HYDRAULIC SYSTEM

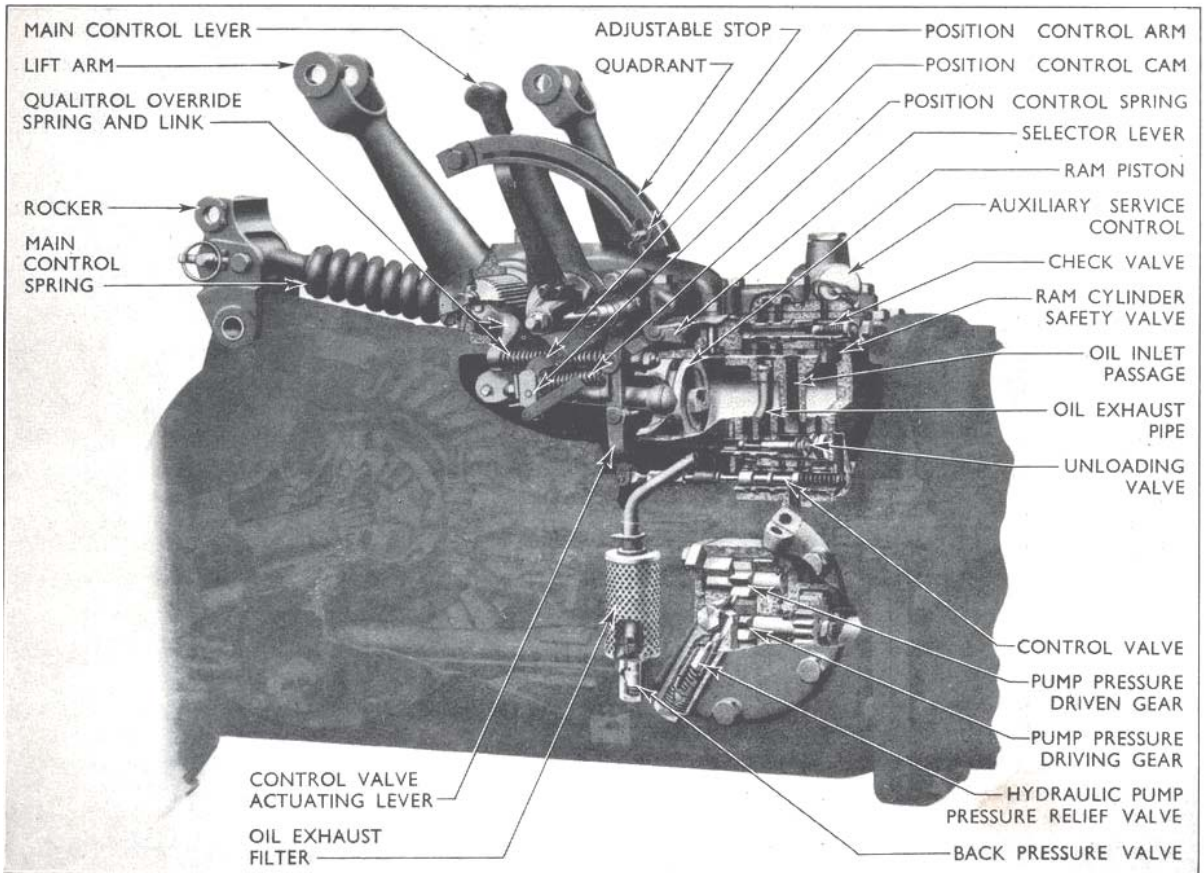


Fig. 1
Sectioned View of Hydraulic System

HYDRAULIC POWER LIFT

General Description

The Hydraulic Power Lift offers a choice of operating control enabling either Qualitrol (constant draft) or Position Control (constant depth) to be selected according to the work being undertaken and the ground conditions encountered.

" Live " hydraulics are automatically available when a " Live " power take-off (optional equipment) is fitted, and gives the advantage that the tractor may be stopped or gear changes carried out without affecting the operation of the hydraulics.

Hydraulic Pump

A single stage gear type pump is flange-mounted in the front compartment of the rear transmission housing, and is driven by a gear attached to the power take-off countershaft (which runs through the gear-box). The oil supply is taken from the rear transmission lubricant and is drawn through a gauze type filter before entering the pump, which supplies it under pressure, to the lift top cover assembly.

Lift Top Cover Assembly

The top cover acts as a housing for the control linkage and has attached to it the lift cylinder assembly, which acts as a combination valve chest and ram cylinder housing. Attached also to the top cover is an auxiliary service plate, containing a special valve which enables the oil to be directed, as required, either to the ram cylinder (to operate the lift arms) or to a take-off point for hydraulically operated auxiliary equipment (see Fig. 2).

The cover also incorporates a check valve, the purpose of which is to stop the return of oil from the ram cylinder when the implement is in the transport position.

Lift Cylinder Assembly

The lift cylinder contains a piston which is connected, via a connecting rod and a lift ram arm, to the lift cross-shaft, the outer ends of which are splined to the lift arms. A safety valve is located in the front end of the cylinder to obviate damage should shock loads be imposed, as, for instance, when carrying heavy implements over rough ground.

Control, Unloading and Back Pressure Valves

The valve chest portion of the lift cylinder is suitably drilled to carry the oil to, and from, the ram cylinder as directed by two valves, the control and unloading valves, which work in conjunction with the control linkage in the lift cover.

The control valve is indirectly connected through an adjustable link and a valve actuating lever to a cross-shaft, to which is attached the main control lever. It is spring-loaded at its front end and is operated by the positioning of the main control lever within a fixed quadrant in conjunction with the balancing of spring pressures in the control linkage.

The unloading valve is a shuttle type of valve which is operated by oil pressure in accordance with the positioning of the control valve.

Under certain conditions of operation exhaust oil from the valve chest is directed through the lift cover and then via an exhaust pipe to a by-pass filter, which works in conjunction with a back pressure valve. (See Fig. 3.) The function of this valve is to maintain a slight pressure in the system at all times, so ensuring correct operation of the unloading valve; the filter gives additional protection to the system by ensuring that a proportion of the exhaust oil is filtered before rejoining the transmission lubricant.

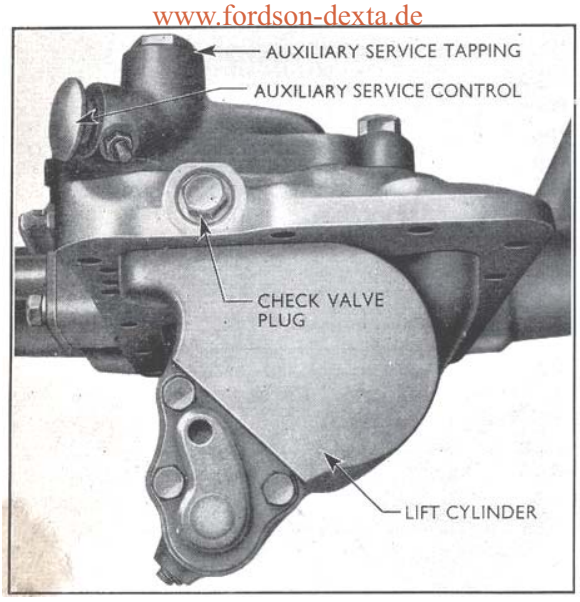


Fig. 2
Lift Cylinder and Auxiliary Service Control

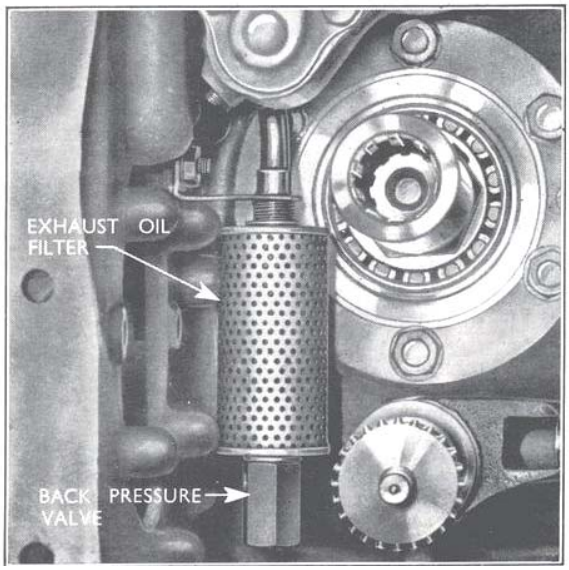


Fig. 3
Exhaust Oil Filter and Back Pressure Valve

Control Linkage

Operation of the lift in Qualitrol and Position Control is regulated by a variation of the pivot point for the control valve actuating lever.

Under Qualitrol a swivel fitted to the actuating lever becomes the pivot point, and also acts as a guide for a spring-loaded link rod, to which is attached the main control spring plunger. A main control spring is fitted over the plunger and is compressed between a spring seat, fixed to the rear end of the lift cover, and an adjustable yoke, which screws onto the rear end of the plunger. The yoke is also attached to a rocker, which is suitably designed to receive the normal upper link connection and pivots on the rear transmission housing.

Under Position Control the pivot point for the control valve actuating lever is a pad machined on the lever (immediately below the qualitrol swivel) against which operates the spring-loaded position control rod. This rod is supported in an arm which is a free fit on the control lever cross-shaft, and is part of an assembly which incorporates a cam, connected by a link and eccentric arm to a selector lever located immediately in front of the main control lever. With the selector lever in a horizontal position the lift operates under Position Control, but by moving the lever downwards the cam on the position control arm assembly withdraws the position control rod into the arm, moving it away from the control valve actuating lever and allowing the Qualitrol linkage to take over.

The position control arm carries a pin against which bears a servo cam machined on the lift ram arm. The latter, being splined to the lift cross-shaft, rotates as the lift arms rise or fall, so moving the position control arm and varying the force applied to the control valve actuating lever to operate the control valve and maintain the implement at a constant depth.

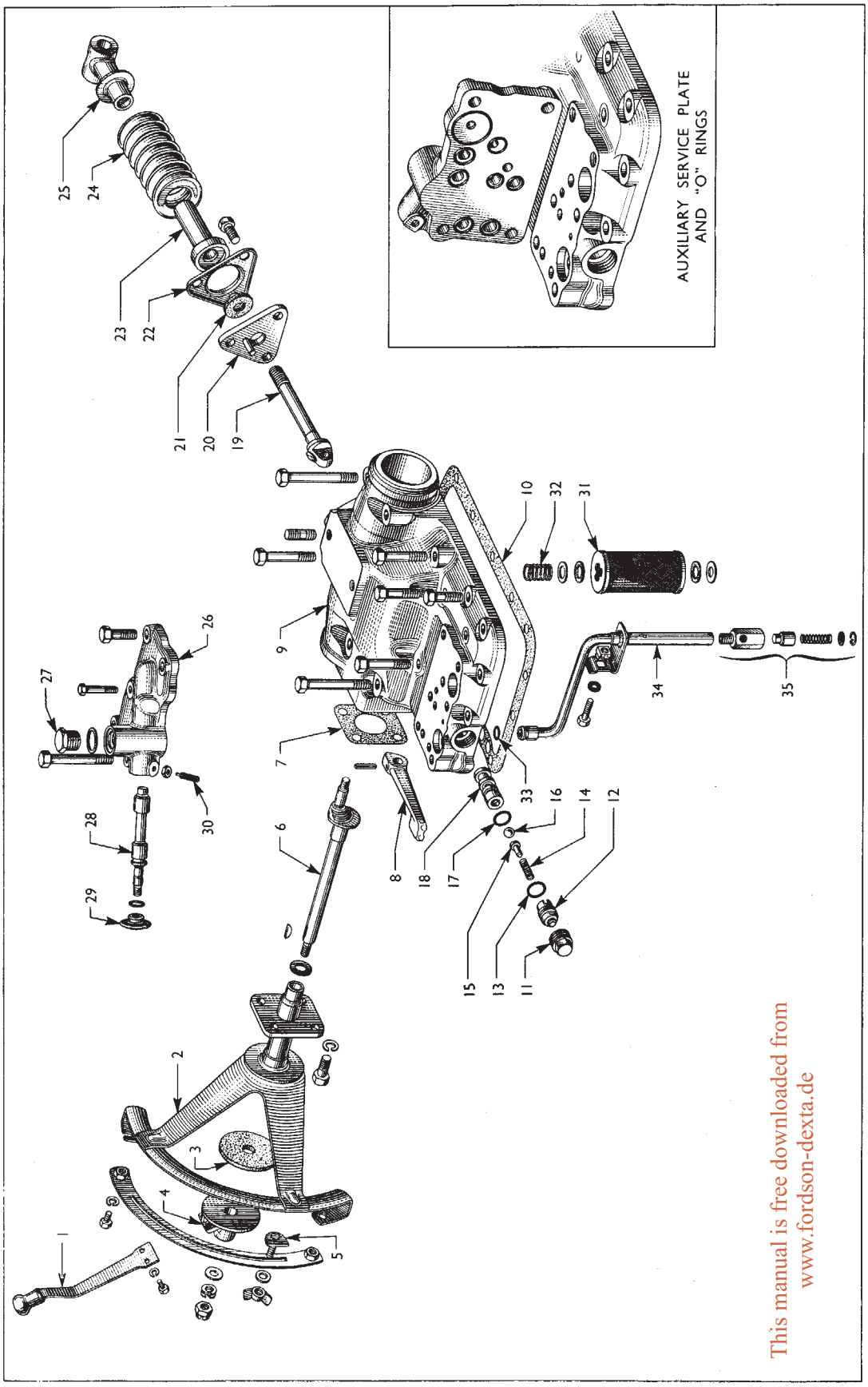


Fig. 4 Hydraulic Lift Cover Assembly, Auxiliary Service Control Assembly and Exhaust Filter Assembly

1 Main Control Lever
2 Quadrant Assembly
3 Friction Disc
4 Friction Plate
5 Control Lever Stop
6 Control Lever Shaft
7 Quadrant Gasket
8 Selector Lever
9 Lift Cover
10 Lift Cover Gasket
11 Check Valve Plug
12 Check Valve Pilot
13 "O" Ring
14 Check Valve Spring
15 Check Valve Ball and Spring Guide
16 7/16" Diameter Ball
17 "O" Ring
18 Check Valve Seat
19 Main Control Spring Plunger
20 Plunger Locking Plate
21 Felt Washer
22 Spring Seat Support
23 Spring Seat
24 Main Control Spring
25 Yoke
26 Auxiliary Service Control Valve Plate
27 Auxiliary Service Take-Off Plug
28 Auxiliary Service Control Valve Spool
29 Auxiliary Service Control Knob
30 Detent Spring and Plunger Assembly
31 Exhaust Oil Filter
32 Exhaust Oil Filter Spring
33 Exhaust Pipe "O" Ring
34 Exhaust Oil Pipe
35 Back Pressure Valve Assembly

Two differant types of Auxily Service Control Valves were made. This page and the following one is taken from an I&T Shop Manual

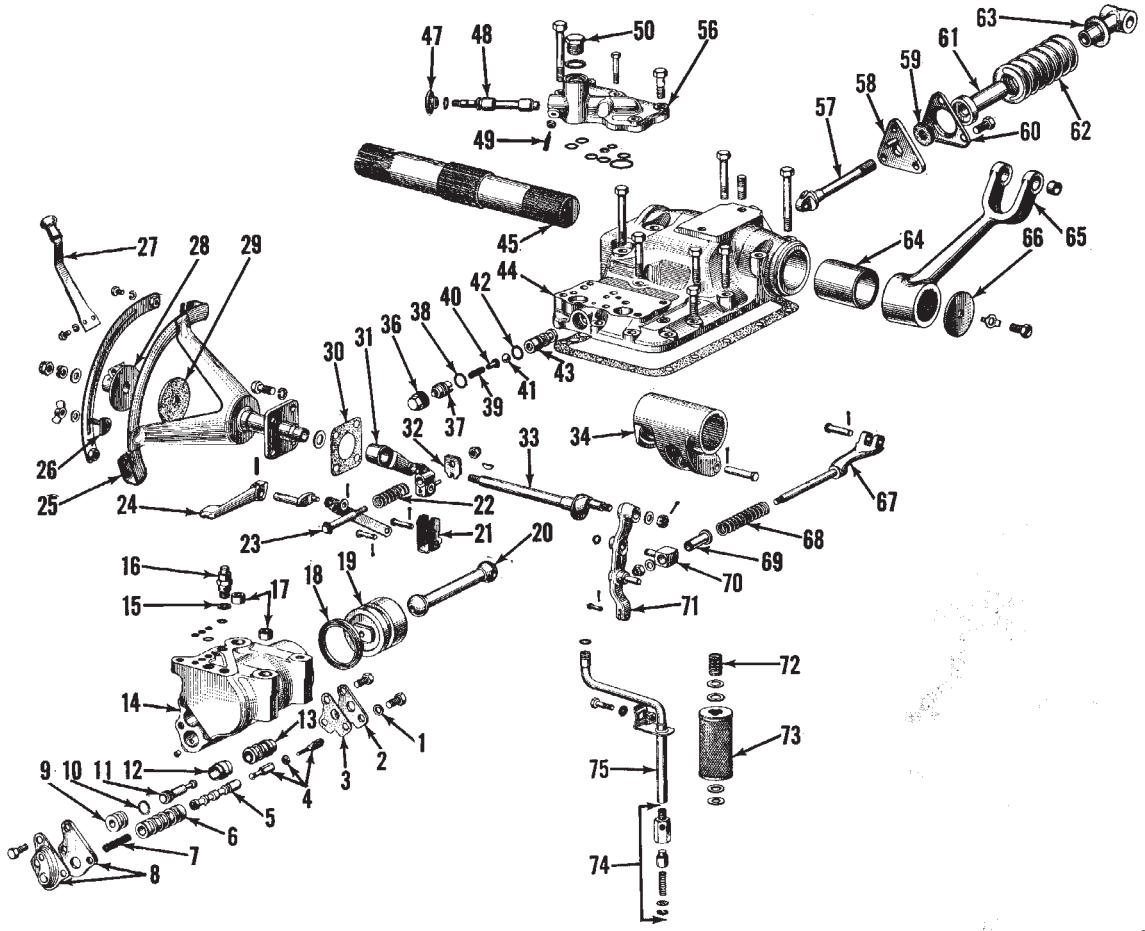
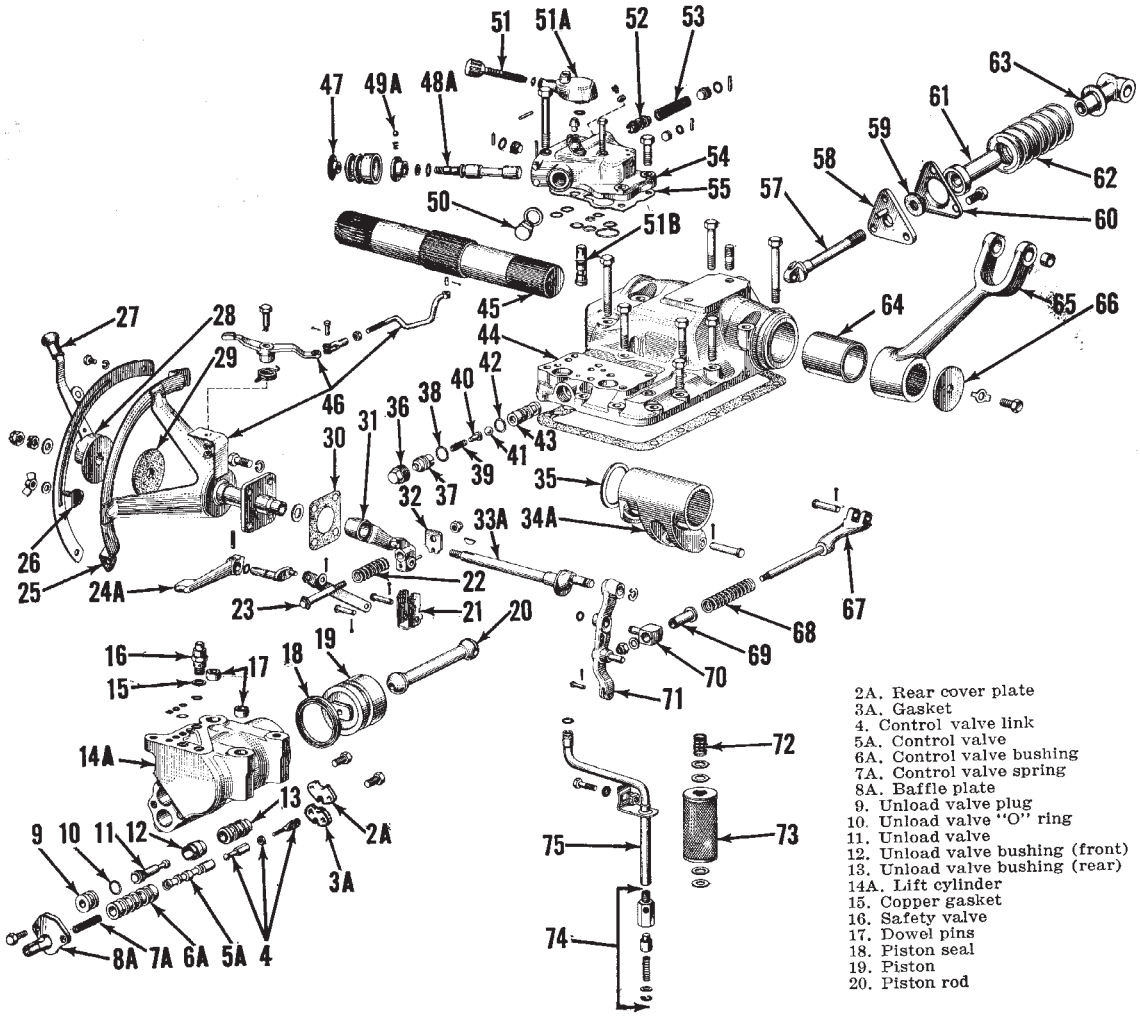


Fig. FO563 — Exploded view of early Fordson Dexta hydraulic lift cover, cylinder and linkage. Accessory plate (56) can be replaced with flow control valve (54—Fig. FO564) if complete valve and linkage are used. Although component parts are different, complete lift cylinder assembly (14) is interchangeable with later type complete lift cylinder assembly (14A — Fig. FO564).

1. Sealing washer
2. Rear cover
3. Gasket
4. Control valve link
5. Control valve
6. Control valve bushing
7. Control valve spring
8. Baffle plate
9. Unload valve plug
10. Unload valve "O" ring
11. Unload valve
12. Unload valve bushing (front)
13. Unload valve bushing (rear)
14. Lift cylinder
15. Copper gasket
16. Safety valve
17. Dowel pins
18. Piston seal
19. Piston
20. Piston rod
21. Control cam
22. Position control spring
23. Position control rod
24. Position control selector lever
25. Quadrant
26. Lever stop
27. Control lever
28. Friction plate
29. Friction disc
30. Gasket
31. Position control arm
32. Stamped adjusting nut
33. Control lever shaft
34. Ram lift arm
36. Check valve plug
37. Check valve pilot
38. "O" ring
39. Check valve spring
40. Check valve spring guide
41. Check valve
42. "O" ring
43. Check valve seat
44. Lift cover
45. Lift arm cross shaft
47. Remote cylinder selector knob
48. Selector valve spool
49. Detent assembly
50. Jack tapping plug
56. Accessory plate
57. Control spring plunger
58. Retaining plate
59. Felt seal
60. Seat support
61. Spring seat
62. Main control spring
63. Control spring yoke
64. Bushings (2)
65. Lift arm
66. Retaining washer
67. Draft control link
68. Over-ride spring
69. Bushing
70. Draft control swivel
71. Valve control lever
72. Spring
73. Oil filter element
74. Back pressure valve
75. Return tube

Two differant types of Auxily Service Control Valves were made. This page and the page before is taken from an I&T Shop Manual



2A. Rear cover plate
3A. Gasket
4. Control valve link
5A. Control valve
6A. Control valve bushing
7A. Control valve spring
8A. Baffle plate
9. Unload valve plug
10. Unload valve "O" ring
11. Unload valve
12. Unload valve bushing (front)
13. Unload valve bushing (rear)
14A. Lift cylinder
15. Copper gasket
16. Safety valve
17. Dowel pins
18. Piston seal
19. Piston
20. Piston rod

Fig. FO564 — Exploded view of late hydraulic lift cover, cylinder and linkage. Ram lift arm (34A) and spacer (35) may be used to replace early production lift arm (34—Fig. FO563). Control lever shaft (33A) and snap ring may be used to replace early production shaft (33—Fig. FO564), washer and nut.

