CLUTCH

A normal single clutch is fitted to all models having the Standard power take-off ; a double clutch incorporating separate clutches for the transmission and the power take-off is fitted to tractors equipped with " Live " power take-off.

The single clutch and double clutch are described in detail under their respective headings.

SINGLE CLUTCH

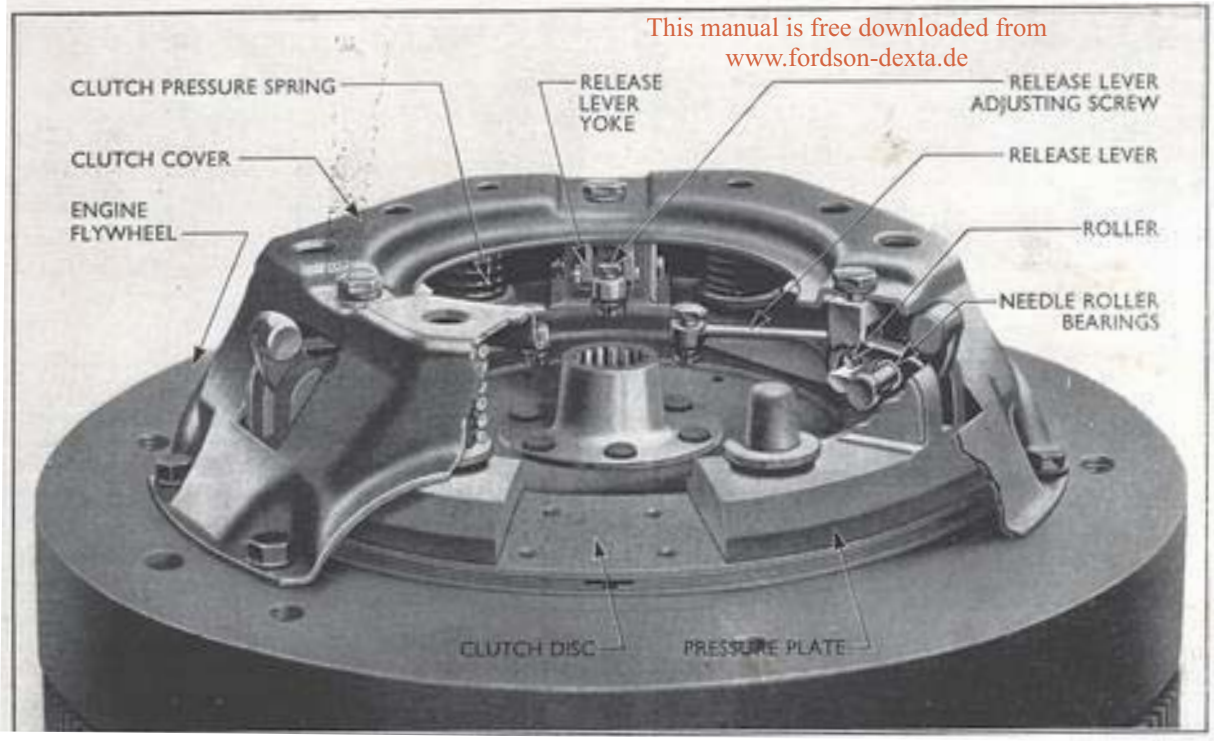


Fig. 1
Cut-away View of the Single Clutch

General Description

This is an 11 in. (279.40 mm.) diameter single disc dry clutch consisting of two main parts, the friction disc and the pressure plate assembly, the latter incorporating the clutch cover and release levers.

The friction disc which locates between the pressure plate and the flywheel is a sliding fit on the splines of the main drive shaft. On the pressure plate side of the disc " leaf " type cushion springs are positioned between the friction lining and disc centre plate to give a smooth " take-up " of the engine drive as the clutch is engaged.

Six special dowel screws fitted through the clutch cover secure the pressure plate assembly to the flywheel, three release levers providing the connection between the driving lugs cast in the pressure plate and yokes secured to the inside of the cover. The release lever pivot pins located in the pressure plate driving lugs operate on needle roller bearings which, in conjunction with a pivot pin and single roller attachment at the yokes, ensures free movement of the release levers.

The three pressure plate driving lugs locate in slots in the cover so enabling engine power to be transmitted from the flywheel to the cover and then to the pressure plate. Nine springs fitted inside the cover exert the necessary force on the pressure plate to ensure the clutch disc will transmit engine torque to the transmission.

At higher engine speeds when greater torque is transmitted, centrifugal force tends to move the weighted outer ends of the release levers towards the

flywheel. This action in effect supplements the spring loading on the pressure plate and therefore the disc.

Clutch Release Mechanism

A pre-lubricated clutch release bearing is fitted to a hub which operates on an extension of the main drive shaft oil seal retainer. Slotted arms, one either side of the release hub, engage the open ends of a fork which is fitted to a cross-shaft located in the clutch housing. An arm on the outer end of the cross-shaft is connected by suitable linkage to the clutch pedal. A torsion spring fitted on the cross-shaft contacts the fork and a cast location in the clutch housing ensuring positive return of the release bearing and clutch pedal when the pedal is released.

Operation

Depressing the clutch pedal causes the cross-shaft to rotate and so moves the release bearing against the spherical headed adjusting screws at the inner ends of the clutch release levers, moving the inner ends of the levers towards the flywheel thereby drawing the pressure plate away from the disc. With the clutch disc free no power will be applied to the transmission and gear selection can be accomplished.

OPERATING ADJUSTMENTS (Single Clutch)

The only routine adjustment necessary with regard to the single clutch is that for clutch pedal free movement. This is the initial movement of the pedal from the fully engaged position, pedal against the stop bracket, to the point where clutch resistance is felt. When correctly adjusted this movement should be $\frac{3}{4}$ in. (19.05 mm.), measured at the pedal pad (see Fig. 3). As it is most important that correct clutch pedal free movement be maintained, the movement should be checked periodically during service and adjusted when necessary to compensate

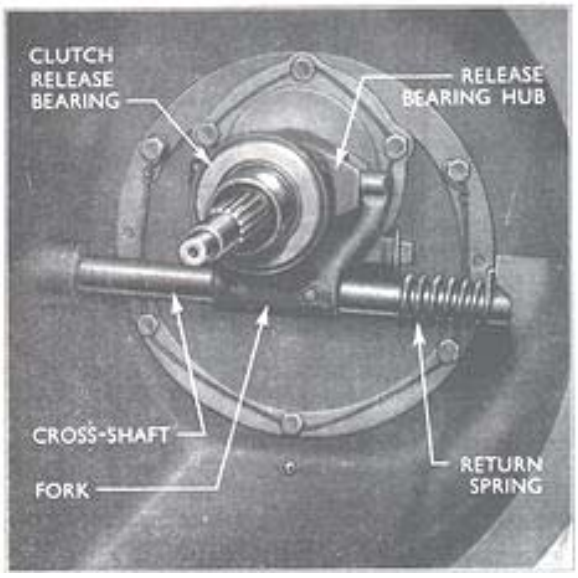


Fig. 2
Clutch Release Mechanism

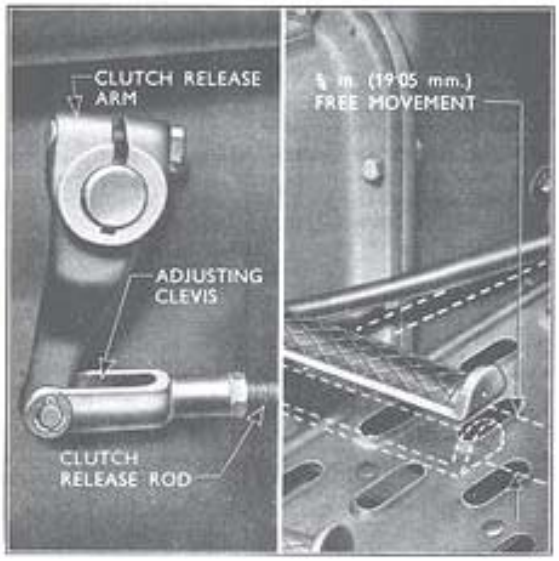


Fig. 3
Clutch Pedal Free Movement Adjustment (Single Clutch)

for normal wear of the clutch disc linings. Operating the tractor with insufficient clutch pedal free movement will cause clutch slip, resulting in excessive wear on the clutch release bearing, clutch disc linings and pressure plate. In extreme cases the heat developed through clutch slip may distort the clutch pressure plate.

