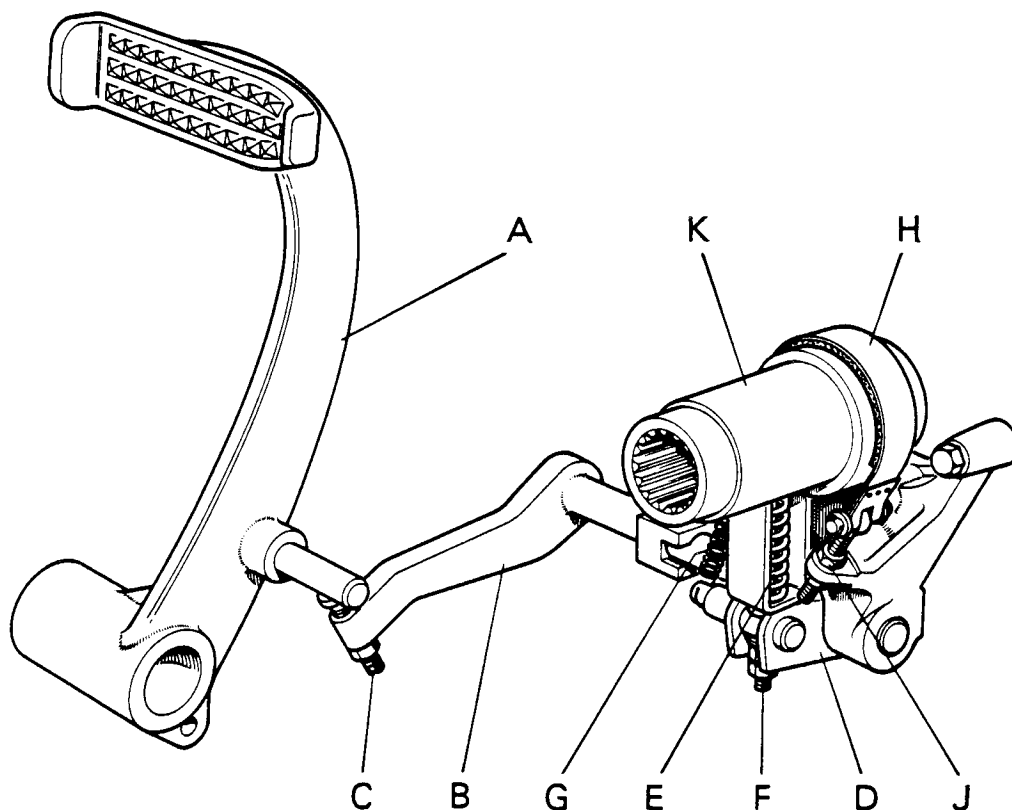


Figure 33. CLUTCH STOP — 1200 LIVEDRIVE TRACTORS

- |                 |                    |                    |                   |
|-----------------|--------------------|--------------------|-------------------|
| A. Clutch pedal | B. Operating lever | C. Adjusting screw | D. Fork           |
| F. Stud         | G. Return spring   | H. Brake band      | J. Adjusting nuts |
|                 | K. Muff coupling   |                    |                   |

Adjust nuts at lower end of stud K so that spring J is compressed to a length of  $2\frac{3}{4}$  in. (67.4 mm). Push anchor pin down and insert a 0.070 in. (1.78 mm) feeler gauge between pin and stop. Release anchor so that it holds feeler gauge then set locknuts P so that band is only just clear of drum. Withdraw feeler gauge, refit clevis pin and set lever adjusting screw E so that it is  $\frac{1}{8}$  in. (1.6 mm) clear of operating lever when pedal is depressed to take up the free-play, and lever F is turned lightly clockwise until brake-band touches drum.

**Internal Setting (1200 Tractors):** Check the length of the compression spring E. (Fig. 33). This should be compressed to a length of  $2\frac{3}{8}$  in. (60.3 mm) and is set by means of the adjusting nuts on stud F. Screw adjusting screw C fully into the operating lever B and release pedal so that it is in the fully engaged position. With clutch stop mechanism held in the "off" position by return spring G, tighten nuts J until clearance between band and drum is just eliminated — take care not to overtighten nuts — then unscrew nuts two full turns and lock firmly. This will give correct clearance between band and drum. Finally set adjusting screw C so that when pedal is depressed to take up free-play and operating lever B is pressed lightly down, so that band is touching drum, screw head is  $\frac{1}{8}$  in. (1.6 mm) clear of pedal pin.

Before refitting gearbox cover, check that the lubricating oil pipe is positioned so that it directs oil

on to clutch-stop drum: the brake lining will wear rapidly if not lubricated.

## Overload Release Withdrawal Mechanism (Hand Clutch)

Models 880 and 990 Tractors can be fitted with a clutch withdrawal mechanism which is operated by an overload release cable from the top link. The resetting lever (hand clutch lever) is mounted on the left-hand side of the rear axle casing and is normally retained in the rear (engaged) position by the catch engaging with the stud. (Fig. 34.)

When the catch lever is raised by the overload release cable, or tripped by hand, the catch releases the lever and allows the tension spring to draw the lever forward, thus disengaging the clutch.

On Livedrive tractors the hand clutch disengages the main drive clutch only, the power take-off and belt pulley remaining operative until disengaged by the clutch pedal.

## Adjustment of the Hand Clutch

Resetting of the clutch pedal free-play by means of the adjustment bolt also resets the free-play in the hand clutch linkage. The setting of the hand clutch rod adjusting nut should, however, always be checked when the clutch is adjusted to ensure that the hand clutch linkage does not prevent the clutch

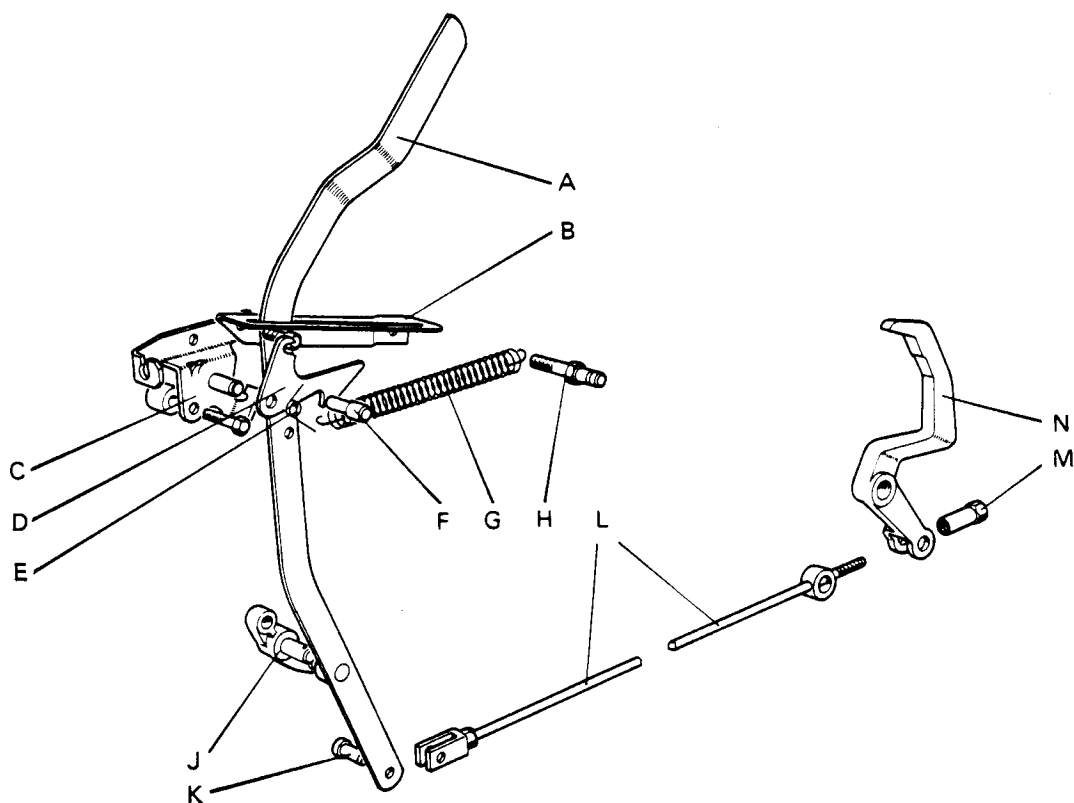


Figure 34. HAND CLUTCH LINKAGE

- |                   |                      |                    |                  |
|-------------------|----------------------|--------------------|------------------|
| A. Hand lever     | B. Guide bracket     | C. Support bracket | D. Trigger       |
| E. Torsion spring | F. Locking pin       | G. Tension spring  | H. Anchor stud   |
| J. Pivot bracket  | K. Clevis pin        | L. Connecting rod  | M. Adjusting nut |
|                   | N. Cross shaft lever |                    |                  |

pedal from returning to the fully engaged position. When the clutch pedal is against the stop on the clutch housing, and the hand clutch lever is locked in the engaged position, the adjusting nut should be  $\frac{1}{8}$  in. (1.5 mm) clear of the pin.

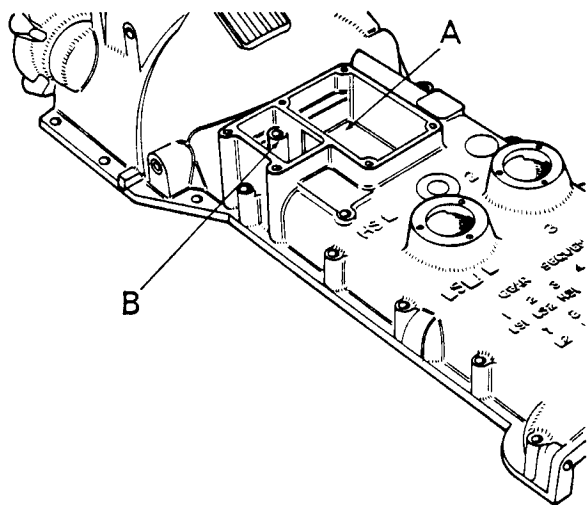


Figure 35.

GEARBOX COVER — 780/770/3800 TRACTORS

- A. Steering box oil bath B. Main frame bolt hole

## Clutch Removal

**770, 780 and 3800 Tractors:** Clutch can be removed after the combined gearbox top and clutch housing has been removed. Procedure for Livedrive and Non-Livedrive differs on one point only — on Livedrive models the power take-off unit must be removed so that the PTO cardan shaft can be withdrawn clear of clutch.

1. Remove earth lead from battery terminal. Remove fuel tank with instrument panel attached to it. Disconnect throttle control from hand lever and drag link from drop arm. If tractor is fitted with power-assisted steering, tie steering ram to tractor frame to avoid straining pipes. Remove steering box, complete with column and wheel.
2. Disconnect wiring from starter and remove starter from clutch housing. Remove the two figure-of-eight spring clips which hold clutch fork to release bearing carrier: these are accessible through aperture on underside of main frame.
3. Remove gearbox cover — 17 bolts into main frame, five bolts into rear axle. Note that one of the main frame bolts is inside the steering box oil bath. (Fig. 35.)
4. On Livedrive models, drain transmission oil into a *clean* container, remove power take-

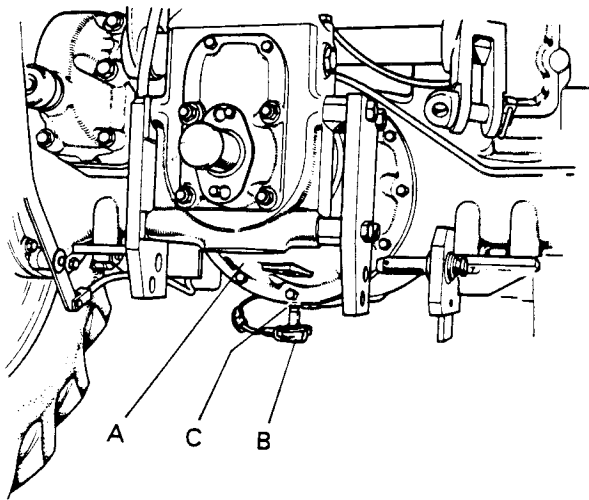


Figure 36. REMOVING OIL FILTER SWITCH ADAPTOR  
A. PTO case B. Adaptor C. 'O' ring — adaptor

off unit and withdraw cardan shaft until it is clear of clutch.

**Caution:** Tractors with a hydraulic filter warning lamp have a switch for this lamp under the PTO unit and it is necessary to remove switch adaptor from PTO case before PTO unit can be withdrawn. (Fig. 36.)