21. Control cam
22. Position control spring
23. Position control rod
24A. Position control selector lever
25. Quadrant
26. Lever stop
27. Control lever
28. Friction plate
29. Friction disc
30. Gasket
31. Position control arm
32. Stamped adjusting nut
33A. Control lever shaft
34A. Ram lift arm
35. Spacer washer
36. Check valve plug
37. Check valve pilot
38. "O" ring
39. Check valve spring
40. Check valve spring guide
41. Check valve
42. "O" ring
43. Check valve seat
44. Lift cover
45. Lift arm cross shaft
46. Flow control valve linkage
47. Remote cylinder selector knob
48A. Selector valve spool
49A. Detent assembly
50. Jack tapping plug
51. Restrictor adjusting knob
51A. Restrictor control lever
51B. Restrictor valve
52. Flow control valve spool
53. Flow control valve spring
54. Flow control valve housing
55. Gasket
57. Control spring plunger
58. Retaining plate
59. Felt seal
60. Seat Support
61. Spring seat
62. Main control spring
63. Control spring yoke
64. Bushing (2)
65. Lift arm
66. Retaining washer
67. Draft control link
68. Over-ride spring
69. Bushing
70. Draft control swivel
71. Valve control lever
72. Spring
73. Oil filter element
74. Back pressure valve
75. Return tube

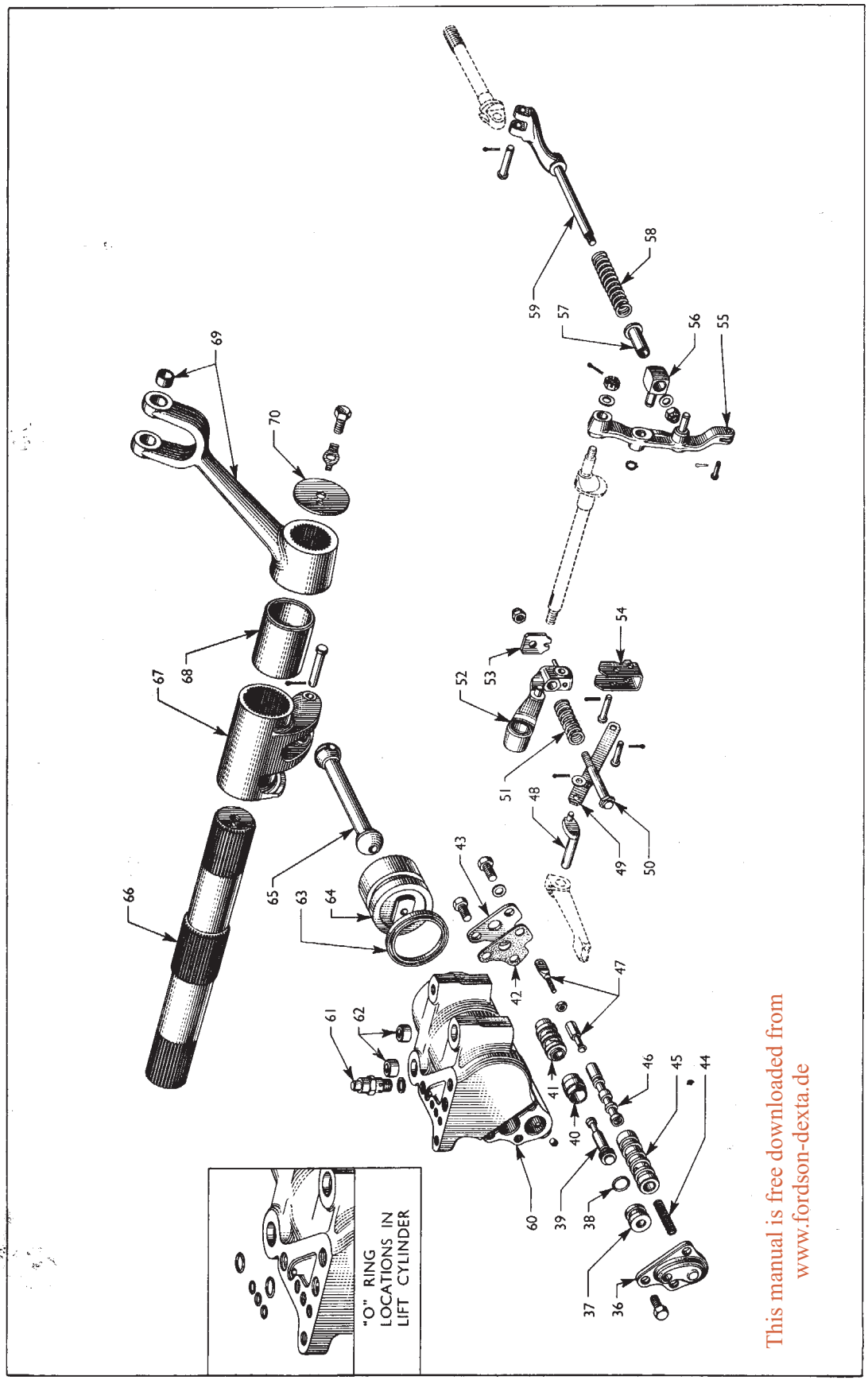


Fig. 5 Hydraulic Lift Cylinder Assembly, Linkage and Lift Arms

36 Cylinder Cover Plate (Front)
37 Unloading Valve Plug
38 Unloading Valve "O" Ring
39 Unloading Valve
40 Unloading Valve Bush (Front)
41 Unloading Valve Bush (Rear)
42 Gasket—Cylinder Cover Plate (Rear)
43 Cylinder Cover Plate
44 Control Valve Spring
45 Control Valve Bush
46 Control Valve
47 Turnbuckle and Link
48 Selector Control Arm
49 Selector Control Link
50 Position Control Rod
51 Position Control Spring
52 Position Control Arm
53 Position Control Drawbar Plate
54 Position Control Cam
55 Control Valve Actuating Lever
56 Qualitrol Swivel
57 Qualitrol Bush
58 Qualitrol Override Spring
59 Qualitrol Link
60 Lift Cylinder
61 Lift Cylinder Safety Valve
62 Lift Cylinder Dowels
63 Piston Gland
64 Ram Piston
65 Ram Piston Connecting Rod
66 Lift Cross-shaft
67 Ram Arm
68 Lift Cross-shaft Bushing
69 Lift Arm and Bush
70 Lift Cross-shaft Washer

HYDRAULIC POWER LIFT FUNCTION

Raising or lowering of the lift arms is effected, in both Qualitrol and Position Control, by first ensuring that the auxiliary service control knob is pushed in, and then moving the main control level within its quadrant. Any required working depth for an implement has a corresponding position on the quadrant and, once this depth has been established, an adjustable stop on the quadrant may be set and the depth quickly regained, after a lifting cycle, by returning the control lever to the stop.

To operate auxiliary equipment, the auxiliary service control knob must first be pulled out, after which oil may be directed to and from the auxiliary equipment by movement of the main control lever.

When operating equipment from the auxiliary service under Qualitrol there is a short range of travel for the main control lever, near the top of the quadrant, within which the full range of control is available. By finding a neutral position within this range, and placing the adjustable stop at this point, the auxiliary equipment may be held at any required height merely by moving the main control lever against this stop.

It is important that the main control lever is in a neutral position before changing from lift arm to auxiliary service operation or vice versa.

NOTE.—If the lift arms are fully raised, the ram piston will hold the control valve in neutral and the " neutral " position for the main control lever will be against the *fixed* stop at the top of the quadrant (see " Raising under Qualitrol "). It will then be necessary to move the control lever past the fixed stop to raise auxiliary equipment.

LINKAGE OPERATION UNDER QUALITROL

Lowering under Qualitrol

Qualitrol is selected by placing the selector lever in the downward position.

Assuming the implement to be initially in the fully raised position, lowering may be effected by moving the main control lever down the quadrant. (See Fig. 6.) Such movement of the control lever moves the upper end of the control valve actuating lever forward and decreases the pressure applied by the qualitrol override spring to the actuating lever swivel. The control valve spring therefore moves the control valve rearwards to the lowering position, and oil is exhausted from the ram cylinder, allowing the lift arms to rotate and the implement to be lowered. Lowering will commence when the control lever is moved a short distance from the stop at the top of the quadrant and will continue until the implement touches the ground, or the control lever is moved back to within approximately 1 in. (25.4 mm.) of the stop at the top of the quadrant.

Immediately the tractor moves forward into work, the weight and suck of the implement tends to increase

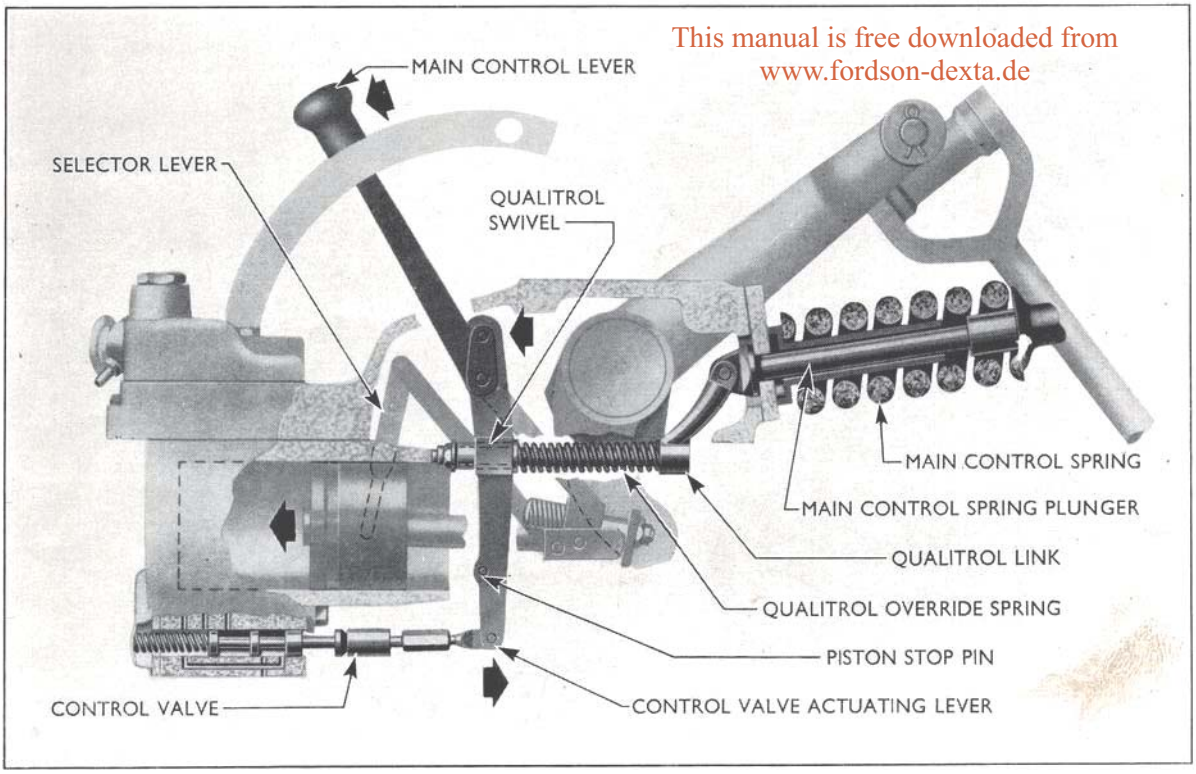


Fig. 6
Qualitrol Linkage - Lowering

the working depth and causes the implement to rotate about the lower link mounting pins, thereby applying a compressive force to the upper link. This force varies in accordance with the depth of work and the resistance of the soil to forward motion.

As the depth, and hence the compressive force on the upper link increases, a thrust is transferred through the rocker (pivoted to the rear transmission housing) to the main control spring plunger, compressing the main control spring and moving the plunger and qualitrol link forward. This movement of the qualitrol link within the actuating lever swivel compresses the qualitrol override spring and so applies a force to the swivel.

Positioning of the main control lever on the quadrant will establish a definite position for the upper end of the control valve actuating lever. When the implement reaches the required depth, the force applied to the swivel causes the actuating lever to pivot at its upper end and move the control valve forward, against the action of the control valve spring, to the neutral position, and lowering ceases.

It is, therefore, the balancing of compression of the qualitrol override spring and the control valve spring, together with the establishment of a pivot point for the actuating lever by the positioning of the main control lever on the quadrant, which governs movement of the control valve and establishes a neutral position.

Operation in work under Qualitrol

Assuming that the implement has now reached the required working depth, the main control spring will be partially compressed, and, as long as the implement draft remains constant, the control valve remains in neutral and no further changes in depth take place.

As soon as an increase in draft occurs a resultant increase in compression of the main control spring takes place, the effect of which is transferred through the qualitrol linkage to move the control valve into the raising position (see Fig. 7). Oil then flows to the ram cylinder and the implement rises until the draft decreases to the amount previously obtained, thus allowing the main control spring to expand to its former position and the control valve to be moved back to the neutral position.

Conversely, a decrease in draft allows the main control spring to expand and the control valve to move to the lowering position, whereupon the weight and suck of the implement carries it to a greater depth. The draft is thus increased to that previously obtained and the control valve again moves back to the neutral position.

By making these slight corrections, therefore, the hydraulic system automatically adjusts itself to maintain a constant draft at the implement.

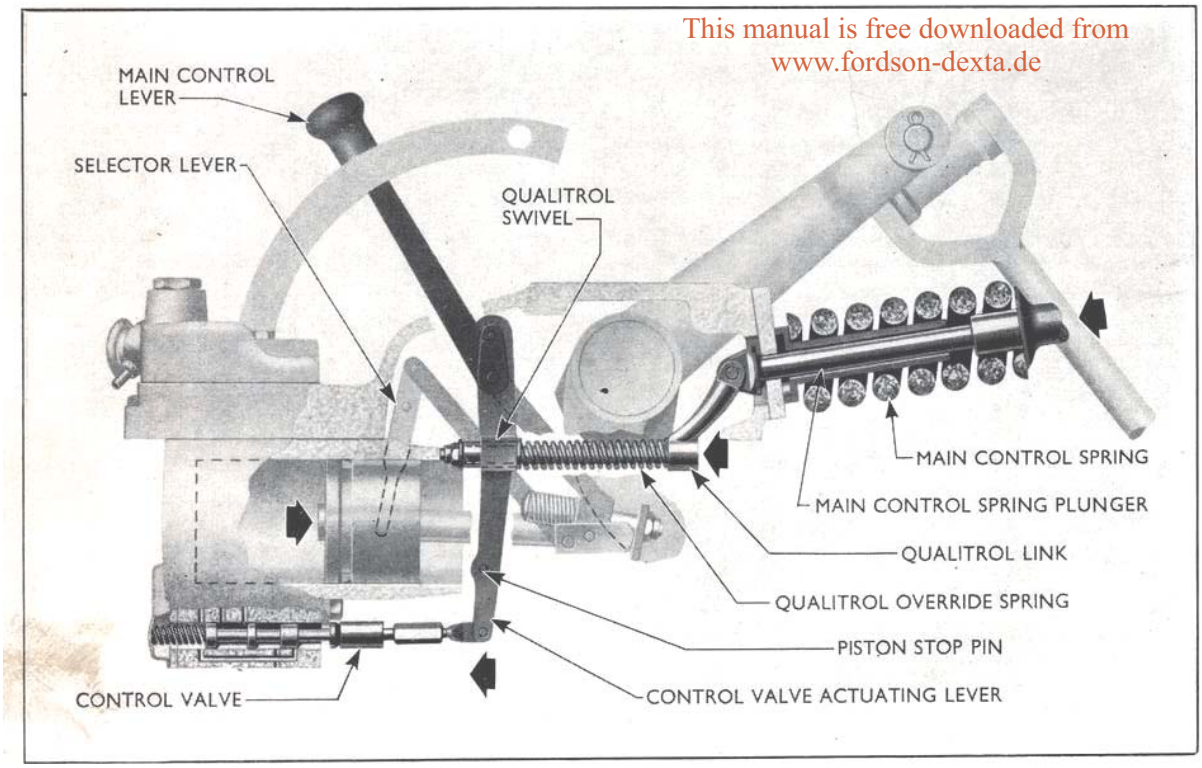


Fig. 7
Qualitrol Linkage - Raising in Work

Raising under Qualitrol

To raise the implement from its working position the main control lever should be moved up the quadrant, thus moving the upper end of the control valve actuating lever to the rear, causing it to pivot at the swivel and move the control valve forward, against the action of the control valve spring, into the raising position. As long as the implement remains in the ground, raising will be directly proportionate to the decrease in implement draft as established by the amount of upward movement given to the control lever, but to fully raise the implement to the transport position the control lever must be moved to the top of the quadrant (i.e. against or within 1 in. (25.4 mm.) approx. of the stop).

As the lift arms reach the fully raised position the ram piston will have moved out sufficiently for the rear edge of the piston to contact a pin on the control valve actuating lever, so forcing the lever to the rear and the control valve into a neutral position.

Raising may also be stopped, to establish an intermediate transport position, by moving the main control lever downwards again and allowing spring pressure to move the control valve into neutral.

LINKAGE OPERATION UNDER POSITION CONTROL

For work on fairly level ground with no wide variations in soil resistance, position control enables the working depth of the implement to be pre-set and for all practical purposes accurate work at constant depth can be achieved.

It is also suitable for operating implements which require to be worked at a set height from the ground, i.e. mowers, weeders, and steerage hoes.

To operate under position control the selector lever should be placed in a horizontal position, thus bringing into action the special linkage between the servo cam on the ram arm and the control valve actuating lever which overrides the qualitrol linkage.

The pivot point for the control valve actuating lever is now moved to the pad machined on the actuating lever immediately below the qualitrol swivel. In operation the pad on the actuating lever contacts the position control rod, compressing the position control rod spring and forcing the control arm pin against the servo cam on the ram arm, which acts as a stop.

As both the ram arm and the lift arms are splined to the lift cross-shaft, raising or lowering of the lift arms will cause the ram arm cam to rotate and so regulate movement of the control valve.

Lowering under Position Control

As with Qualitrol, lowering may be effected by moving the control lever down the quadrant. There is, however, one significant difference in that under Qualitrol the implement is lowered to the ground

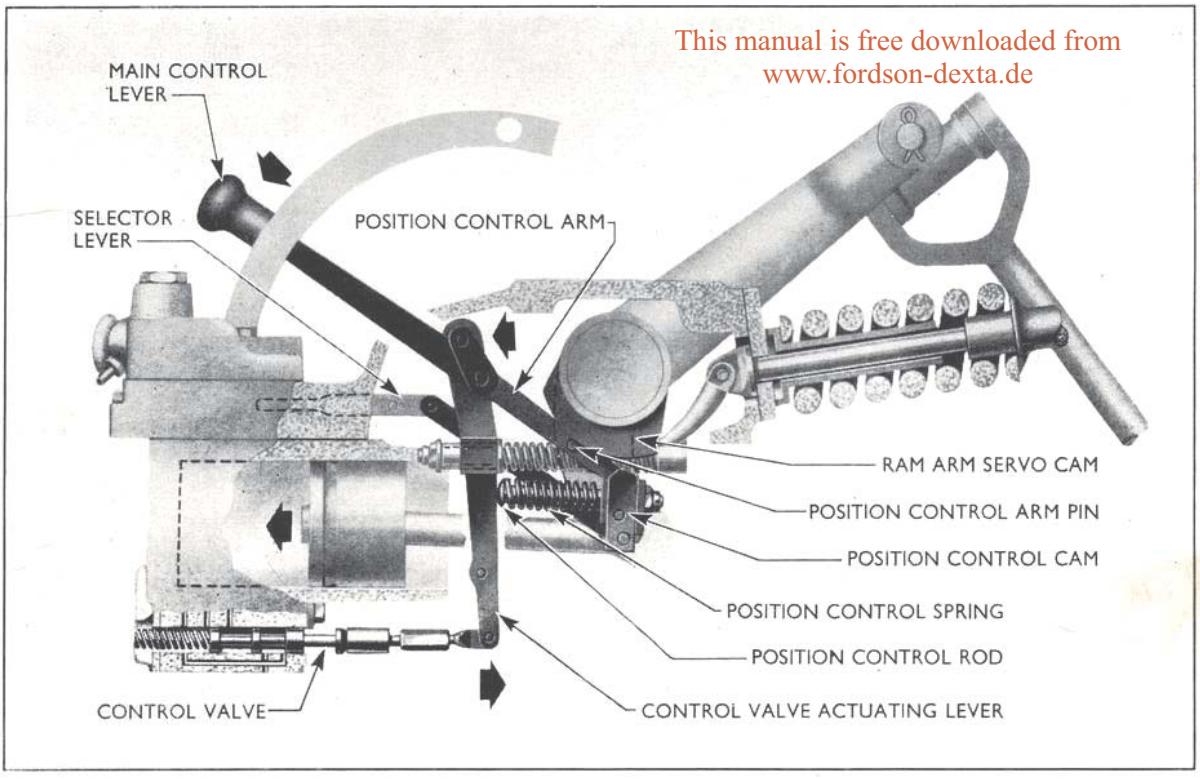


Fig. 8
Position Control Linkage - Lowering

almost immediately the control lever is moved away from the stop at the top of the quadrant (unless the control lever is moved back up the quadrant), whereas under position control the implement is lowered an amount directly proportionate to the amount of movement of the control lever.

As the control lever is moved down the quadrant the upper end of the actuating lever moves forward, away from the position control rod, thus relieving the compression on the position control spring and allowing the control valve spring to move the control valve into the lowering position. (See Fig. 8.) Oil is then exhausted from the ram cylinder and the lift arms drop under the weight of the implement.

As the lift arms drop, however, the cam on the ram arm forces the position control arm forward, gradually increasing the compression on the position control spring until the pressure exerted on the actuating lever by the control rod is sufficient to overcome the force applied by the control valve spring. When this condition is reached, the actuating lever pivots at its attachment to the control lever cross-shaft and moves the control valve into the neutral position.

The positioning of the main control lever on the quadrant establishes the point at which this neutral position is attained and sets the working depth of the implement.

Operation in work under Position Control

In operation, obstructions in the field may tend to force a soil engaging implement out of the ground, but the weight and suck of the implement will immediately return it to its pre-set depth.

Any leakage in the ram cylinder circuit will cause the lift arms to lower, but this will be compensated for by the ram arm cam forcing the position control arm forward, compressing the control valve spring, and thus applying a thrust to the control valve actuating lever to move the control valve into the raising position. The lift arms will then rise to their previous position and the ram arm cam will in consequence relieve the compression on the position control spring, thus allowing the control valve spring to return the control valve to the neutral position.

By making these slight corrections the hydraulic system is automatically adjusted to maintain the implement at a constant depth.

Raising under Position Control

To raise the implement, the control lever should be moved up the quadrant, thus pivoting the actuating lever on the position control rod and moving the control valve into the raising position. (See Fig. 9.) The lift arms will continue to rise until the ram arm servo cam permits the position control arm assembly to move rearward a sufficient amount to allow the control valve to be moved into the neutral position. Thus the nearer the control lever is moved towards the top of the quadrant, the higher the lift arms will be raised.

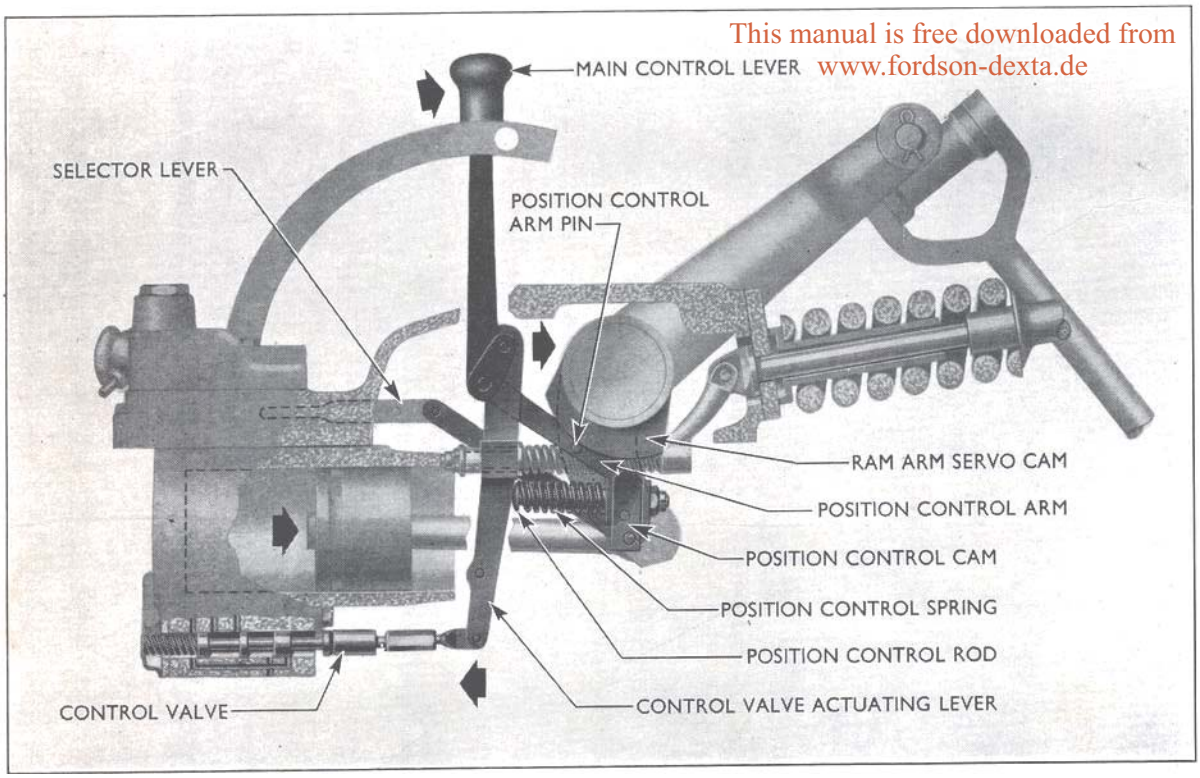


Fig. 9
Position Control Linkage - Raising

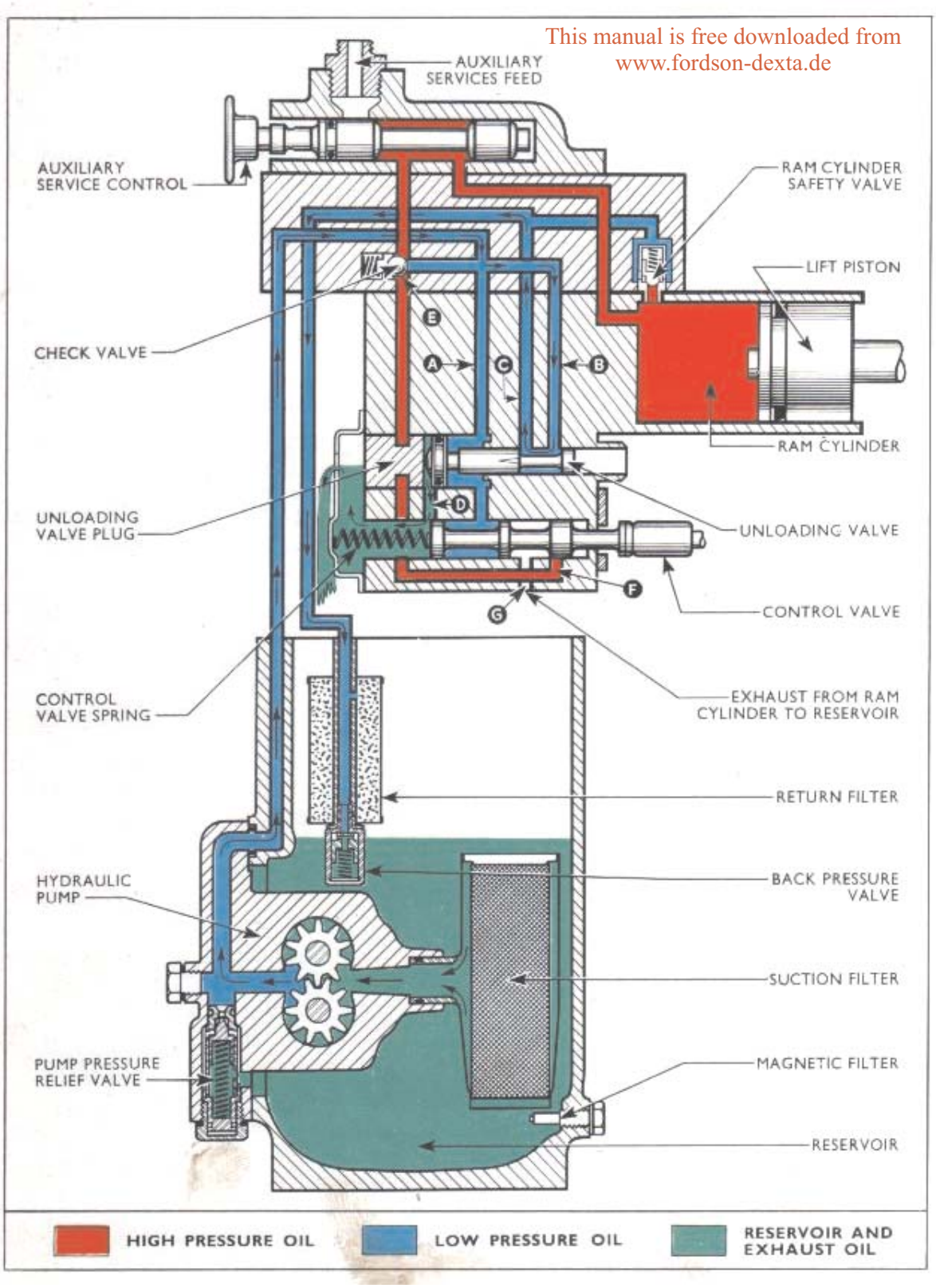


Fig. 10
Hydraulic Oil Flow - Neutral

HYDRAULIC LIFT OIL FLOW

Oil Flow in Neutral Position

The control valve is returned to the neutral position after the desired depth (or height) is reached, and also after each automatic correction is made to maintain draft (under Qualitrol) or position (under Position Control).