The following procedure should be adopted when setting clutch pedal free movement on tractors fitted with the single clutch.

On tractors fitted with the double clutch the method outlined below must not be used in an attempt to compensate for clutch pedal free movement. (See "OPERATING ADJUSTMENTS—Double Clutch")

1. Loosen the clevis locknut on the clutch release rod, remove the split pin and clevis pin connecting the rod to the clutch release arm.

2. Unscrew the clevis from the release rod to increase the free movement of the pedal or vice-versa. Reconnect the rod to the clutch release arm with the clevis pin and check that the clutch pedal has the necessary $\frac{3}{4}$ in. (19.05 mm.) free movement at the pedal pad (see Fig. 3).

3. After correctly setting the free movement, tighten the clevis locknut and fit a split pin to the clevis pin.

REPAIR OPERATIONS

To Remove the Single Clutch

1. Separate the engine and front axle assembly from the transmission as described in the "ENGINE" section under the heading "To Remove the Engine and Front Axle Assembly."

2. Loosen the six special dowel screws securing the pressure plate assembly to the flywheel, releasing the screws alternately to prevent springing the cover. Support the pressure plate and disc, remove the screws then lift the pressure plate and disc away from the flywheel.

Inspection

Inspect the clutch disc to ensure that the linings are not loose, worn or oil soaked and that the rivets securing the disc to the hub are secure. The disc should be replaced if there is any indication of overheating or distortion due to clutch slip. Investigate the source of any oil or grease on the linings and rectify before fitting a new disc.

Examine the pressure plate assembly to ensure the release levers are not binding and that there has been no overheating of the pressure plate, which would be indicated by surface discoloration. Also check that the face of the pressure plate is not scored, distorted or cracked.

Ensure the adjusting screws are secure in the release levers. **The screws are set and locked in position during initial assembly; in service no attempt should be made to alter the setting.**

To Refit the Single Clutch

Before refitting the clutch, the clutch pilot bearing should be checked and renewed if worn as described in the "ENGINE" section under the heading "CLUTCH PILOT BEARING." The recess in the flywheel behind the bearing should be lightly packed with a good quality high melting point grease to ensure satisfactory lubrication of the bearing. Ensure that the flywheel and pressure plate faces are completely free from oil and grease.

1. Locate the clutch disc on the clutch disc locator (Tool No. T.7079) with the longer boss of the disc hub adjacent to the handle of the tool and insert the small diameter end of the tool into the clutch pilot bearing so that the clutch disc is against the face of the flywheel (see Fig. 4).

2. Place the pressure plate assembly over the disc, position on the flywheel, and fit the six special dowel screws. Fully tighten the screws alternately to prevent springing the clutch cover and remove the clutch disc locator.

3. Reconnect the engine and front axle assembly to the transmission as described in the "ENGINE" section under the heading "To Replace the Engine and Front Axle Assembly."

4. Check and adjust if necessary the clutch pedal free movement.

To Remove the Single Clutch Release Bearing

The clutch release bearing is pre-lubricated and should require little attention in service.

Examine the release bearing for evidence of looseness on the hub. If the bearing does not run smoothly or if there is excessive side movement it should be replaced. **Being pre-lubricated, on no account must the bearing be cleaned in solvent.**

1. Separate the engine and front axle assembly from the transmission as described in the "ENGINE" section under the heading "To Remove the Engine and Front Axle Assembly."

2. Disconnect the clutch release rod from the clutch release arm by removing the split pin and clevis pin.

3. Lift the inner end of the return spring away from the clutch fork, rotate the fork towards the front of the clutch housing and withdraw the release bearing and hub assembly.

4. Remove the release bearing from the hub.

To Replace the Single Clutch Release Bearing

1. Fit a new release bearing to the hub, thrust face outwards.

2. Pack the recess in the release hub bore with a good quality high melting point extreme pressure grease.

3. Rotate the fork towards the front of the clutch housing and slide the release bearing and hub assembly, bearing outermost, into position, at the same time engaging the fork with the slotted arms of the hub. Rotate the fork to the rear and, with the hooked end of the return spring located around the lug cast in the housing, engage the inner end of the spring with the front face of the small projection on the side of the fork (see Fig. 2).

4. Reconnect the engine and front axle assembly to the transmission as described in the "ENGINE" section under the heading "To Replace the Engine and Front Axle Assembly."

5. Connect the clutch release rod to the clutch release arm with a clevis pin, check and adjust if necessary the clutch pedal free movement, ensuring that on completion the release rod clevis pin is secured with a split pin.

Fig. 4
Positioning the Clutch Disc on the Flywheel

To Remove the Clutch Pedal (Single Clutch)

1. Unclip the armoured side and rear light cable from the underside of the left-hand footplate.

2. Remove the three footplate to fender bolts and the four footplate to support bracket bolts then lift the footplate away from the tractor.

3. Disconnect the clutch release rod from the clutch pedal by removing the split pin and clevis pin.

4. Withdraw the P.T.O. shifter lever after removing the nut, spring washer and cotter bolt securing it to the P.T.O. shifter arm.

5. The clutch pedal can now be withdrawn from its bearing on the P.T.O. shifter plate.

To Refit the Clutch Pedal (Single Clutch)

1. Fit the clutch pedal on its bearing on the P.T.O. shifter plate ensuring the pedal arm which connects with the release rod is positioned to the rear of the clutch pedal stop bracket.

2. Locate the P.T.O. shifter lever on the end of the P.T.O. shifter arm with the offset in the lever towards the housing and secure in position with the cotter bolt, spring washer and nut.

3. Connect the clutch release rod to the pedal with a clevis pin and secure with a split pin.

4. Place the footplate in position on the two support brackets ensuring that the armoured side and rear light cable is positioned in the locations provided by the formed corner of the front support bracket and the groove in the rear bracket. Fit the bolts to secure the footplate to the support brackets and fender.