5. Release circlip at front of muff coupling and slide coupling forward. Detach release bearing support snout from frame by removing the three fixing bolts. If tractor is fitted with a band type clutch stop, disconnect the band and remove stop assembly out of frame.
6. Remove bolts attaching clutch cover to flywheel, placing a  $\frac{1}{8}$  in. nut under each release lever at the same time, to prevent the thrust springs expanding too far. Lift clutch and driveshaft assembly out of frame; raise cover first and follow with shaft.
7. Retain the three flywheel springs until required for assembly.

## Clutch Replacement

**770, 780 and 3800 Tractors:** After servicing the clutch unit (see appropriate page) and checking the components with reference to the fault-finding information on Page 37, replace the clutch in reverse order to removal, main points to note being listed below.

1. Fit PTO plate with hub towards flywheel and separator plate with assembly marks aligned.
2. Place the three springs in flywheel holes. Assemble release bearing and support snout on shaft, fitting new 'O' ring in snout groove.
3. Fit driveshaft assembly in clutch cover and fit transmission driven plate on shaft — hub towards flywheel — then fit assembly on to flywheel. Line up dowel holes and replace

bolts, tightening evenly and by diametrical selection until fully tightened.

4. Check muff coupling end-float. This should be not less than 0.010 in. (0.25 mm) and may be increased by removing shims from behind rear end of coupling.
5. Before fitting gearbox cover, check that clutch cross shaft spring is correctly located against fork and casting and set clutch stop, if fitted. (See Page 25.)
6. Refit the figure-of-eight spring clips to clutch fork, working through the bottom of main frame.
7. When assembly is completed, adjust pedal free-play and if necessary reset pedal, or lever, on cross shaft splines. (See Page 7.) Adjust clutch stop, if fitted.

## Removing Clutch — 880 and 990 Tractors

The most convenient method of removing the clutch depends on the tractor type. All Livedrive tractors are fitted with a band type clutch brake. On early tractors this prevented the muff coupling on six-speed tractors being slid far enough forward to clear the gearbox driveshaft. This means that the clutch must be removed by splitting the tractor — as on 12-speed models.

On later models a change was introduced reducing the width of the clutch-stop drum, allowing the clutch to be removed out of the top of main frame after the gearbox cover has been removed — as on Non-Livedrive models.

Clutch removal methods for different tractors are as below:

1. **Non-Livedrive 6-speed Tractors:** Remove gearbox and clutch cover and lift out the clutch — Method 'A'.
2. **Livedrive 6-speed Tractors:** Up to Serial Numbers 990/A/487806, 880/A/533604. Split the tractor and remove the clutch from the flywheel — Method 'B'.
3. **Livedrive 6-speed Tractors:** Serial Numbers 990/A/487807 onwards, 880/A/533604 onwards, 4600/900001 onwards. Remove the gearbox and clutch cover and lift out the clutch — Method 'A'.
4. **Livedrive 12-speed Tractors:** Split the tractor and remove the clutch from the flywheel — Method 'B'.

## Removing Clutch Upwards — Method 'A'

1. Disconnect fuel pipes, wiring, and throttle and stop control linkages. On 990 tractors, remove throttle lever.
2. Remove fuel tank and instrument panel. Disconnect steering drop-arm.

3. On 990 Tractors only: Remove steering-box to obtain access to the bolt beneath it which passes through the spacer wedge and into the clutch housing.
4. Remove all gearbox cover fixing bolts (five through the rear axle) and lift cover off main frame. On 880 Tractors the gearbox cover and steering-box can be removed as a unit.
5. On 990 Tractors only: Disconnect the main lead and remove starter motor.
6. Slacken clutch free-play adjusting screw and remove clutch cover.
7. On Livedrive models only: Remove clutch stop brake band by disconnecting it at both ends. Release circlips locating the brake drum and slide the drum forwards to the support snout.
8. Release circlip retaining the muff coupling and slide coupling fully forwards. Do not disturb muff coupling end-float adjusting shims on gearbox drive shaft.
9. On Livedrive models remove PTO housing and withdraw PTO cardan shaft.

*Caution:* Tractors with a hydraulic filter warning lamp have a switch for this lamp under the PTO unit and it is necessary to remove switch adaptor from PTO case before PTO unit can be withdrawn. (Fig. 36.)

10. Detach support housing from main frame by unscrewing the three fixing bolts and remove the two spring clips securing cross-shaft fork to release bearing carrier.
11. On Non-Livedrive models, slide the support snout and clutch shaft away from flywheel until the clutch shaft is clear of flywheel spigot bearing.
12. Remove the bolts fixing clutch cover to flywheel, wedging a  $\frac{7}{8}$  in. nut under each release lever as this is done. These nuts prevent the clutch thrust spring expanding too far and so assist removal.
13. Ease clutch cover assembly off its dowels and remove the clutch and shaft assembly complete from the main frame.  
On Non-Livedrive tractors this can be done by lifting the rear of the clutch shaft until it is clear of the gearbox and then lifting the whole unit rearwards and upwards. On Livedrive tractors the rear of the clutch shaft must first be lowered into the main frame and the unit then lifted out, cover assembly first.
14. Mark the clutch cover, separator plate and flywheel to ensure replacement in the same relative positions. Retain the three push-off springs for reassembly.

## Clutch Replacement — Method 'A'

The clutch should be replaced in the reverse order to removal, special attention being given to the following points.

1. Examine the flywheel spigot bearing and replace if necessary. Place a small quantity of high-melting-point grease in the cavity behind the bearing.

2. Check the fit of the drive plates on the clutch shaft. The plates should slide freely on the spline without excessive slackness. Fit the plates with the hub towards the flywheel. (Borglite plates — "Flywheel" mark to flywheel.)
3. Check that the separator teeth backlash is within the following limits:  
10/10 in. double clutch—0.010 in. to 0.014 in.  
11/10 in. double clutch—0.007 in. to 0.011 in.

If the tolerance is above that quoted, rattle may occur when the clutch is operated but if the tolerance is below that quoted then difficulty may be experienced in engaging the PTO gears, due to the PTO clutch dragging.

4. Refit clutch cover with dowel holes in alignment with dowels in flywheel. Tighten the bolts progressively and by diagonal selection to avoid distortion of cover.
5. Check that the clutch cross shaft is not binding in the main frame.
6. Check that PTO cardan shaft is straight. If bent more than 0.005 in. (0.127 mm) it may foul on the inside of the hollow transmission shaft.
7. Check that the support snout bearing is a clearance fit on the clutch shaft. The bearing should have a radial clearance of 0.0015 in. (0.04 mm), 6-speed or 0.006 in. (0.15 mm) 12-speed.
8. Check the muff coupling end-float, 0.010 in.—0.040 in. (0.25 mm—1.01 mm).
9. On 990 Tractors the clutch housing and gearbox cover are bolted together to increase the effective depth of the main frame. To obtain a rigid attachment a taper wedge is fitted between the housing and the cover faces. After firmly bolting the clutch housing and gearbox cover in position — tightening the gearbox cover against the rear axle before tightening the cover-to-main-frame bolts — place the wedge in the gap between the two faces and push the bolts through the holes in gearbox cover. If the wedge is not tight in the gap when the bolts are screwed in loosely, push the wedge upwards and add shims so that when the bolts are tightened the housing and cover are bolted solidly together without being distorted.
10. When the replacement is completed, readjust the clutch free-play and clutch stop, if fitted.

## Removing the Clutch by Splitting the Tractor — Method 'B'

As the engine and transmission units are heavy and require to be aligned carefully when being reassembled, this operation should be carried out with the tractor standing on firm, level ground.

Place a jack under the front end of rear main frame so that it can support the rear half of tractor when the front main frame is withdrawn. Place a block of wood between the jack and main frame and extend the jack so that it takes weight but does not lift the tractor. Drive two suitable wooden wedges between each side of the front extension and axle

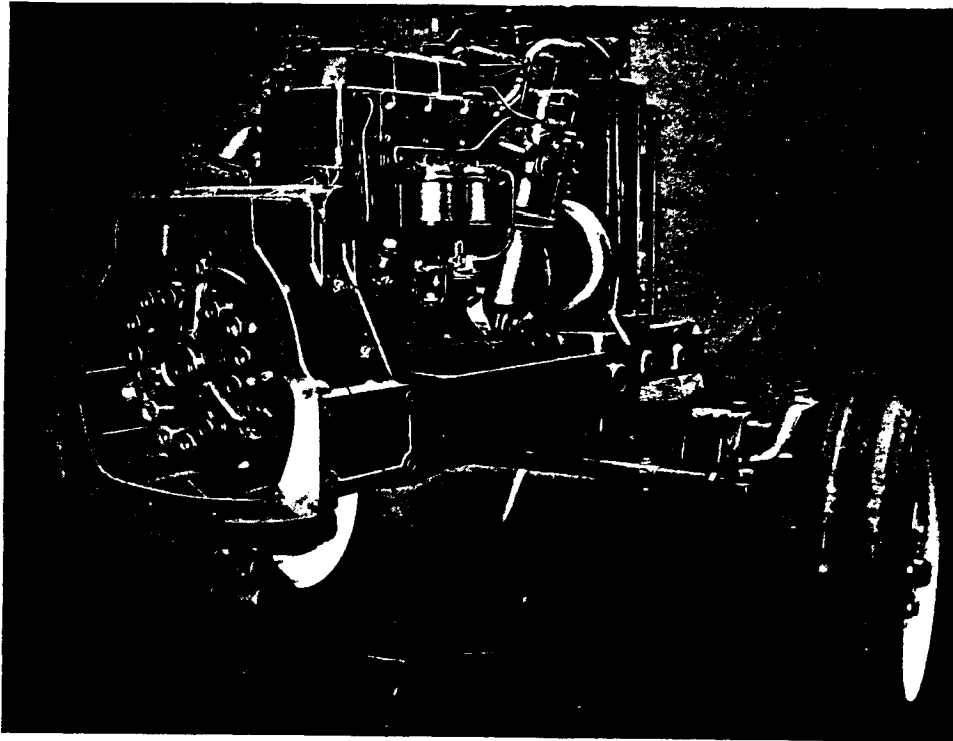


Figure 37. 880 TRACTOR "SPLIT" FOR CLUTCH REMOVAL

A. Supporting wedge

B. Clutch assembly

C. Flywheel housing

beam, so that the engine unit will remain upright. The wedges should be of hard wood and approximately 5 in. (12.5 cm) long so that they can be driven firmly into position without any possibility of becoming dislodged. Place a trolley jack under the flywheel housing so that the engine unit can eventually be drawn forwards.

## Procedure — Method 'B'

1. Disconnect throttle and stop control linkages.
2. On 990 Tractors remove the throttle lever.
3. Disconnect fuel pipes and wiring, and remove fuel tank and instrument panel.
4. Disconnect main lead and remove starter motor (990 only).
5. Disconnect steering drop-arm.
6. Remove the bolts attaching the clutch cover and rear main frame to front section of the tractor.
7. Draw the front half of tractor forwards until it is clear of clutch driveshaft. To avoid damaging the clutch plates or driveshafts adjust the two jacks so that the front and rear main frames are withdrawn squarely away from each other.
8. Fit a  $\frac{7}{8}$  nut under each release lever and unbolt the clutch unit from the flywheel.
9. Mark the separator plate and withdraw it from flywheel. Retain the three push-off springs until required for assembly.