Figure 10 shows schematically the oil flow through the system when the control valve is in the neutral position, the flow being identical for both Qualitrol and Position Control.

The hydraulic pump supplies oil to the lift cover where it is passed to the check valve passage and enters the check valve seat. As the check valve ball is retained on its seat by a spring, the oil follows passages 'A' and ' B ' to the unloading valve bushes.

Oil from passage 'A' passes around an annular groove formed by the unloading valve forward bushing and enters the unloading valve chamber through a ' V '-shaped slot, where it works on the rear face of the unloading valve, moving it forward into the unload position.

Any oil in front of the unloading valve is forced, by the forward movement of the valve, into the control valve spring compartment and leaks away to the rear transmission housing through a hole in the top of the front cover plate.

Oil from passage ' B ' passes around, and into, the unloading valve rear bushing, where it is trapped until the unloading valve moves forward and opens up a passage for the oil to flow from passage ' B ' to passage ' C.' The oil now by-passes the check valve chamber and is directed to the auxiliary service plate, from where it is routed to the lift cover and then, via an exhaust pipe and filter, to mix again with the transmission lubricant.

Oil Flow in Raising Position

Oil is supplied by the pump to the check valve chamber as before, but as the control lever is moved to the raising position and the control valve moves forward, a passage ' D ' is opened leading from the control valve to the front of the unloading valve; at the same time the leak-off passage leading from the front of the unloading valve to the front cover plate is sealed off.

Oil flows from the check valve passage through drilling 'A' to the unloading valve bushing, some entering the bushing to operate on the rear face of the unloading valve and the rest continuing around the annular recess in the outside diameter of the bushing to the control valve, from where it is now free to pass to the front face of the unloading valve.

As the area in contact with the oil on the front face of the unloading valve is larger than that on the rear face, the total pressure exerted on the front of the valve exceeds the pressure applied to the rear, and in consequence the valve moves rearwards, thus stopping the oil flow between passages ' B ' and ' C.'

Pressure now builds up in the system until it reaches sufficient proportions to move the check valve ball from its seat, against the action of the spring, so allowing the oil to pass to the auxiliary service plate where it is directed, according to the positioning of the auxiliary service control valve, to either the ram cylinder or to auxiliary equipment. For the purposes of illustration, Fig. 11 shows the auxiliary service control valve in the inner position and oil pressure being applied to the ram cylinder piston to raise the lift arms to the height required (in accordance with the positioning of the main control lever).

Oil Flow in Lowering Position

When the control valve is moved to the lowering position, it closes the passage ' D ' from the control valve to the front of the unloading valve and opens up ports ' F ' and ' G.'

Oil from the pump therefore follows the usual channels to the check valve chamber and then through passage 'A' to enter the unloading valve bush, where it operates on the rear face of the unloading valve. As the passage to the front of the unloading valve is closed, no pressure is applied to the front face of the valve and it therefore moves forward, opening up a passage for the oil to flow from ' B ' to ' C ' and so back to the transmission housing (as in the neutral position). Oil remaining in front of the unloading valve is forced out through the control valve spring chamber and leaks off through the hole in the front cover plate.

No pressure build-up can therefore occur in the system and the check valve closes.

The weight of the implement now forces the piston forward and drives the oil from the ram cylinder through suitable passages in the lift cover to passage 'E,' which by-passes the check valve and connects with an annular groove in the unloading valve plug. A vertical drilling connects the annular groove in the plug with a longitudinal passage leading to port ' F.'

Oil, therefore, flows through port ' F ' into the control valve, from where it is exhausted through port ' G,' which is open to the rear transmission housing. (See Fig. 12.)

HYDRAULIC CONTROL ADJUSTMENTS

Adjustment of Main Control Lever

After an extensive period of operation, wear on the main control lever friction plate and friction disc may necessitate adjustment of the nut securing the friction plate to the quadrant. The nut should be tightened so that an effort of 4/5 lbs. (1.814/2.268 kg.), measured with a spring balance, at the top end of the main control lever, is required to move the lever within the quadrant.

Adjustment of Main Control Spring

The main control spring setting is correct for all normal operations when there is enough pre-

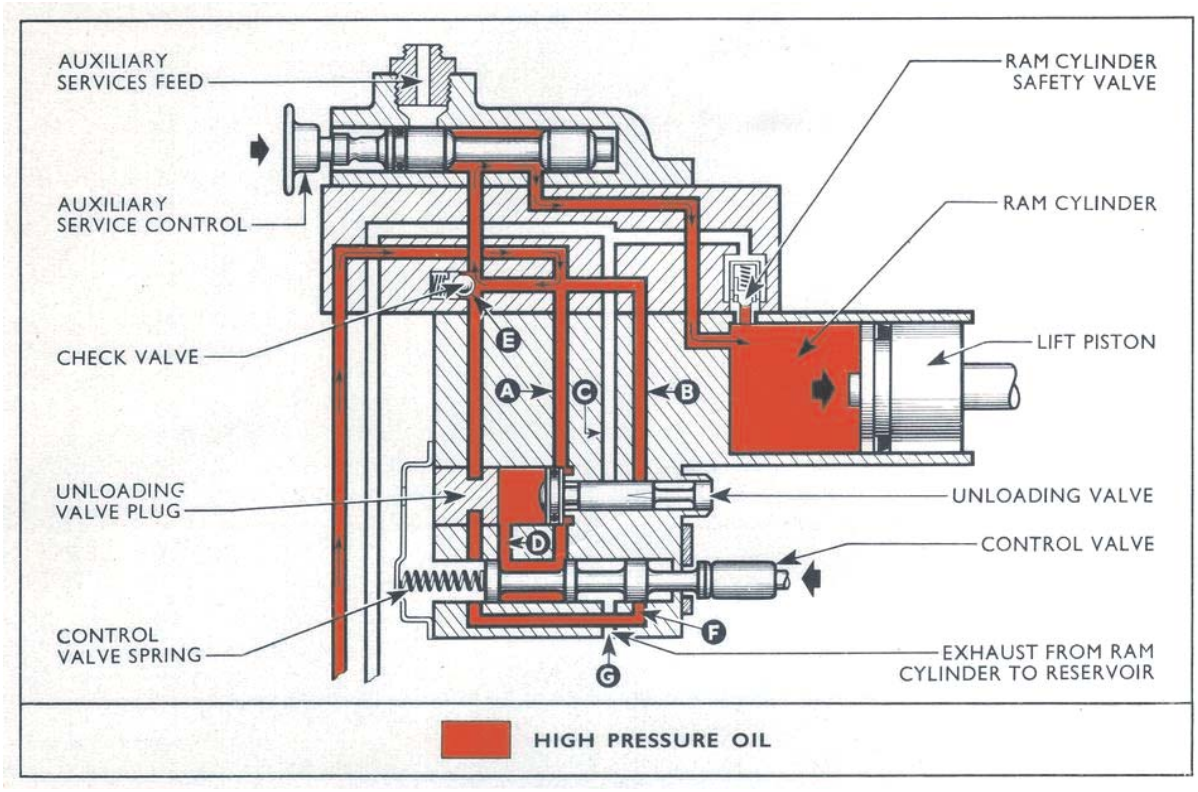


Fig. 11
Hydraulic Oil Flow - Raising

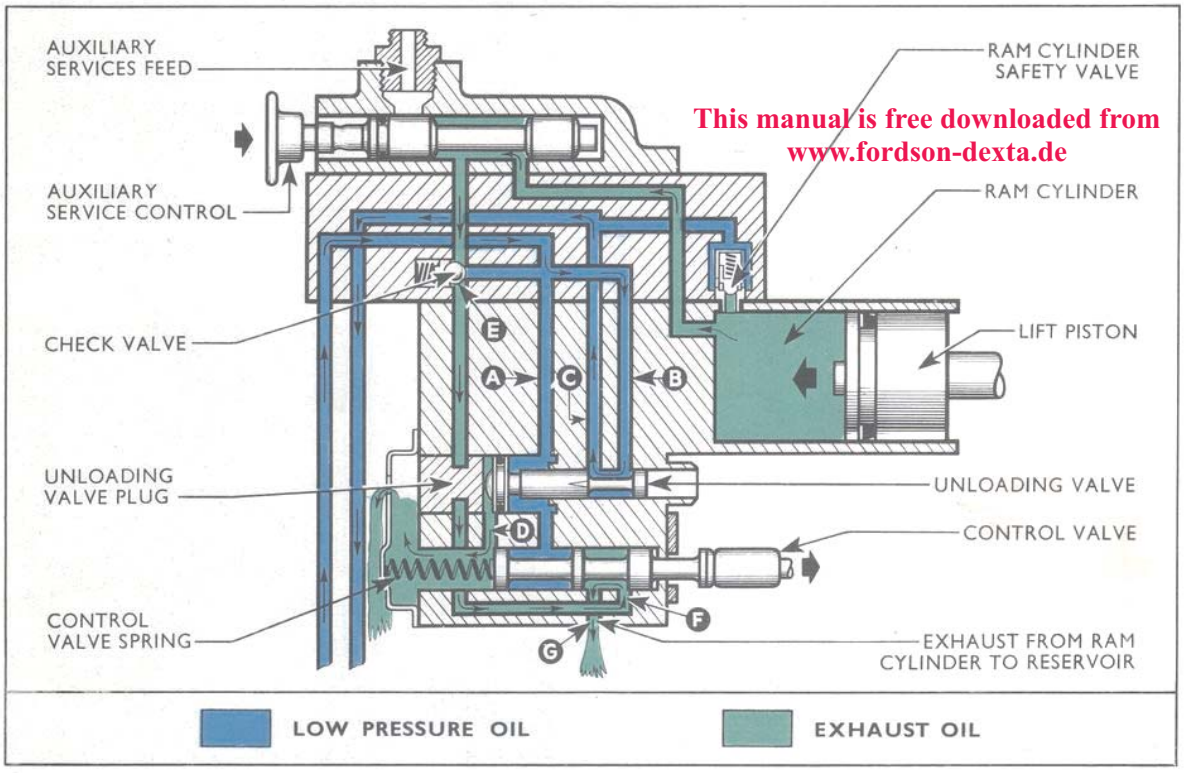


Fig. 12
Hydraulic Oil Flow - Lowering

compression of the spring to just allow the spring to be rotated with the finger and thumb of one hand.

If it cannot be turned in this manner, or if the pre-compression is insufficient to meet the above requirement, the spring plunger yoke should be released from its connection to the rocker and turned in a clockwise direction to increase the loading on the spring, and vice versa to decrease the loading.

When operating under Qualitrol it may be advantageous, when undertaking certain operations, to increase the spring pre-compression beyond the normal setting, i.e. in order to obtain abnormal penetration from an earth moving implement. Before resorting to such a procedure, care must be taken to ensure that the implement itself is correctly set.

It must also be realised that with such settings the sensitivity of the Qualitrol will be reduced and care must be taken to correct the spring adjustment before resuming normal operations.

Qualitrol Linkage Adjustment

1. Remove the lift assembly from the tractor (see section headed " To Dismantle the Hydraulic Lift Assembly ") and place it in a soft jawed vice with the main control spring pointing upwards. (See Fig. 13.)

2. Before attempting any adjustment to the qualitrol linkage the main control spring must first be adjusted correctly and then tightened a further half turn.

3. Assemble locating arm T.8512/a to the underside of the lift cover flange, attaching it to the two rear holes on the right-hand side. Insert the locating pin T.8512/f through the arm and right-hand lift arm bush. (See Fig. 13.)

4. Place the selector lever in the downward position, i.e. at right angles to the lift cover.

5. Raise the main control lever to within .5 in. (12.7 mm.) of the stop formed by the upper hexagon nut on the quadrant. Slip gauge T.8512/g has a sideways dimension of exactly .5 in. (12.7 mm.) and this may be inserted between the quadrant stop and the lever so that the lever may be accurately positioned for adjustment (the gauge is shown dotted in Fig. 13).

6. Remove the slip gauge from the quadrant, loosen the control valve turnbuckle locknut and adjust the turnbuckle until the Qualitrol end of slip gauge T.8512/g can be just inserted between the control valve and the rear end of the control valve bush. After adjustment, tighten the turnbuckle locknut and recheck with the slip gauge.

7. Back off the main control spring yolk to obtain the correct operating adjustment of the main control spring before replacing the lift.

Position Control Adjustment

Before attempting to adjust this control the main control spring must be set correctly and the qualitrol linkage adjustment carried out ; then proceed with the following operations :—

1. Place the selector lever in a horizontal position, i.e. parallel with the lift cover.

2. Move the main control lever down the quadrant until it rests against the stop formed by the hexagon nut at the lower end of the quadrant.

3. Hold the position control rod locknut and turn the position control rod until the Position Control end of the slip gauge T.8512/g can be just inserted between the control valve and the rear end of the control valve bush. (See Fig. 14.)

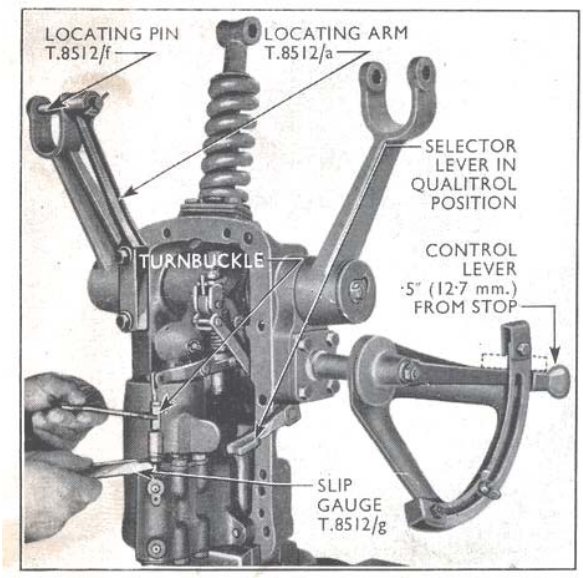


Fig. 13
Qualitrol Linkage Adjustment

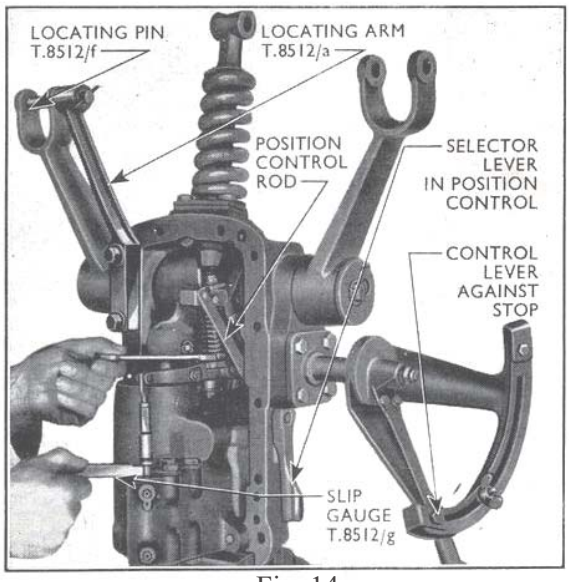


Fig. 14
Position Control Linkage Adjustment

TO DISMANTLE THE HYDRAULIC LIFT ASSEMBLY

Absolute cleanliness is essential when undertaking repairs on the hydraulic lift and every precaution must be taken to see that all mud or dirt is removed before any attempt is made to disturb the lift or dismantle any of its components. It is recommended that suitable clean receptacles are provided for all small components and that parts with highly finished surfaces are carefully cleaned as they are removed, and placed on clean cloth to prevent damage.

To Remove the Auxiliary Service Control Plate Assembly

1. Remove the two nuts and spring washers retaining the driving seat spring to the studs located in the lift cover and remove the seat.

2. Extract the five set-screws retaining the auxiliary service control plate to the hydraulic lift top cover.

NOTE.—The two screws on the right-hand side of the plate are longer than the others and pass through both plate and cover into tapped holes in the wall of the rear transmission housing. The centre screw is the shortest of the five screws used.

To Dismantle the Auxiliary Service Control Plate Assembly

1. Remove the eight rubber ' O ' rings and discard them.

2. Remove the nut from the valve spool locking plunger assembly and extract the assembly from the plate.

3. Withdraw the valve spool complete with operating knob and remove the knob if necessary.

To Rebuild the Auxiliary Service Control Plate Assembly

1. Replace the valve spool in the plate. If it is necessary to fit a new spool it should be noted that it is a selective fit in the plate. (See Specification.) When making the assembly the largest valve should be fitted which will operate without binding in the housing. It is most important that great care is taken whilst handling the valve spools to obviate the possibility of burrs, distortion or bruising, otherwise it is possible to obtain a misleading impression as to the correct size of the valve required when making the assembly.

2. Assemble the locking plunger and spring assembly to the plate. Screw in the assembly until the plunger locates in the valve spool and adjust until the control knob can be operated without undue effort. Retain with a locking nut and operate the spool to ensure freedom of movement.

3. Fit a new set of rubber ' O ' rings in the various counterbores of the oil passages on the underside of the plate.

NOTE.—There are three different ' O ' ring sizes and the correct size of ring must be used in each passage (see Fig. 15).

See that the machined surface of the plate is carefully handled to avoid scoring or bruising which could give rise to an uneven surface and consequential oil leaks when the plate is reassembled to the cover.

To Replace the Auxiliary Service Control Plate Assembly

1. Ensure that the mating surfaces of the plate and the lift cover are clean and locate the plate on the cover.

2. Insert and fully tighten the retaining screws.

3. Replace the driving seat, adjust its position and securely tighten the retaining nuts.

To Remove the Lift Cover Assembly

1. Remove the seat and place the main control lever in the lowering position, thus allowing oil to be exhausted from the lift cylinder.

2. Remove the upper link and disconnect the right- and left-hand lifting rods from their respective lift arms.

3. Disconnect the main control spring plunger yoke from the rocker by removing the clevis pin. Swing the rocker away from the yoke.

4. Remove the two screws located on the right-hand side of the auxiliary service control plate, which pass through both the plate and the cover.

5. Remove the twelve remaining screws located around the periphery of the cover and retaining it to the rear transmission housing.

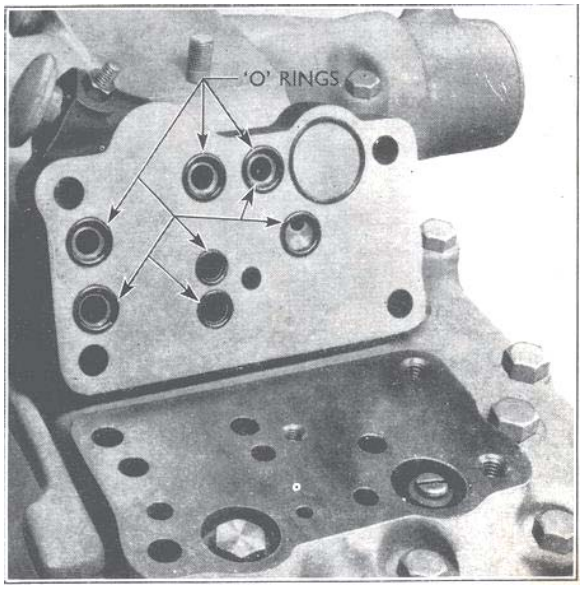


Fig. 15
Auxiliary Service Control Plate

A note should be made of the positioning of each screw as, apart from the two which pass through both the auxiliary service control plate and the cover, there are five different length screws used at the various locations.

6. Remove the hydraulic lift cover assembly complete with lift cylinder and control linkage.

To Replace the Lift Cover Assembly

1. Fit new 'O' rings at the top of the inlet and exhaust passages in the wall of the rear transmission housing and locate a new gasket on the top surface of the housing. The gasket must be accurately located so that it does not restrict the flow of oil to and from the lift cover.

2. Replace the hydraulic lift cover assembly; insert and fully tighten the retaining screws.

3. Adjust the main control spring plunger yoke as described under "Adjustment of Main Control Spring" and connect the yoke to the rocker with the appropriate clevis pin.

4. Replace the upper link and connect up the lifting rods to the lift arms.

5. Replace the seat as previously described.

To Remove the Check Valve

1. Remove the lift cover assembly as previously described and place the lift cover on a bench suitably supported to protect the machined surface.

2. Unscrew the check valve plug and, using a pair of sharp nosed pliers, extract the valve pilot, spring, spring guide and ball, from the check valve passage in the cover. (See Fig. 16.)

3. The check valve seat is a press fit in the check valve passage in the cover but it is suitably threaded

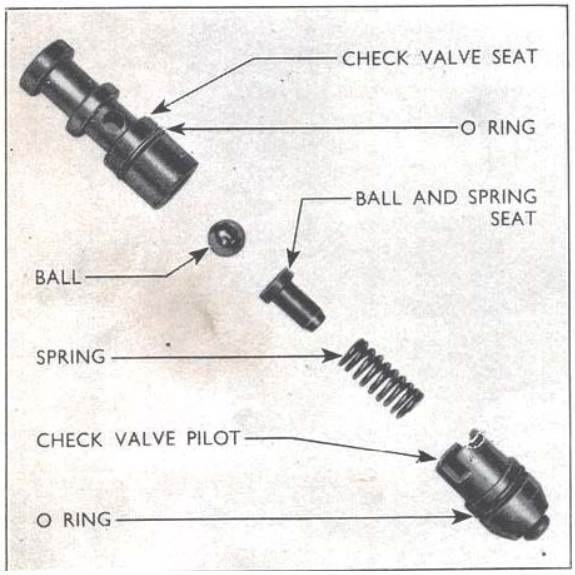


Fig. 16
Check Valve Assembly

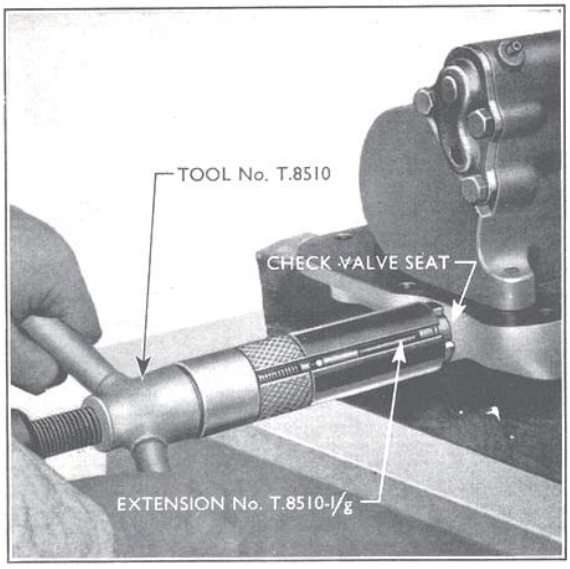


Fig. 17
Removing Check Valve Seat

at its forward end to accept the thread of the removal extension T.8510–1/g (used in conjunction with Tool No. T.8510). Screw the shorter threaded end of the extension into the centre of the tool and the long threaded end into the seat. Operate the wing nut on the tool and withdraw the seat (see Fig. 17).

NOTE.—It is most important that the hollow outer tube of the tool seats squarely against the end of the lift cover during the removal operation, as excessive misalignment may result in breakage of the seat which will then be extremely difficult to remove.

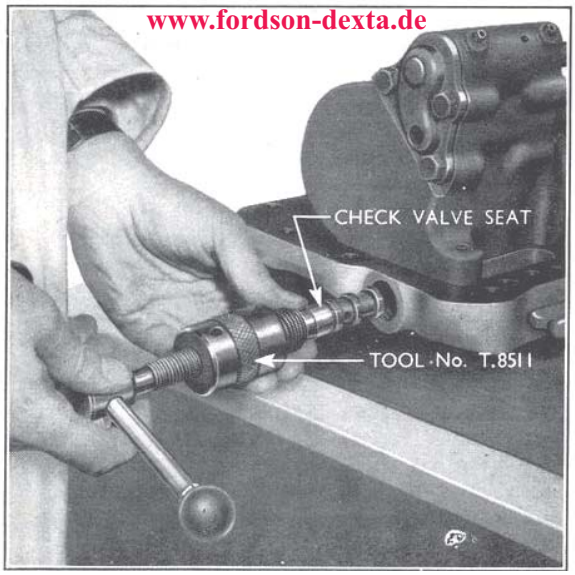


Fig. 18
Replacing Check Valve Seat

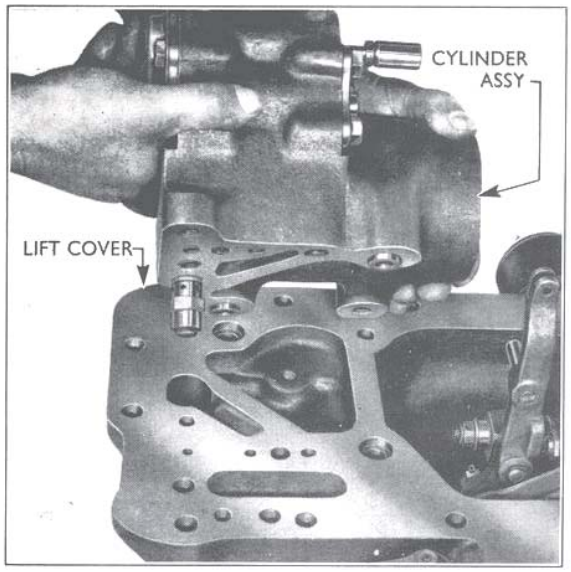


Fig. 19
Removing Lift Cylinder from Cover

To Replace the Check Valve

1. Examine the seat and renew if scored or damaged on its outer surface or if the actual seat (for the ball) is chipped or damaged.

2. Fit a new ' O ' ring to the recess in the check valve seat and locate the seat on the pilot of Tool No. T.8511 (see Fig. 18). Enter the seat into the check valve passage and screw the body of the tool into the threaded outer end of the passage. Operate the centre screw of the tool and press the check valve seat into position.

3. Remove the tool and instal a new ' O ' ring on the check valve pilot. Assemble the check valve ball, spring guide, spring and pilot to the cover. Replace the check valve plug and tighten to 45/55 lbs. ft. (6.219/7.601 kg.m.) torque.

To Remove the Lift Cylinder Assembly

1. Remove the lift cover as previously described and withdraw the auxiliary service control plate.

2. Disconnect the control valve linkage, by removing the pin securing the turnbuckle assembly to the control valve actuating lever assembly, and remove the turnbuckle.

3. Move the lift arms to the raised position and swing the ram piston connecting rod away from the piston.

4. Remove the four set-screws securing the lift cylinder to the lift cover (one of these is recessed into the cover) and withdraw the cylinder from the cover (see Fig. 19). Pull the cylinder straight out from the cover to avoid damaging the safety valve.

To Dismantle the Lift Cylinder Assembly

1. Remove the cylinder safety valve by turning it anti-clockwise. Use a spanner on the hexagon body of the valve and do not attempt to remove the centre portion. The slot in the centre portion of the valve is for adjustment purposes when the valve is originally assembled. It is set to open at 2,400 lbs. per square inch (168.74 kg. per sq. cm.) and then sealed. No attempt should be made to break the seal, but if at any time the valve is suspected of being faulty it should be removed and replaced with a new assembly which is known to be correct.