5. Locate the armoured side and rear light cable in the clip provided at the rear of the footplate.

6. Check and adjust if necessary the clutch pedal free movement.

DOUBLE CLUTCH

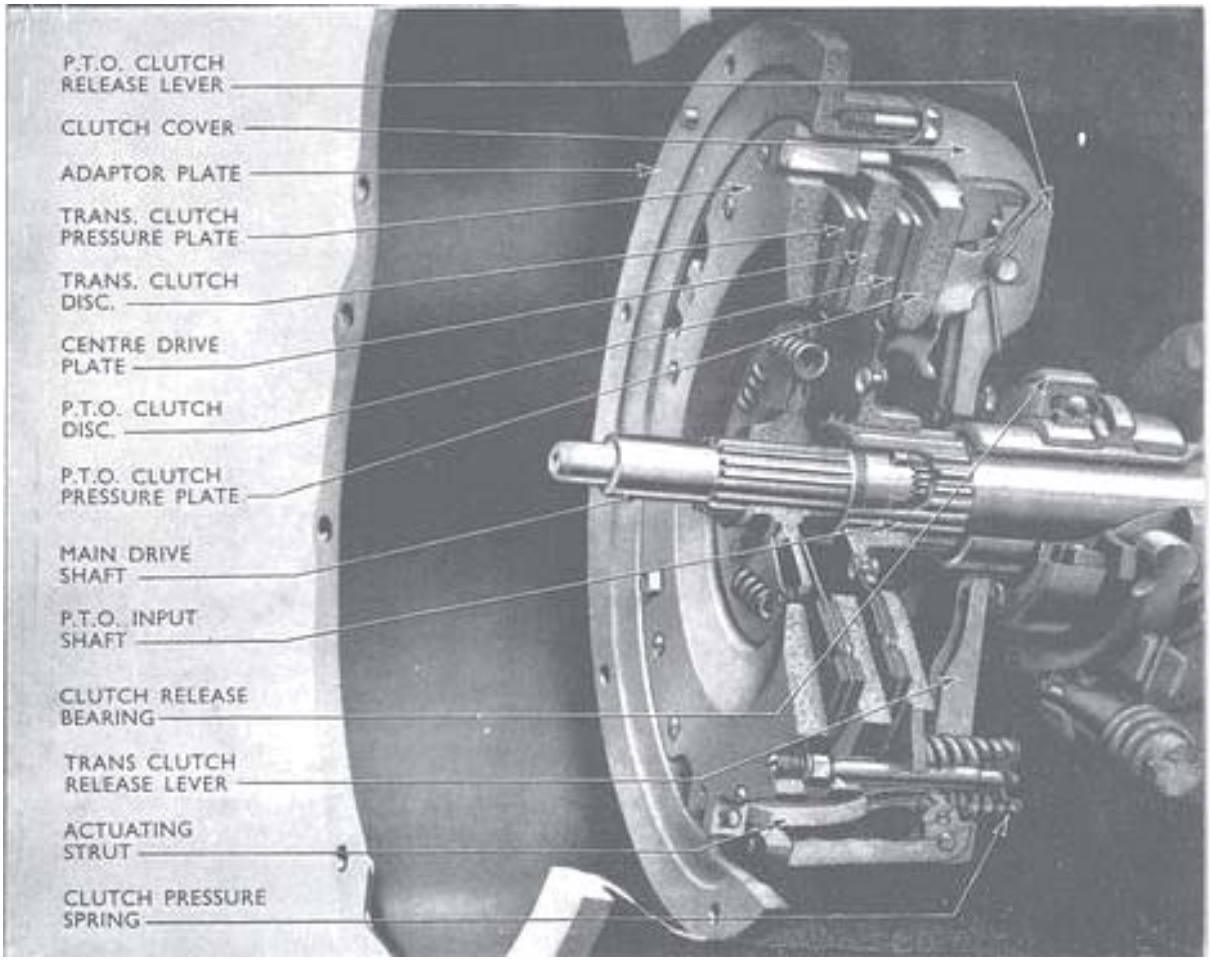


Fig. 5
Clutch Housing Cut-away showing Sectioned View of the Double Clutch Installation

General Description

A 9 in. (228.60 mm.) diameter double disc dry clutch is fitted to tractors equipped with " Live " P.T.O. so as to enable the drive to be disconnected from the main transmission without affecting the drive to the P.T.O. The double clutch is actually two clutches embodied in a single assembly ; the forward clutch transmitting the drive from the engine to the transmission and the rear clutch transmitting the drive from the engine to the P.T.O.

The engine flywheel is common to tractors with Standard and " Live " P.T.O. but to accommodate the double clutch an adaptor plate is fitted between the flywheel and centre drive plate of the double clutch assembly. This plate is doweled to the flywheel and secured by six self-locking screws. A similar number of special dowel screws fitted with spring washers secure the double clutch centre drive plate to the adaptor plate.

The transmission clutch disc consists of two friction linings riveted one either side of a spring steel plate which is mounted on a hub incorporating six circumferentially arranged coil springs to dampen torsional vibration. The splined bore of the hub is a sliding fit on the main drive shaft. The P.T.O. clutch disc also consists of two friction linings riveted to a centre plate which in turn is attached to a rigid type hub ; the splined bore of the hub being a sliding fit on the P.T.O. input shaft.

The drive to the transmission clutch pressure plate is transmitted by three square pins riveted to the centre drive plate which engage in slots in the transmission clutch pressure plate. Twelve spring retaining pins equally spaced around the edge of the transmission pressure plate pass through clearance holes in the centre drive plate and P.T.O. clutch pressure plate, the latter being located at the rear of the centre drive plate.

Twelve springs fitted over the retaining pins exert the necessary force on both pressure plates to ensure the discs are held against the centre drive plate, thus enabling engine power to be transmitted to the transmission and P.T.O.

Three driving lugs cast in the P.T.O. pressure plate locate in rectangular holes in a pressed steel cover which is secured to the centre drive plate by six shoulder screws and spring washers. Three release levers which are free to pivot on the clutch cover engage, by means of pins, with machined slots in the driving lugs of the P.T.O. pressure plate. A further three release levers pivot on pins in the cover and connect to the transmission pressure plate by means of struts which pass through clearance holes in the cover and centre drive plate. Hardened spherical headed screws fitted to the inner ends of the release levers provide adjustment for the levers.

The transmission clutch release levers are positioned in the clutch assembly so that they are approximately $\frac{3}{4}$ in. (19.05 mm.) nearer the clutch release bearing than the P.T.O. clutch release levers. This permits complete disengagement of the transmission clutch without actuating the P.T.O. clutch, thus allowing gear changing to be carried out without stopping the drive to the P.T.O.

Clutch Release Mechanism

The clutch release mechanism is similar to that used with the single clutch fitted to tractors equipped with Standard P.T.O. but the pre-lubricated release bearing is of more robust construction and is mounted on a shorter hub. Because of the two-stage action of the double clutch the external linkage differs from that used with the single clutch, as does the method of adjusting the clutch pedal free movement.

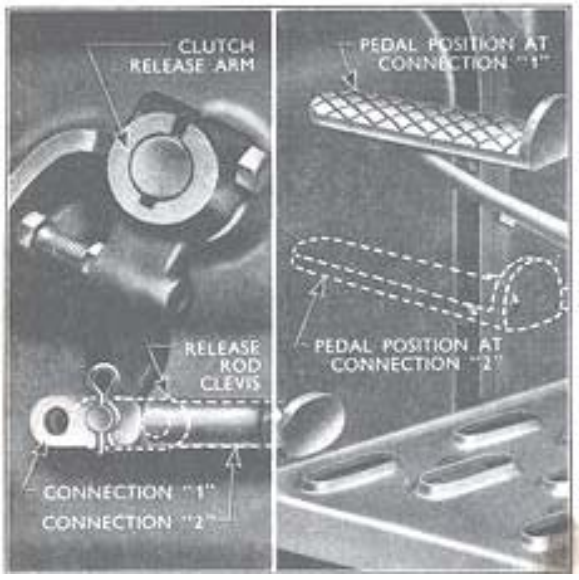


Fig. 6
Alternative Release Rod Connections and Resultant Clutch Pedal Positions

Operation

With the clutch pedal in the fully engaged position engine power is transmitted to both the transmission and P.T.O. drives. Depressing the clutch pedal through approximately the first half of its total travel, the point at which increased resistance is felt, actuates the transmission clutch, freeing the disc and disconnecting the drive to the transmission. Depressing the pedal through the remainder of its travel frees the P.T.O. clutch disc, disconnecting the drive between the engine and P.T.O. When the pedal is depressed to its fullest extent, therefore, the drive is disconnected from both the transmission and P.T.O. Initial movement of the pedal as it is released causes engagement of the P.T.O. clutch, followed by engagement of the transmission clutch as the pedal moves to the fully returned position.