## Replacing

1. Examine flywheel spigot bearing and replace if necessary. Place a small amount of high-melting-point grease in the cavity behind the bearing.
2. Place the three push-off springs into the holes in flywheel and fit driven plate in position (hub to flywheel).
3. Fit separator plate into flywheel with the markings aligned.
4. A mandrel, or pilot clutch shaft (see Fig. 38), will be required to centralise the driven plates as the clutch assembly is fitted to the flywheel. Insert this pilot shaft through the clutch cover bearing and fit transmission plate on to it (hub to flywheel side).
5. Bolt clutch assembly to flywheel, the end of the mandrel being located in the flywheel spigot bearing. Tighten bolts progressively and by diagonal selection to avoid distortion and then withdraw the mandrel.
6. Check that the adjusting screw clearances are 0.070 in. (1.8 mm) as these are more accessible when the tractor is split.
7. Check that clutch release mechanism is in order and that cross shaft is not binding in main frame. Fully release the pedal free-play adjustment.
8. Ensure that the PTO cardan shaft is engaged on the splines of the input shaft in the PTO



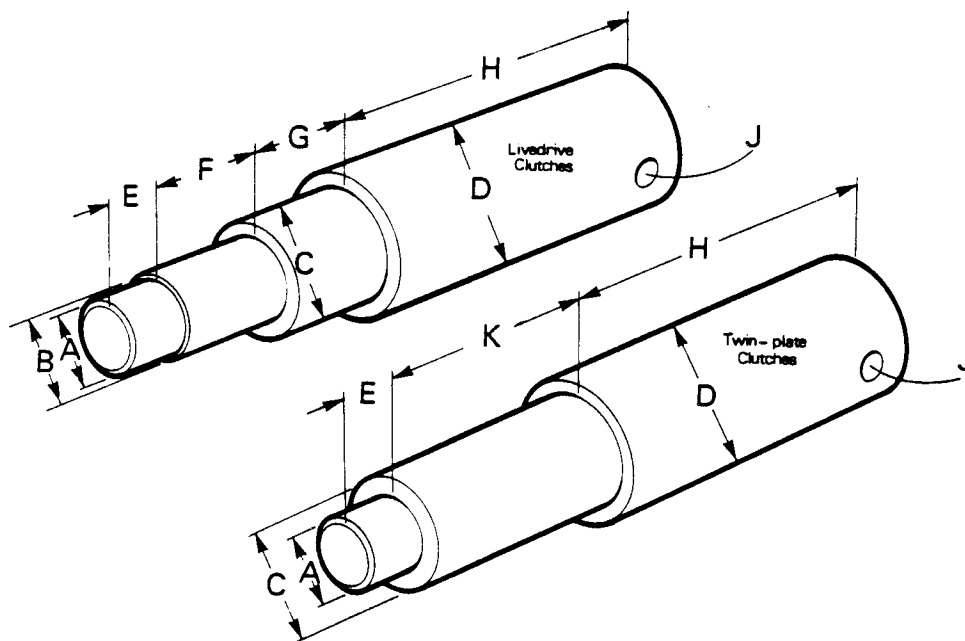


Figure 38. CLUTCH PLATE PILOT — LIVEDRIVE TRACTORS (EXCEPT 1200)

A. 0.874 in (22.20 mm)	B. 0.915 in (23.24 mm)	C. 1.420 in (36.07 mm)
D. 1.771 in (44.98 mm)	E. $\frac{3}{8}$ in (15.88 mm)	F. $1\frac{1}{2}$ in (38.10 mm)
G. $1\frac{1}{2}$ in (44.45 mm)	H. 5 in (127 mm)	J. $\frac{3}{8}$ in (9.5 mm) dia. hole
	K. $3\frac{1}{2}$ in (82.55 mm)	

- housing and also that it is pushed fully to the rear.
9. Clean the faces of the two halves of the tractor and push together. (It is essential that the two faces should be parallel and in line and two guide studs temporarily screwed into the main frame will assist aligning the two halves.) When the clutch driveshaft enters the cover, turn the engine so that the splines on the driven plates can be lined up with those on the driveshaft and cardan shaft.
10. When the two sections are together and have entered into the dowels, fit the bolts and fully tighten.
11. Refit starter and throttle lever on the 990 Tractor.
12. Replace fuel tank, reconnect fuel pipes, throttle and stop controls, and steering drop-arm.
13. Adjust pedal linkage as described on page 6, and clutch stop, if fitted.
4. Drain steering box oil, disconnect hand throttle and remove steering box, complete with column and wheel.
5. Drain transmission oil into *clean containers*, capacity approximately 10 gallons (45.4 litres).
6. Remove seat and support from rear axle case. Remove drawbar and lower links.
7. After removing sensing unit, remove the twelve bolts attaching PTO case to axle case then remove PTO unit so that cardan shaft can be withdrawn clear of clutch. (Fig. 39.)
8. Remove gearbox cover — five bolts into rear axle case, four bolts into clutch housing and 14 bolts into main frame (two of these are inside steering cavity). (Fig. 40.)
9. Remove clutch housing — three bolts into starter support plate and six into main frame. Place PTO clutch lever in "disengaged" position and hook three retaining staples, Part No. 962188, between the PTO release levers and cover, then unlock hand lever and allow the staples to hold the levers towards the clutch cover. (Fig. 21.)
10. Release circlip at front of muff coupling from its groove in driveshaft and if coupling is fitted with wedge-shaped plungers, remove these by lifting retaining clip to one side so that plungers may be extracted. As the two plungers are fitted the opposite way round, note which way each plunger chamfer is fitted.

## Clutch Removal

### 1200 Tractors:

1. Remove bonnet top, grille and tool box. Disconnect battery and remove starter.
2. Disconnect drag link from drop arm. If tractor is fitted with power-assisted steering tie ram to tractor frame, to avoid straining pipes.
3. Unscrew engine speed indicator cable, disconnect fuel pipe and instrument panel wiring so that fuel tank and panel can be removed complete.

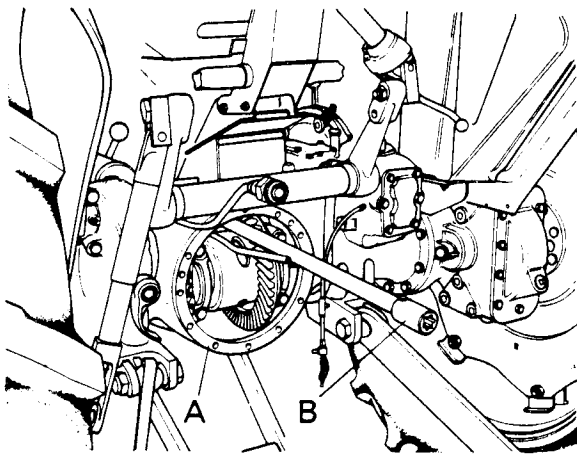


Figure 39.

PTO CARDAN SHAFT WITHDRAWN FROM CLUTCH

A. Rear axle case B. Cardan shaft

13. Remove the nine long bolts attaching clutch assembly to flywheel, but do not remove the short bolts attaching clutch cover to separator housing. Lift clutch unit, complete with driveshaft, release bearings and support snout, out of the tractor. Raise driveshaft first, then lift complete assembly upwards and rearwards.
14. Withdraw driveshaft from separator housing and remove release bearings, etc.

## Refitting Clutch Unit

Before refitting clutch unit, first check the following:

11. Fully unscrew adjusting nut on PTO clutch connecting rod and disconnect PTO release bearing carrier by removing the special bolt from one side and pivot pin from other side of cross shaft fork.
12. Unscrew adjusting nut on transmission connecting rod to end of thread and remove the three screws attaching support snout and clutch stop to main frame.

1. Examine PTO clutch linkage; lubricate hand lever catch and pivot. Check that cross shaft operates quite freely in main frame. Examine release bearing and renew if any signs of roughness are apparent. On later tractors the bearing housing is connected by a flexible tube to the cross shaft bearing grease passage so that the bearing is lubricated at the same time as the left-hand bearings. If the bearing does not have provision for being lubricated during service, ensure that it is packed with molybdenum disulphide, lithium based grease. If the pin on the right-hand side of the release bearing housing is only 2 in. (50.8 mm) long, replace this with a later type pin, Part No. 925323, which is 2½ in.

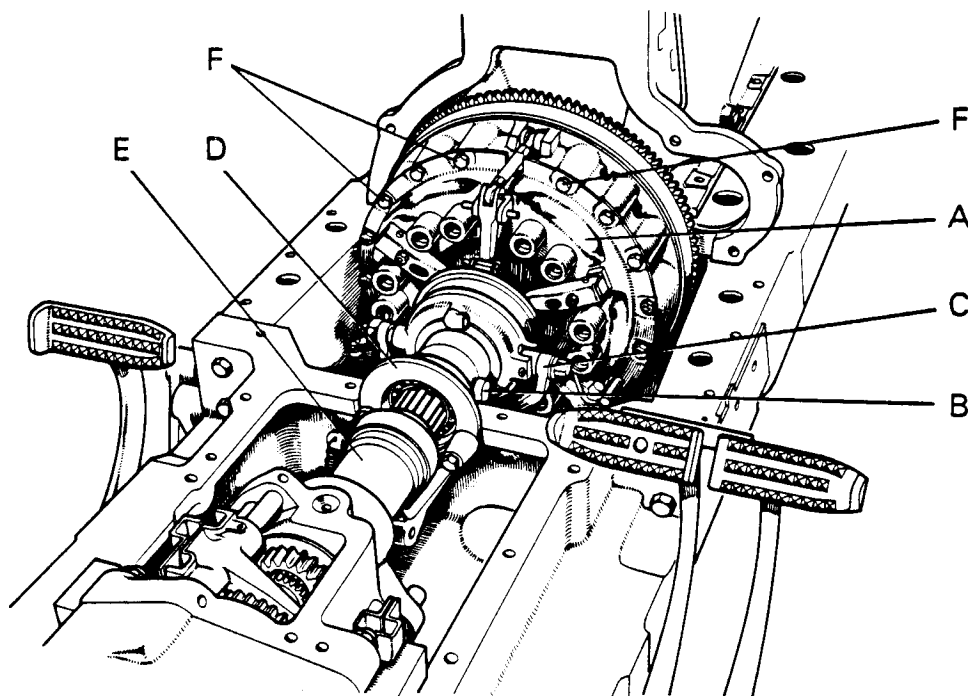


Figure 40. 1200 TRACTOR WITH CLUTCH HOUSING AND GEARBOX COVER REMOVED

A. Clutch assembly	B. Transmission release fork	C. PTO release fork
D. Support snout	E. Muff coupling	F. Bolts — clutch to flywheel

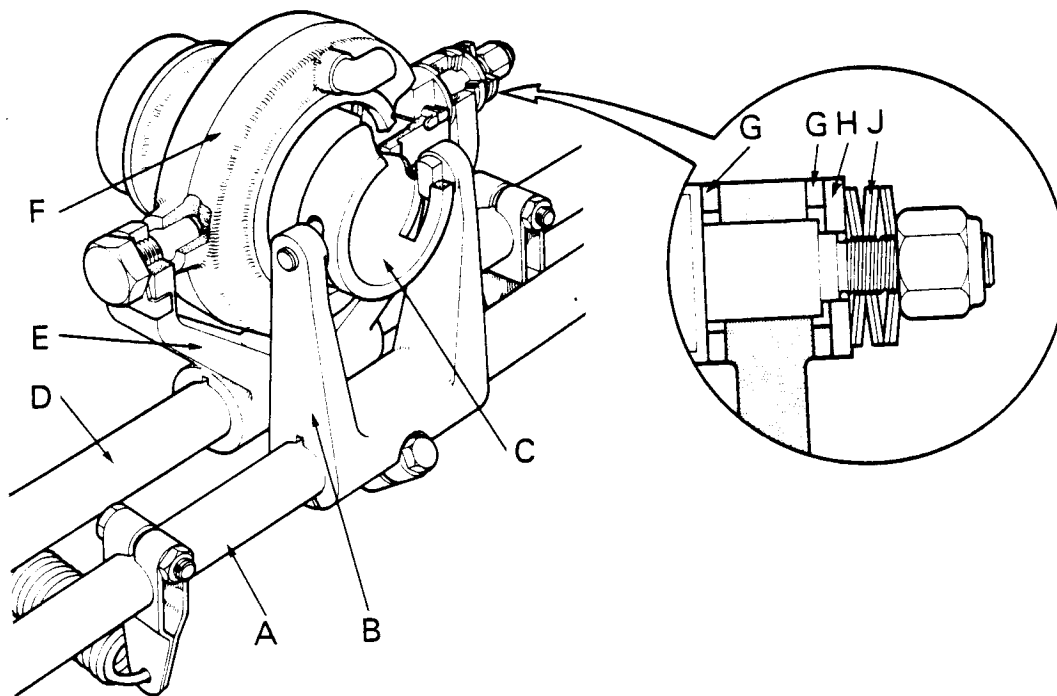


Figure 41. CLUTCH RELEASE MECHANISM — 1200 TRACTORS

A. Cross shaft	} Transmission clutch	D. Cross shaft	E. Fork
B. Fork		F. Bearing carrier	G. Friction washer
C. Sleeve		H. Special washer	J. Belleville washer

(57.1 mm) long and the additional length of thread will allow six Belleville washers to be fitted in place of a single washer fitted on earlier, shorter, pin. (Fig. 41.) Fit tabwasher (626399) on left-hand pivot pin.

2. Examine transmission clutch linkage: lubricate pedal pivot and ensure that pedal does not foul starter switch wire conduit. Check that cross shaft operates freely. Lubricate pins in cross shaft fork with anti-scuffing paste. Renew release bearing if rough or dry: if bearing is renewed, fit latest type bearing, Part No. 620112. Clean inside of bearing carrier, smear it with anti-scuffing paste and check that carrier slides freely on support snout.

Refit clutch in reverse order of removal, taking note of the following:

Lower clutch stop into tractor frame and fit driveshaft, complete with release bearings, support snout, circlip and muff coupling into clutch unit. Fit PTO driven plate in flywheel and lower complete assembly into position, taking care to locate the two release bearing carriers in their forks. Slide cardan shaft into the clutch until it passes through PTO driven plate and enters flywheel spigot bearing, then bolt clutch assembly to flywheel.