2. If necessary remove the two dowel rings from the top face.

3. Discard the five ' O ' rings fitted in the counter-bores of the various oil passages.

4. Turn the cylinder onto its top face (or hold it in a soft jawed vice) and, to prevent damage to the machined surface, ensure that the bench top is smooth and clean.

5. Remove the three set-screws securing the front cover plate to the lift cylinder and remove the plate and control valve spring.

6. Remove the three set-screws securing the rear cover plate to the lift cylinder and remove the plate and gasket. It should be noted that a copper sealing washer is fitted under the head of the screw located between the control valve and the lift cylinder. (See Fig. 20). This particular screw fits into the threaded end of a longitudinal passage through which oil is exhausted from the ram cylinder. (Also in communication with this passage is a small vertical drilling located close to the rear blanking plug at the bottom of the cylinder.)

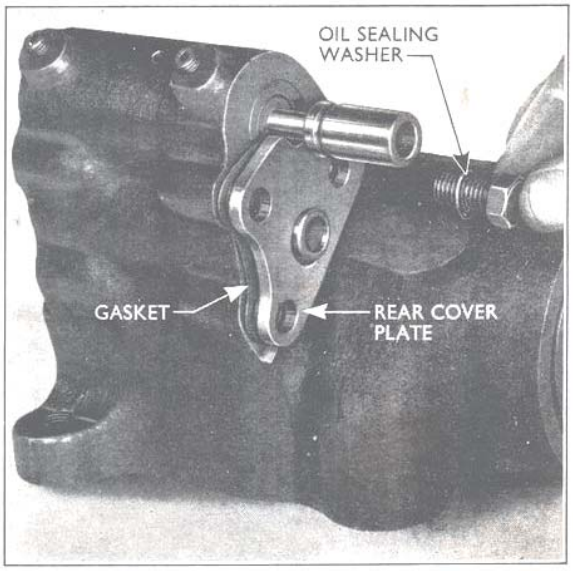


Fig. 20
Removing Rear Cover Plate from Cylinder

7. Remove the control valve, withdrawing it from the rear of the cylinder. Take great care in handling this valve to prevent damage or scoring of the lands, or distortion of the valve as a whole.

8. Attach removing adaptor T.8510–1/f to the main tool T.8510, screw the outer end of the adaptor into the unloading valve plug, at the front end of the unloading valve chamber, and withdraw the plug. (See Fig. 21.)

Note the annular recess in the plug which allows exhaust oil from the ram cylinder to by-pass the unloading valve. It is important that care is taken to avoid damage to the external surface of the plug as a leak past the plug will affect the operation of the lift. (See Fault Diagnosis.)

9. Remove the unloading valve from the front end of the cylinder and discard the ' O ' ring fitted to the large end of the valve.

10. Attach the short threaded end of extension T.8510–1/b to main tool T.8510 and pass the extension through the control valve bush so that the main tool remains at the front end of the cylinder. Screw the special nut T.8150–1/h onto the rear threaded end of the extension until it locates squarely on the rear face of the control valve bush, with the small taper on the front face of the nut located within the bush to centralise the tool. Operate the wing nut of the tool and withdraw the bush (see Fig. 22). Unscrew the special nut and remove the bush from the extension.

11. Pass the extension through the unloading valve bushes, attach the nut, locating it squarely against the rear end of the rear bush, and withdraw both bushes from the cylinder in one operation. (See Fig. 23.)

12. Remove the ram piston by applying air pressure through the safety valve hole whilst holding the thumb over the hole which is adjacent to it. (See Fig. 24.)

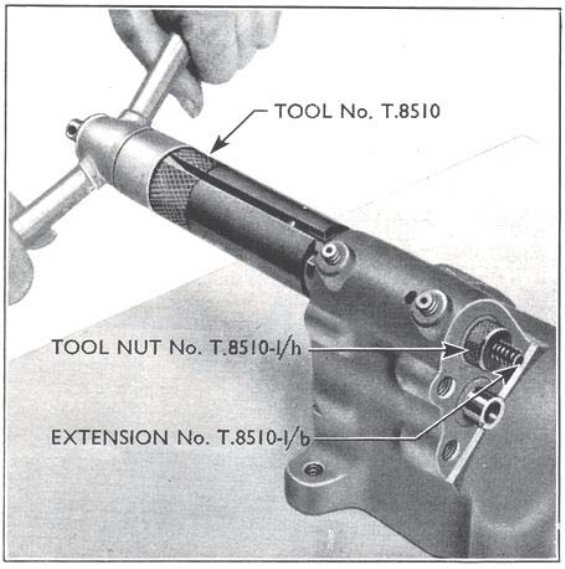


Fig. 22
Removing Control Valve Bush

CAUTION

Do not use excessive air pressure or the piston may fly out suddenly and cause injury or damage. Ordinary foot pump pressure is sufficient to move the piston.

13. Unless the piston gland is known to be giving an absolutely perfect seal it is recommended that the gland is discarded and a new one fitted on reassembly.

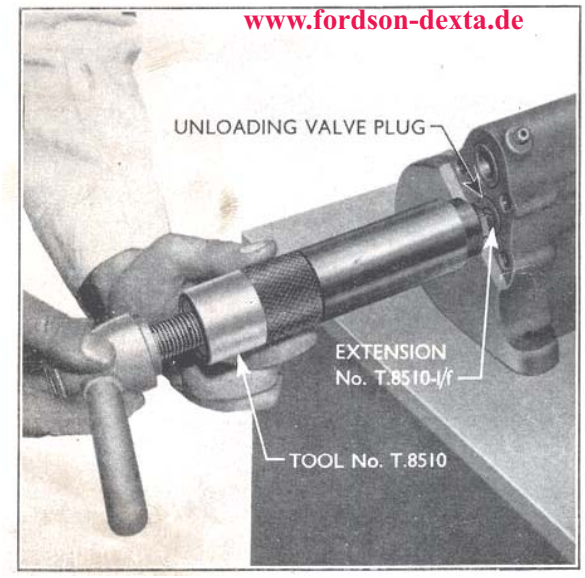


Fig. 21
Removing Unloading Valve Plug

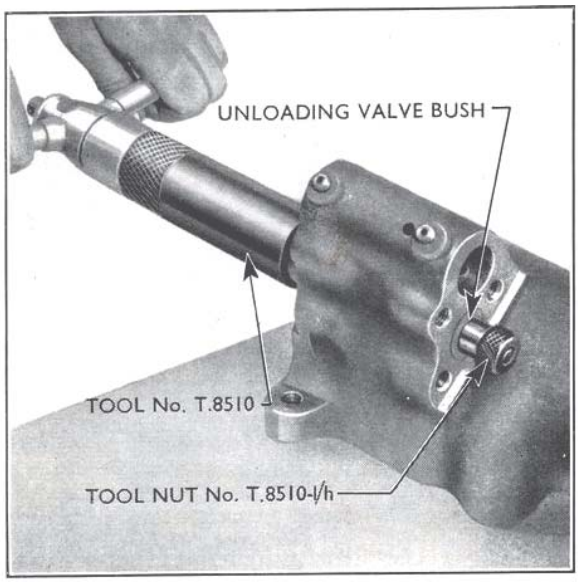


Fig. 23
Removing Unloading Valve Bush

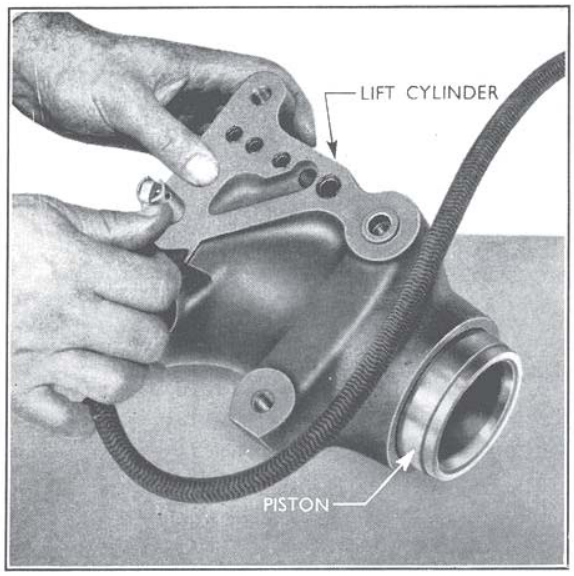


Fig. 24
Removing the Ram Piston

To Rebuild the Lift Cylinder Assembly

Owing to the extreme accuracy of the valves, bushings and sealing plugs used on the lift cylinder it is important that any part which is worn, scratched, distorted, or in fact damaged in any way, be discarded and only perfect parts fitted on reassembly. Each bush is a press fit in its respective bore in the cylinder and the control valve is a selective fit in its bush. All ' O ' rings and gaskets used for sealing purposes should be discarded and replaced by new parts on reassembly.

The outside of the lift cylinder bears colour spots (paint) at the front end of the cylinder, adjacent to the unloading valve and control valve bores, for identification of the bore size. The two unloading valve bushes and the control valve bush are similarly marked.

The colour spots should not be confused with a colour **streak** which is also placed adjacent to the control valve bore to indicate the **internal** diameter of the control valve bush. This streak is used to assist the original building of the unit during factory production and bears no relation to the size of a new bush when it is assembled in service.

1. Observe the colour spot on the outside of the cylinder adjacent to the front end of the unloading valve chamber and select a front and a rear unloading valve bush with corresponding colour markings.

Attach the short threaded end of extension T.8510–1/a to main tool T.8510 and, working from the front of the cylinder, pass the extension through the unloading valve bushing bore.

Place the unloading valve front bush over the extension and locate it at the entrance to the bore. The bush has a small single notch at one end, which should face into the bore, and two large notches at the opposite end, which must locate against the rear bush.

Place the unloading valve rear bush over the extension, making the assembly with the long spigot end facing away from the front bush.

Screw the special guide nut T.8510–1/e onto the extension and locate the adjacent spigot end of the rear bush in the counterbore in the nut. Lubricate the outside surfaces of both bushes and draw them into the bore (see Fig. 25) until the inner end of the spigot (i.e. the back face of the rear land) on the rear bush is flush with the rear face of the cylinder, i.e. the bushes are correctly located when the front face of the guide nut touches the rear face of the cylinder. The rear bush must be centralised correctly when making the assembly, otherwise difficulty may be experienced in obtaining entry into the bore.

NOTE.—It is important that the bushes are correctly located, i.e. neither under- nor over-flush with the rear face of the cylinder.

2. Release the special nut and withdraw the tool from the unloading valve bushes.

3. Observe the colour spot on the outside of the cylinder adjacent to the control valve bushing bore. Select a control valve bush with a similar colour marking. Insert guide and stop adaptor T.8510–1/k (spigot end foremost) into the front of the control valve bushing bore and, still working from the front of the cylinder, pass extension T.8510–1/a fitted to tool T.8510 through the guide. Locate the control valve bush over the extension. It will be noted that the lands of the bush vary in size and the assembly should be made with the widest land facing to the rear of the cylinder. (Counterbored end to front of cylinder.)

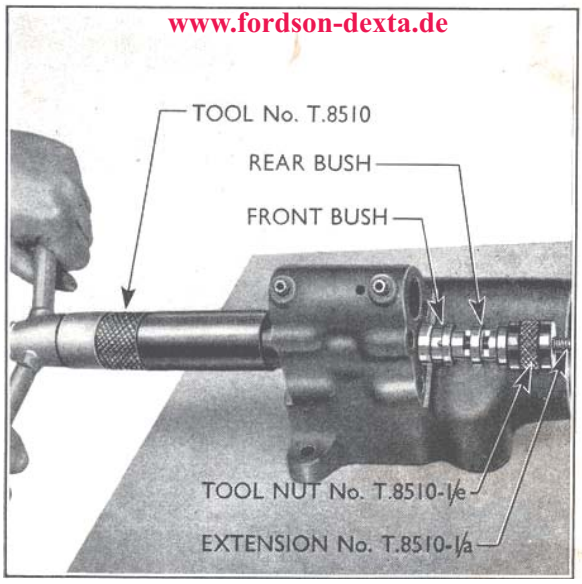


Fig. 25
Replacing the Unloading Valve Bushes

Lubricate the bush and, using nut T.8510–1/h to retain the bush and centralise the extension, pull the bush into the bore (see Fig. 26) until the front face of the bush meets the inner face of the guide.

Slacken the wing nut of the tool and reverse the guide, passing the spigot into the body of the tool so that the larger face of the guide is presented to the front face of the cylinder. Re-tighten the wing nut of the tool and draw the control valve bush fully into position to seat against the guide so that the front end of the bush is flush with the front face of the cylinder.

NOTE.—It is important that when finally positioned the front end of the bush is neither over- nor under-flush with the front face of the cylinder.

4. Instal a new ' O ' ring in the recess at the large end of the unloading valve, lubricate the valve and ' O ' ring and insert in the corresponding bushes in the lift cylinder. Make the assembly from the front of the cylinder with the large end of the valve facing towards the front.

5. The unloading valve plug is colour marked in the same manner as the unloading valve bush and a plug with a matching colour marking should be selected for assembly.

Fit the unloading valve plug to the front of the unloading valve chamber with the threaded central hole in the plug facing outwards.

Press the plug into the bore until the outer face is flush with the front face of the cylinder.

6. The control valve is colour marked to provide identification as to its diameter, but this should not be used as a means of selecting a valve to match the control valve bush. When the bush is pressed into its bore in the cylinder, the internal diameter becomes smaller in proportion to the amount of interference between bush and bore. When selecting a control valve, therefore, one should be chosen which, irrespective of colour markings, is the largest which will operate within the bush without binding. It is, therefore, extremely important that both the internal surface of the bush and the external surface of the valve lands are completely free from burrs and that care is taken when handling the valve to prevent distortion.

7. Having decided on a particular size of valve, it should be left in the bush and retained by replacement of the rear cover plate, using a new gasket and securing the plate to the rear face of the cylinder with three set-screws.

Fig. 27
Replacing Cylinder Front Cover Plate

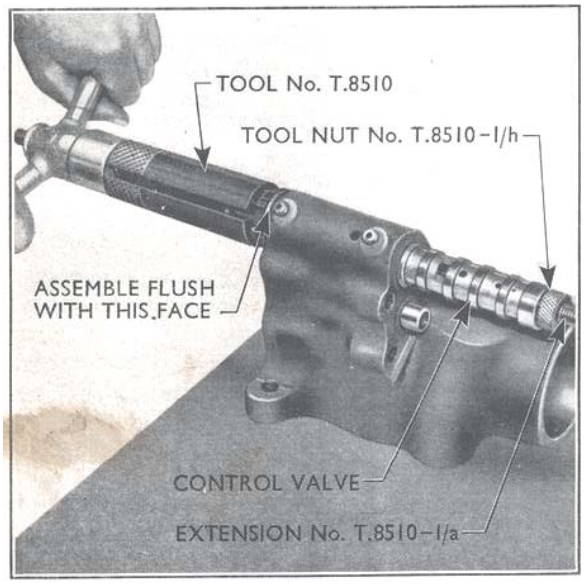


Fig. 26
Replacing the Control Valve Bush

Fig. 28
Replacing Ram Cylinder Safety Valve

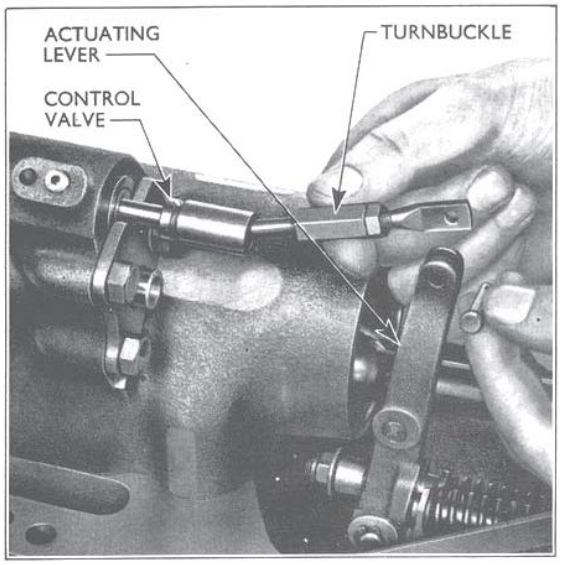


Fig. 29
Replacing Control Valve Turnbuckle

NOTE.—Remember that the set-screw located between the control valve and the ram cylinder fits into the end of a longitudinal exhaust passage in the cylinder. A copper sealing washer must therefore be fitted under the head of this particular screw to obviate oil leaks from the passage. (See Fig. 20.)

8. Replace the control valve spring in the recess in the front cover plate and reassemble the plate to the cylinder. (See Fig. 27.) Retain with three set-screws.

9. Turn the cylinder and assemble the two ring dowels (if they have been removed) in the diagonally opposing counterbored holes in the top face of the cylinder.

10. Fit a new gland to the ram piston, lubricate both gland and piston and assemble to the cylinder.

11. Replace the cylinder safety valve assembly, using a new gasket between the valve and the cylinder. (See Fig. 28.)

To Replace the Lift Cylinder

1. Ensure that the top surface of the cylinder and the mating face on the cover are clean and free from scores or burrs.

2. Fit new ' O ' rings in the counterbores of the oil passages, refit the cylinder to the cover and fully tighten the retaining screws.

3. Replace the control valve turnbuckle assembly securing the rear end to the control valve actuating lever with the appropriate cotter pin and split pin (see Fig. 29). Insert the forward end of the ram piston connecting rod within the piston and carry out the qualitrol linkage and position control adjustment as previously described.

Refit the auxiliary service plate, assemble lift cover assembly to the tractor and replace the driver's seat as previously described.

To Dismantle the Lift Cover Assembly

1. Remove the lift cylinder assembly from the cover, as previously described, and disconnect the ram piston connecting rod from the lift ram arm.

2. Remove the lift cover from the vice and place it on the bench so that it rests on its top face, suitably supported to protect the machined surfaces.

3. Unscrew the main control spring plunger yoke and remove the main control spring.

4. Remove the three set-screws retaining the main control spring seat support to the rear of the lift cover and withdraw the seat, seat support, felt ring and plunger locking plate.

5. Straighten the lock washer tab and remove the screw and flat washer retaining each lift arm to the lift cross-shaft.

6. Remove the two lift cross-shaft bushes and withdraw the cross-shaft from the lift cover leaving the ram arm in the cover.

7. Pull the control valve actuating lever towards the rear of the lift cover, so compressing the qualitrol override spring. Remove the self-locking nut and flat washer retaining the qualitrol bushing to the qualitrol link rod.

8. Remove the main control lever from the friction plate after extracting the two securing screws.

9. Remove the self-locking nut, double coil spring washer and flat washer securing the friction plate to the lift control lever shaft, and withdraw the friction plate, woodruff key and cork friction disc.

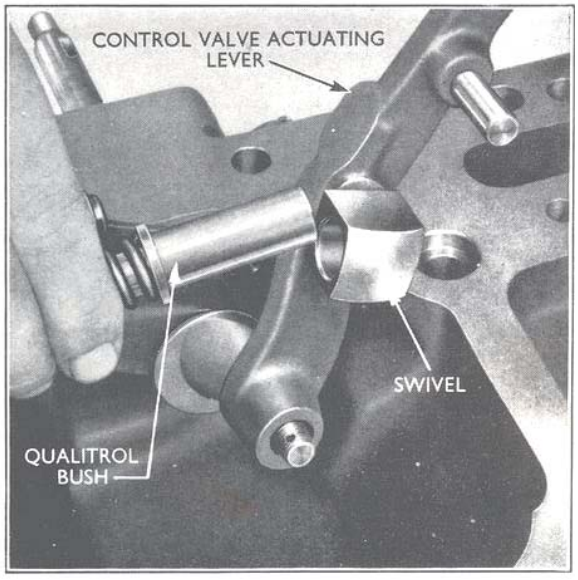


Fig. 30
Removing Control Valve Actuating Lever

10. Remove the four screws and spring washers that secure the quadrant assembly to the lift cover and slide the quadrant assembly from the lift control lever shaft. Remove the flat washer fitted between the inner end of the quadrant and the position control arm.

11. Remove the split pin, nut and flat washer securing the control valve actuating lever assembly to the lift control lever shaft and slide the actuating lever and swivel assembly forward off the qualitrol bush (see Fig. 30). Withdraw the actuating lever from the lift control lever shaft and remove it from the lift cover. If necessary, remove the swivel from the actuating lever after extracting the special snap ring.

12. Remove the qualitrol bush and override spring from the qualitrol link rod.

13. Rotate the lift ram arm to its most forward position and remove the qualitrol link and main control spring plunger assembly from the cover. Dismantle this assembly by removing the split pin and cotter pin securing the link rod to the plunger.

14. Remove the split pin and washer that retain the selector control link to the selector control arm.

15. Remove the position control assembly and the lift control lever shaft from the lift cover and slide the shaft from the position control arm.

To Dismantle the Position Control Linkage Assembly

(i) Remove the split pin and cotter pin retaining the selector control link to the position control cam and remove the link.

(ii) Remove the split pin and cotter pin securing the position control arm to the position control cam and remove the cam.

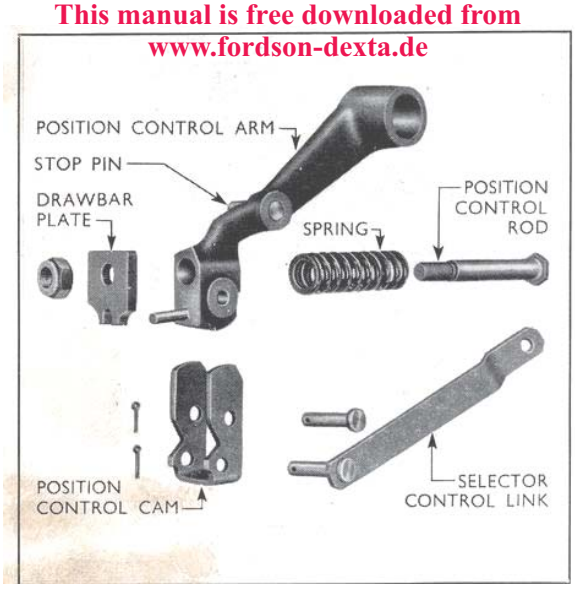


Fig. 31
Position Control Linkage Assembly

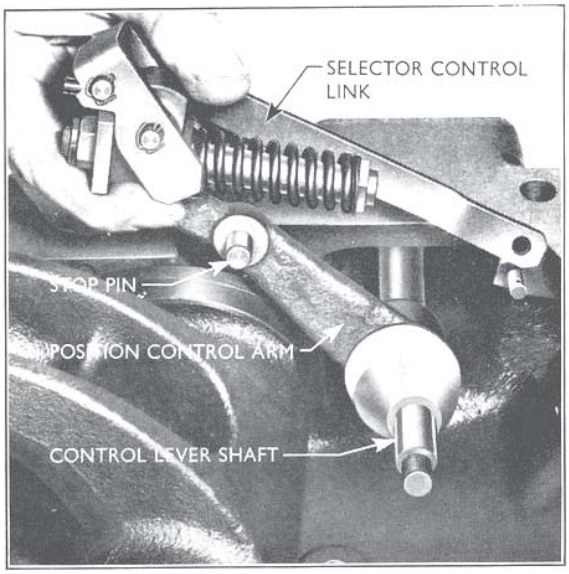


Fig. 32
Assembly of Position Control Linkage to Cover

(iii) Release the position control rod, spring and drawbar plate from the position control arm by removing the self-locking nut.

To Rebuild the Position Control Linkage Assembly

(i) Assemble the position control spring to the rod and insert in the position control arm, making the assembly from the opposite side to the drawbar plate guide pin.

(ii) Assemble the drawbar plate (non-cambered face inwards) to the threaded end of the rod with the slot in the plate engaging with the drawbar plate guide pin in the control arm. Retain with a new self-locking nut.

(iii) Locate the position control cam on the arm, with the straight side of the cam facing away from the drawbar plate guide pin, and insert a cotter pin through the holes nearest the open end of the cam and the corresponding hole in the control arm. Secure with a split pin.

(iv) Secure the selector link to the cam with a cotter pin and split pin. Make the assembly with the longer straight end to the cam and the crank in the link facing inwards, the link to be on the outside of the cam on the opposite side to the stop pin in the arm. (See Fig. 31.)

16. Remove the ram arm from the lift cover.

17. Remove the pin securing the selector lever to the selector control arm and remove the selector control arm from its location in the lift cover.

To Rebuild the Lift Cover Assembly

1. Instal the selector control arm in its appropriate bore in the lift cover and fit the selector lever to the arm, securing it with the special split retaining pin.

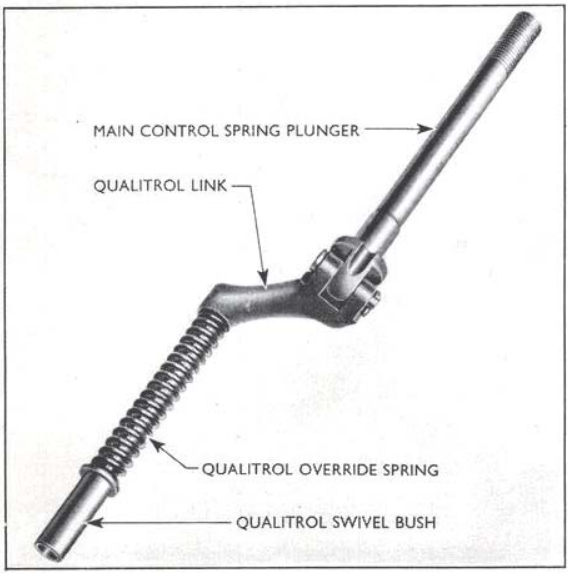


Fig. 33
Qualitrol Link and Control Spring Plunger Assembly

2. Place the ram arm in the cover with the machined cam on the same side as the selector control arm.

3. Assemble the lift control lever shaft to the position control assembly with the eccentric on the shaft on the same side as the large stop pin on the position control arm.

4. Place this assembly in the lift cover with the eccentric on the shaft facing inwards (see Fig. 32) and connect the selector control link to the selector control arm. Secure with a flat washer and split pin.

5. Assemble the main control spring plunger to the qualitrol link with the slot in the plunger facing away from the fork in the link and secure with a clevis pin and split pin. Assemble the qualitrol override spring and bush to the qualitrol link assembly with the flange on the bush adjacent to the spring. (See Fig. 33.)

6. Fit the qualitrol swivel to the control valve actuating lever, with the swivel on the same side as the piston stop pin. Secure with the special snap ring.

7. Fit the qualitrol link assembly to the control valve actuating lever assembly, passing the qualitrol bushing through the swivel so that the machined pad on the rear side of the lever faces towards the qualitrol override spring.

8. Position the resulting assembly in the lift cover so that the main control spring plunger protrudes through the rear of the cover and the qualitrol swivel faces the centre of the housing. (See Fig. 34.)

9. Rotate the lift ram arm to its most rearward position and connect the inner end of the control valve actuating lever to the main control lever shaft, securing it with a flat washer, castellated nut and split pin.