Two holes in the clevis at the front end of the clutch release rod provide alternative points for connecting the clutch release rod to the release arm. For operations necessitating the use of both the transmission and P.T.O. clutches the pin connecting the clutch release rod to the release arm must be inserted through the rear hole in the release rod clevis (see Fig. 6—CONNECTION " 1 "). For operations requiring the use of the transmission clutch only the connection should be made by inserting the pin through the front hole in the clevis. In this position the height of the clutch pedal is reduced, the limited pedal movement then available being sufficient only to operate the transmission clutch (see Fig. 6—CONNECTION " 2 "). This arrangement is particularly advantageous when using hydraulically operated equipment such as mounted loaders, earth scoops, etc., as continuous operation of the hydraulic pump is ensured.

It is most important when operating P.T.O. driven equipment that the pin connecting the clutch release rod to the release arm be inserted through the rear hole of the release rod clevis, so enabling the P.T.O. drive to be readily stopped in an emergency.

A spring retaining clip fitted to the release rod clevis pin facilitates changing the pin from one hole to the other.

OPERATING ADJUSTMENTS (Double Clutch)

In service normal clutch disc lining wear will tend to reduce clutch pedal free movement. This is the initial movement of the clutch pedal from the fully engaged position to the point where clutch resistance is felt. When correctly adjusted this movement should be $\frac{3}{4}$ in. (19.05 mm.), measured at the pedal pad (see Fig. 14). It is essential that the clutch pedal free movement be checked periodically during service and adjusted when necessary, as operating the tractor with insufficient free movement will result in excessive wear on the clutch components and clutch release bearing.

The two-stage action of the double clutch necessitates a different method of adjustment for clutch pedal free movement to that employed on tractors incorporating the single clutch and a stop screw which projects from the front of the clutch release

arm (see Fig. 14) is fitted to provide the necessary means of adjustment. Screw the stop screw into the release arm to increase clutch pedal free movement and vice-versa. Ensure the stop screw locknut is re-tightened after adjustment.

On tractors fitted with the double clutch adjustment of the clevis on the clutch release rod will not alter the clutch pedal free movement. (See "To Adjust the Clutch Pedal Linkage—Double Clutch").

REPAIR OPERATIONS

Individual replacement of worn discs is not recommended, i.e. if it is necessary to replace either a worn P.T.O. or transmission clutch disc both discs should be renewed.

To Remove the Double Clutch

1. Separate the engine and front axle assembly from the transmission as described in the "ENGINE" section under the heading "To Remove the Engine and Front Axle Assembly."

2. Support the clutch assembly, remove the six special dowel screws and spring washers securing the clutch centre drive plate to the adaptor plate and remove the clutch.

3. The adaptor plate is positioned on the flywheel by two dowels and may be removed after unscrewing the six self-locking screws.

To Dismantle the Double Clutch

1. Mark the centre drive plate, transmission clutch pressure plate and P.T.O. clutch pressure plate so that they may be replaced in the same relative position, to ensure balance.

2. With the three centre drive plate locating pegs removed from the Double Clutch Assembly Fixture (Tool No. 7502), place the clutch assembly on the fixture with the cover upwards. The large diameter at the bottom of the fixture centre spindle should locate in the bore of the transmission clutch disc hub with the transmission clutch pressure plate resting on the three lugs cast in the fixture base.

3. Remove the split pin and pivot pin connecting each of the three actuating struts to the transmission pressure plate.

4. Unlock the twelve clutch pressure spring retainers, then, moving the clutch assembly on the fixture as required, compress each spring using the spring compressor (Tool No. 7502–1) and remove the retainers, spring seats, and springs.

NOTE.—To facilitate removal of the spring retainers set the position of the spring compressor head by means of the two knurled adjusting nuts provided, so that the springs are compressed to an almost coil bound condition when the compressor handle is in the locked position. Care should be taken, however, not to over-adjust the compressor so that excessive force is required to move the compressor handle into the locked position, otherwise damage to the tool may result.

5. Remove the six shoulder screws and spring washers securing the cover to the centre drive plate and lift off the cover complete with release levers and P.T.O. pressure plate.

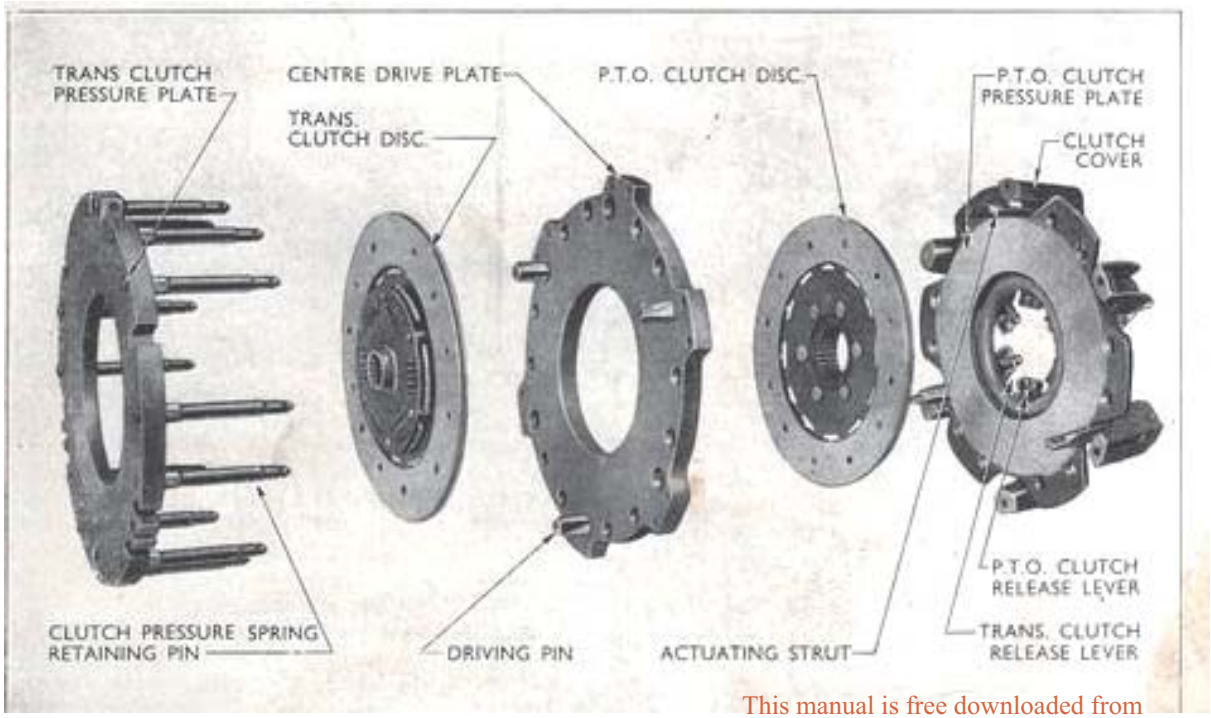


Fig. 7
Exploded View of the Double Clutch

6. The P.T.O. clutch disc, centre drive plate, transmission clutch disc and transmission clutch pressure plate can now be lifted off the fixture, one at a time, for cleaning and inspection.

Inspection

Inspect each clutch disc to ensure that the linings are not loose, worn or oil soaked and that the rivets holding the discs to the hubs are secure. The discs should be replaced if there is any indication of overheating due to clutch slip or if there appears to be any distortion.

Examine the pressure plates and centre drive plate for signs of binding or overheating, which would be indicated by surface discoloration, and check that they are not scored, cracked or distorted. Replace any damaged clutch spring retaining pins and ensure that these pins are all securely " staked " in position. Check that the three driving pins are securely riveted to the centre drive plate.