Bolt support snout and clutch stop to main frame, slide muff coupling on to gearbox mainshaft and slide circlip into driveshaft groove. Muff couplings without plungers can be fitted on any spline but couplings with plungers must be fitted

with plunger holes opposite chamfered splines on shafts, the plunger tapers will then be against a chamfer and not against a spline corner. As the plunger tapers must be towards the non-driving side of spline ensure that front plunger is fitted with taper on its leading side and taper on rear plunger towards its trailing side.

No undue force should be required when sliding coupling on to gearbox shaft and, when retaining circlip is in position, coupling should have 0.008 to 0.040 in. (0.20 to 0.01 mm) end-float. If necessary this can be increased by removing shims from rear end of coupling.

Connect PTO release bearing carrier to its fork, fitting six Belleville washers, plain washer and two friction washers as shown in Fig. 41. Tighten the Nyloc nut to compress Belleville washers then unscrew a half-turn.

Set clutch stop (see Page 26) before replacing gearbox cover. Smear new cover gaskets with grease, to hold them in position, then fit cover and tighten bolts down into main frame only sufficient to hold cover against main frame face. Fully tighten bolts through rear axle case then fully tighten cover-to-main-frame bolts. Place spacing wedge in gap between gearbox cover and clutch housing. If wedge is not tight, add shims until wedge is so tight it has to be driven in with a copper hammer. When the bolts are fully tightened, housing and cover will then be bolted solidly together without distortion.

After replacing steering box, refill with oil to level-plug and refill transmission with oil after fitting PTO unit.

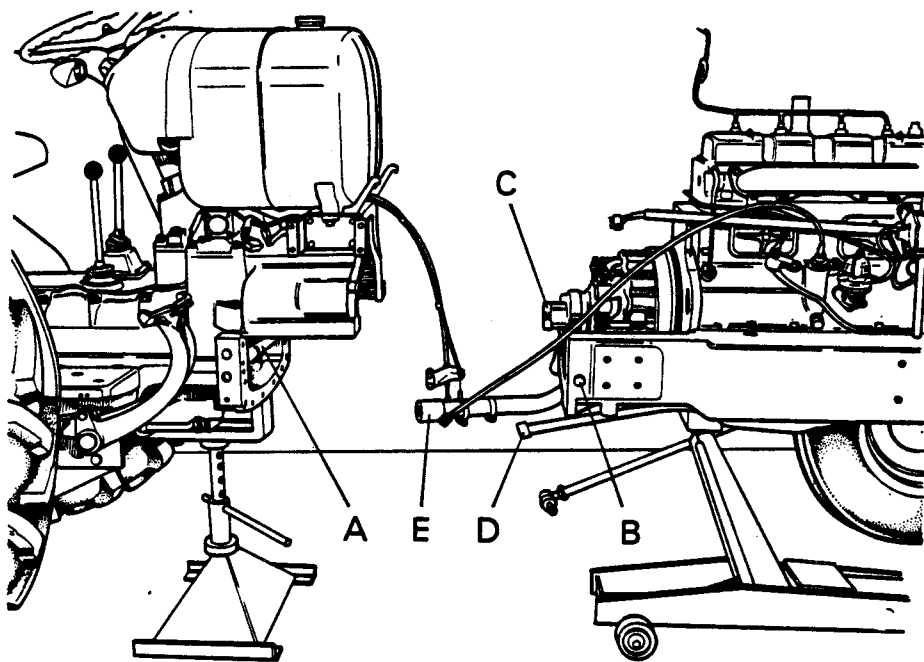


Figure 42. 1200 TRACTOR "SPLIT" FOR CLUTCH REMOVAL

- A. Transmission cross shaft    B. PTO cross shaft    C. Transmission release bearing sleeve  
D. Hydraulic pressure pipe    E. Hydraulic pump inlet pipe

Ensure that both clutches have the correct amount of free-play. (See Page 16.)

## Clutch Removal by Splitting Tractor

This is an alternative method of clutch removal but as the two halves of the tractor are very heavy it *must only be carried out in a workshop with a hard, level floor and if equipment capable of safely supporting the weight of the tractor is available.*

**FAILURE TO OBSERVE THESE PRECAUTIONS MAY RESULT IN PERSONAL INJURY AND SERIOUS DAMAGE TO THE TRACTOR.**

As it is necessary to centralise the PTO release mechanism very carefully when joining the two halves of tractor together, this method of clutch removal should be carried out by experienced personnel only.

1. With tractor standing on firm, level ground and with ample space round it, firmly apply hand brake.
2. Remove silencer, bonnet top and grille. Disconnect battery leads and remove toolbox.
3. Drain transmission oil into *clean containers*, capacity approximately 10 gal (45 litres).
4. Remove starter motor. Disconnect main wiring harness connectors under fuel tank and wiring to oil warning lamp switch.
5. Release guide tube wiring after disconnecting engine speed indicator cable. Disconnect fuel and leak-off pipes from tank.

6. Disconnect throttle and stop cables from injection pump, then remove cable bracket from pump.
7. Disconnect steering drag link from drop arm. If tractor is fitted with hydrostatic steering, disconnect the two flexible ram pipes, also all four pipes from the servo valve and pipes from pump to reservoir. The two large pipes may then be extracted forwards from under fuel tank.

**CAUTION:** It is essential that all pipes and connections are sealed against ingress of dirt, otherwise serious damage may occur when the system has been assembled.

8. Remove clutch pit cover. Place hand clutch lever in "disengaged" position and place a retaining staple, Part No. 962188, over each PTO release lever: it will be necessary to turn engine to bring release levers opposite cover aperture. Return hand lever to "engaged" position and check that staples are correctly positioned.
9. Remove adjusting nuts from PTO and transmission rods. Disconnect anchor from transmission cross shaft return spring. This anchor is hooked through a hole in the underside of the main frame, 6½ in. (16.5 cm) forward of main frame joint and 5 in. (12.7 cm) towards the left-hand side of the frame centre line.
10. Disconnect hydraulic pressure pipe at union underneath right-hand foot plate and disconnect pump inlet pipe from filter housing.

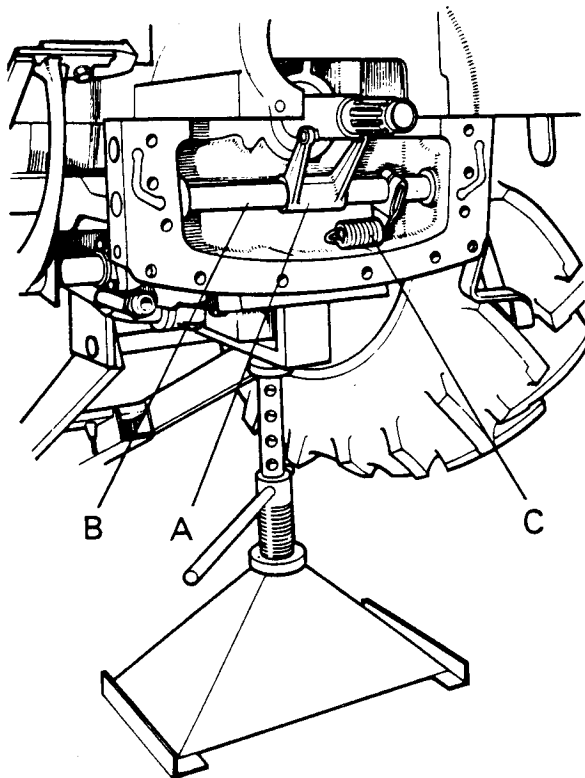


Figure 43.  
TRANSMISSION RELEASE FORK - 1200 TRACTORS  
A. Release fork B. Cross shaft C. Return spring

Pipe is sealed by an 'O' ring inside housing and on early tractors, where pipe was fitted directly into housing, the pipe should be removed and 3 in. (76.2 mm) cut off the housing end of pipe. Thoroughly clean inside of pipe after cutting. Connecting pipe (921796), hose (917126) and clips (621960) can be fitted during assembly.

11. Remove two centre bolts from main frame joint so that trolley-jack can be located under front frame, behind oil sump. Place an adjustable stand under rear of main frame joint and extend jack and stand so that they take weight but do not lift main frame.
12. Disconnect check chains, remove bolts

attaching drawbar frame to PTO and lower frame to ground. If more convenient, the drawbar can be completely removed.

13. Remove sensing unit from PTO case, then remove PTO unit from rear axle case. Withdraw cardan shaft: if coupling is not bolted to cardan shaft, insert a bolt through hole in shaft end so the shaft can be levered out until it is clear of clutch. (Fig. 39.)
14. Drive a wooden wedge between each side of main frame and front axle to hold front end of tractor vertical (Fig. 42). Remove bolts attaching clutch cover to engine and main frame and, after ensuring that stand and jack are supporting weight of frame, remove remaining front-to-rear main frame bolts.
15. With the aid of an assistant, carefully push front of tractor forward until there is a 3 to 4 in. (8 to 10 cm) gap in frame. Remove bolt attaching return spring lever to transmission cross shaft (Fig. 43) so that shaft can turn as main frames are moved further away. If release bearing is fitted with a lubrication pipe, disconnect this from side of main frame.
16. Withdraw front of tractor until clutch is accessible then remove the nine long cover bolts and lift clutch assembly from flywheel.

## Replacing the Clutch

To ensure driven plates are centralised, and thus permit driveshafts to be engaged as the two halves of tractor are brought together, a pilot tool made to the dimensions shown in Fig. 44 is required.

Insert pilot through bearing in separator housing so that it centralises transmission plate then fit PTO driven plate on pilot and fit assembly on flywheel. Engage pilot in crankshaft spigot bearing and align cover and flywheel marks. Replace the nine long bolts and tighten evenly and by diametrical selection. Withdraw pilot when bolts have been firmly tightened.

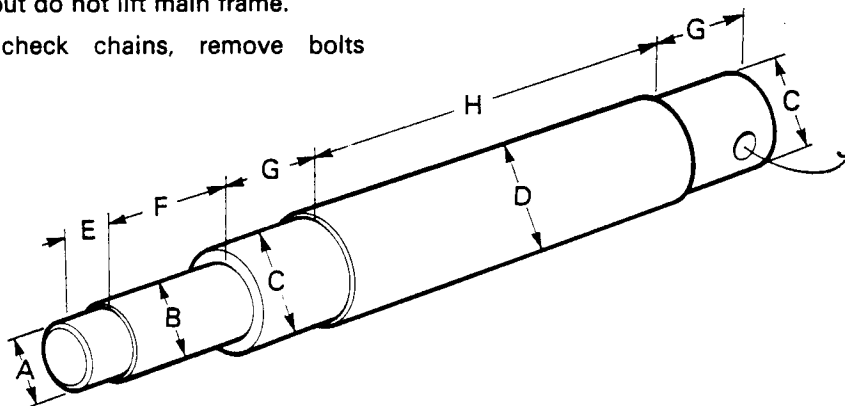


Figure 44. CLUTCH PLATE PILOT — 1200 TRACTORS

A. 0.874 in (22.20 mm)	B. 0.915 in (23.24 mm)	C. 1.374 in (34.90 mm)
D. 1.420 in (36.07 mm)	E. $\frac{3}{4}$ in (19.05 mm)	F. $2\frac{1}{2}$ in (57.15 mm)
G. $1\frac{1}{2}$ in (38.10 mm)	H. 6 in (152.4 mm)	J. $\frac{3}{8}$ in (9.5 mm) dia. hole

## Examination Before Building Tractor

Before commencing to assemble tractor, check the following:

1. Examine release bearings and renew if they show any signs of roughness or are dry. If transmission release bearing is renewed, fit the latest type bearing, Part No. 620112. Clean inside of bearing carrier and check that it slides freely on support snout.
2. If the PTO clutch fork pivot is the early type with only one Belleville washer, fit the latest type pin (925323) and six Belleville washers (626723) as shown in Fig. 41. Tighten the Nyloc nut until the Belleville washers are fully compressed then unscrew half-a-turn. Fit the latest type tabwasher (626399) on the left-hand pivot pin.
3. Check that both clutch cross shafts are quite free in their bearings. Lubricate pins on transmission fork with anti-scuffing paste.
4. Lubricate pedal pivot and check that pedal does not foul starter switch wire conduit. Lubricate hand lever catch and pivot. Check that lever pull-off spring has sufficient tension to hold lever fully forward; if necessary, replace the pull-off spring or fit an additional spring.