10. Replace the quadrant assembly with the appropriate washer between the inner end of the quadrant and the position control arm. Use a new gasket between cover and quadrant and secure with four screws and spring washers.

11. Compress the qualitrol override spring by pulling the control valve actuating lever towards the rear of the lift cover and fit the flat washer and self-locking nut to the end of the qualitrol link. Tighten the nut until it seats securely against the shoulder on the link. (See Fig. 35.)

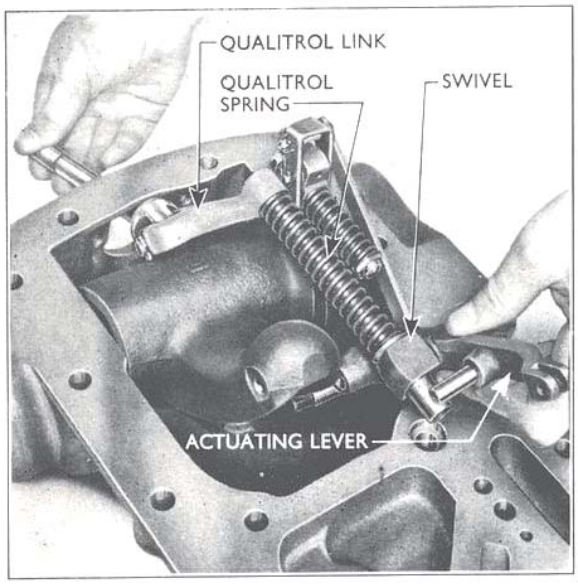


Fig. 34
Assembly of Qualitrol Linkage to Cover

Fig. 35
Retention of Qualitrol Link to Swivel

12. Instal the lift cross-shaft, picking up the master spline in the ram arm on the corresponding master spline on the centre of the shaft. (See Fig. 36.)

13. Assemble the cross-shaft bushes, one on either side of the shaft, and position them flush with the side of the cover.

14. Fit the lift arms to the lift cross-shaft, picking up the master splines at the outer ends of the shaft. Fit a retaining washer, locking tab and retaining set-screw to each end of the shaft. Tighten the screws until the lift arms just drop under their own weight with no end play between the arms and the housing. Secure in this position by bending the locking tabs against the heads of the screws.

NOTE.—Over-tightening the screws will cause the lift arms to " bind " and adversely affect the operation of the lift.

15. Fit the cork friction disc and woodruff key to the main control lever shaft.

16. Assemble the friction plate over the woodruff key and retain on the control lever shaft with a flat washer, double coil spring lockwasher and self-locking nut. Do not fully tighten the nut.

17. Secure the main control lever to the friction plate with two set-screws and spring washers.

18. Tighten the self-locking nut on the control lever shaft to give a resistance of 4 to 5 lbs. (1.814 to 2.268 kg.) at the ball end of the main control lever.

19. Instal new " O " rings in the cylinder assembly and assemble the cylinder to the cover. Attach the control valve turnbuckle to the control valve actuating lever as previously described.

20. Attach the ram piston connecting rod to the ram arm, using the appropriate cotter pin and split pin, and place the forward end of the rod within the piston.

Fig. 37
Assembly of Main Control Spring Plunger Locking Plate

21. Fit the main control spring plunger locking plate so that the pin on the plate registers with the slot in the forward end of the plunger. (See Fig. 37.)

22. Fit a new felt seal in the counterbore in the front end of the main control spring seat and place this assembly over the main control spring plunger to locate against the rear face of the locking plate. Locate the spring seat support over the seat and

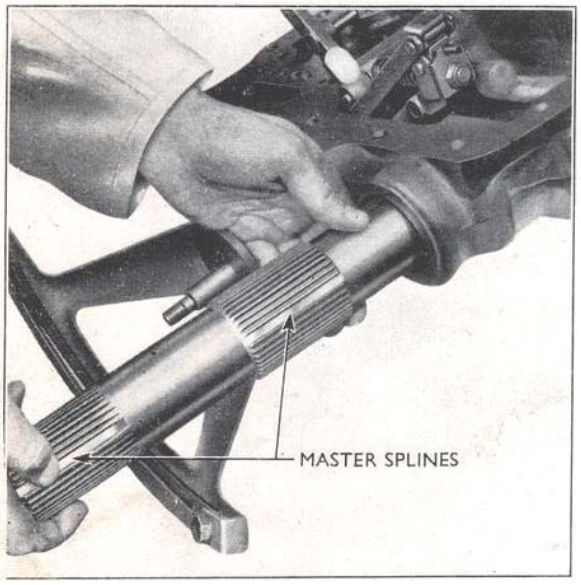


Fig. 36
Assembly of Lift Cross-shaft to Cover

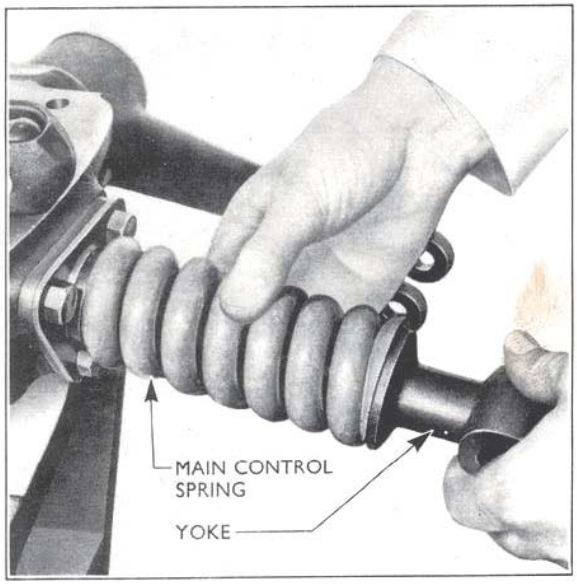


Fig. 38
Main Control Spring Adjustment

plunger locking plate, and secure to the rear of the lift cover with three set-screws.

23. Position the main control spring on the spring seat and screw the yoke onto the plunger. Tighten the yoke until the main control spring may be just rotated with the finger and thumb of one hand. (See Fig. 38.)

24. Carry out the adjustments to the main control spring, qualitrol linkage and position control linkage, as previously described.

25. Instal new " O " rings in the auxiliary service control plate and fit the plate to the cover.

26. Replace the lift assembly on the rear transmission housing, as previously described, using a new gasket between the cover and the transmission housing and fitting new " O " rings at the inlet and outlet passages in the side of the rear transmission housing.

27. Connect the main control spring yoke to the rocker, attach the top link to the rocker and the lifting rods to the lift arms.

28. Refit the seat, attach an implement and test the lift for operation by raising and lowering the implement several times.

EXHAUST OIL FILTER AND BACK PRESSURE VALVE ASSEMBLY

To Remove

1. Remove the hydraulic lift cover assembly as previously described.

2. Remove the screw retaining the exhaust oil pipe to the right-hand side of the transmission housing. (See Fig. 39.)

3. Lower the assembly until the exhaust oil pipe is free from the passage in the transmission housing top flange and then withdraw the complete exhaust oil filter and back pressure valve assembly through the hydraulic lift cover aperture in the rear transmission housing.

To Replace

First discard the " O " sealing ring fitted to the upper end of the exhaust pipe, and also those fitted to the counterbores of the exhaust and inlet oil passages in the rear transmission housing top flange.

1. Enter the assembly to the rear transmission housing and push the exhaust filter pipe into the passage in the top flange of the housing until it protrudes from the top of the passage a sufficient amount to enable the new " O " sealing ring to be assembled to the groove in the upper end of the pipe.

2. Pull the assembly downwards to locate the " O " sealing ring and assemble the retaining screw in the side of the transmission housing picking up the captive nut in the exhaust oil pipe bracket.

3. Fit new " O " sealing rings to the counterbores of the inlet and exhaust oil passages in the top of the rear transmission housing flange and refit the hydraulic lift top cover assembly as previously described, using a new gasket between cover and rear transmission housing.

To Overhaul the Back Pressure Valve

1. Remove the complete exhaust oil filter and back pressure valve assembly as previously described.
2. Release the wire retainer from its groove in the internal bore of the back pressure valve body.
3. Remove the spring seating plate followed by the spring.
4. Extract the valve from the body.

Before rebuilding the valve assembly the surface of the valve and the internal bore of the body should be checked for damage or scoring. The valve should be perfectly free to slide in the body which should also be free from dirt or obstruction.

If necessary check the tension of the spring (see Specification). To rebuild the valve assembly, reverse the dismantling procedure and then replace the complete exhaust oil filter and pressure valve assembly in the rear transmission housing as previously described.

To Renew the Exhaust Oil Filter

Normally, this filter will not require replacing, excepting when major overhauls are being carried out on the hydraulic lift and rear transmission assemblies.

1. Remove the complete exhaust oil filter and back pressure valve assembly as previously described.
2. Unscrew the back pressure valve from the exhaust oil pipe.
3. Remove the plain washer and rubber washer from the base of the filter and withdraw the filter from the exhaust oil pipe.
4. Remove the rubber sealing washer, plain washer and spring from above the filter.

Renew the rubber sealing washers if they show signs of deterioration and refit the new filter by reversing the dismantling procedure.

Refit the complete exhaust oil filter and back pressure valve assembly to the rear transmission housing as previously described.

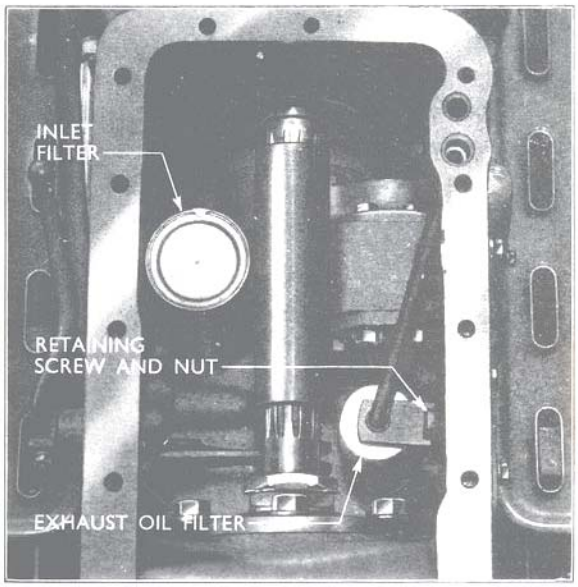


Fig. 39
Location of Exhaust Oil Filter Assembly

FAULT DIAGNOSIS

A logical sequence of checks based on observation of symptoms provide the most rapid means of diagnosing faults in the hydraulic system. By carefully watching the operation of the hydraulic lift, conclusions may be quickly reached as to which of the conditions below are applicable and the remedies necessary to correct these faults.

The more likely causes are listed first, and, as these are eliminated, the more complex points are considered.

All external features affecting the operation of the lift, such as type and condition of implement, its setting, method of attachment and the ground conditions on which it is being operated, should be taken into consideration and any deviation from standard corrected before attempting to diagnose any particular fault on the hydraulic system.

1. Failure to Lift

(*a*) Check that the auxiliary service control knob is moved to its innermost position.

(*b*) Check that the transmission oil level is correct and that the correct grade of oil is being used.

(*c*) If the failure to lift occurs when the system is under Qualitrol, place the selector lever in Position Control and move the main control lever to the top of the quadrant to establish if the failure is confined to the Qualitrol system.

If the system fails to operate under Qualitrol only, remove the lift cover assembly and check the Qualitrol linkage adjustment as previously described.

(*d*) If the failure occurs on both Qualitrol and Position Control, check both the qualitrol and position control linkage adjustment. At the same time check over the linkage to see that there is no question of distortion or binding.

(*e*) If these adjustments are correct and there are no obvious signs of discrepancies in the linkage, check the ram piston gland and replace if it is not making a perfect seal.

(*f*) Check the lift cylinder safety valve and ensure that the sealing washer is in good condition and seating correctly. If necessary replace the safety valve with one which is known to be satisfactory. Attempts should not be made to dismantle this valve.

(*g*) Check the back pressure valve fitted to the exhaust filter, and the exhaust filter itself, as any failure to hold the back pressure in the system will result in faulty operation of the unloading valve.

(*h*) Check the inlet filter to the pump for blockage.

(*i*) If the trouble is still not located, replace the hydraulic lift cover assembly and either carry out a pressure test on the pump, or replace the pump with one which is known to be correct.

2. Rapid Corrections during Operation or in the Raised Position

As explained under the description of operation of the hydraulic system, any internal leakage of oil will be automatically corrected by the lift linkage moving the control valve into the " Raising " position. If the leak is substantial, " bobbing " of the implement will occur, caused by a continuous rise and fall of the lift arms.

The standard test for this condition is as follows :

1. Attach a weight of approximately 1,250 lbs (567 kg.) to the ends of the lower links or connect up a suitable implement.
2. Move the selector lever downwards to the Qualitrol position.
3. Move the main control lever to the top of the quadrant to a point .5 in. (12.7 mm.) from the stop.
4. Start the engine and observe the operation of the lift arms. The arms should move to the fully-raised position and remain there. During a period of two minutes, not more than three corrections of the linkage should occur.

If the rate of correction is in excess of the above figure, the lift cover assembly should be removed and the following points checked :—

(*a*) Remove the check valve and examine the check valve seat for chipping or scoring; examine the ball and replace if the surface is eroded or damaged; check the spring poundage (see specification).

(*b*) Remove the lift cylinder rear cover and examine the condition of the gasket; also that of the washer and the securing screw which fits into the longitudinal passage in the lift cylinder.

(*c*) Remove the control valve, check the surface of the lands for scoring or damage, and ensure that it fits correctly.

(*d*) Remove the unloading valve plug and check the fit in the forward end of the unloading valve chamber. Examine the surface of the plug and the chamber to ensure that a good seal is being obtained.

(*e*) Remove the unloading valve and check that the valve fits correctly and that the " O " ring is in good condition. It is recommended that this " O " ring is renewed irrespective of its apparent condition.

(*f*) Check that the " O " rings between the lift cylinder and the top cover, and also between

the auxiliary service plate and the cover, are in good condition. No matter what their condition, it is recommended that new seals be fitted on reassembly. Examine the machined surfaces of the cylinder and plate and the mating surfaces of the top cover.

(*g*) Remove the ram piston and ensure that the piston gland is sealing correctly.

(*h*) Check the Qualitrol and Position Control adjustment, as previously described, before reassembling the lift cover to the tractor.

3. Erratic Action or Over-Correction

This will usually be indicative of an inoperative control valve, binding of the control valve linkage, or over-tightening of the lift arm securing screws.

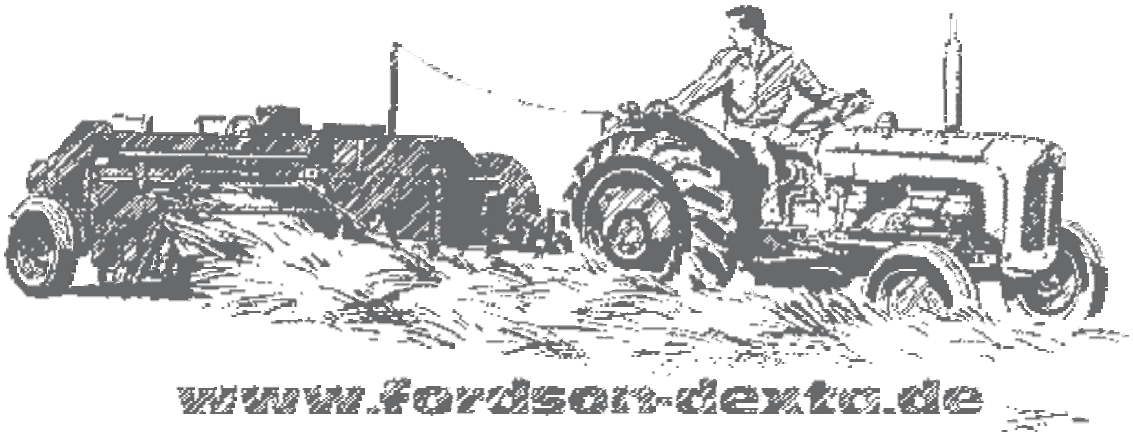
(*a*) Check the adjustment of the lift arm securing screws, which should be tightened until the lift arms will just drop under their own weight.

(*b*) Remove the lift cover assembly and check the control valve for freedom of movement.

(*c*) Check the main control spring plunger for freedom of movement; in particular, see that it is free to move on the locking pin in the rear plate.

(*d*) Check the qualitrol link for scoring or binding at the swivel bush.

(*e*) When installing the cover assembly, check that the main control spring yoke moves freely in the rocker.



HYDRAULIC LIFT SPECIFICATIONS

Lift Cylinder

Ram cylinder diameter .. .. 2.9995 to 3.0010 ins. (76.19 to 76.23 mm.)
Ram piston diameter .. .. 2.998 to 2.999 ins. (76.15 to 76.18 mm.)

Control valve spring :
No. of coils 19
Length .. 1.45 ins. under load of 24.5 to 28.5 lb. (36.83 mm. under load of 11.11 to 12.93 kils.)

Cylinder safety valve :
Blow-off pressure .. .. 2,400 lb. per sq. in. (168.73 Kilogram per sq. cm.)

Control and Unloading Valve Bush Bores

Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
White	.9996 to .9998	25.390 to 25.395
Blue	over .9998 to 1.0000	25.395 to 25.400
Yellow	over 1.0000 to 1.0002	25.400 to 25.405
Green	over 1.0002 to 1.0004	25.405 to 25.410
Orange	over 1.0004 to 1.0006	25.410 to 25.415

Control and Unloading Valve Bushes and Unloading Valve Plug

Colour Marking	*Outside Diameter (ins.)*	*Outside Diameter (mm.)*
White	1.0002 to 1.0004	25.405 to 25.410
Blue	over 1.0004 to 1.0006	25.410 to 25.415
Yellow	over 1.0006 to 1.0008	25.415 to 25.420
Green	over 1.0008 to 1.0010	25.420 to 25.425
Orange	over 1.0010 to 1.0012	25.425 to 25.430

Control Valve

Colour Marking	*Outside Diameter (ins.)*	*Outside Diameter (mm.)*
White	.5917 to .5919	15.029 to 15.034
Blue	over .5919 to .5921	15.034 to 15.039
Yellow	over .5921 to .5923	15.039 to 15.044
Green	over .5925 to .5926	15.049 to 15.052
Orange	over .5927 to .5928	15.055 to 15.057

Tightening Torque Figures	*lbs./ft.*	*kg./m.*
Lift top cover to transmission housing screws ..	30 to 35	4.15 to 4.84
Lift cylinder to top cover screws	40 to 45	5.53 to 6.22
Auxiliary service plate to top cover screws ..	30 to 35	4.15 to 4.84
Front cover plate to lift cylinder screws	17 to 22	2.35 to 3.04
Rear cover plate to lift cylinder screws	17 to 22	2.35 to 3.04
Hydraulic pump to transmission housing screws	30 to 35	4.15 to 4.84
Hydraulic pump through bolts	40 to 45	5.53 to 6.22
Control lever quadrant to shaft nut	4 to 5 lb*	1.814 to 2.268 kg.*
Check valve plug	45 to 55	6.22 to 7.60

* Measured at ball of main control lever

Back pressure valve :
- Blow-off pressure .. .. 23 to 26 lb/sq. in. (1.62 to 1.83 kg/sq.cm.)
- Spring length .. .74 in. under load of 2.28 to 2.52 lb. (18.8 mm. under load of 1.03 to 1.14 kg.)

Hydraulic Pump

Flow capacity .. .. 3.68 Imp. gal. (16.72 Litre) at 1,550 r.p.m.

Relief valve :
- Thickness of shim .. .. .010 in. (.254 mm.), .025 in. (.635 mm.)
- Blow-off pressure .. .. 2000 to 2200 lb. /sq.in. (140.6 to 154.7 kg./sq. cm.)

Relief valve :
- Maximum thickness permissible .. .. .080 in. (2.032 mm.)

Lift Cover

Check valve bore diameter .. .. .749 to .750 in. (19.025 to 19.05 mm.)

Check valve seat :
- Land diameter (Rear of " O " ring) .. .. .7510 to .7505 in. (19.08 to 19.06 mm.)

Cross-shaft journal diameter .. .. 1.998 to 1.996 in. (50.75 to 50.70 mm.)

Cross-shaft bush diameter :
- Outside diameter .. .. 2.370 to 2.372 in. (60.20 to 60.25 mm.)
- Inside diameter .. .. 2.001 to 2.003 in. (50.83 to 50.88 mm.)

Position control spring :
- No. of coils 10.7
- Length .. 1.96 ins. under load of 72 ± 6 lbs. (49.78 mm. under load of 32.66 ± 2.72 kg.)
  1.52 ins. under load of 152 ± 10 lbs. (38.61 mm. under load of 68.95 ± 4.54 kg.)

Check valve spring :
- No. of coils 9.5
- Length .. 0.70 in. under load of 10.2 to 12.2 lbs. (17.78 mm. under load of 4.65 to 5.53 kg.)

Qualitrol override spring :
- No. of coils 18
- Length .. 3.58 ins. under load of 105 ± 7 lbs. (90.93 mm. under load of 47.63 ± 3.18 kg.)
  3.21 ins. under load of 177 ± 10 lbs. (81.53 mm. under load of 80.29 ± 4.54 kg.)

Qualitrol swivel bore .. .. .631 to .633 in. (16.03 to 16.08 mm.)

Qualitrol swivel bush :
- Outside diameter .. .. .627 to .629 in. (15.93 to 15.98 mm.)
- Inside diameter .. .. .439 to .442 in. (11.15 to 11.23 mm.)

Auxiliary service tapping .. .. ½ in. B.S.P.

Auxiliary Service Control Valve Bore in Plate		
Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
White	.7490 to .7493	19.025 to 19.032
Blue	over .7493 to .7496	over 19.032 to 19.040
Yellow	over .7496 to .7500	over 19.040 to 19.050

Auxiliary Service Control Valve		
Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
White	over .7485 to .7488	over 19.012 to 19.020
Blue	over .7488 to .7491	over 19.020 to 19.027
Yellow	over .7491 to .7494	over 19.027 to 19.035

HYDRAULIC PUMP

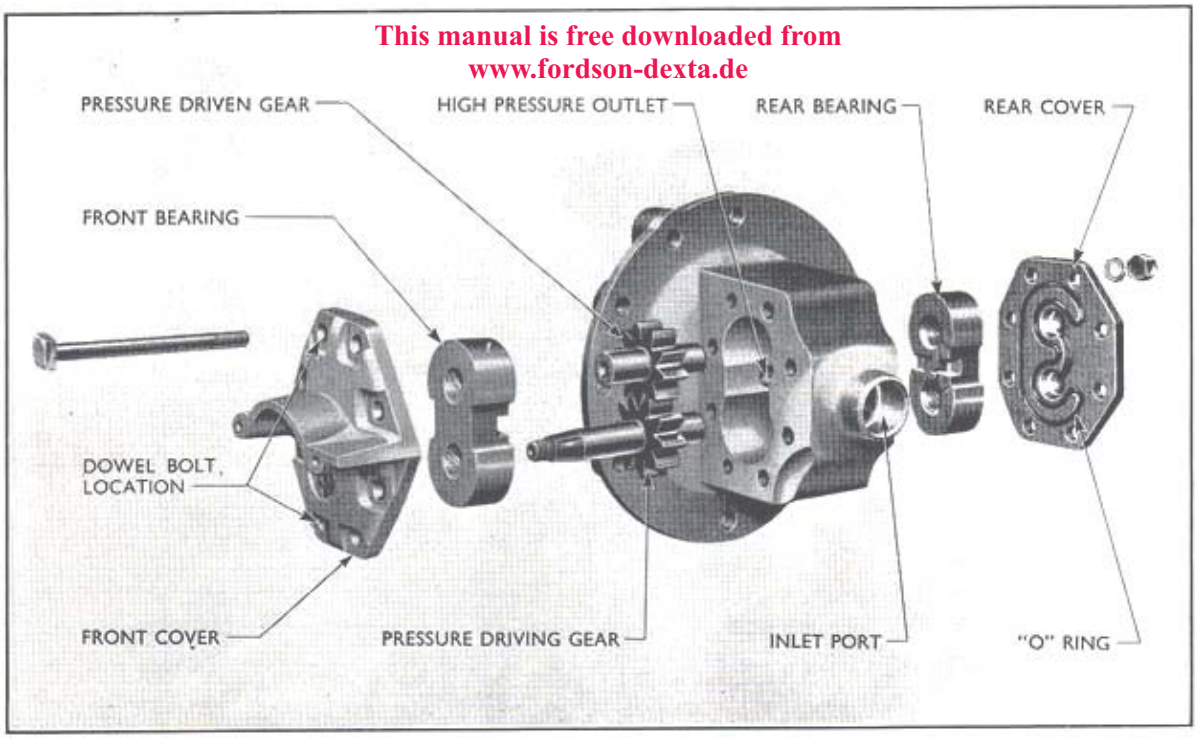


Fig. 40
Hydraulic Pump Assembly

General Description

The hydraulic pump is flange-mounted on the right-hand side of the rear transmission housing and is gear driven from the rear of the power take-off countershaft, which passes through the gearbox.

Two spur type gears, producing high pressure oil for operation of the hydraulic power lift, are mounted in specially designed bearing blocks, which are a precision fit in the pump housing. The pump pressure driving gear is integral with its shaft, the front of which protrudes through the pump front cover plate and is suitably tapered to accept an external gear which is keyed to the shaft. This external gear meshes with a driving gear which is splined to the power take-off countershaft. The hydraulic pump is, therefore, in constant operation whenever the engine is running in any gear, including neutral, provided the clutch is engaged.

Features of this arrangement are that—

(1) It is not necessary for the power take-off selector lever to be in the engaged position in order to operate the hydraulics, and

(2) When a " Live " power take-off is fitted the transmission clutch may be disengaged without affecting the drive to the pump.

Rotation of the pressure gears within the pump housing draws oil from the rear transmission housing, through a gauze type strainer into the inlet side of the pump. The strainer is directly mounted in the inlet port of the pump and incorporates a magnetic plug which collects any fine ferrous particles of metal which may be present in the oil.

On entering the pump the oil fills the gear tooth spaces and is carried around the housing, by the closely fitting gears, to the point where the teeth in the two gears come into mesh. The oil is then thrust out from between the teeth and delivered through an outlet port to a passage formed in the pump flange. This passage has a spring-loaded pressure relief valve fitted at its lower end, which is set to blow off at 2,100 to 2,300 lbs. per sq. inch and so prevent damage should the pump be overloaded. At its upper end the passage connects with a vertical drilling in the rear transmission casing which leads to the hydraulic lift.

An oil duct is incorporated on the high pressure side of the pump bearings to allow high pressure oil to be directed from the gears to the back faces of the bearings, where it is trapped between the bearings and their respective cover plates. An ' O ' ring is fitted in a specially shaped groove in each cover plate to ensure positive sealing between the bearing and

its corresponding cover plate. The effect of this design is to pressure load the bearings towards the gears, thus keeping end-float to a minimum, providing automatic compensation for wear, and ensuring maximum efficiency from the pump.

On the low pressure side of the pump a duct in each bearing, together with spiral grooves in the bearing bores and small reservoirs in the cover plates, ensure a continuous flow of low pressure oil to the bearing surfaces for lubrication purposes.