The adjusting screws in the clutch release levers should be checked to ensure that they cannot be turned with a torque of less than 5 lbs. ft. (.691 kg.m.). If the specified torque cannot be obtained replace either or both of these parts to obtain the required condition.

All clutch springs requiring a force of less than 98 to 108 lbs. (44.45 to 48.99 kg.) to compress them to a length of 1.67 ins. (42.42 mm.) should be replaced.

To Dismantle the Clutch Cover and P.T.O. Pressure Plate Assembly

At initial assembly the pivot pins securing the six clutch release levers to the clutch cover are pressed into position and the ends " staked." If the clutch has been serviced since initial assembly and any of the clutch release levers are secured by means of the special service pivot pins which have provision for split pin retention, it will of course, to detach these levers, be necessary to withdraw the split pins before removing the pivot pins.

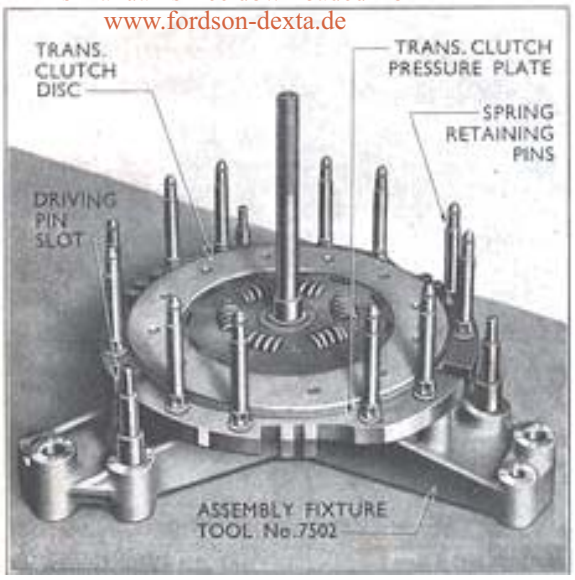


Fig. 8
Transmission Clutch Pressure Plate and Disc Installed on Assembly Fixture

1. Place the cover and P.T.O. pressure plate, cover upwards, on a suitable block of wood so that the actuating struts are free.

2. Remove the pivot pins securing the three transmission clutch release levers to the cover and lift each lever, complete with actuating strut, out of its location in the cover.

3. Push out the pivot pins connecting the actuating struts to their release levers, remove the actuating struts and small torsion springs.

4. Remove the pivot pins, also small torsion springs, securing the three P.T.O. clutch release levers to the cover.

5. Move each P.T.O. clutch release lever towards the centre of the cover so as to disengage the pivot pin in the lever from the slot in the P.T.O. pressure plate driving lug and withdraw the levers from their locations in the cover. Remove the lever to pressure plate pivot pin from each release lever.

6. The clutch cover can now be lifted away from the P.T.O. pressure plate.

To Rebuild the Clutch Cover and P.T.O. Pressure Plate Assembly

In service, " staked " pivot pins, fitted at initial assembly to secure the clutch release levers to the clutch cover, must, if removed, be replaced with the special service pivot pins which have provision for split pin retention.

Pivot points, sliding surfaces of release levers, etc., and P.T.O. pressure plate driving lugs should be lightly lubricated with a good quality high melting point extreme pressure grease.

1. To facilitate assembly of the transmission clutch release levers and actuating struts, it is suggested that the P.T.O. pressure plate be placed on a suitable piece of wood, machined face downwards.

2. Instal the clutch cover over the P.T.O. pressure plate, locating the three pressure plate driving lugs in the rectangular holes provided in the cover.

3. Locate a parallel pivot pin through the hole at the extreme outer end of each short P.T.O. clutch release lever. Slide the end of each lever into position on the clutch cover so that the pin in the lever engages with the slot machined in the P.T.O. pressure plate driving lug which protrudes through the cover. Position a hook ended torsion spring on the plain diameter under the head of each of the three long pivot pins with the shorter arm of the spring adjacent to the head of the pin. Align each P.T.O. release lever in the clutch cover and fit the pivot pins through the cover and levers locating the appropriate ends of each torsion spring in the hole provided in the release lever and over the vertical edge of the cover (see Fig. 10). Secure the three pivot pins with split pins.

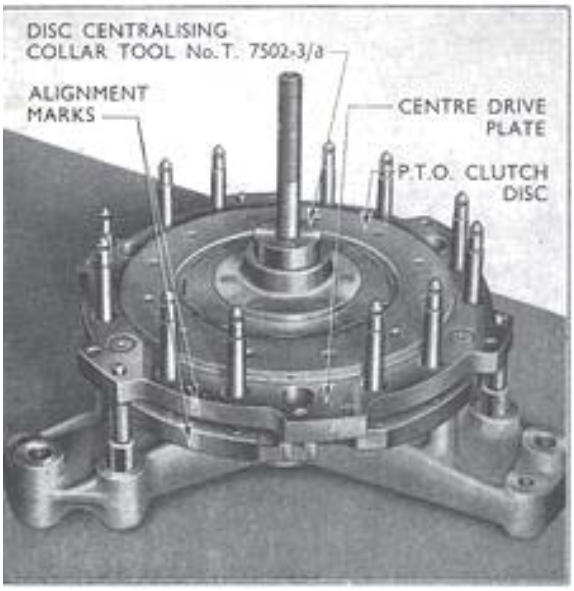


Fig. 9
Installation of Centre Drive Plate and P.T.O. Clutch Disc on Assembly Fixture

4. Assemble each of the three actuating struts to the three transmission release levers by positioning the larger end of the strut inside the outer end of the release lever so that the open side of the strut faces away from the release lever adjusting screw. Align the hole in the strut with the inner hole of the release lever. Position the torsion spring so that the coil is in line with the hole in the strut and the longer arm is located inside the strut with the formed end of the spring arm turned outwards. Insert a parallel pivot pin through the lever, strut and spring.

5. Position the three transmission release lever and actuating strut assemblies in their locations in the clutch cover, with the struts passing through the clearance holes provided in the cover. Align each transmission release lever, fit the pivot pins through the cover and levers then secure the pins with split pins. The pivot pins should pass through the cover and transmission levers in the opposite direction to those securing the P.T.O. release levers.

To Rebuild the Double Clutch

It is essential that used clutch spring retainers be regarded as expendable and new ones fitted.

NOTE.—The centre drive plate, P.T.O. and transmission clutch pressure plates are balanced separately before initial assembly. To facilitate reassembly in service, a yellow paint mark is placed on the edge of each of the above-mentioned components to indicate the heavy point. If for any reason it is necessary to renew one or more of these plates their relative position in the complete clutch assembly should be such that the three yellow paint marks are as evenly spaced as possible around the circumference of the assembly. If, however, the original parts are to be reassembled they should be positioned in the complete clutch in accordance with the marking made when dismantling.

Lubricate sliding surfaces of the driving pins with a light smear of good quality high melting point extreme pressure grease. Ensure the operating faces of the centre drive plate and pressure plates are completely free from oil and grease.

1. Position the three centre drive plate locating pegs of the Double Clutch Assembly Fixture (Tool No. 7502) in the three holes machined closest to the centre spindle in the base arms of the fixture.

2. Locate the transmission clutch pressure plate centrally on the three lugs cast in the base arms of the fixture and, to facilitate installation of the centre drive plate, position the pressure plate so that the centres of the three driving pin slots are offset approximately $1\frac{1}{8}$ ins. (28.57 mm.) in a clockwise direction from the centres of the fixture locating pegs (see Fig. 8).

3. Place the transmission clutch disc, sprung hub downwards, on the transmission clutch pressure plate, locating the bore of the disc hub on the large diameter at the bottom of the fixture centre spindle (see Fig. 8).