## Assembling Tractor

1. Screw two  $\frac{1}{2}$  UNC $\times$ 6 in. (15 cm) guide studs into third hole down on each side of front main frame face. Bring the two halves of

tractor together until guide studs enter appropriate holes in rear main frame. Ensure slots in transmission bearing carrier are vertical and fork inserts are positioned so that they can enter slots when cross shaft is turned, then continue bringing main frames together until cross shaft can be turned and pins engaged in carrier slots. When the frames are only 3 to 4 in. (7.5 to 10.0 cm) apart examine release fork to make sure that pins are correctly engaged in carrier slots then replace bolt in return spring lever and connect PTO bearing lubrication pipe into left-hand side of main frame.

2. Push two halves of tractor to close the gap and allow a bolt to be fitted in each side of frame but *do not tighten bolts to force frames together*. It will probably be necessary to turn engine before driven plate can be engaged on clutch shaft splines.
3. Push cardan shaft through clutch until it passes through driven plate and into fly-wheel spigot bearing. If cardan shaft cannot be pushed into spigot bearing, connect linkage and disengage PTO clutch then push shaft in whilst turning it. Refit all main frame and clutch cover bolts and firmly tighten. Connect linkage and adjust. (See Page 16.)
4. Continue assembly of tractor in reverse order of dismantling. Fit new hydraulic oil filter, or wash if earlier gauze type, before filling transmission with oil. If original oil is being replaced, pour through a funnel with a fine strainer and do not replace the last gallon, which will have accumulated any sediment. If tractor is fitted with hydrostatic steering reconnect all pipes, fill with new fluid and then bleed and check system.

# CLUTCH FAULT DIAGNOSIS

The most common causes of faulty clutch operation are summarised below for easy reference and if unsatisfactory operation is experienced the appropriate section should be consulted. When a clutch is removed for examination all the points applicable should be checked, because if the fault is due to more than one cause these must all be

rectified in order to obtain satisfactory operation.

Operating conditions can also have an effect on clutch operation and these should not be overlooked when investigating clutch problems. The most common causes of clutch failure are due to the operator riding the clutch pedal or not maintaining sufficient pedal free-play.

## Livedrive Clutch

### Transmission Clutch Slip

1. Insufficient pedal free-play.
2. Insufficient clearance in hand clutch linkage.
3. Cross shaft tight in its bearings.
4. Plate facings worn.
5. Plate facings contaminated with oil.  
If the facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling, or misplaced front seals. The gearbox oil can also leak along the inside of the clutch driveshaft if the felt seal is misplaced or damaged.
6. Thrust springs weak (see page 45 for checking details).
7. Pressure plate lugs binding in cover slots and preventing pressure plate from being held tightly against the flywheel.
8. Spring cups in cover damaged, causing the cups to foul the spring coils and preventing the springs from exerting their full pressure.
9. Excessive material ground from separator plate, or pressure plate, causing reduction of spring pressure.

### Power Take-off Clutch Slip

1. Incorrect adjustment of the three inner adjusting screws.
2. Worn or distorted linings.
3. Separator plate tight in flywheel.
4. Thrust springs weak (see page 45 for details).
5. Pressure plate lugs binding in cover slots and preventing pressure plate from being held tightly against the drive plates.
6. Excessive material ground from separator plate causing reduction of spring pressure.
7. Spring cups in cover damaged, causing cups to foul the spring coils and preventing the springs from exerting their full pressure.

### Transmission Clutch Drag

1. Incorrect pedal free-play adjustment.
2. Incorrect adjustment of hand clutch linkage.
3. Incorrect adjustment of inner cover adjusting screws and/or pedal roller eccentric.
4. Incorrectly adjusted clutch stop.
5. Plate facings dragging due to being contaminated with oil.  
If the facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling, or misplaced front seals. The gearbox oil can also leak along the inside of the clutch driveshaft if the felt seal is misplaced or damaged.
6. Incorrect release lever setting.
7. Wear in release mechanism: release lever ends, pivots or needle rollers.
8. Drive plate tight on clutch shaft splines.
9. Drive plate distorted: the plate should not be more than 0.015 in. (0.38 mm) out of true.
10. Driveshaft not revolving freely in cover bearing. This may be due to a seized or damaged bearing, but can also be caused by the bearing being distorted by the cover bore. The bearing must not be tight in the bore and if necessary the bore should be scraped out until the bearing can be pushed into place by hand. The bearing housing must also be concentric with the clutch cover and to check this it is necessary to remove and dismantle the clutch, then replace the cover assembly on the flywheel. Bearing bore run-out can then be checked with a dial gauge: if the total dial variation exceeds 0.004 in. (0.10 mm) correct by scraping the bore. A slight increase in bore diameter will not be detrimental.
11. Power take-off shaft fouling inside of clutch shaft. There should be no contact between the cardan shaft and driveshaft except by the felt sealing ring. Straighten the cardan shaft if it is more than 0.005 in. (0.13 mm) out of true when turned between the centres. Check the

inner bore of the clutch driveshaft: if the bore is marked cardan shaft is out of true.

12. Muff coupling end-float or alignment: the coupling should have not less than 0.010 in. (0.25 mm) end-float and should be free to engage in all spline positions through 360°, otherwise the clutch shaft and gearbox input shafts are not in line. If the shafts are not in line check the clutch shaft support bearing — there should be radial clearance between the shaft and bearing, 0.0015 in. (0.04 mm) on 6-speed and 0.006 in. (0.015 mm) on 12-speed — and check the gearbox mountings: the gearbox is not mounted rigidly to the main frame but should have not less than 0.012 in. (0.30 mm) "float".
13. Separator plate tapered across diameter. The plate should be completely flat with a maximum of 0.002 in. (0.05 mm) surface ripple.

## Power Take-off Clutch Drag

1. Incorrect pedal free-play adjustment.
2. Incorrect adjustment of cover adjusting screws.
3. Drive plate facings bonded to flywheel, due to infrequent use. It is important that the power take-off clutch is disengaged periodically, to prevent any possibility of the facings adhering to the flywheel face.
4. Incorrect release lever height setting.
5. Distorted drive plate: the plate should not be more than 0.015 in. (0.38 mm) out of true.
6. Seized flywheel spigot bearing.
7. Insufficient clearance between separator plate and flywheel. The plate teeth backlash can be checked with a feeler gauge and should be 0.007–0.011 in. (0.18–0.28 mm) on a 990 clutch, or 0.010–0.014 in. (0.25–0.35 mm) on other clutches.

## Dual Clutch

### Transmission Clutch Slip

1. Insufficient pedal free-play.
2. Cross shaft tight in bearings
3. Release bearing housing tight on support snout.
4. Plate facings worn.
5. Plate facings contaminated with oil. If facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to over-filling or misplaced seals. Gearbox oil may also leak along inside of clutch drive shaft if heart-shaped seal is displaced or damaged.
6. Thrust springs weak (see Page 49 for checking details).
7. Pressure plate lugs binding in cover slots and preventing pressure plate being held tightly against separator housing.
8. Spring cup in cover damaged and causing cups to foul coils and prevent springs exerting full pressure.
9. Excessive material ground from pressure plate, causing reduction of spring pressure.

4. Pressure plate lugs binding in separator housing.
5. Release levers, or toggles, binding or fouling.
6. Worn plate facings.
7. Weak thrust springs (see Page 49 for checking details).

### Transmission Clutch Drag

1. Incorrect free-play adjustment.
2. Incorrectly adjusted clutch stop.
3. Plate facings dragging due to being contaminated with oil. If facings are renewed because of oil contamination, the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling or displaced front seals. Gearbox oil can also leak along inside of clutch driveshaft if heart-shaped seal is displaced or damaged.
4. Incorrect release lever setting.
5. Wear in release mechanism, release lever ends or pivots.
6. Driven plate tight on shaft splines.
7. Driven plate distorted: plate should not be more than 0.015 in. (0.38 mm) out of true.
8. Driveshaft not revolving freely in separator housing bearing. This may be caused by a seized or damaged bearing, but can also be caused by bearing being tight in housing bore. The bearing must not be tight in bore

### Power Take-Off Clutch Slip

1. Insufficient free-play in linkage.
2. Cross shaft tight in bearings.
3. Hand lever pivot seized.



and bore must be concentric. If bore variation exceeds 0.004 in. (0.10 mm) when checked with dial gauge, correct by scraping bore. A slight increase in bore diameter will not be detrimental.

9. Power take-off cardan shaft fouling inside of clutch driveshaft. There should be no contact between shafts, except by the sealing ring. Straighten cardan shaft if it is more than 0.005 in. (0.13 mm) out of true when turned between centres.
10. Muff coupling end-float or alignment: coupling should have not less than 0.010 in. (0.25 mm) end-float and should be free to engage in all spline positions through 360°, otherwise clutch and gearbox shafts are not in line. If shafts are not in line, check clutch support snout bearing — there should be 0.0015 in. (0.04 mm) radial clearance be-

tween shaft and bearing — and check gearbox mountings: gearbox is not mounted rigidly in frame but should have not less than 0.012 in. (0.30 mm) "float" when gearbox cover is bolted down.

## Power Take-Off Clutch Spin

1. Incorrect free-play in hand lever.
2. Driven plate facings bonded to flywheel due to infrequent use. It is important that PTO clutch is disengaged periodically, to prevent any possibility of facings adhering to flywheel face.
3. Incorrect release lever height setting.
4. Distorted driven plate: plate should be not more than 0.015 in. (0.38 mm) out of true.
5. Seized flywheel spigot bearing.

# Single Clutch

## Clutch Slip

1. Incorrect pedal free-play.
2. Incorrect adjustment of hand clutch linkage.
3. Cross shaft tight in its bearings.
4. Drive plate facings worn.
5. Drive plate facings contaminated with oil. If the facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling, or misplaced front seals.
6. Thrust springs weak (see page 45 for checking details).
7. Pressure plate lugs binding in cover slots and preventing plate from being held tightly against the flywheel.
8. Excessive material ground from pressure plate, causing reduced pressure of thrust springs.

## Clutch Spin

1. Incorrect pedal free-play.
2. Incorrect release lever height setting.
3. Clutch stop friction pad worn.

4. Plate facings dragging due to being contaminated with oil. If the facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling, or misplaced front seals.
5. Drive plate distorted: plate should be not more than 0.015 in. (0.38 mm) out of true.
6. Drive plate hub tight on clutch shaft splines.
7. Worn release mechanism: release lever ends, pivots or eyebolts.
8. Seized flywheel spigot bearing.
9. Muff coupling end-float or alignment: the coupling should have not less than 0.010 in. (0.25 mm) end-float and should be free to engage in all spline positions through 360°, otherwise the clutch shaft and gearbox input shafts are not in line. If the shafts are not in line check the clutch shaft support bearing — there should be 0.0015 in. (0.04 mm) radial clearance between the shaft and bearing — and check the gearbox mountings: the gearbox is not bolted rigidly to the main frame but should have not less than 0.012 in. (0.30 mm) "float".

# Twin Plate Clutch

## Clutch Slip

1. Insufficient pedal free-play.
2. Cross shaft tight in its bearings.
3. Plate facings worn.
4. Plate facings contaminated with oil.

If the facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling, or misplaced front seals.

5. Thrust springs weak (see page 48 for checking details).
6. Pressure plate lugs binding in cover slots and preventing pressure plate from being held tightly against the flywheel.
7. Spring cups in cover damaged, causing the cups to foul the spring coils and preventing the springs from exerting their full pressure.
8. Excessive material ground from separator plate, causing reduction of thrust spring pressure.

## Clutch Drag

1. Incorrect pedal free-play adjustment.
2. Incorrect adjustment of inner cover adjusting screws.
3. Clutch stop friction pad worn.
4. Plate facings dragging due to being contaminated with oil.  
If the facings are renewed because of oil contamination the oil leakage should be rectified to prevent a recurrence. Possible sources of oil leakage are: rear main bearing leakage; gearbox leakage due to overfilling or misplaced seals.
5. Incorrect release lever setting.
6. Wear in release mechanism: release lever ends, pivots or needle rollers.
7. Driven plates tight on shaft splines.

8. Drive plates distorted. Plates should be not more than 0.015 in. (0.38 mm) out of true.
9. Driveshaft not revolving freely in cover bearing. This may be due to a seized or damaged bearing, but can also be caused by the bearing being distorted by the cover bore. The bearing must not be tight in the bore and if necessary the bore should be scraped out until the bearing can be pushed into place by hand. The bearing housing must also be concentric with the clutch cover and to check this it is necessary to remove and dismantle the clutch, then replace the cover assembly on the flywheel. Bearing bore run-out can then be checked with a dial gauge: if the total dial variation exceeds 0.004 in. (0.10 mm) correct by scraping the bore. A slight increase in bore diameter will not be detrimental.
10. Muff coupling end-float or alignment: the coupling should have not less than 0.010 in. (0.25 mm) end-float and should be free to engage in all spline positions through 360°, otherwise the clutch shaft and gearbox input shafts are not in line. If the shafts are not in line check the clutch shaft support bearing — there should be 0.0015 in. (0.04 mm) radial clearance between the shaft end bearing — and check the gearbox mountings: the gearbox is not bolted rigidly to the main frame but should have not less than 0.012 in. (0.30 mm) "float".
11. If a rear-mounted hydraulic pump, driven directly from the flywheel, is fitted, examine the driveshaft bore to ensure that it is not contacting the pump driveshaft.