A special seal, fitted between the front cover and the pump drive gear, safeguards the pump by keeping out air should the operator inadvertently allow the oil level in the rear axle to drop below the safe level. This seal should always be fitted with the sealing edge (i.e. spring side of seal) facing outwards from the pump cover.

To Remove the Pump Pressure Relief Valve

For illustration purposes, the pump pressure relief valve assembly is shown " exploded " in Fig. 41, after the pump has been removed from the tractor, but it should be noted that servicing of this item may be accomplished whilst the pump is still mounted in the transmission housing.

1. Remove the plug and special sealing washer from the base of the relief valve chamber in the pump mounting flange.

2. Extract the relief valve and body assembly.

3. Remove the ' O ' sealing ring from the upper end of the valve body.

4. Hold the body, unscrew the spring retainer and extract the shims fitted between the end of the spring and the retainer. Make a note of the number of shims fitted, and of their thickness. These shims control the maximum working pressure of the pump and it is important that the correct thickness of shim is fitted when reassembling (see Specification).

5. Remove the relief valve plunger from the upper portion of the valve body.

To Reassemble the Pump Pressure Relief Valve

1. Examine the relief valve plunger for signs of scoring or wear. Similarly, examine the valve seat

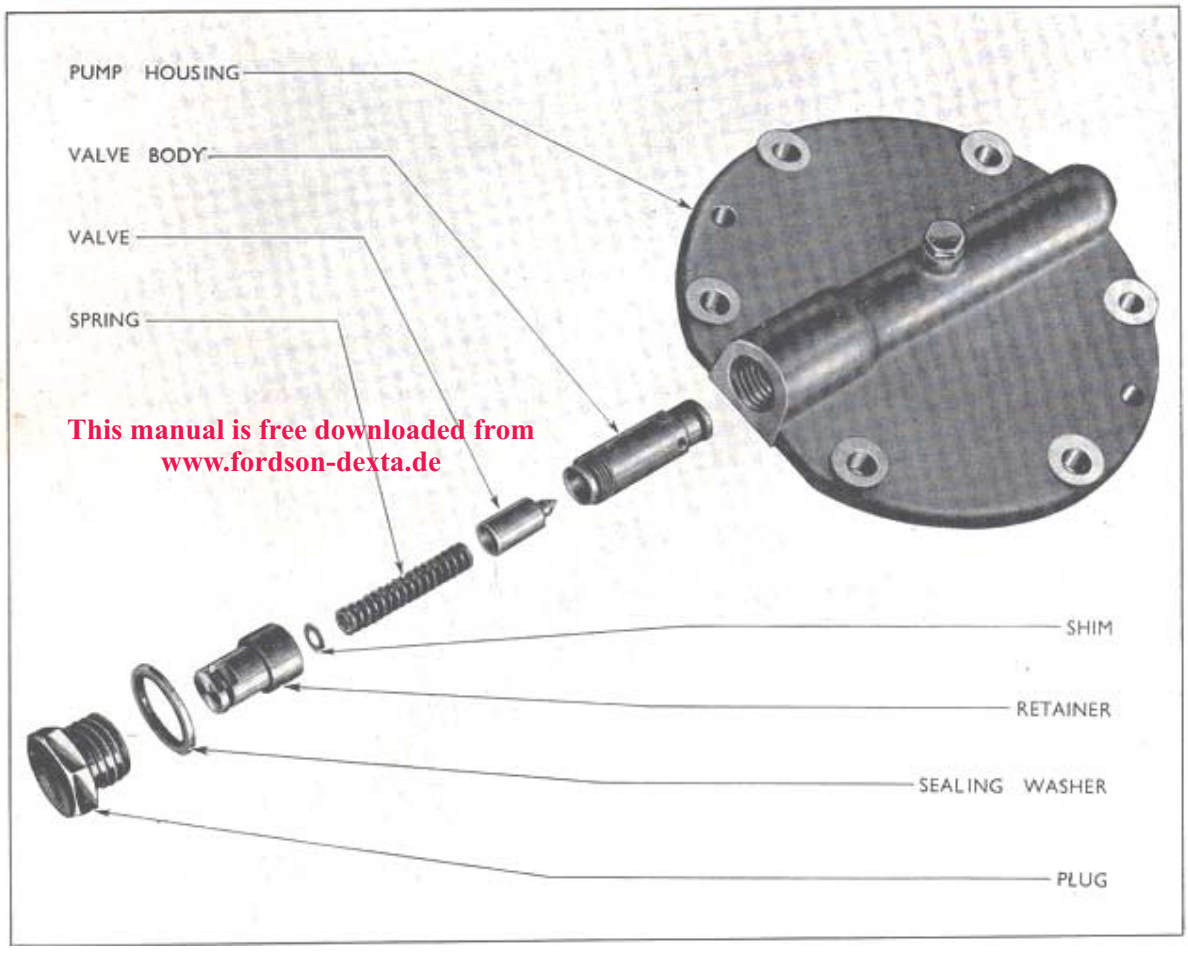


Fig. 41
Hydraulic Pump Pressure Relief Valve Assembly

in the upper body and ensure that an even seat marking is being obtained.

2. Replace the shims in the bore of the spring retainer and install the spring. (See ' Testing the Hydraulic Pump ').

3. Assemble the retainer and spring assembly to the valve body and fully tighten the retainer.

4. Fit a new ' O ' sealing ring in the annular recess in the top of the valve body.

5. Replace the relief valve assembly in the pump, fit a new sealing washer to the end plug and replace the plug in the threaded end of the relief valve chamber. Securely tighten the plug.

To Remove the Hydraulic Lift Pump

1. Drain the oil from the rear transmission housing.

2. Remove the right-hand footplate and disconnect the right-hand brake operating rod.

3. Remove the hydraulic lift cover assembly as described on page 13.

NOTE.—It is possible to remove the pump without disturbing the hydraulic lift cover assembly but replacement is much easier if the cover is also removed. In addition, to service the pump inlet strainer necessitates either removal of the hydraulic lift top cover or splitting the rear axle away from the gearbox.

4. Extract the screws retaining the pump flange to the right-hand side of the rear transmission housing.

5. Remove the pump assembly and withdraw the inlet strainer through the hydraulic lift aperture in the top of the rear transmission housing. The inlet strainer should be withdrawn, examined and cleaned whenever the hydraulic pump is removed for servicing.

To Dismantle the Hydraulic Lift Pump

1. Remove the two screws and locking washers retaining the driving gear shroud to the pump front cover.

2. Straighten the locking tab and remove the nut retaining the external driven gear to the pump pressure driving gear shaft.

3. Using puller tool No. T.8514, draw the external driven gear from the shaft.

4. Remove the Woodruff key from the pump pressure driving gear shaft.

5. Remove the nuts, spring washers and through bolts retaining the two end covers. Note that the second bolts from the flange, top and bottom, are dowel bolts machined to very fine limits (see Fig. 40), and they should not be mixed with the other retaining bolts. These bolts are marked with letter ' D ' on their heads.

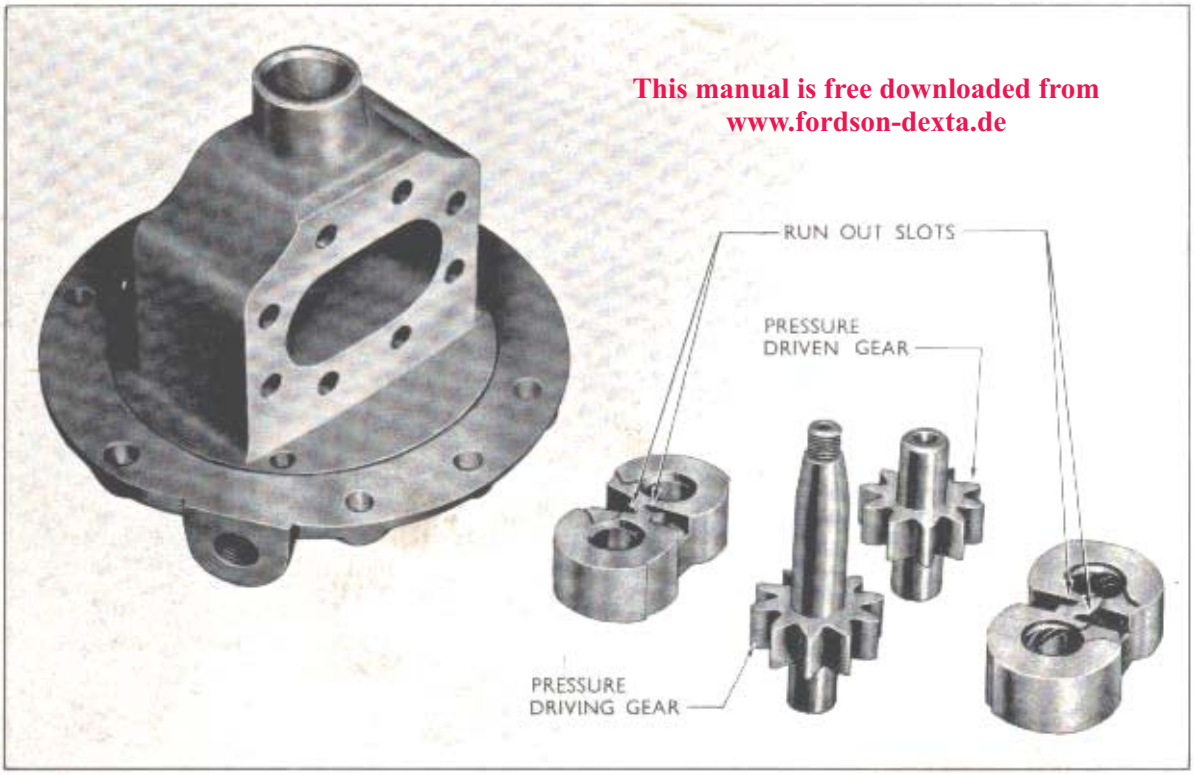


Fig. 42
Hydraulic Pump Body, Bearings and Gears

6. Remove the covers and extract the ' O ' sealing ring from the locating groove in each cover.

7. If necessary, extract the circlip retaining the pressure driving gear shaft seal to the front cover and remove the seal, using a drift of near size to the hole in the cover.

8. Slide the pump gears and bearings from the housing, if possible as one unit. No force should be applied to the gear shafts under any circumstances.

9. Examine the bearings for signs of seizure or scoring on the faces or journals. Light score marking may be removed by lapping on a surface plate, using ' O ' grade emery paper and paraffin. Any bearings showing excessive journal wear must be replaced. Bearings must always be fitted or replaced as pairs and must not be mixed.

10. Examine the body for wear in the gear running track. If the track is worn deeper than .0025 in. (.0635 mm.) on the pump inlet side, the body must be replaced.

11. Examine the gears for damage or excessive wear on journals, faces or teeth. The maximum run-out across the gear face to the tooth edge should not exceed .001 in. (.025 mm.). The gear journals may be lightly polished with ' O ' grade emery paper to remove wear marks. Similarly, the gear faces may be polished by sandwiching the emery paper between the gear face and a scrap bearing and rotating the gear. If new gears are fitted, the journal sizes on either side of each individual gear must be paired within .001 in. (.025 mm.) of each other. The face widths of each pair of gears must be held to within .001 in. (.025 mm.) of each other. This applies equally to the mixing of gears from different pumps or the replacement of single gears.

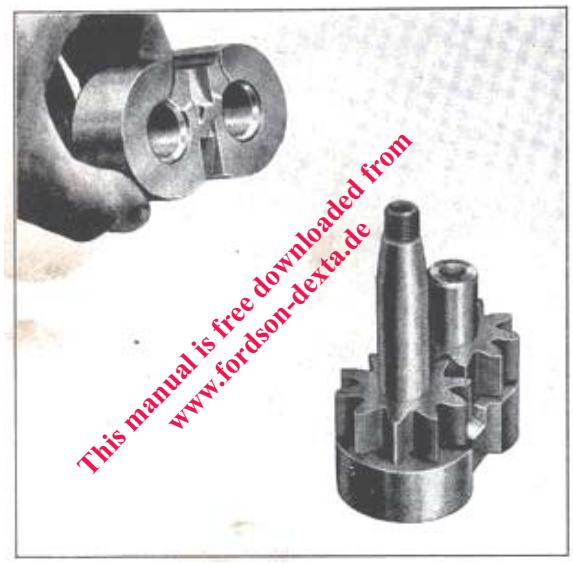


Fig. 43
Assembling Gears and Bearings

12. All rubber seals, ' O ' rings, etc., should be replaced when servicing the pump.

To Assemble the Hydraulic Pump

It should be noted that the two bearings, although similar in appearance are **not** identical and they must be assembled in correct relationship to gears and housing. The pump main body should be placed on the bench, flange downwards, with the pressure relief valve chamber bore pointing towards the operator.

Arrange the bearings and gears as shown in Fig. 42. In this position the right-hand (rear) bearing will have the small run-out slots from the oil ducts, at the **upper** end of the **left**-hand (high pressure) duct and the **lower** end of the **right**-hand (low pressure) duct.

The left-hand (front) bearing will have the run-outs at the upper end of the **right**-hand (high pressure) duct and the **lower** end of the **left**-hand (low pressure) duct.

1. With the right-hand (rear) bearing in the position shown in Fig. 42, i.e. with the plain side of the bearing downwards and the run-out from the **bores** to the right (i.e. low pressure side of pump) assemble the pump pressure driven gear to the further bore of the bearing.

2. Assemble the pump pressure driving gear to the nearer bore of the bearing, threaded end of the shaft pointing upwards and teeth meshing with the pressure driven gear (see **Fig. 43**).

3. Turn the left-hand (front) bearing so that the plain face points upwards and assemble to the gears, so that the small relief on the outer diameter of each bearing (i.e. the high pressure side) is on the left-hand side of the assembly.

4. Install the bearing and gear assembly in the pump housing, with the threaded end of the pressure driving gear pointing to the left and the small reliefs on the outer diameter of the bearings facing the high pressure (flange) side of the pump (see **Fig. 44**).

5. Fit a new ' O ' sealing ring to each cover plate and assemble the plates to the pump, locating them so that the straight side of the ' O ' ring grooves are adjacent to the pump flange, and the oil channels in the covers curve upwards.

6. Lightly secure the end covers to the pump body with the two dowel bolts which must be correctly positioned, as described in paragraph 5, column 1 (see also Fig. 40). Fit the remaining six bolts together with the nuts and spring washers, taking care to locate the square bolt heads in the square recesses in the front cover. Tighten the nuts evenly to 40/45 lbs. ft. torque (5.528/6.219 kg.m.).

It is essential that this torque figure is not exceeded and an accurate torque wrench must be used on this operation.

7. Replace the Woodruff key in the pump pressure driving gear shaft and assemble the external gear to

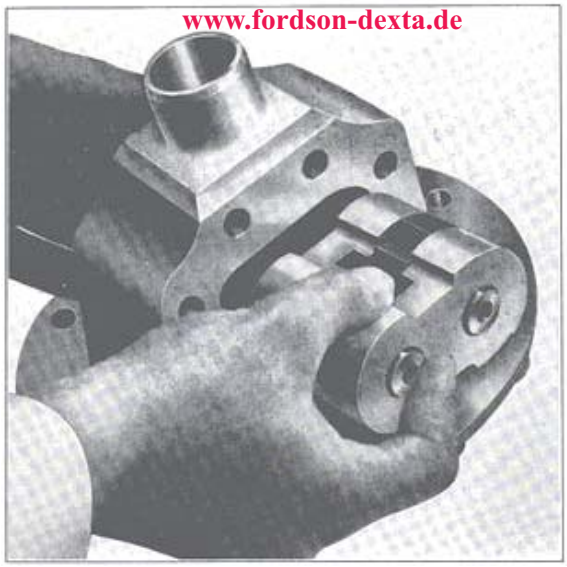


Fig. 44
Assembling Gears and Bearings to Pump Body

the shaft. Place a locking tab washer on the threaded end of the shaft, assemble and fully tighten the retaining nut, then turn the tab over to lock the nut in position.

8. Refit the driving gear shroud and retain to the pump front cover with the two screws and locking washers.

To Replace the Hydraulic Lift Pump

1. Fit a new ' O ' sealing ring on the side of the rear transmission housing adjacent to the delivery port in the pump flange. Fit a new ' O ' sealing ring on the outlet spigot of the inlet strainer casing (to the pump) and replace the strainer in the rear transmission housing ensuring the hole in the strainer bracket locates on the spigot screw in the side of the transmission housing.

3. Pour into the pump inlet plenty of clean new oil to lubricate the pump gears and bearings during start-up.

4. Replace the pump assembly using a new gasket between the pump flange and the rear transmission housing. As the pump is refitted the inlet port of the pump should be entered over the outlet spigot of the strainer casing. Ensure that the two dowels in the side of the rear transmission housing are correctly located in the corresponding holes in the pump flange and replace and tighten the pump to transmission housing securing screws to a torque of 30/35 lbs. ft. (4.15/4.84 kg.m.).

5. Replace the hydraulic lift top cover assembly as previously described.

6. Reconnect the right-hand brake operating rod and replace the right-hand footplate.

Testing the Hydraulic Pump

The pump is set to give the requisite delivery and pressure before leaving the factory and normally very little trouble may be anticipated in service. Should, however, the pump delivery pressure be suspect it may be checked by fitting a pressure gauge to the threaded hole provided for this purpose in the side of the pump relief valve chamber.

Immediately prior to making the test, however, the tractor should be operated to bring the transmission oil to its normal operating temperature.

Attach swivel adaptor T.8503–1/g to pressure gauge T.8503, remove the sealing plug and screw the swivel adaptor and gauge assembly into the threaded hole in the pump relief valve chamber.

Remove the jack tapping plug from auxiliary service control valve plate and the filler plug from the rear axle. Install pressure testing equipment T.8503–1, fitting the " T " adaptor T.8503–1/f to the jack tapping and the opposite end to the rear axle filler aperture. It will facilitate installation if the " T " adaptor is assembled first and the hose and shut-off valve assembly is then fitted to the " T " adaptor. Install the jack tapping plug in the upper end of the " T " adaptor.

Fully open the shut-off valve, start the engine and run at 1,550 r.p.m.

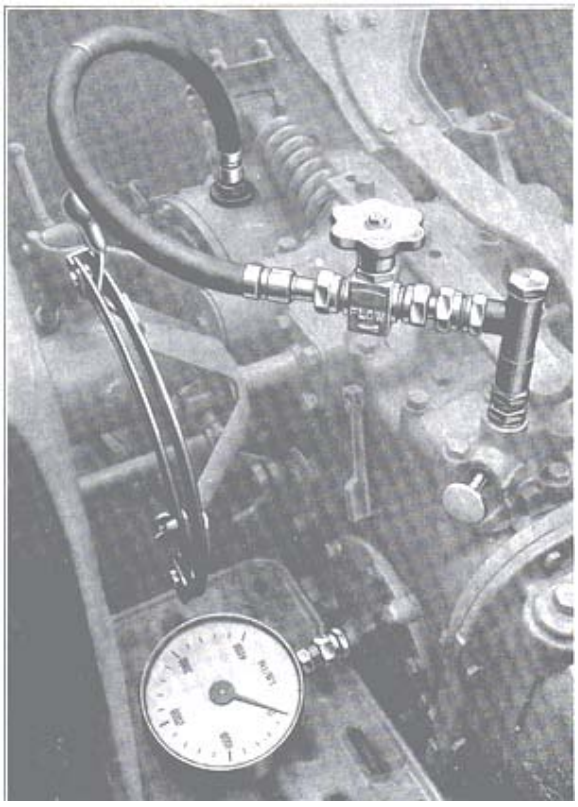


Fig. 45
Hydraulic Pump Test Equipment

Move the auxiliary service control knob to the outer position and place the hydraulic power lift control lever in the fully raised position.

Gradually close the shut-off valve and observe the reading on the pressure gauge which should show a steady increase in pressure up to 2,100 to 2,300 lbs/sq. in. (147.6 to 161.7 kg/sq. cm.). At this pressure the relief valve should blow off and the pressure should drop to approximately 600 lbs/sq. in. (42.18 kg/sq. cm.).

If the relief valve blows off at a pressure lower than that specified, it may be that insufficient shims have been fitted between the relief valve spring and the spring retainer (a faulty relief valve spring will also produce the same symptoms).

Shims are available in thicknesses of .005 in. (.127 mm.) .010 in. (.254 mm.), .015 in. (.381 mm.) and .025 in. (.635 mm.) and give an increase in operating pressure of approximately 10 lbs/sq. in. (.7031 kg/sq. cm.) for each .001 in. (.025 mm.) thickness of shim.

NOTE.—The maximum total thickness of shim permissible is .080 in. (2.032 mm.).

In the event of the relief valve not blowing off, either too many shims have been fitted in which case the gauge will read more than 2,300 lbs/sq. in. (161.7 kg/sq. cm.) or the pump itself may be at fault and the pressure will not reach the specified figures. If the latter is suspected the pump should either be replaced with one which is known to be correct, or dismantled to determine the cause.

HYDRAULIC PUMP SPECIFICATIONS

The following specification supersedes that quoted on page 27 of this section

Flow capacity	3.31 Imp. gall. (15.03 litre) per min. at 1,550 r.p.m. (engine)
Relief valve pressure	2,100 to 2,300 lb./sq. in. (147.6 to 161.7 kg./sq. cm.)
Thickness of shims available	.005 in. (.127 mm.), .010 in. (.254 mm.), .015 in. (.381 mm.), .025 in. (.635 mm.)
Maximum permissible total thickness of shim	.080 in. (2.032 mm.)

Tightening torque :—

Hydraulic pump through bolts	40 to 45 lbs. ft. (5.53 to 6.22 kg.m.)
Hydraulic pump to rear transmission housing screws	30 to 35 lbs. ft. (4.15 to 4.84 kg.m.)

DOUBLE-ACTING RAM VALVE

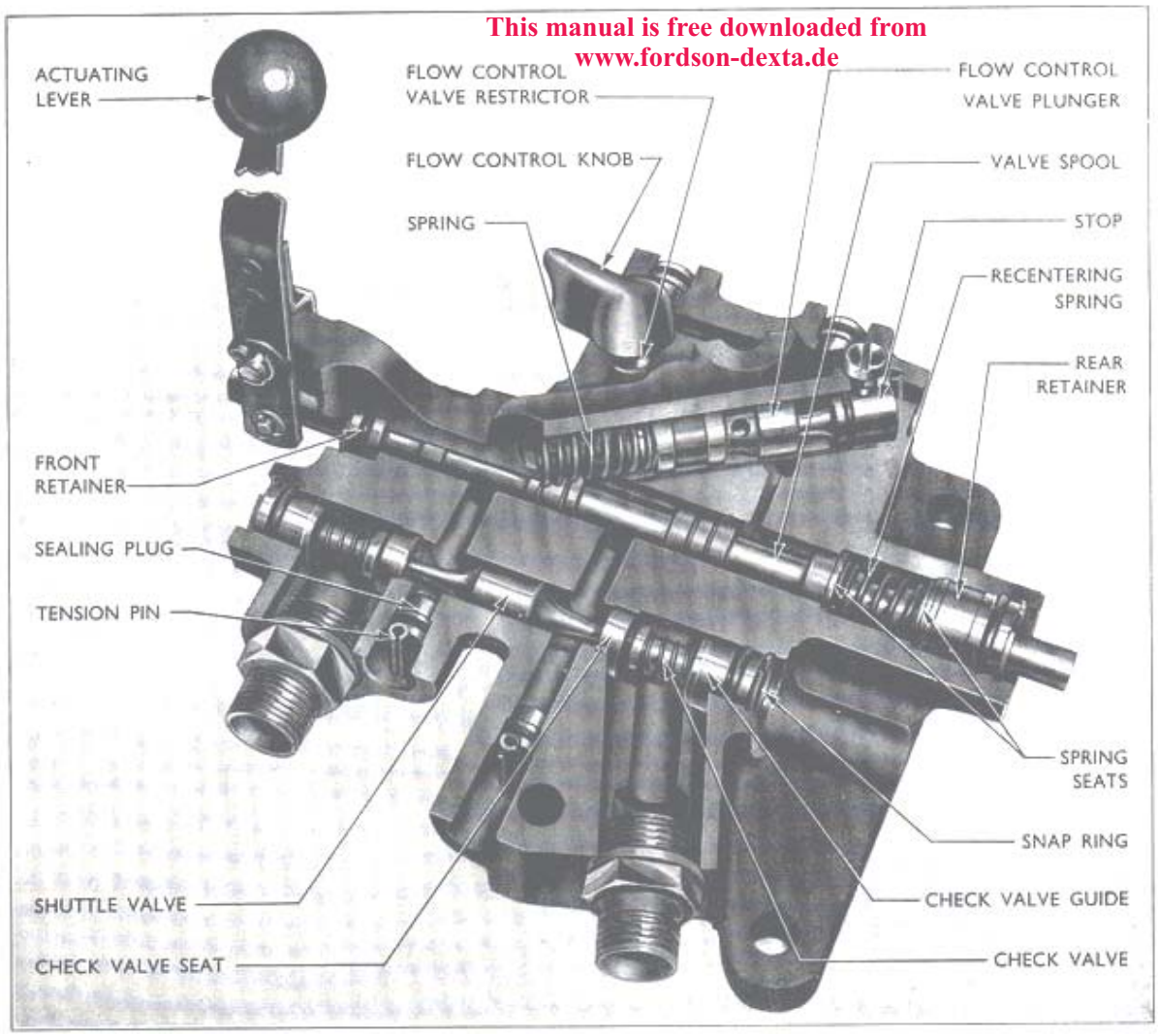


Fig. 46
Sectioned View of D.A.R. Valve

The double acting ram valve (D.A.R. valve) is fitted as a production option in place of the auxiliary service control valve on the hydraulic lift cover. It consists of two main components ; a control valve spool—operated by a hand controlled actuating lever, and a flow control device—adjusted by the flow control knob (see Fig. 47).

If required, two pipes may be fitted leading from the D.A.R. valve to a bracket mounted at the rear of the transmission housing, where the pipes connect with the male halves of two self-sealing couplings. In this position they are readily accessible for connecting up the coupling pipes to trailed or rear mounted equipment.

Using the D.A.R. valve it is possible to feed oil from the hydraulic pump on the tractor, to one side of an external double acting ram, and exhaust oil from the other side of the ram back into the rear transmission housing via the D.A.R. valve. By means of the flow control device it is also possible to control the rate of flow of oil to external equipment, which in turn governs the speed at which oil exhausts from the equipment.

The D.A.R. valve can be used to operate external single acting rams, but if such equipment is other than that officially approved by Ford Motor Co. Ltd., care must be taken to ensure that some form of restrictor is fitted between the ram and the D.A.R. valve to control the return flow of oil, particularly if the equipment is liable to drop quickly under gravitational pull, e.g., front end loader with a loaded bucket.

The actuating lever for the D.A.R. valve is spring-loaded in the neutral position and must be held forward or rearward as required to operate external equipment (see Fig. 47).

DESCRIPTION

The D.A.R. valve fits in the same location on the hydraulic lift cover as the auxiliary service control valve and is retained by four set-screws.