4. Aligning the marks made on the centre drive plate and transmission pressure plate at the time of dismantling (see previous Note), locate the centre drive plate on the fixture so that the driving pins engage in the transmission pressure plate slots and the fixture locating pegs fit in three of the plain holes at the edge of the centre drive plate (see Fig. 9).

5. Locate the P.T.O. clutch disc centralising collar (Tool No. T.7502–3/a) on the fixture centre spindle, ensuring that the collar abuts the shoulder of the spindle. Place the P.T.O. clutch disc, hub upwards, on the centre drive plate, locating the bore of the disc hub on the centralising collar (see Fig. 9).

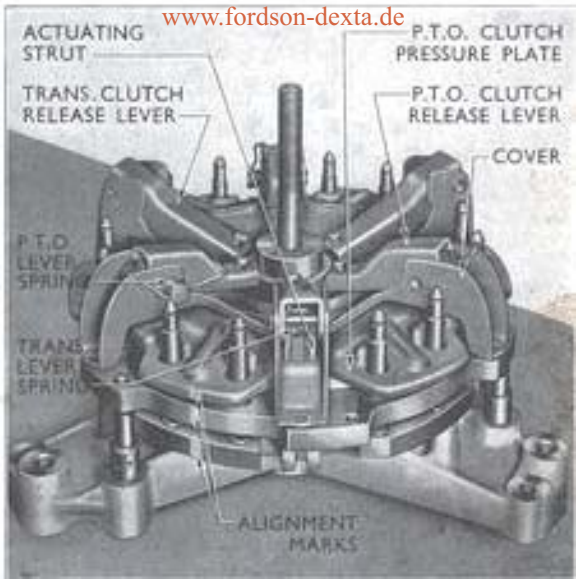


Fig. 10
Installation of Clutch and P.T.O. Pressure Plate Assembly on Fixture

6. Place the clutch cover and P.T.O. pressure plate assembly over the P.T.O. disc (see Fig. 10) ensuring the mark made on the P.T.O. pressure plate during dismantling is aligned with the corresponding marks on the centre drive plate and transmission clutch pressure plate (see previous Note). The three release lever actuating struts pass through clearance holes in the centre drive plate and engage in slots in the transmission pressure plate.

7. Align the six securing screw holes in the clutch cover with the threaded holes at the edge of the centre drive plate, fit the six shoulder screws and spring washers, fully tighten the screws.

NOTE.—When fully tightened, the ends of the screws must not protrude from the centre drive plate otherwise when refitting the clutch assembly the centre drive plate will not locate correctly on the adaptor plate.

8. Fit the twelve clutch pressure springs over the retaining pins, locating the bottom ends of the springs around the semi-circular lugs cast in the P.T.O. pressure plate and fit the spring seats to the springs. Moving the clutch assembly on the fixture as required, compress the springs one at a time with the spring compressor (Tool No. 7502–1) and, as each spring is compressed, fit a **new** spring retainer through the cut-away provided in the spring compressor head, locating it in the groove in the spring retaining pin.

Turn the retainer so that the open end is towards the clutch centre.

As the spring compressor is removed from each spring ensure the spring seat locates fully on the retainer. Close in the open ends of the retainers to lock them securely in position.

NOTE.—To facilitate replacement of the spring retainers the spring compressor should be adjusted

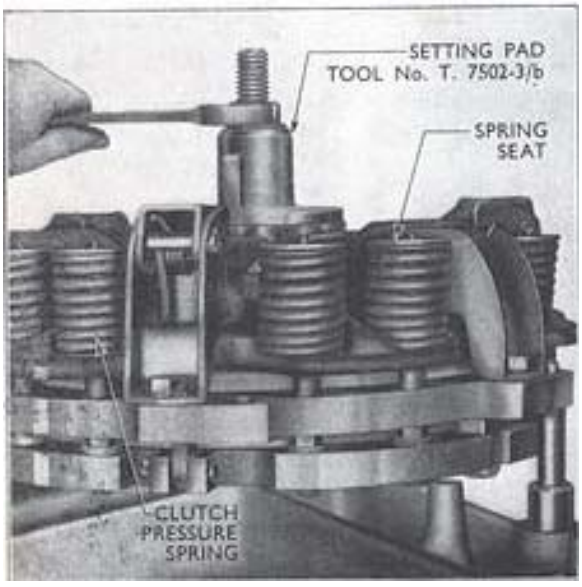


Fig. 11
Clutch Assembled - Depressing Release Levers to Insert Setting Blocks

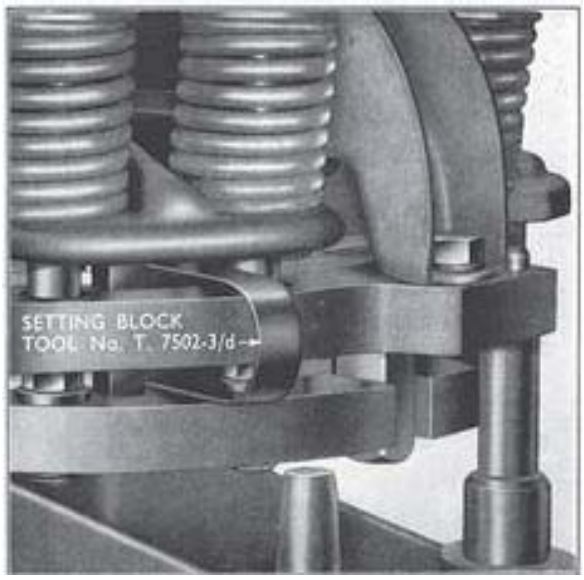


Fig. 12
Setting Block in Position

as outlined for removing the retainers under the heading " To Dismantle the Double Clutch."

9. Align the ends of the three actuating struts in the transmission pressure plate slots, fit the pivot pins and retain with split pins.

NOTE.—After rebuilding the double clutch, whether new parts have been fitted or not, the setting of the clutch release lever screws should be checked and adjusted where necessary, as described below.

To Adjust the Double Clutch Release Levers

1. Locate the setting pad (Tool No. T.7502–3/b) over the centre spindle of the assembly fixture so that the large end face of the pad contacts the transmission clutch release lever screws. Fit the flat washer and nut to the centre spindle then screw down the nut so that the setting pad depresses the transmission and P.T.O. release levers (see Fig. 11), moving the pressure plates away from the centre drive plate. When carrying out this operation, ensure the P.T.O. and transmission lever adjusting screws project out of the levers approximately the same distance ($\frac{3}{8}$ in. (9.53 mm.) will be suitable), otherwise a fouling condition may occur which will prevent sufficient movement of the pressure plates. **Discontinue screwing down the nut immediately if the levers are depressed to the point where they strike the clutch cover.**

2. When the pressure plates have moved sufficiently, insert the three setting blocks (Tool No. T.7502–3/d) between the operating faces of the pressure plates and the centre drive plate until they touch the periphery of the clutch discs (see Fig. 12) ; the setting blocks should be positioned at 120° intervals around the clutch so that each is directly below one of the small webs which, cast in the top face of the P.T.O. pressure plate, separate adjacent clutch pressure springs (see Fig. 13).

NOTE.—Only by positioning the setting blocks as described above can it be assured that the upper section of the blocks contact the machined operating face of the P.T.O. pressure plate and correct release lever adjustment obtained.

3. Remove the nut, washer and setting pad from the fixture centre spindle ensuring that as the pressure is taken off the release levers and the pressure plates clamp the setting blocks against the centre drive plate the blocks do not move from the correct position.

4. Ensure the P.T.O. clutch disc centralising collar is contacting the shoulder of the fixture centre spindle and replace the setting pad on the fixture so that the small diameter face abuts the centralising collar. Two lugs are provided on the setting pad for checking the setting of the release lever adjusting screws, the longer lug for the transmission release levers and the smaller one for the P.T.O. release levers. Set each of the six release lever adjusting screws separately, turning each screw so that when the setting pad is held down firmly on the centralising collar with the appropriate lug directly above the screw being adjusted, a .005 in. (.127 mm.) feeler gauge can just be inserted between the top of the screw and the machined surface on the underside of the lug (see Fig. 13).