# CLUTCH SERVICE TOOLS

## Baseplate Kits

Basic Baseplate Kit (No. 1) can be used for all Selectamatic Tractor clutches and the various spacers and adaptors, etc., required for different clutches are available in kits so that tool requirements can be matched to the actual range of clutches being serviced.

The list of Baseplate Kits shows the full range, and contents, of kits and the tractor models, and clutches, for which they are required.

As it is essential to use the correct adaptors and spacers, etc., the List of Setting Equipment shows spacers and adaptors to use for each clutch.

## Flywheel Kits

An alternative method of setting a clutch unit is to use the tractor flywheel instead of a baseplate and kits of adaptors and spacers, etc., are available to enable clutch units to be serviced by this method.

The list of Flywheel Kits shows the full range, and contents, of kits and the tractor models and clutches for which they are required.

As it is essential to use the correct adaptors and spacers, etc., the list of Setting Equipment shows which adaptors and spacers to use for each clutch.

## BASEPLATE KITS

Tractor	Clutch	Kit No. and Part No.	Contents of Kit			Remarks
			Part No.	Description	Qty	
All models	All types	Kit No. 1 961850	912917	baseplate	1	Basic baseplate Kit
			961845	centre pillar	1	
			961844	actuator	1	
			961846	setting finger, short	1	
			961086	stud, $\frac{3}{8}$ UNC x $3\frac{1}{2}$ in.	9	
			19472	washer, $\frac{3}{8}$ in.	9	
			607045	nut, $\frac{3}{8}$ UNC	9	
			602806	setscrew, $\frac{1}{8}$ UNC x $1\frac{1}{2}$ in.	6	
			961087	socket, $\frac{1}{8}$ AF (ED 562)	1	
			961697	code card	1	
			961847	operating instructions	1	
			961848	fibre box	1	
Livedrive models						
770, 780, 880	Borg and Beck 10/10 in.	Kit No. 2 961856	912723	adaptor — centre pillar	1	Used with Kit 1
			961853	spacer, Code 8 — centre pillar	1	
990	Borg and Beck 11/10 in.		908888	spacer, Code 16X — centre pillar	1	
			961855	spacer, Code 14 — pressure plate	3	
3800, 4600	Borg and Beck 10/10 in.		912724	spacer — cover to baseplate	9	
780, 880	Laycock 10/10 in.		962577	spacer — pillar adaptor	1	Used with Kits 1 and 2
1200	Borg and Beck 11/11 in.	Kit No. 7 962135	920203	setting finger, long	1	Used with Kits 1, 2 and 4
			920198	adaptor — centre pillar (PTO)	1	
			920199	adaptor — centre pillar (Trans.)	1	
			962139	spacer, Code 13 — pressure plate	3	
			920202	bolt, $\frac{3}{8}$ / $\frac{1}{2}$ UNC, special	9	
			920201	nut, $\frac{1}{2}$ UNC, special	9	
			920204	adaptor plate — actuator	1	
			962188	retaining staple	3	
			962147	socket (ED 500)	1	
			962220	code card	1	
			962138	operating instructions	1	
Non-Livedrive models — Single-plate clutch						
770	Borg and Beck 9 in.	Kit No. 4 961862	961857	spacer, Code 3 — pressure plate	4	Used with Kits 1 and 2
880	Borg and Beck 10 in.					
990	Borg and Beck 11 in.					
1200	Borg and Beck 12 in.					
Non-Livedrive models — Twin-plate clutch						
880	Borg and Beck 10/10 in.	Kit No. 3 961861	961843	spacer, Code 17X — pressure plate	3	Used with Kits 1 and 2
990	Borg and Beck 10/10 in.					
990	Borg and Beck 11/10 in.					

# KITS FOR USE WITH FLYWHEELS

Tractor	Clutch	Kit No. and Part No.	Contents of Kit			Remarks
			Part No.	Description	Qty	
All models	All types	Kit No. 10 961866	961845 961844 961846 13179 961877 19472 19403 961864 961865 961088 961848	centre pillar actuator setting finger, short bolt, $\frac{3}{8}$ BSF x $3\frac{1}{2}$ in. stud, $\frac{3}{8}$ BSF x $3\frac{3}{4}$ in. washer, $\frac{3}{8}$ in. nut, $\frac{3}{8}$ BSF socket, $\frac{3}{8}$ BSF (ED 600) operating instructions code card fibre box	1 1 1 2 8 10 10 1 1 1 1	Basic flywheel kit
Livedrive models 770 780 880 3800 4600	Borg and Beck 10/10 in.	Kit No. 11 961870	961867 961868 961853 961859 961855 961869	adaptor, No. 1 — flywheel adaptor, No. 9 — centre pillar spacer, Code 8 — centre pillar spacer, Code 10 — separator plate spacer, Code 14 — pressure plate setting finger, short	1 1 1 3 3 1	Used with Kit 10
770 780 880 3800 4600	Borg and Beck 10/10 in.	Kit No. 14 961873	961873	adaptor, No. 2 — flywheel	1	Used with Kits 10, 11 and 12
780 880	Laycock 10/10 in.		962577	spacer — pillar adaptor	1	Used with Kits 10 and 11
990	Borg and Beck 11/10 in.	Kit No. 12 961871	908888 961086 607045 961087	spacer, Code 16X — centre pillar stud, $\frac{3}{8}$ UNC x $3\frac{3}{4}$ in. nut, $\frac{3}{8}$ UNC socket, $\frac{3}{8}$ AF (Ed 562)	1 9 9 1	Used with Kits 10 and 11
1200	Borg and Beck 11/11 in.	Kit No. 21 962137	920199 920198 962139 920203 920204 962188 920200 920201 962147 962138 962221	adaptor — centre pillar (Trans.) adaptor — centre pillar (PTO) spacer, Code 13 — pressure plate (Trans.) setting finger, long adaptor plate — actuator retaining staple stud, $\frac{1}{2}$ UNC x $5\frac{1}{2}$ in. nut, $\frac{1}{2}$ UNC socket (ED 500) operating instructions code card	1 1 3 1 1 3 9 9 1 1 1	Used with Kits 10, 11, 12, 14 and 19
Non-Livedrive models—Single-plate clutch 770	Borg and Beck 9 in.	Kit No. 18 961851	961858 602806	spacer, Code 11 — centre pillar setscrew, $\frac{1}{8}$ UNC x $1\frac{1}{2}$ in.	1 6	Used with Kits 10, 11, 15, 17
780 880 3800 4600	Borg and Beck 10 in.	Kit No. 17 961876	961876	adaptor, No. 4 — flywheel	1	Used with Kits 10 and 11
990	Borg and Beck 11 in.	Kit No. 19 908889	908889	spacer, Code 15X — centre pillar	1	Used with Kits 10 and 11
1200	Borg and Beck 12 in.	Kit No. 22 962448	962139 912724	spacer, Code 13 — pressure plate spacer — pressure plate	4 4	Used with Kits 10, 11, 14, 17
Non-Livedrive models—Twin-plate clutch 880 990 990	Borg and Beck 10/10 in. Borg and Beck 10/10 in. Borg and Beck 11/10 in.	Kit No. 13 961872	961855	spacer, Code 14 — separator plate	3	Used with Kits 10, 11 and 12

THESE TOOLS NO LONGER AVAILABLE.

## SETTING EQUIPMENT REQUIRED WHEN USING BASEPLATE

Tractor	Clutch type	Centre pillar spacer	Centre pillar adaptor	Pressure plate spacer	Cover spacer
<b>Livedrive models</b> 770 780 880 3800 4600	Borg and Beck 10/10 in.	Code 8 (961853)	912723	Code 14 (961855)	912724
780 880	Laycock 10/10 in.	Code 8 (961853)	912723 + 962577	Code 14 (961855)	912724
990	Borg and Beck 11/10 in.	Code 16X (908888)	912723	Code 14 (961855)	912724
1200	Borg and Beck 11/11 in.	Code 16X (908888)	920199 (Trans.) 920198 (PTO)	Code 13 (962139) Code 3 (961857)	none none
<b>Non-Livedrive models — Single-plate clutch</b> 770	Borg and Beck 9 in.	Code 8 (961853)	none	Code 3 (961857)	none
780 880 3800 4600	Borg and Beck 10 in.				
990	Borg and Beck 11 in.				
1200	Borg and Beck 12 in.	Code 16X (908888)	none	Code 3 (961857)	none
<b>Non-Livedrive models — Twin-plate clutch</b> 880	Borg and Beck 10/10 in.	Code 8 (961853)	912723	Code 17X (961843)	912724
880 990 990	Borg and Beck 10/10 in. Borg and Beck 10/10 in. Borg and Beck 11/10 in.	Code 16X (908888)	912723	Code 17X (961843)	912724

## SETTING EQUIPMENT REQUIRED WHEN USING FLYWHEEL

Tractor	Clutch type	Flywheel adaptors	Centre pillar adaptor	Centre pillar spacer	Pressure plate spacers Transmission	PTO
<b>Livedrive models</b> 770 780 880 3800 4600	Borg and Beck 10/10 in.	No. 1 (961867) and No. 2 (961873)	No. 9 (961868)	Code 8 (961853)	Code 14 (961855)	Code 10 (961859)
780 880	Laycock 10/10 in.	Nos. 1 and 2 (961867 and 961873)	No. 9 (961868) and 962577	Code 8 (961853)	Code 14 (961855)	Code 10 (961859)
990	Borg and Beck 11/10 in.	No. 1 (961867)	No. 9 (961868)	Code 16X (908888)	Code 14 (961855)	Code 10 (961859)
1200	Borg and Beck 11/11 in.	Nos. 1 and 2 (961867 and 961873)	920199  920198	Code 16X (908888) Code 16X (908888)	Code 13 (962139) —	Code 10 (961859)
<b>Non-Livedrive models—Single-plate clutch</b>  770	Borg and Beck 9 in.	Nos. 1 and 4 (961867 and 961876)	—	Code 11 (961858)	Code 3 (961857)	—
880 3800 4600	Borg and Beck 10 in.	Nos. 1, 2, 4 (961867, 961873 and 961876)	—	Code 8 (961853)	Code 3 (961857)	—
990	Borg and Beck 11 in.	Nos. 1 and 4 (961867 and 961876)	—	Code 15X (908889)	Code 3 (961857)	—
1200	Borg and Beck 12 in.	Nos. 1 and 2 (961867 and 961873)	No. 9 (961868)	Code 16X (908888)	Code 13 + 912724	—
<b>Non-Livedrive models — Twin-plate clutch</b>  880	Borg and Beck 10/10 in.	No. 1 (961867)	No. 9 (961868)	Code 8 (961853)	Code 14 (961855)	—
990 990	Borg and Beck 10/10 in. Borg and Beck 11/10 in.	No. 1 (961867)	No. 9 (961868)	Code 16X (908888)	Code 14 (961855)	—

# DIMENSIONAL DATA

## Double Clutch (Livedrive) — 770

Clutch type .. .. .	Borg and Beck BB10/189C
Plate type and diameter (transmission) .. .. .	Borglite, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.350 in (8.89 mm)
Plate type and diameter (PTO) .. .. .	rigid, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.320 in (8.13 mm)
Number of springs (transmission) .. .. .	9
Spring colour (inner transmission) .. .. .	brown
Spring pressure (at checking length) .. .. .	80–85 lb (36–38 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Spring colour (outer transmission) .. .. .	brown
Spring pressure (at checking length) .. .. .	120–130 lb (54–58 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Number of springs (PTO) .. .. .	6
Spring colour (PTO) .. .. .	buff
Spring pressure (at checking length) .. .. .	88–94 lb (39–42 kg)
Spring checking length .. .. .	2.26 in (57.40 mm)
Separator plate thickness .. .. .	0.705–0.700 in (17.90–17.78 mm)
Cover adjusting screw clearance .. .. .	0.070 in (1.78 mm)
Pedal free-play .. .. .	$\frac{1}{2}$ – $\frac{3}{4}$ in (13–19 mm)
Release lever height, i.e.: Distance from the tips of the release levers to the base plate face when the clutch is assembled with 0.349 in. (8.865 mm) thick spacers in place of the transmission plate and 912724 spacers between the cover flange and base plate. This dimension also applies when the clutch is assembled on a flywheel and fitted with 0.310 in. (7.874 mm) thick spacers in place of the power take-off plate and 0.349 in. (8.865 mm) spacers in place of the transmission plate .. .. .	
Pedal pad height above footplate when free-play is taken up .. .. .	3.345 in (84.96 mm) $3\frac{1}{4}$ – $5\frac{1}{4}$ in (95.0–135.0 mm)