A vertical actuating lever which pivots on a pin in a fixed lug on the main body of the valve assembly is connected at its lower end to the D.A.R. valve spool. Fitted to the front and rear of the valve spool are retainers, on the inner and outer diameter of which are fitted rubber "O" rings. The retainers are held in position in the main body by snap rings.

On the rear of the valve spool is the recentering spring and seats. The spring and seats being held in position between a step in the valve body and a snap ring fitted in a groove on the valve spool.

To the right of the valve spool (when viewed from the driver's seat) is the flow control device. This consists of the flow control valve restrictor and the flow control valve plunger and spring.

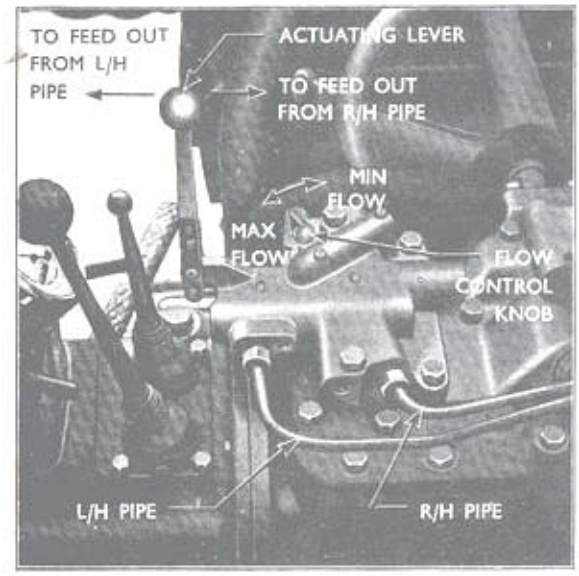


Fig. 47
Actuating Lever and Flow Control Knob

The flow control valve restrictor is located directly below, and connected to, the flow control knob. At the rear and slightly to the left of the flow control knob is a raised portion of the D.A.R. valve body in which the flow control valve plunger and spring are housed. They are retained in the housing by a stop which has a rubber " O " ring located in a groove on its outer diameter. The stop is secured by a pin screwed into the top of the housing.

To the left of the valve spool (when viewed from the driver's seat), and located in passages in the valve body is a shuttle valve on either side of which are the check valves. These locate in guides fitted at the front and rear of the body, and seat on renewable steel inserts which are an interference fit in the body.

All passages and drillings in the D.A.R. valve are sealed with plugs which have rubber " O " rings located in grooves on their outer diameter. These plugs are retained in position by either snap rings or tension pins.

The only oil passageway that leads directly into the D.A.R. valve is the oil feed from the hydraulic pump which flows through suitable passages to the valve spool and the flow control valve plunger.

The feed to the hydraulic ram cylinder and the exhaust from the hydraulic lift valve assembly pass through cast passages in the D.A.R. valve body but in no way affect the operation of the valve.

The exhaust from the D.A.R. valve is entirely separate from that of the ram cylinder or the hydraulic lift valve assembly, that is why it is necessary to ensure that a restrictor is fitted between the D.A.R. valve and the ram of certain types of equipment, to control the rate of flow of return oil from the equipment.

OPERATION

With the actuating lever in its neutral position (held in position by the recentering spring) normal operation of the hydraulic lift arms is possible, using the main control lever. Oil flow through the D.A.R. valve is shown in Fig. 48, and is indicated by the black arrows. Oil will also be present at the front and rear faces of the flow control valve plunger, but as there is no oil flow the pressure applied on each side will be equal, and the plunger will be held in the closed position by the spring.

If the actuating lever is moved from the neutral position, the hydraulic lift cylinder is isolated from the hydraulic pump, and oil is delivered under pressure to the external double acting ram. At the same time, the oil displaced from the opposite side of the ram piston is returned through the D.A.R. valve and exhausted into the rear transmission housing.

When the actuating lever is moved through neutral to the opposite position the oil flow is reversed ; and the passage previously used to supply oil under pressure to the double acting ram becomes the oil return passage, and vice-versa.

Fig. 49 shows the oil flow through the D.A.R. valve when the actuating lever is in the forward position. As the valve spool is moved rearward by the actuating lever the passage " C " to the hydraulic lift cylinder is blocked off and a passage " E " leading to the front check valve is uncovered.

Oil pressure in the system will build up until it is sufficient to raise the front check valve off its seat ; it will also move the shuttle valve to the rear and lift the rear check valve off its seat. This will allow oil, under pressure, to flow to an external double acting ram via the front check valve and the drilling " G." In moving the double acting ram piston it will force oil from the other side of the piston into the valve body through the passage " H," past the rear check valve, around the valve spool and out of the valve body into the rear transmission case via the exhaust passage " J."

If the actuating lever is moved from the forward position through neutral to the rearward position (see Fig. 50), the valve spool is moved to the front and a passage " F " to the rear check valve is uncovered. Oil pressure in the system will build up until it is sufficient to raise the rear check valve off its seat ; it will also move the shuttle valve to the front and raise the front check valve off its seat. This will cause oil flow, to and from the double acting ram, to be reversed (out through passage " H " and in through passage " G ") and thus move the double acting ram piston in the opposite direction.

With the actuating lever in either its forward or rearward position no oil can flow to the hydraulic lift cylinder through passage " C," and therefore operation of the D.A.R. valve actuating lever overrides the hydraulic lift main control lever. The actuating lever can also be operated irrespective of the position of the main control lever in its quadrant.

FLOW CONTROL DEVICE

To adjust for slow or fast flow the control knob may be set in any position between the cast stops marked " F " and " S " on the D.A.R. valve body. The stop marked " F " indicates the maximum rate of flow position and " S " the minimum rate of flow position (see Fig. 47).

With the D.A.R. valve actuating lever in either its forward or rearward position, oil, under pressure, is passing through the flow control valve restrictor, around the valve spool and out to an external double acting ram (see Figs. 49 and 50). As the oil passes

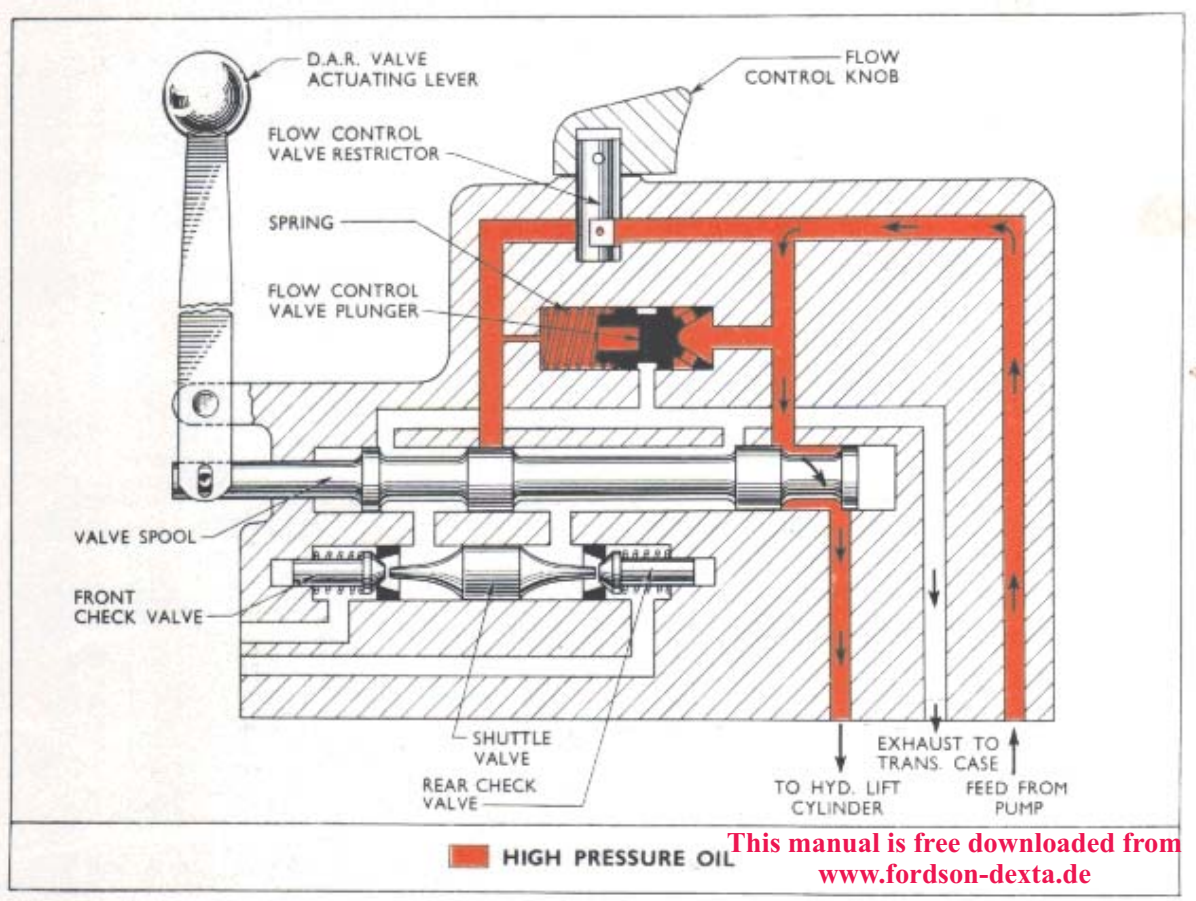


Fig. 48
Oil Flow - Actuating Lever in Neutral Position

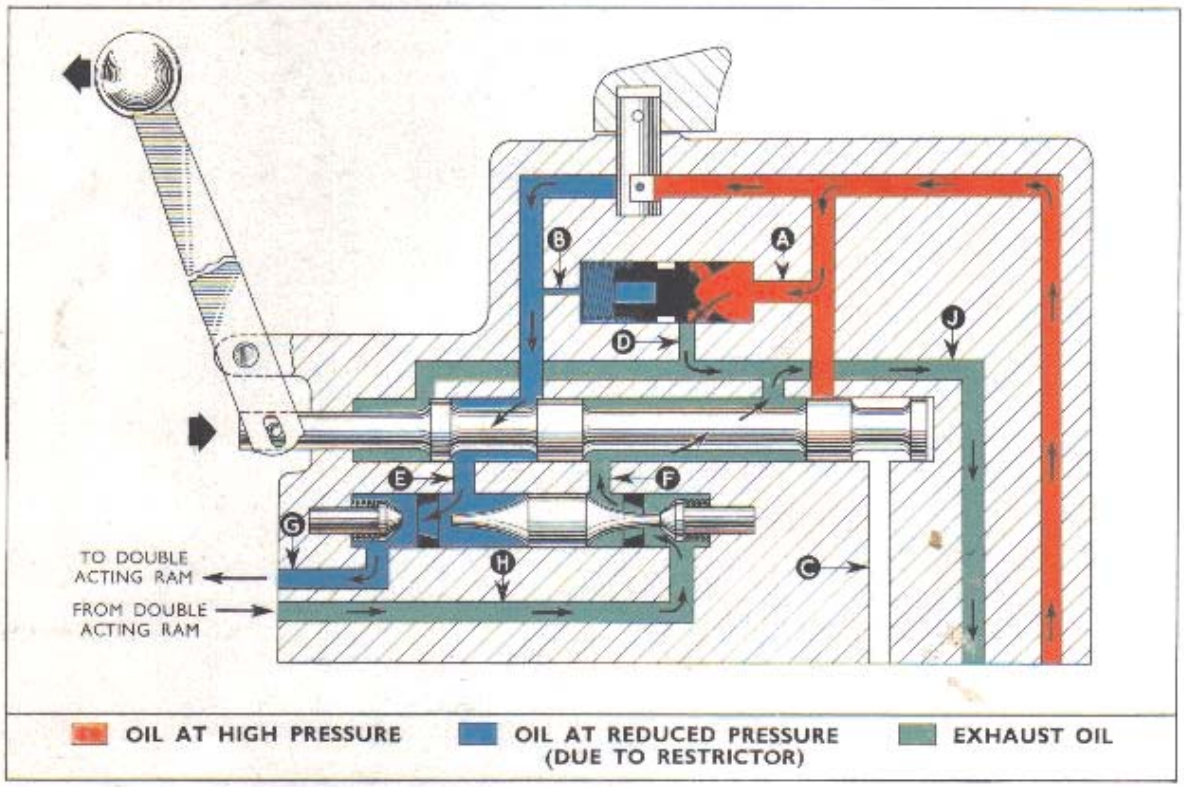


Fig. 49
Oil Flow—Actuating Lever in Forward Position

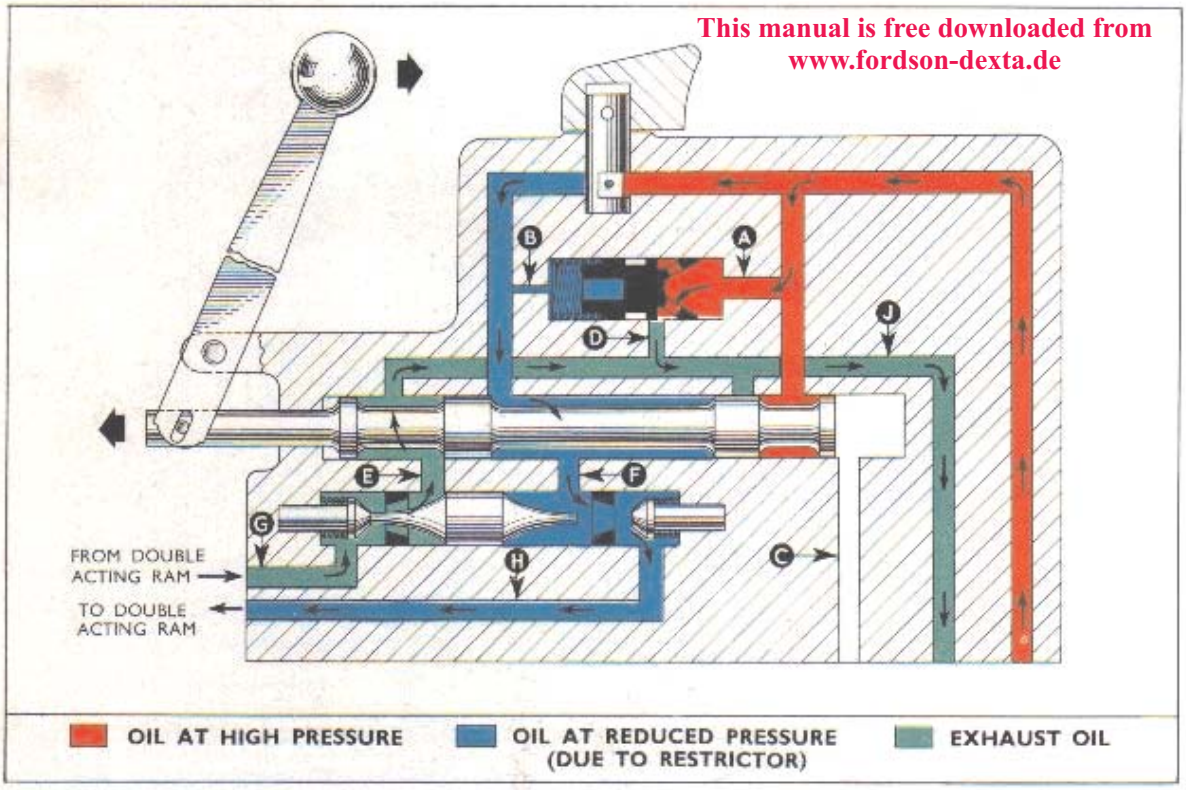


Fig. 50
Oil Flow - Actuating Lever in Rearward Position

the flow control valve restrictor it experiences a pressure drop due to the restriction to flow.

Therefore, oil under pressure, is being fed to the front of the flow control valve plunger through the drilling " A," and oil at decreased pressure (due to the pressure drop across the restrictor) to the rear of the plunger through the small drilling " B." If the pressure difference is sufficient to overcome the force of the flow control valve plunger spring it will move the flow control valve plunger and allow oil to exhaust to the rear transmission case through the drilling " D." The amount of oil " bled off " or exhausted will depend on the pressure difference between the front and rear of the flow control valve plunger ; this, in turn being determined by the amount of restriction to oil flow, i.e., the position of the restrictor (see Fig. 51).

Therefore, the rate of oil flow to an external double acting ram cylinder can be controlled at will by the operator, within the limiting design range of the flow control device, by merely setting the flow control valve restrictor in the desired position.

The correct rate of flow will depend on the weight and type of equipment being used, and will also be affected by the operating conditions and engine speed. Care should always be taken to ensure that the recommendations of the equipment manufacturer regarding speed of operation for the equipment are strictly observed.

TO OVERHAUL THE D.A.R. VALVE

To Remove

1. Unscrew the two retaining nuts and remove the driver's seat. If an extra comfort seat is fitted, swing it back into its most rearward position.

2. If the D.A.R. valve has feed pipes fitted, from the valve to the rear mounting bracket, disconnect the pipes from the D.A.R. valve by unscrewing the union nuts. Cover the ends of the pipes to protect them against the ingress of dirt.

3. Remove the four retaining set-screws and lift the D.A.R. valve from its location on the hydraulic lift cover. Suitably cover the top of the lift cover to stop the entry of dirt.

To Dismantle

1. Remove the retaining split pins and flat washers from the actuating lever clevis pins. Push the clevis pins out and remove the actuating lever.

2. Drive out the tension pin securing the flow control knob to the flow control valve restrictor, and remove the restrictor by pushing it downwards out from the underside of the valve housing.

3. Unscrew the flow control valve plunger stop retaining pin and remove the flow control valve plunger stop, plunger and spring.

4. Using a suitable pair of circlip or pointed nose pliers, remove the snap rings from the front and rear of the valve spool. Push the spool out from the rear of the housing complete with the rear seal retainer, recentering spring and spring seats.

To remove the recentering spring and seats, detach the small circlip from the valve spool.

5. Remove the valve spool front seal retainer from the valve housing taking care not to damage it.

6. Remove the snap rings from the check valve guides and remove the front check valve guide by inserting a suitable lever through the front jack tapping and levering the guide out. Remove the front check valve and spring.

7. Push on the front end of the shuttle valve to remove the rear check valve guide, check valve and spring. The check valve seats are an interference fit in the housing and they should only be removed if they need renewing or if the shuttle valve requires attention.

With one seat removed it is possible to slide the shuttle valve out of its bore.

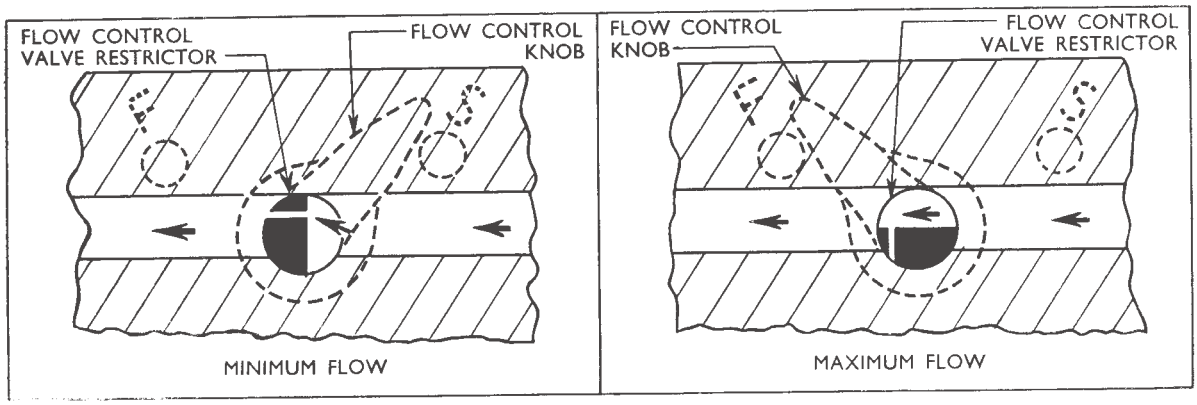


Fig. 51

Operation of the Flow Control Valve Restrictor

8. It is not normally necessary to remove the sealing plugs from the passageways in the valve housing, although it is advisable if you require to give the housing a thorough clean out. There are six plugs in the housing—three retained by snap rings and three by tension pins. A pair of circlip or pointed nose pliers are required to remove the snap rings. The tension pins, however, can be driven out, using a small pin punch.

The sealing plugs are a press fit in the valve housing and to assist in their removal they have a tapped hole in them (No. 6–32–NC).

9. Remove and discard all rubber " O " rings. Thoroughly clean all components and inspect for damage or signs of wear. Renew any parts found defective, and **all " O " rings.**

NOTE.—The valve spool and the flow control valve plunger are selective fits in the D.A.R. valve housing. (See the Specification and Repair Data on page 41.) When selecting a new part the largest valve spool or flow control valve plunger should be fitted which will operate without binding in the housing.

It is most important that great care is taken whilst handling the valves to obviate the possibility of burrs, distortion or scratches, which could lead to a misleading impression as to the correct size of valve required.

To Reassemble

1. Replace one of the check valve seats, using the special tool No. T.8516, with the angled inner diameter of the seat facing inwards, until the seat contacts the shoulder in the bore. Care must be taken not to damage the seat, and it should have a firm, smooth outer edge to ensure a good seat for the check valve.

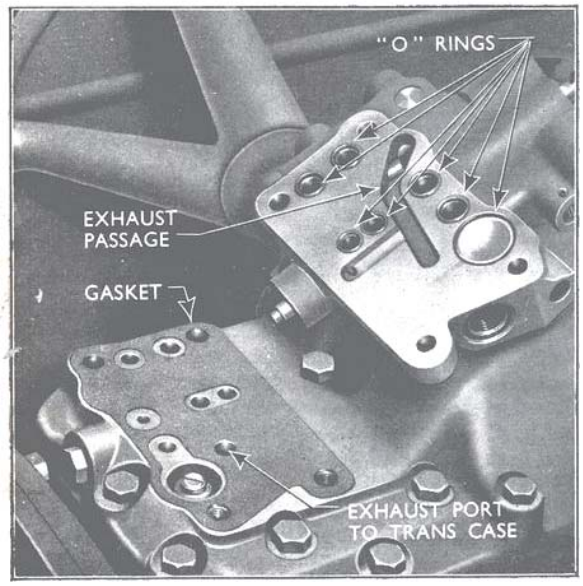


Fig. 52
"O" Ring Location

2. Lubricate the shuttle valve and replace it in the housing.

3. Replace the other check valve seat taking the precautions as described in paragraph 1.

4. Replace the check valves, springs and guides in the housing, and secure in position with two snap rings.

5. Refit the recentering spring and seats to the valve spool and secure in position with a circlip.

6. Lubricate the valve spool and replace it in the valve housing. Enter it from the rear with the recentering spring towards the rear.

7. Fit the front and rear seal retainers to the valve spool, taking care not to damage the " O " rings, and secure in position with two snap rings. The flat face of the rear retainer faces outwards.

8. Replace the flow control valve plunger and spring into the housing with the plain bore (parallel) of the plunger facing inwards. Fit the plunger stop and retain it in position with the threaded pin.

9. Push the flow control valve restrictor into its bore from the underside of the housing, taking care to see that the flat on the restrictor is facing to the right (when viewed from the rear of the body). **This is most important, otherwise incorrect operation of the restrictor will result.**

10. Fit the flow control knob to the restrictor and secure it in position with a tension pin.

11. Replace the actuating lever, fit the clevis pins and secure in position with two flat washers and split pins. The offset in the actuating lever must be to the right (when viewed from the rear of the D.A.R. valve).

To Replace

1. Ensure that the mating faces of the lift cover and D.A.R. valve are perfectly clean.

2. Fit new " O " rings into their appropriate locations on the D.A.R. valve and a new gasket (see Fig. 52).

3. Replace the D.A.R. valve on the lift cover and secure in position with four set-screws. The screws are all of different lengths and care should be taken to ensure that they are replaced in their correct positions, i.e., when viewed from the rear of the tractor the screws should be—front right 4.25 ins. (107.95 mm.) long ; rear right, 2.75 ins. (69.85 mm.) long ; front left, 2.125 ins. (53.975 mm.) long, and the rear left, 1.125 ins. (28.575 mm.) long.

4. Reconnect the feed pipes to their respective unions in the valve body, and tighten the union nuts securely.

5. Replace the driver's seat, and securely tighten the two retaining nuts.

SPECIFICATION AND REPAIR DATA—D.A.R. VALVE

Valve Spool

Diameter at each end .. .. .435 to .437 in. (11.049 to 11.100 mm.)

Diameter of lands :—

Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Red	.7435 to .7437	18.885 to 18.890
Yellow	.7437 to .7439	18.890 to 18.895
Blue	.7439 to .7441	18.895 to 18.900
Green	.7441 to .7443	18.900 to 18.905
White	.7443 to .7445	18.905 to 18.910

Diameter of bore in housing :—

Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Red	.7440 to .7442	18.898 to 18.903
Yellow	.7442 to .7444	18.903 to 18.908
Blue	.7444 to .7446	18.908 to 18.913
Green	.7446 to .7448	18.913 to 18.918
White	.7448 to .7450	18.918 to 18.923

Flow Control Valve Plunger

Outer diameter :—

Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Red	.6670 to .6672	16.942 to 16.947
Yellow	.6672 to .6674	16.947 to 16.952
Blue	.6674 to .6676	16.952 to 16.957
Green	.6676 to .6678	16.957 to 16.962
White	.6678 to .6680	16.962 to 16.967

Diameter of bore in housing :—

Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Red	.6675 to .6677	16.955 to 16.960
Yellow	.6677 to .6679	16.960 to 16.965
Blue	.6679 to .6681	16.965 to 16.970
Green	.6681 to .6683	16.970 to 16.975
White	.6683 to .6685	16.975 to 16.980

Flow Control Valve Plunger Stop

Outer diameter .. .. .662 to .666 in. (16.815 to 16.916 mm.)

Thread size in extractor hole .. .. $\frac{1}{4}$ in.—28 U.N.F.

Flow Control Valve Plunger Spring

No. of coils	13.5
Free length	2.80 ins. (71.12 mm.)
Length under load	1.31 ins. (33.27 mm.) under 11.9 lbs. (5.4 kgs.)

Shuttle Valve

Outer diameter	.6240 to .6245 in. (15.850 to 15.862 mm.)
Diameter of bore in housing	.6250 to .6255 in. (15.875 to 15.888 mm.)

Check Valve Seat

Inner diameter	.310 to .315 in. (7.874 to 8.001 mm.)
Outer diameter	.6880 to .6885 in. (17.475 to 17.488 mm.)
Diameter of bore in housing	.686 to .687 in. (17.424 to 17.450 mm.)

Check Valve and Guide

Diameter of check valve	.332 to .335 in. (8.433 to 8.509 mm.)
Angle of head	45°
Inner diameter of guide	.343 to .348 in. (8.712 to 8.839 mm.)
Outer diameter of guide	.745 to .748 in. (18.923 to 18.999 mm.)
Diameter of bore in housing	.750 to .754 in. (19.050 to 19.152 mm.)

Valve Spool Seal Retainers

Inner diameter	.441 to .443 in. (11.201 to 11.252 mm.)
Outer diameter	.996 to .998 in. (25.298 to 25.349 mm.)
Diameter of bore in housing	1.001 to 1.005 ins. (25.425 to 25.527 mm.)