NOTE.—Press firmly at the inner end of the release lever before checking the adjusting screw setting to ensure that any free movement of the lever is taken up.

5. Invert the setting pad on the fixture centre spindle so that the large end face contacts the transmission release lever adjusting screws (as in Fig. 11). Fit the washer and nut to the centre spindle, screw down the nut then extract the three setting blocks. Remove the nut, washer and setting pad from the fixture centre spindle.

6. The clutch assembly can now be lifted off the fixture and the centralising collar removed from the hub of the P.T.O. disc.

To Refit the Double Clutch

Before installing the clutch assembly the flywheel pilot bearing should be checked and replaced if worn as described in the " ENGINE " section under the heading " CLUTCH PILOT BEARING." The recess in the flywheel behind the bearing should be lightly packed with a good quality high melting point grease to ensure satisfactory lubrication of the bearing.

1. If the adaptor plate has been removed from the flywheel, check that both the large diameter end face of the adaptor plate and the face of the flywheel are free from burrs then refit the adaptor plate so that the dowels in the plate locate in the appropriate holes in the flywheel. Fit and fully tighten the six self-locking screws.

2. Ensuring that the mounting faces of the centre drive plate and adaptor plate are free from burrs, refit the clutch assembly to the adaptor plate and secure with the six special dowel screws and spring washers.

3. Reconnect the engine and front axle assembly to the transmission as described in the " ENGINE " section under the heading " To Replace the Engine and Front Axle Assembly."

4. Check and adjust if necessary the clutch pedal linkage, adopting the procedure outlined as follows under the heading " To Adjust the Clutch Pedal Linkage (Double Clutch)."

To Adjust the Clutch Pedal Linkage (Double Clutch)

Adjusting the effective length of the clutch release rod, by screwing the clevis onto the rod or vice-versa, provides on tractors fitted with the double clutch a means of controlling the total effective movement of the clutch pedal which, due to the two-stage action of the clutch, is necessary to ensure correct clutch operation.

The release rod which is set correctly at initial assembly should be checked and adjusted if necessary after the normal " bedding-in " period, after extended periods of usage or after carrying out any repair operation on the clutch or associated parts.

Operating the tractor with the release rod incorrectly set can result in unsatisfactory clutch action or excessive clutch wear and could in extreme cases cause damage to the clutch. It is essential, therefore, that care is taken when making this adjustment and that the following procedure be strictly adhered to.

1. Remove the P.T.O. shaft guard and cover from the rear of the tractor to expose the shaft. (Not necessary if a belt pulley is fitted.)

2. Loosen the clutch release rod clevis locknut, disconnect the release rod from the release arm by

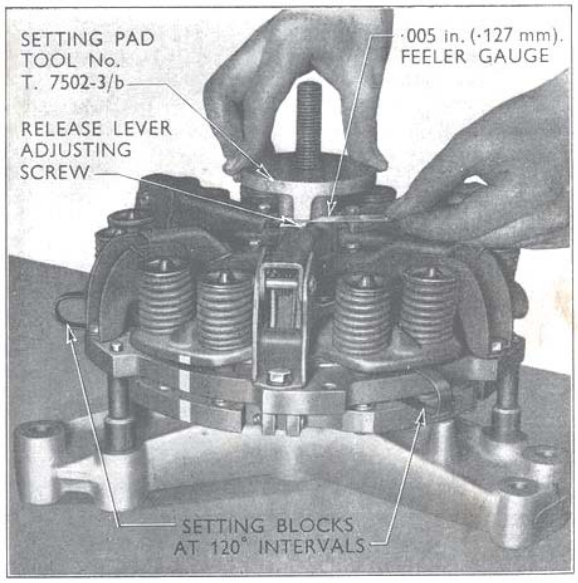


Fig. 13
Checking the Setting of a Release Lever Adjusting Screw

removing the spring retaining clip and withdrawing the clevis pin (see Fig. 14).

3. Move the P.T.O. lever into the engaged position and start the engine.

4. Adjust the release rod, by screwing the clevis onto the rod or vice-versa, so that with the rod reconnected to the release arm as shown in Fig. 6—CONNECTION " 1 " (i.e. pin inserted through the rear hole in the clevis) the P.T.O. shaft (or belt pulley if fitted) stops revolving just as, or just before the clutch pedal, when depressed, contacts the footplate.

NOTE.—Do not screw the clevis onto the rod to such an extent that the total release movement of the clutch is taken up **before** the clutch pedal contacts the footplate. If the clevis is screwed on too far the clutch mechanism will " bottom " before the pedal meets the footplate—this can be felt if the pedal is slowly depressed. Movement of the pedal beyond this point may cause damage to the clutch and under such circumstances the clutch and its associated parts should be removed for examination to determine why over-adjustment of the release rod has been necessary.

5. Having carried out the above adjustment alter the connection of the release rod to the release arm by inserting the pin through the front hole in the clevis (as in Fig. 6—CONNECTION " 2 ").

6. Again depress the clutch pedal until it contacts the footplate, at which point the transmission clutch should be completely disengaged and this can be verified by engaging and disengaging a gear. If this condition is in effect no further adjustment of the release rod is required, if not it will be necessary to re-adjust the release rod, screwing the clevis onto the rod to obtain the required condition.

NOTE.—If re-adjustment of the release rod has been necessary, connect the rear hole in the release rod clevis to the release arm and carry out a final check to ensure that the clutch pedal, when depressed, contacts the footplate before the total clutch release movement is expended. (See previous NOTE under Operation 4.)

7. With the release rod adjustment completed move the P.T.O. lever into the disengaged position and stop the engine.

8. Tighten the release rod clevis locknut and with the release rod connected to the release arm to give the required pedal operation, fit the spring retaining clip to the clevis pin.

9. If necessary, adjust the stop screw projecting from the front of the clutch release arm until there is the required $\frac{3}{4}$ in. (19.05 mm.) clutch pedal free movement at the pedal pad and tighten the locknut (see Fig. 14).

10. Refit the P.T.O. shaft cover and guard to the rear of the tractor. (Not necessary if a belt pulley is fitted.)

To Remove and Replace the Double Clutch Release Bearing

The clutch release mechanism used with the double clutch is similar to that used with the single clutch although the release bearing is of more robust construction and is mounted on a shorter hub. The bearing should require little attention in service, it is pre-lubricated and must not be cleaned in solvent. If the bearing has excessive side movement or is loose on the hub it should be renewed following the procedure outlined under the headings " To Remove the Single Clutch Release