## Single Clutch (Non-Livedrive) — 770

Clutch type .. .. .	Borg and Beck BB9/273A
Plate type and diameter .. .. .	Borglite, 9 in (22.86 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.330 in (8.38 mm)
Number of springs .. .. .	12
Spring colour .. .. .	black
Spring pressure (at checking length) .. .. .	150–160 lb (67–69 kg)
Spring checking length .. .. .	1.688 in (42.875 mm)
Pedal free-play .. .. .	$\frac{1}{2}$ – $\frac{3}{4}$ in (13–19 mm)
Release lever height: Distance from the tips of the release levers to the base plate or flywheel face when the clutch is assembled with three 0.330 in. (8.382 mm) thick spacers in place of the driven plate .. .. .	
Pedal pad height above footplate when free play is taken up .. .. .	1.895 in (48.13 mm) $2\frac{1}{4}$ – $3\frac{1}{4}$ in (57.0–95.0 mm)

## Double Clutch (Livedrive) — 880

Clutch type .. .. .	Borg and Beck BB10/167E
Plate type and diameter (transmission) .. .. .	Borglite, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.350 in (8.89 mm)
Plate type and diameter (PTO) .. .. .	rigid, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.320 in (8.13 mm)
Number of springs (transmission) .. .. .	12
Spring colour (inner transmission) .. .. .	brown
Spring pressure (at checking length) .. .. .	80–85 lb (36–38 kg)

Spring checking length .. .. .	2.60 in (66.04 mm)
Spring colour (outer transmission) .. .. .	brown
Spring pressure (at checking length) .. .. .	120–130 lb (54–58 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Number of springs (PTO) .. .. .	6
Spring colour (PTO) .. .. .	buff
Spring pressure (at checking length) .. .. .	88–94 lb (39–42 kg)
Spring checking length .. .. .	2.26 in (57.40 mm)
Separator plate thickness .. .. .	0.705–0.700 in (17.90–17.78 mm)
Cover adjusting screw clearance .. .. .	0.070 in (1.78 mm)
Pedal free-play .. .. .	1–1½ in (25.4–38.0 mm)
Release lever height, i.e.: Distance from the tips of the release levers to the base plate face when the clutch is assembled with 0.349 in. (8.865 mm) thick spacers in place of the transmission plate and 912724 spacers between the cover flange and base plate. This dimension also applies when the clutch is assembled on a flywheel and fitted with 0.310 in. (7.874 mm) thick spacers in place of the power take-off plate and 0.349 in. (8.865 mm) spacers in place of the transmission plate .. .. .	
	3.345 in (84.96 mm)

### Laycock double clutch (Livedrive) — alternative fitting 780 and 880

Clutch type .. .. .	Laycock No. 83939
Plate type and diameter (transmission) .. .. .	Borglite 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.340 in (8.63 mm)
Plate type and diameter (PTO) .. .. .	rigid, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.310 in (7.87 mm)
Number of springs .. .. .	12
Spring colour .. .. .	pale green
Spring pressure at checking length .. .. .	103–113 lb (46–51 kg)
Spring checking length .. .. .	1.5 in (38.1 mm)
Spring overall diameter .. .. .	0.840 in (21.34 mm)
Separator plate thickness .. .. .	0.705–0.700 in (17.90–17.78 mm)
Cover adjusting screw clearance:	
clutch on baseplate .. .. .	0.048 in (1.22 mm)
clutch on flywheel .. .. .	0.057 in (1.447 mm)
Pedal free-play, 880 .. .. .	1–1½ in (25.4–38.0 mm)
Pedal free-play, 780 .. .. .	¾–1 in (19–25.4 mm)

Release lever height, i.e. distance from head of release lever adjusting screw to baseplate face when clutch is assembled with 0.349 in. (8.865 mm) thick spacers in place of transmission plate and 912724 spacers between cover flange and baseplate. This dimension also applies when clutch is assembled on a flywheel and fitted with 0.310 in. (7.874 mm) thick spacers in place of power take-off plate and 0.349 in. (8.865 mm) spacers in place of transmission plate .. .. .	
	3.720 in (94.49 mm)

### Single Clutch (Non-Livedrive) — 880

Clutch type .. .. .	Borg and Beck 10A6G
Plate diameter .. .. .	Borglite, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.330 in (8.38 mm)
Number of springs .. .. .	12
Spring colour .. .. .	light green
Spring pressure (at checking length) .. .. .	105–115 lb (47–52 kg)



Spring checking length .. .. .	1.688 in (42.875 mm)
Pedal free-play .. .. .	1-1½ in (25.4-38.0 mm)
Release lever height, i.e.: Distance from the tips of the release levers to the base plate or flywheel face when the clutch is assembled with three 0.330 in. (8.382 mm) thick spacers in place of the driven plate .. .. .	1.955 in (49.53 mm)

## Double Clutch (Livedrive) — 990

Clutch type .. .. .	Borg and Beck BB11/180E
Plate type and diameter (transmission) .. .. .	Borglite 11 in (27.44 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.350 (8.89 mm)
Plate type and diameter (PTO) .. .. .	rigid, 10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.320 in (8.13 mm)
Number of springs (transmission) .. .. .	12
Spring colour (inner-transmission) .. .. .	brown
Spring pressure (at checking length) .. .. .	80-85 lb (36-38 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Spring colour (outer transmission) .. .. .	red
Spring pressure (at checking length) .. .. .	140-150 lb (63-67 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Number of springs (PTO) .. .. .	6
Spring colour (PTO) .. .. .	pink
Spring pressure (at checking length) .. .. .	113-121 lb (51-54 kg)
Spring checking length .. .. .	2.26 in (57.40 mm)
Separator plate thickness .. .. .	0.765-0.760 in (19.44-19.30 mm)
Cover adjusting screw clearance .. .. .	0.070 in (1.78 mm)
Pedal free-play .. .. .	1-1½ in (25.4-38.0 mm)
Release lever height, i.e.: Distance from the tips of the release levers to the base plate face when the clutch is assembled with 0.349 in. (8.865 mm) thick spacers in place of the transmission plate and 912724 spacers between the cover flange and base plate. This dimension also applies when the clutch is assembled on a flywheel and fitted with 0.310 in. (7.874 mm) thick spacers in place of the power take-off plate and 0.349 in. (8.865 mm) spacers in place of the transmission plate .. .. .	3.445 in (87.5 mm)

## Single Clutch (Non-Livedrive) — 990

Clutch type .. .. .	Borg and Beck 11A6G
Plate type and diameter .. .. .	Borglite 11 in (27.44 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.330 in (8.38 mm)
Number of springs .. .. .	12
Spring colour .. .. .	yellow/light green
Spring pressure (at checking length) .. .. .	135-145 lb (61-65 kg)
Spring checking length .. .. .	1.688 in (42.875 mm)
Pedal free-play .. .. .	1-1½ in (25.4-38.0 mm)
Release lever height, i.e.: Distance from the tips of the release levers to the base plate or flywheel face when the clutch is assembled with three 0.330 in. (8.382 mm) thick spacers in place of the driven plate .. .. .	1.955 in (49.53 mm)

## Twin Plate Clutch — 880 (Early clutch with inner cover)

Clutch type .. .. .	special twin plate
Plate diameter .. .. .	10 in (25.4 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.350 in (8.89 mm)

Plate diameter	} inner plate	10 in (25.4 cm)
Plate thickness (new)		0.350 in (8.89 mm)
Plate facing material		Capasco F30C
Number of springs on pressure plate		12
Spring colour (inner)		brown
Spring pressure (at checking length)		80–85 lb (36–38 kg)
Spring checking length		2.60 in (66.04 mm)
Spring colour (outer)		brown
Spring pressure at (checking length)		120–130 lb (54–58 kg)
Spring checking length		2.60 in (66.04 mm)
Number of springs on inner cover		6
Identification		Part No. 625149
Spring pressure (at checking length)		10 lb (4.54 kg)
Spring checking length		2.25 in (57.15 mm)
Separator plate thickness		0.705–0.700 in (17.90–17.78 mm)
Cover adjusting screw clearance		0.050 in (1.270 mm)
Pedal free-play		1–1½ in (25.4–38.0 mm)

Release lever height, i.e.: Distance from the tips of the release levers to the base plate face when the clutch is assembled with 0.389 in. (9.880 mm) spacers in place of the transmission plate and 912724 spacers between the cover flange and base plate. This dimension also applies when the clutch is assembled on a flywheel and fitted with 0.349 in. (8.865 mm) spacers in place of both drive plates.

3.345 in (84.96 mm)

### Twin Plate Clutch — 990 (Early clutch with inner cover)

Clutch type		special twin plate
Plate diameter	} outer plate	11 in (27.94 cm)
Plate facing material		Mintex H19
Plate thickness (new)		0.350 in (8.89 mm)
Plate diameter	} inner plate	10 in (25.4 cm)
Plate facing material		Capasco F30C
Plate thickness (new)		0.350 in (8.89 mm)
Number of springs on pressure plate		12
Spring colour (inner)		brown
Spring pressure (checking length)		80–85 lb (36–38 kg)
Spring checking length		2.60 in (66.04 mm)
Spring colour (outer)		brown
Spring pressure (checking length)		120–130 lb (54–58 kg)
Spring checking length		2.60 in (66.04 mm)
Number of springs on inner cover		6
Identification		Part No. 625149
Spring pressure (at checking length)		10 lb (4.54 kg)
Spring checking length		2.25 in (57.15 mm)
Separator plate thickness		0.765–0.760 in (19.43–19.30 mm)
Cover adjusting screw clearance		0.050 in (1.270 mm)
Pedal free-play		1–1½ in (25.4–38.0 mm)

Release lever height, i.e.: Distance from the tips of the release levers to the base plate face when the clutch is assembled with 0.389 in. (9.880 mm) spacers in place of the transmission plate and 912724 spacers between the cover flange and base plate. This dimension also applies when the clutch is assembled on a flywheel and fitted with 0.349 in. (8.865 mm) spacers in place of both drive plates.

3.445 in (87.5 mm)

### Twin Plate Clutch — 990 and 880 (Later clutch without inner cover)

Clutch type		special twin plate
Plate diameter		10 in (25.4 cm)
Plate facing material		Thermoid 11046

Plate thickness (new) .. .. .	0.350 in (8.89 mm)
Number of springs on pressure plate .. .. .	12
Spring colour (inner) .. .. .	brown
Spring pressure (at checking length) .. .. .	80–85 lb (36–38 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Spring colour (outer) .. .. .	red
Spring pressure (at checking length) .. .. .	140–150 lb (63–67 kg)
Spring checking length .. .. .	2.60 in (66.04 mm)
Separator plate thickness – 990.. .. .	0.765–0.760 in (19.44–19.30 mm)
Separator plate thickness – 880.. .. .	0.705–0.700 in (17.90–17.78 mm)
Pedal free-play .. .. .	1–1½ in (25.4–38.0 mm)
Release lever height, i.e.: Distance from tips of release levers to base plate face when clutch is assembled with 0.389 in. (9.880 mm) spacers in place of drive plate and 912724 spacers between cover flange and baseplate. This dimension also applies when clutch is assembled on a flywheel and fitted with 0.349 in. (8.865 mm) spacers in place of both drive plates .. .. .	
	3.445 in (87.5 mm)

### Dual Clutch (Livedrive) — 1200

Clutch type .. .. .	Borg and Beck 49400
Plate type and diameter (transmission) .. .. .	Borglite 11 in (27.94 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.340 in (8.64 mm)
Plate type and diameter (PTO) .. .. .	rigid 11 in (27.94 cm)
Plate facing material .. .. .	Capasco F30C
Plate thickness (new) .. .. .	0.324 in (8.23 mm)
Number of springs (transmission) .. .. .	12
Spring colour .. .. .	dark blue/light green
Spring pressure (at checking length) .. .. .	130–140 lb (58–63 kg)
Spring checking length .. .. .	1.69 in (42.92 mm)
Number of springs (PTO) .. .. .	12
Spring colour .. .. .	red
Spring pressure (at checking length) .. .. .	131–140 lb (59–63 kg)
Spring checking length .. .. .	1.41 in (35.81 mm)
Pedal free-play .. .. .	$\frac{7}{8}$ to 1 in (22 to 25 mm)
Hand lever free-play .. .. .	1½ to 2½ in (48 to 54 mm)
Release lever height, i.e.: Distance from baseplate or flywheel face to	
transmission release lever plate .. .. .	5.385–5.215 in (136.78–132.46 mm)
PTO release lever plate .. .. .	6.37–6.27 in (161.80–159.26 mm)

### Single Clutch (Non-Livedrive) — 1200

Clutch type .. .. .	Borg and Beck 12AS
Plate type and diameter .. .. .	Borglite, 12 in
Plate facing material .. .. .	Mintex H19
Plate thickness (new) .. .. .	0.52 in (13.21 mm)
Number of springs .. .. .	16
Spring colour .. .. .	lavender/black
Spring pressure (at checking length) .. .. .	112–122 lb (50–55 kg)
Spring checking length .. .. .	1.69 in (42.92 mm)
Pedal free-play .. .. .	1 in (25.4 mm)
Release lever height, i.e.: Distance from tips of release levers to flywheel face when clutch is assembled with four 0.520 in (13.2 mm) spacers in place of driven plate .. .. .	
	2.25 in (57.15 mm)

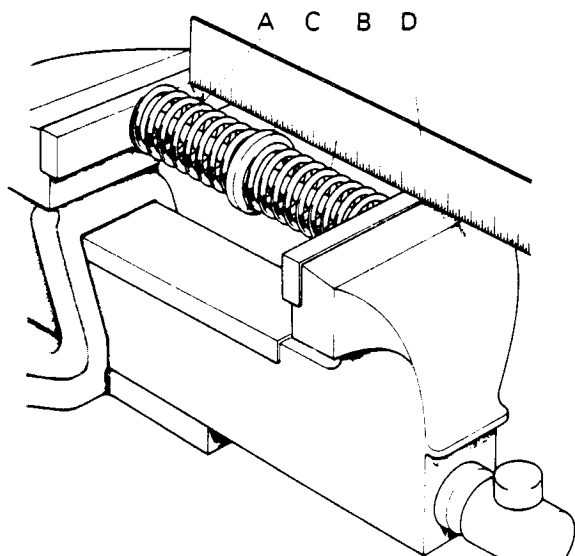


Figure 45. CHECKING THRUST SPRINGS

- A. New spring      B. Old spring  
C. Spacer          D. Rule

## Checking Thrust Springs

If a spring tester is not available, springs should be checked as follows:

1. Select an average length spring from a set of *new* springs to use as a guide.
2. First compare free-length of new spring against old springs and discard any springs whose free-length is over  $\frac{1}{8}$  in. (1.5 mm) shorter than the new spring.
3. Finally compare loaded length of springs by compressing the new spring and each old spring in turn, in series between vice jaws. For safety fit a 3 in. (76 mm) piece of  $\frac{3}{8}$  in. (9.5 mm) diameter rod inside the springs and fit a short spacer between the spring ends. Compress springs between vice jaws until new spring is reduced to its loaded length (see data pages) then measure length of old spring. If old spring is within  $\frac{1}{8}$  in. (1.5 mm) of length of new spring it is satisfactory and can be refitted but any spring whose compressed length is more than  $\frac{1}{8}$  in. (1.5 mm) shorter than new spring is weak and must be discarded.

# SUMMARY OF DESIGN CHANGES

## Details of Change

Power take-off clutch adjusting screws on inner cover increased from  $\frac{1}{4}$  UNF to  $\frac{5}{8}$  UNF. Parts, except screws and nuts, are interchangeable but if a new inner cover is used with an earlier outer cover the holes in the outer cover must be increased to  $\frac{1}{8}$  in. (17.5 mm), to provide clearance for the larger adjusting screws.

Drain hole drilled through support snouts, Part Nos. 89334 and 911906 to prevent any possibility of oil seepage past the clutch shaft bearing reaching the clutch.

Clutch driven plate change from rigid type to Borglite. Part number of plate changed from 906854 to 915694. As the Borglite plate has 40 facing rivets and the rigid plate only 24 rivets, facings are not interchangeable.

Width of clutch stop drum reduced from  $1\frac{5}{8}$  in. to 1 in. so that on 6-speed tractors the clutch can be removed without "splitting" the tractor. Part number of the drum changed from 915582 to 917780 and these are not interchangeable unless a new clutch driveshaft is also fitted.

Clutch driveshaft ball bearing (19201) changed to single seal type bearing. The new bearing, Part No. 620033 is interchangeable with the previous bearing and must be fitted with the sealed side towards the support snout.

Stop bolt, Part No. 912855, fitted on left-hand fender to give positive stop for resetting-lever and prevent damage to guide bracket (913860).

Clutch-housing locating-dowels case hardened and increased in length from  $\frac{3}{4}$  to  $1\frac{1}{8}$  in. (19.0 to 28.5 mm) to give more positive location of housing. Part No. of dowel changed from 35840 to 621838.

## When introduced

AD4/47A/63792  
AD3/55A/2847  
AD3/49A/1929  
(April 1966)

990/A/484285  
880/A/531626  
(April 1966)

AD4/47B/41329  
(April 1966)

990/A/487807  
880/A/533604  
(June 1966)

990/A/487807  
880/A/533604  
(June 1966)

880/535820  
990/491847  
(September 1966)

AD3/49A/4988  
AD3/55A/8773  
AD4/47A/72497  
(January 1967)

Hole in clutch pedal, for operating starter safety switch, tapped $\frac{3}{8}$ UNC so that threaded operating peg (K920281) can be used instead of plain peg (K918618).	880/539423 990/496835 (January 1967)
Clutch-stop fork end, Part No. K916482, replaced by fork end K916481.	880/539995 990/497389 (February 1967)
Tension of PTO thrust springs increased from 41 to 53 kg (91 to 117 lb). Part number and colour marking of springs changed from K900261 (buff) to K902514 (pink). Part number of cover assembly changed from K917998 to K921273. Springs are interchangeable if fitted in sets.	AD4/47A/78292 (June 1967)
Tension of transmission thrust spring increased from 53 to 61 kg (117 to 135 lb). Part number and colour marking of springs changed from K625210 (lavender/black) to K962292 (dark blue/light green). Part number (K919860) of clutch assembly is unchanged and springs are interchangeable if fitted in sets.	AD4/55A/4665 (November 1967)
Power take-off clutch operating toggles increased in diameter. As the new toggles, which may be identified by having $\frac{3}{8}$ UNF threads, have larger eyebolts than the $\frac{5}{8}$ UNF toggles, corresponding changes to the clutch cover, pressure plate and release levers do not allow the new toggles to be fitted to earlier clutches unless all the later parts are fitted.	AD4/55A/2839 (June 1967)
Strength of clutch-pedal springs increased from 3 to 8 kg (7 to 18 lb) by increasing thickness of springs from 13 SWG to 10 SWG. Part number of springs (K921684 and K921685) and retaining pins (K921683 and K921686) unchanged.	780/600610 (December 1967)
Strength of cross shaft return spring increased by changing thickness of spring from 7 SWG to 6 SWG. Part number of spring (K921687) unchanged.	780/600745 (January 1968)
Clutch dust cover U1174 introduced to prevent build up of dust in the flywheel housing. Required only in exceptionally dry and dusty conditions.	1200 (February 1968)
Tension of transmission lever anti-rattle springs increased by changing thickness of springs from 12 SWG to 10 SWG, and lever adjusting screws changed to lighter screws with socket head. Part number of spring changed from K919863 to K923989, and number adjusting screw changed from K919864 to K923990. Parts are interchangeable but must be fitted in sets to preserve clutch balance.	AD4/55/5611 (February 1968)
Pull-off spring (K624935), hook (K916478) and anchor plate (K924167) fitted on PTO hand lever to hold lever firmly in "engaged" position and prevent unnecessary wear of release mechanism.	1200/706056 (July 1968)
Length of trunnion pin in cross shaft fork increased and six Belleville washers (K626723) fitted on pin to increase tension and hold release bearing clear of release lever plate when clutch is engaged. Part number of pin changed from K915834 to K925323.	1200/707333 (December 1968)
Power take-off release-bearing housing connected to grease channel in main frame by a nylon tube, so that release bearing is lubricated at same time as left-hand cross-shaft bearings. Part number of housing (K915837) unchanged but tapped boss incorporated for tube connection.	1200/707536 (January 1969)
Transmission release bearing changed from Part No. K19169, which has 7.9 mm ( $\frac{5}{16}$ in) ball bearings, to Part No. K620112 bearing, which has 9.5 mm ( $\frac{3}{8}$ in) diameter balls. Bearings are interchangeable and the K620112 bearing should be used as a replacement.	1200/708319 (March 1969)
Twin-plate clutch redesigned so that both drive plates are engaged simultaneously. Inner cover (K918606 or K918613) deleted and three springs (K625232) fitted in pressure plate so that inner driven plate is released at same time as outer plate. Earlier clutches can be changed by discarding the inner cover and fitting a new pressure plate (K962573) and three springs (K625232).	355001/22392 355005/1011 355105/1002 449005/1415 (June 1969)
Cored holes in front main frame (K915404) repositioned and clutch housing vent cover (K904246) changed to plain cover (K923650) to prevent dust entering clutch compartment.	1200/710355 (September 1969)

Slot in guide brackets (K919401 and K919402) reshaped to facilitate operation of hand-lever catch. Part numbers of brackets unchanged but care must be taken that new and old type brackets are not used on the same tractor.

1200/711248  
(November 1969)

Tension of transmission thrust springs increased from 57 kg (125 lb) to 66 kg (145 lb). Part number and colour marking of springs changed from K902512 (brown) to K928922 (red). Springs are interchangeable if fitted in sets

449001/19735  
(April 1970)

Transmission lever pivot pin increased in length from 6.5 to 8 mm ( $\frac{1}{4}$  to  $\frac{5}{16}$  in). Release levers strengthened, part number changed from K919851 to K962808. Wider thrust pads on release lever plate drilled and fitted with spring steel pins. Rat trap springs replace leaf springs on release lever plate. Transmission spring changed from K625231 (dark blue/light green) to K625262 (violet/black) and strength increased from 61 to 68 kg (135 to 150 lb). Parts not interchangeable.

AD4/55A/15122  
(September 1970)

Groove machined on the 12 speed gearbox driveshaft and at the support snout steady bearing position and 'O' ring K15535 fitted.

990/824197  
880/560763  
4600/900497  
U1074/1099  
(February 1971)

Clutch release lever adjusting screw repositioned centrally on the thrust button.

#### TRANSMISSION RELEASE LEVER IDENTIFICATION (1200)

Stamped	DB Part Number	Set of three Use	Description
49405	K919581	K962979	Release lever narrow → E15122
55118	K962808		Release lever wide E15122 →
55568	K962948	K962979	Release lever wide later models

455001/17909  
455021/1205  
455031/15037  
(August 1971)

Length of PTO release lever adjusting screws increased by 5 mm ( $\frac{3}{8}$  in) to provide more adjustment during bedding in of clutch. Part number of screws changed from K962536 to K962994.

355001/33058  
(December 1971)

Height of clutch stop boss changed from 32 to 24 mm ( $1\frac{1}{2}$  to  $1\frac{5}{8}$  in) to ensure that adequate clutch adjustment is present at all times.

885/620406  
885N/646022  
885G/651001  
(May 1972)

Clutch release lever springs changed from K962539 (12SWG) to K963598 (3.175 mm; 0.125 in). The number of coils at the spring eye reduced from  $2\frac{1}{2}$  to  $1\frac{1}{2}$  turns. Spring part number changed from K962539 to K963598.

355011/14364  
349001/10543  
(April 1972)

Suffix letters "L" for Laycock and "B" for Borg and Beck are stamped on engine blocks after engine numbers to eliminate special engine numbers denoting type of clutch.

(August 1972)

The PTO stage clearance changed from 1.45 mm to 1.22 mm (0.057 in to 0.048 in) at the adjusting screw when checked at the flywheel. The pedal clearance from the footplate should be 190 to 230 mm ( $7\frac{1}{2}$  to 9 in).

355011/27212  
355022/3368  
349101/1628  
(December 1972)

The Livedrive clutch driveshaft support bearing changed from one to two neoprene seals to prevent oil leaks.

January 1973

Laycock clutch drive plates changed from F30C facing to a Thermoid facing. Transmission driveplate part number changed from K926850 to K942291.

355011/18917  
349101/1726  
(March 1973)

Laycock 10/10 in double clutch release lever mechanism fitted with a one piece roller instead of the former roller and pin.

(June 1974)

Other David Brown Tractors publications on clutches are available through your DB Dealer or from Publications Section, David Brown Tractors Ltd., Meltham, Huddersfield, England HD7 3AR.

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