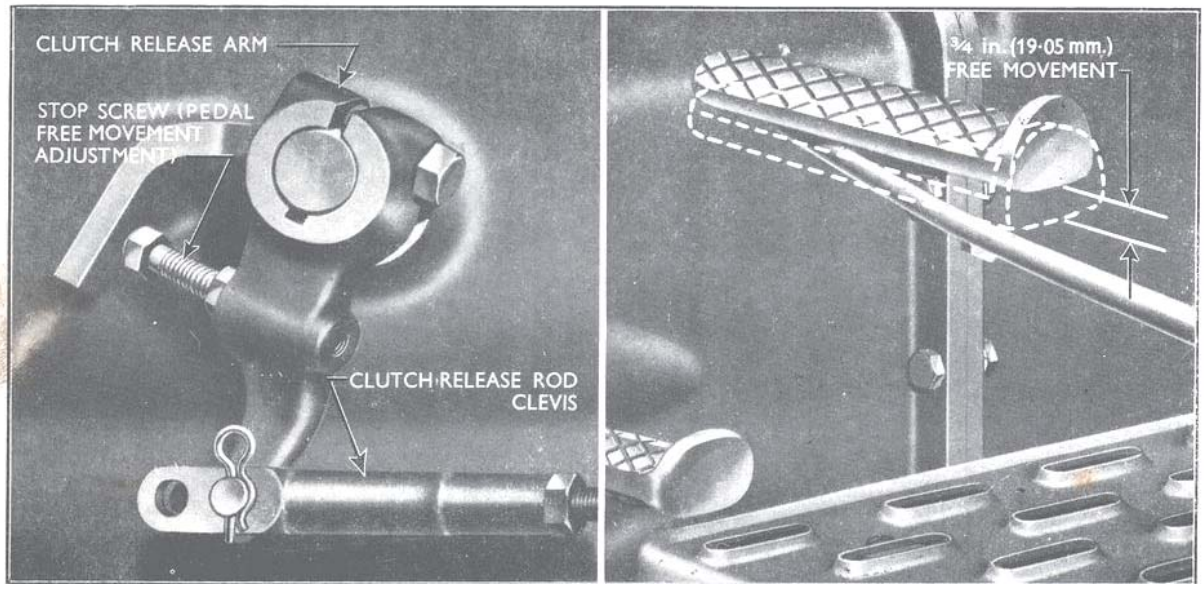
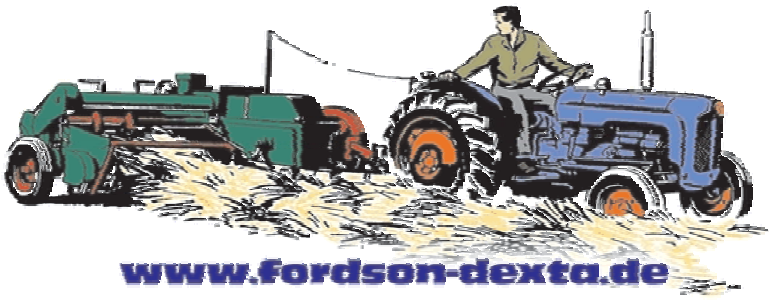


Fig. 14
Clutch Pedal and Linkage (Double Clutch)

Bearing" and "To Replace the Single Clutch Release Bearing." When carrying out these operations on tractors fitted with the double clutch, however, it should be borne in mind that a spring retaining clip secures the clutch release rod clevis pin and the same clip should be fitted at reassembly, also after replacing the release bearing, check and adjust if necessary the clutch pedal free movement **and** the clutch release rod setting following the procedure outlined under the heading "To Adjust the Clutch Pedal Linkage (Double Clutch)."

To Remove and Refit the Clutch Pedal (Double Clutch)

The clutch pedal mounting on tractors incorporating the double clutch is identical to that on tractors fitted with the single clutch with the exception that the clutch pedal stop bracket is not fitted. If it is required therefore to remove and replace the clutch pedal on tractors fitted with the double clutch follow the procedure outlined under the headings "To Remove the Clutch Pedal (Single Clutch)" and "To Refit the Clutch Pedal (Single Clutch)" disregarding the instruction for positioning the pedal relative to the stop bracket when refitting the pedal. In addition, after refitting the clutch pedal, check and adjust if necessary the clutch pedal free movement **and** the clutch release rod setting following the procedure outlined under the heading "To Adjust the Clutch Pedal Linkage (Double Clutch)."



SINGLE CLUTCH SPECIFICATIONS

Size	11 ins. (279.40 mm.)
Type	Single disc; dry

Disc Assembly

Lining O.D.	10.969 to 11.031 ins. (278.61 to 280.19 mm.)
Lining I.D.	6.469 to 6.531 ins. (164.31 to 165.89 mm.)
Total mean effective friction area (both sides of disc assembly)	116 sq. ins. (748.39 sq. cm.) approx.
Number and type of cushion springs	6—" leaf " type
Cushion spring location	Between lining and centre plate on pressure plate side of disc assembly
Number and type of splines in hub	15—involute form

Pressure Plate and Cover Assembly

Pressure plate O.D.	11.06 ins. (280.92 mm.)
Number of pressure springs	9
Pressure spring free length	2.59 ins. (65.79 mm.)
Pressure spring length under compression	1.56 ins. (39.62 mm.) under load of 85 to 95 lbs. (38.56 to 43.09 kg.)
Pressure spring colour coding	Dark blue paint
Total mean spring pressure (clutch engaged—new disc)	14 lbs./sq. in. (.984 kg./sq. cm.) approx.

Release Bearing and Hub

Type	Pre-lubricated ball bearing
Size	3.38 ins. (85.85 mm.) O.D. ; 2.0622 to 2.0627 ins. (52.380 to 52.393 mm.) I.D. ; .792 in. (20.12 mm.) overall length
Hub length	4.00 ins. (101.60 mm.)
Hub lubrication	Pack recess in bore with a good quality high melting point extreme pressure grease

Clutch Pedal

Free movement	$\frac{3}{4}$ in. (19.05 mm.)

DOUBLE CLUTCH SPECIFICATIONS

Size	9 ins. (228.60 mm.)
Type	Double disc; dry

Transmission Disc Assembly

Lining O.D.	8.969 to 9.031 ins. (227.81 to 229.39 mm.)
Lining I.D.	5.969 to 6.031 ins. (151.61 to 153.19 mm.)
Total mean effective friction area (both sides of disc assembly)	68 sq. ins. (438.71 sq. cm.) approx.
Number of dampener springs	6
Dampener spring free length	1.002 to 1.022 ins. (25.45 to 25.96 mm.)
Dampener spring length under compression	.80 in. (20.32 mm.) under load of 185 to 205 lbs. (83.92 to 92.99 kg.)
Dampener spring colour coding	Orange paint
Number and type of splines in hub	15—involute form

P.T.O. Disc Assembly

Lining O.D.	8.969 to 9.031 ins. (227.81 to 229.39 mm.)
Lining I.D.	5.969 to 6.031 ins. (151.61 to 153.19 mm.)
Total mean effective friction area (both sides of disc assembly)	68 sq. ins. (438.71 sq. cm.) approx.
Number and type of splines in hub	29—involute form

Pressure Plates

Transmission pressure plate O.D.	10.68 ins. (271.27 mm.)
Nominal diameter of P.T.O. pressure plate operating surface	9.12 ins. (231.65 mm.)

Clutch Cover and Release Levers

Transmission release levers	3—overall length 3.34 ins. (84.84 mm.)
P.T.O. release levers	3—overall length 4.37 ins. (111.00 mm.)
Transmission release lever securing pin overall length	1.46 ins. (37.08 mm.)
P.T.O. release lever securing pin overall length	1.87 ins. (47.50 mm.)
Minimum turning torque for release lever adjusting screws	5 lbs. ft. (.691 kg.m.)

Clutch Pressure Springs

Number of springs	12
Free length	2.77 ins. (70.36 mm.) approx.
Length under compression	1.67 ins. (42.42 mm.) under load of 98 to 108 lbs. (44.45 to 48.99 kg.)
Colour coding	Violet paint
Total mean spring pressure (clutch fully engaged—new discs)	36 lbs./sq. in. (2.531 kg /sq. cm.) approx.

Release Bearing and Hub

Type	Pre-lubricated ball bearing
Size	3.95 ins. (100.33 mm.) O.D. ; 2.4997 to 2.5002 ins. (63.493 to 63.505 mm.) I.D. ; 1.12 ins. (28.45 mm.) overall length
Hub length	2.38 ins. (60.45 mm.)
Hub lubrication	Pack recess in bore with a good quality high melting point extreme pressure grease

Clutch Pedal

Free movement	¾ in. (19.05 mm.)