Valve Spool Recentering Spring

No. of coils	7
Free length	1.42 ins. (36.07 mm.)
Length under load	.88 in. (22.35 mm.) at 11.75 lbs. (5.33 kg.)

Flow Control Restrictor

Outer diameter :—	
Above slot	.495 to .498 in. (12.573 to 12.649 mm.)
Below slot	.524 to .527 in. (13.310 to 13.386 mm.)
Base	.670 to .675 in. (17.018 to 17.145 mm.)

Sealing Plugs

Outer diameter	.527 to .529 in. (13.386 to 13.437 mm.)
Diameter of bore in housing	.530 to .532 in. (13.462 to 13.513 mm.)
Thread size in extractor hole	No. 6—32—N.C.

Thread size in jack tappings	½ in. B.S.P.
Tightening torque for D.A.R. valve retaining bolts	40 to 45 lb. ft. (5.53 to 6.22 kg.m.)

HYDRAULIC POWER LIFT

Since the introduction of the Fordson Dexta only minor modifications have been made to the hydraulic system and these changes have, where they affect servicing details or procedure, been covered through the medium of Service Letters. With the introduction of the Super Major certain components of the Dexta hydraulic system have been replaced or modified to allow the use of common parts or similar manufacturing methods on both tractors.

This supplement is intended to be used in addition to the information previously issued in the Fordson Dexta Workshop Manual and covers the latest parts, including the flow control valve, and information which has already been issued in the form of Service Letters to provide a complete supply of information covering the hydraulic system up to the current time.

It is not intended to repeat the repair procedure or the illustrations in the existing manual except where there is some definite variation in the procedure or appearance of the part. Many of the illustrations in the main section of the manual will therefore strictly apply only to the previous unit but where the parts and operations concerned are basically similar it has not been considered worthwhile making new illustrations.

The hydraulic oil flow as previously described in the Workshop Manual is basically correct with the exception that a flow control valve and restrictor are now incorporated in the auxiliary service control plate. The lowering cycle has been modified by the use of a new control valve and bush giving a simpler method of producing the lift cylinder. With the new control valve oil is passed in front of the control valve and exhausted through the spring chamber during lowering, also in the neutral cycle oil from in front of the unloading valve exhausts into the transmission through drillings in the control valve instead of passing the front of the valve. The oil flow in the neutral, raising and lowering cycles with the new parts is shown in Figs. 55, 56 and 57, and the operation of the flow control valve and restrictor are described fully later in this supplement.

Lift Cylinder Assembly

The lift cylinder is interchangeable as an assembly with the previous part but due to modifications to the oil drillings in the cylinder it is essential that the correct bushes, valves and retaining plates are used in sets on each cylinder.

The current and previous cylinders can be easily identified, the earlier cylinder having two blanking plugs and an exhaust port in the base of the valve portion, together with three screw fixings for the front and rear retaining plates whereas on the latest cylinder the exhaust ports and blanking plugs have been deleted and the retaining plates, which have been modified in shape, are now secured by two screws.

The method of removing and replacing the unloading valve plug and bushes is the same as previously described. There are, however, two types of unloading valve plug available in service with different size internal threads, adaptor T.8510–1/f is suitable for withdrawing the earlier plug while adaptor

Fig. 53
Removing the Unloading Valve Plug

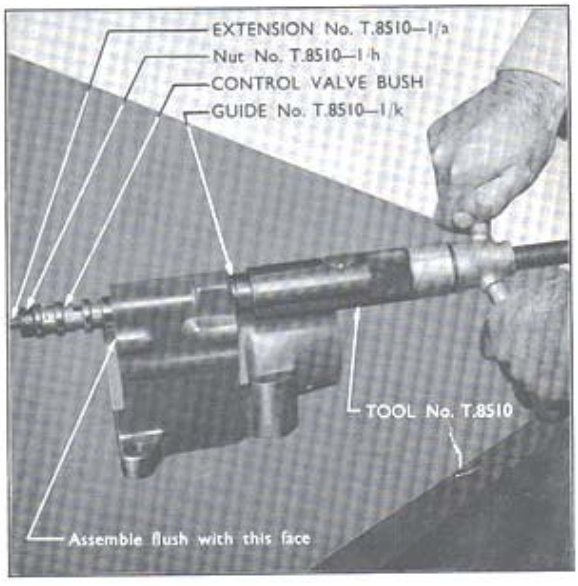


Fig. 54
Replacing the Control Valve Bush

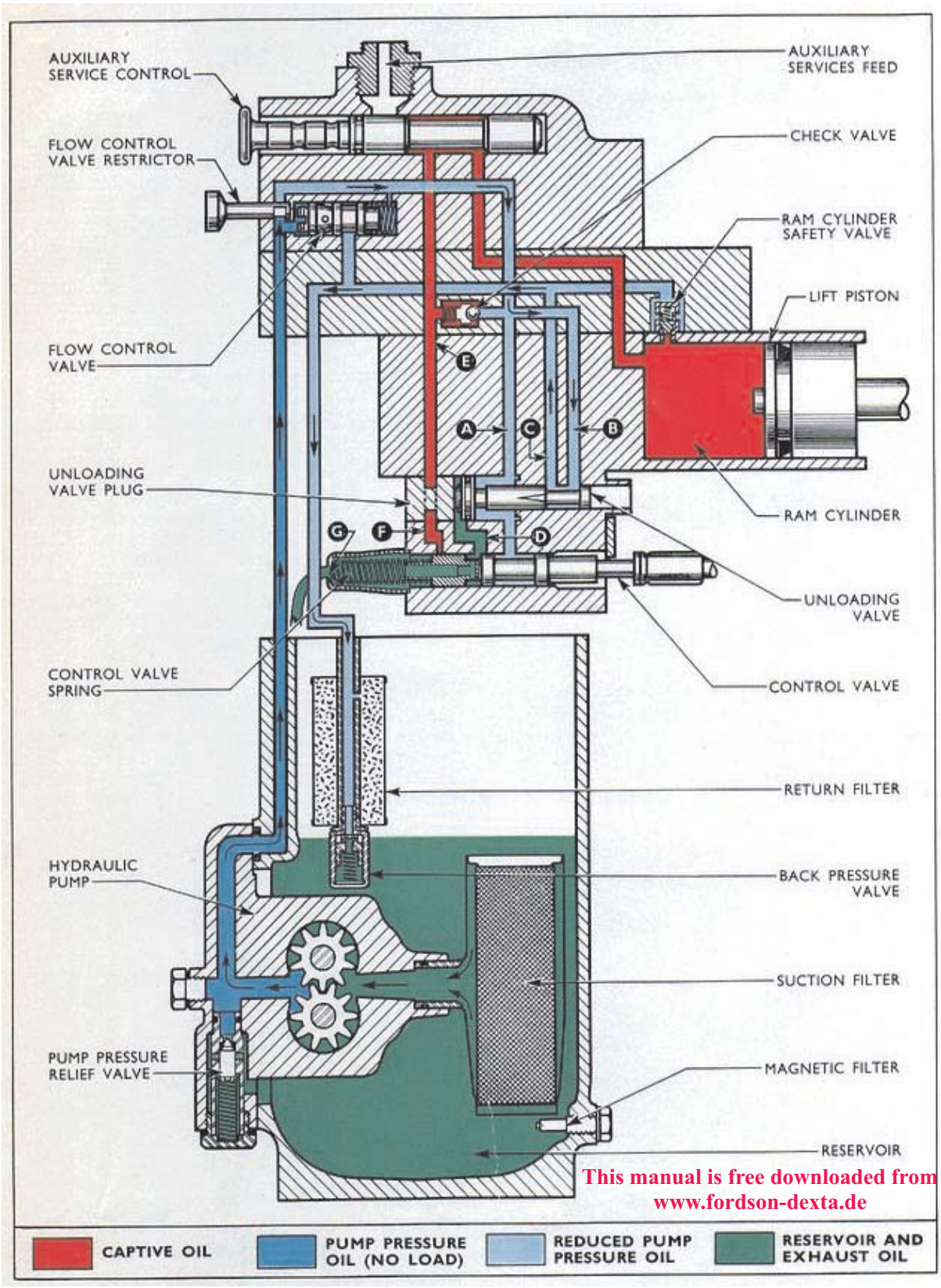


Fig. 55
Hydraulic Oil Flow - Neutral

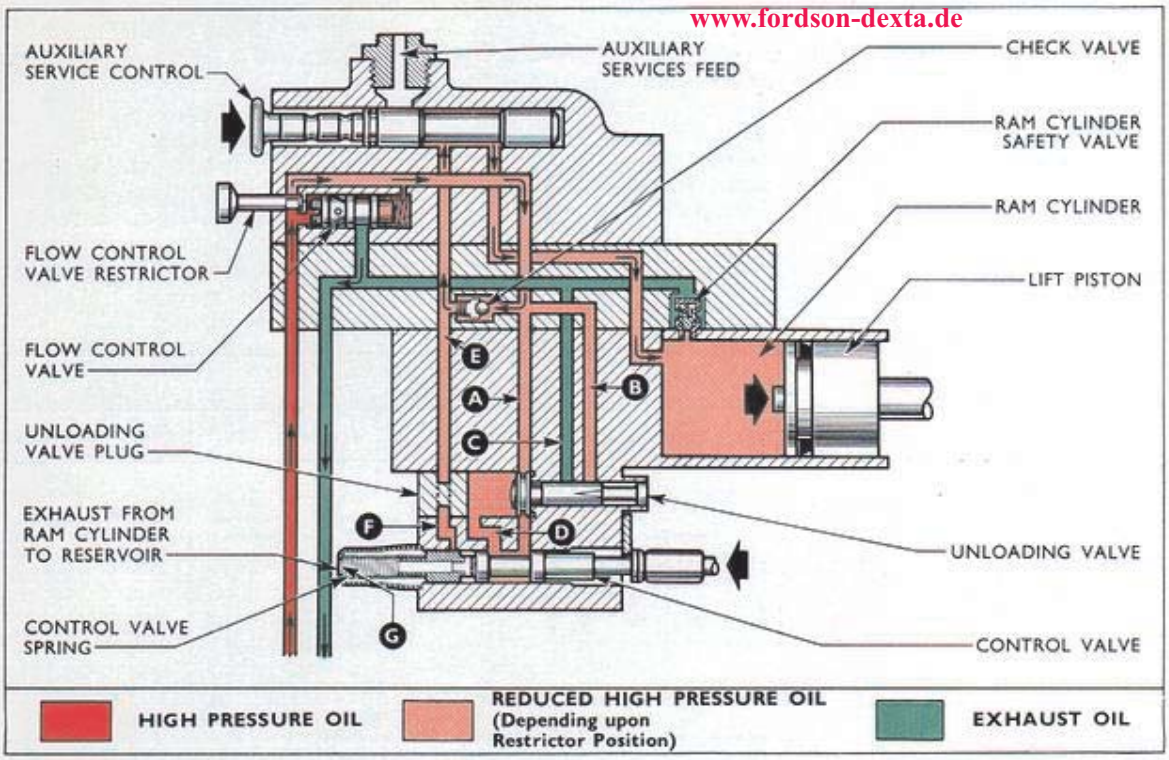


Fig. 56
Hydraulic Oil Flow—Raising

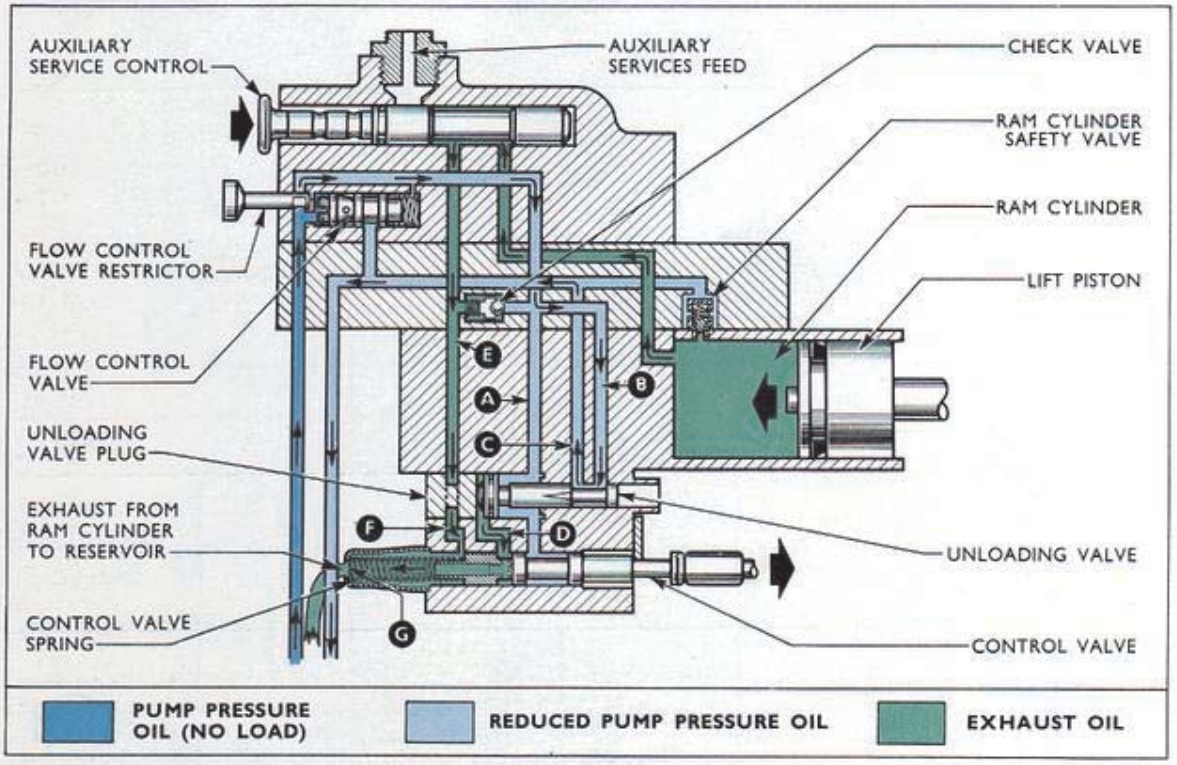


Fig. 57
Hydraulic Oil Flow - Lowering

T.8510–1/g is used for the current plug (see Fig. 53). The same tools as previously specified i.e. T.8510–1/a/h/k, are used for removal and replacement of the new control valve bush but when replacing the new bush it is recommended that the operation is carried out from the rear of the cylinder, pulling the bush in until it is flush with the front face of the cylinder (see Fig. 54). The bush should be located with the long annular recess to the rear of the cylinder.

The front and rear retaining plates are new parts, as is the control valve spring, and these parts must not be used on previous cylinders. It should be noted that the gasket and sealing washer fitted to the previous rear plate are no longer used. They must, however, continue to be fitted to the previous cylinder.

Since the Dexta was first introduced the size range for the control and unloading valve bushes and unloading valve plug has been extended. Also, with the introduction of the current valve chest, the Part Nos. of the control valve and bush have been changed and the following tables give the appropriate Part Nos., colour markings and dimensions of the various parts :

Unloading Valve Bushings and Plug

Colour Mark	*Rear Bush*	*Front Bush*	*Plug*	*Diameter (ins.)*	*Diameter (mm.)*
Blue/White	957E–482–F	957E–440–F	957E–916–F	1.0000–1.0002	25.400–25.405
White	957E–482–A	957E–440–A	957E–916–A	1.0002–1.0004	25.405–25.410
Blue	957E–482–B	957E–440–B	957E–916–B	1.0004–1.0006	25.410–25.415
Yellow	957E–482–C	957E–440–C	957E–916–C	1.0006–1.0008	25.415–25.420
Green	957E–482–D	957E–440–D	957E–916–D	1.0008–1.0010	25.420–25.425
Orange	957E–482–E	957E–440–E	957E–916–E	1.0010–1.0012	25.425–25.430
Green/White ..	957E–482–G	957E–440–G	957E–916–G	1.0012–1.0014	25.430–25.435
Red/White	957E–482–H	957E–440–H	957E–916–H	1.0014–1.0016	25.435–25.441

Control Valve Bushing

Colour Mark	*Prior to Serial No. 957E–68355*	*After Serial No. 957E–68355*	*Diameter (ins.)*	*Diameter (mm.)*
Blue/White	957E–481–F	E1ADDN–481–F	1.0000–1.0002	25.400–25.405
White	957E–481–A	E1ADDN–481–A	1.0002–1.0004	25.405–25.410
Blue	957E–481–B	E1ADDN–481–B	1.0004–1.0006	25.410–25.415
Yellow	957E–481–C	E1ADDN–481–C	1.0006–1.0008	25.415–25.420
Green	957E–481–D	E1ADDN–481–D	1.0008–1.0010	25.420–25.425
Orange	957E–481–E	E1ADDN–481–E	1.0010–1.0012	25.425–25.430
Green/White	957E–481–G	E1ADDN–481–G	1.0012–1.0014	25.430–25.435
Red/White	957E–481–H	E1ADDN–481–H	1.0014–1.0016	25.435–25.441

Control Valve

Colour Mark	*Prior to Serial No. 957E–68355*	*Between Serial Nos. 957E–68355 and 957E–72408*	*After Serial No. 957E–72408*	*Diameter (ins.)*	*Diameter (mm.)*
White	957E–488–A	957E–488–L	957E–488–T	.5917–.5919	15.029–15.034
Blue	957E–488–B	957E–488–M	957E–488–U	.5919–.5921	15.034–15.039
Yellow	957E–488–C	957E–488–N	957E–488–V	.5921–.5923	15.039–15.044
Green	957E–488–D	957E–488–P	957E–488–W	.5925–.5926	15.049–15.052
Orange	957E–488–E	957E–488–R	957E–488–X	.5927–.5928	15.055–15.057

Main Control Lever Cross-Shaft

To enable parts common to both the Super Major and Dexta, and similar production methods to be used, the inner end of the control lever cross-shaft has been modified and the actuating lever is now retained by a snap ring instead of the flat washer, castellated nut and split pin previously used.

These two cross-shafts are completely interchangeable, providing that the correct hardware is used to secure the actuating lever. This change became effective in production at Tractor Serial No. 957E–74917.

Main Control Lever, Quadrant Assembly and Top Cover

With the introduction of the flow control valve, i.e. after Serial No. 957E–68355 the quadrant assembly was modified to incorporate a pivot point for the flow control valve linkage.

In addition the main control lever was modified and now carries a movable spacer which, when inserted between the lever and the flow control linkage, provides automatic fast operation of the hydraulics whenever the lever is moved to the " raise " position on the quadrant.

At Tractor Serial No. 957E–76093, changes were made to the fixing flange to enable the quadrant assembly to be retained by two screws instead of the four previously used.

To suit the two screw fixing arrangement a gasket with two holes for the fixing screws, instead of the previous four-hole type is used between the current type quadrant and the top cover.

In line with the changes to the quadrant the top cover has been modified and the latest cover has only two tapped holes for securing the quadrant.

Auxiliary Service Control Valve

The latest type auxiliary service control valve, incorporating a flow control device, is completely interchangeable as an assembly with the previous type, provided that a modified quadrant assembly and the necessary flow control valve linkage are also fitted.

The spool, retainer and housing are not interchangeable as separate items with previous production parts.

Operation of the Flow Control Valve

The flow control device, incorporated in the auxiliary service control valve plate, enables the driver to limit the rate of flow of oil to the ram cylinder or auxiliaries.

The rate of flow is adjusted by screwing the knob and spindle in or out of the control knob, moving the restrictor between the " F " (maximum flow) and " S " (minimum flow) marks cast in the housing. When the knob is screwed fully out, the restrictor will be in the minimum flow position, as the knob is screwed in the restrictor will be rotated until it reaches the maximum flow position. Regardless of the position at which the control knob is set, when the quadrant lever is raised to the top of the quadrant the flow control valve linkage will automatically move it to the fast position providing the quadrant spacer is moved into position between the control lever and the flow control linkage. When the implement is returned to work the flow control valve restrictor will automatically return to its pre-set position.

When the hydraulic system is in operation oil is being fed to the restrictor and the front face of the flow control valve at pump pressure, it then continues, via the restrictor, to the check valve passage and also via a small drilling to the rear face of the flow control valve.

Due to the obstruction to flow at the restrictor there will be a slight pressure drop at this point and the oil acting on the front and rear faces of the flow control valve will be at different pressures. The difference in these pressures will be in direct relation to the position of the restrictor, the further it is closed, the greater will be the difference. If sufficient difference exists, the high pressure oil will move the flow control valve against the pressure of the flow control valve spring and allow oil from the high pressure side to bleed off into the transmission housing.

The driver can thus, by altering the position of the restrictor, control the quantity of oil flowing to the ram cylinder or auxiliary circuit as required.

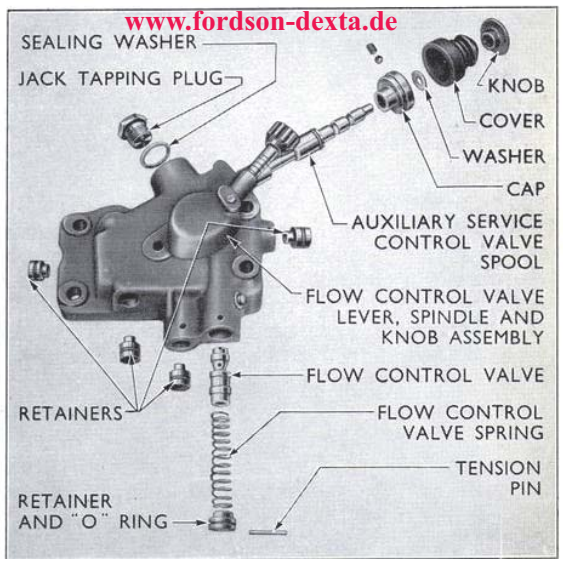


Fig. 58
Auxiliary Service Control Plate and Flow Control Valve

This is of particular benefit when operating in Qualitrol as it enables the operator to smooth out the reaction from the hydraulic system. When operating in undulating or rapidly varying soil conditions, there is a tendency for the implement to " bump " or over-correct and this can be overcome by setting the restrictor in the slow position. When operating under heavy conditions, where wheel slip is limiting traction, setting the restrictor in the fast position will allow corrections to take place at full speed. As the system causes a raising correction, weight will be transferred rapidly to the tractor assisting the tractor tyres to bite in and obtain a grip. A further advantage of the system is that when operating mounted equipment such as hedgers, setting the restrictor at " slow " will allow the operator to make small corrections to suit varying soil contours and will minimise the tendency to raise the implement too high which would occur on a system not equipped with flow control.

While the flow control valve has no control on the rate of lowering, the new control valve and bush mentioned previously are designed to allow a progressive rate of drop. The control valve bush now has three pairs of holes in it, each behind the other so that as the valve moves to the lowering position the holes will be progressively opened. Moving the valve a small amount means that the oil must exhaust through one pair of holes and gives a slow rate of drop, as the valve is moved further back the second and then the third pair of holes will be uncovered, increasing the rate of drop.

To Remove and Dismantle the Flow Control Valve and Auxiliary Service Control Plate

1. Disconnect the flow control linkage from the knob by removing the clevis pin and split pin.

2. Remove the set screws securing the auxiliary service plate to the lift cover. Remove and discard the "O" rings fitted between the plate and the lift cover.

3. Drive out the tension pin securing the auxiliary service spool cap and withdraw the spool, cap and rubber cover. Unscrew the knob from the spool, remove the cover and flat washer and slide the cap off the spool, taking care not to lose the locating ball and spring from inside the cap. Remove and discard the "O" ring from the spool.

4. Drive out the pin securing the flow control knob to the restrictor, remove the knob and push the restrictor downwards out of the housing. Remove and discard the "O" ring fitted in the upper recess of the restrictor bore.

5. Drive out the pin in the end of the flow control valve chamber and withdraw the retainer, spring and valve plunger. Remove and discard the "O" ring fitted to the retainer.

6. Similarly, drive out the remaining four tension pins and remove the retainers and "O" rings fitted in the other oil passages in the housing.

To Reassemble the Auxiliary Service Control Plate and Flow Control Valve

1. Fit new "O" rings to the retainers, press into position in their bores and secure with tension pins.

2. Place the flow control valve plunger in its bore. This valve is a selective fit and the largest valve should be fitted which will operate without binding in the bore. Replace the flow control valve spring followed by the retainer, using a new "O" ring on the retainer, and secure by driving in the tension pin.

3. Insert the restrictor in its bore in the plate, keeping the large end to the lower face of the plate. Place a new "O" ring over the top of the restrictor and into the counterbore in the housing. Place the control knob in position over the restrictor and secure with a tension pin.

NOTE.—The holes in the restrictor and knob are drilled off-centre to ensure correct relationship between these parts.

4. Place the spring and ball in the internal recess of the auxiliary service spool cap. Depress the ball into the recess and slide the cap on to the spool. Place the flat washer on the end of the spool, followed by the rubber cover and operating knob.

5. Fit new "O" rings to the valve spool and fit the spool to the valve chest. The spool is a selective fit in its bore and the largest spool which will operate without binding should be fitted. Locate the cap in the entrance to the bore and secure with a tension pin.

6. Fit new "O" rings to the oil passages between the plate and the lift cover and fit the valve chest to the lift cover, using a new gasket.

Since the Dexta was introduced the range of auxiliary service spools has been increased to cover five bore and spool sizes. The colour markings of the bore and spool are shown in the tables below, together with the colour markings of the flow control valve and its bore. It should be remembered that the current spool, although having the same outside diameters as the previous type is not interchangeable. The table, however, is applicable to both types of spool.

Position Control/Qualitrol Selector Lever

Effective with approximate Tractor Serial No. 957E–53258 the position control selector arm was modified by the incorporation of an annular groove in the spindle section.

An "O" ring is now fitted at this location to improve oil sealing between the selector arm and lift cover. Whilst the selector arms are completely interchangeable, the "O" ring can only be fitted to the latest type arm.

Auxiliary Service Control Valve Bore		
Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Green	from .7487 to .7490	from 19.017 to 19.025
White	over .7490 to .7493	over 19.025 to 19.032
Blue	over .7493 to .7496	over 19.032 to 19.040
Yellow	over .7496 to .7500	over 19.040 to 19.050
Orange	over .7500 to .7503	over 19.050 to 19.058

Auxiliary Service Control Valve		
Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Green	from .7482 to .7485	from 19.005 to 19.013
White	over .7485 to .7488	over 19.013 to 19.020
Blue	over .7488 to .7491	over 19.020 to 19.028
Yellow	over .7491 to .7494	over 19.028 to 19.036
Orange	over .7494 to .7497	over 19.036 to 19.043

Flow Control Valve Plunger Bore		
Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Red	from .6675 to .6677	from 16.955 to 16.960
Yellow	over .6677 to .6679	over 16.960 to 16.965
Blue	over .6679 to .6681	over 16.965 to 16.970
Green	over .6681 to .6683	over 16.970 to 16.975
White	over .6683 to .6685	over 16.975 to 16.981

Flow Control Valve Plunger		
Colour Marking	*Diameter (ins.)*	*Diameter (mm.)*
Red	from .6670 to .6672	from 16.942 to 16.948
Yellow	over .6672 to .6674	over 16.948 to 16.953
Blue	over .6674 to .6676	over 16.953 to 16.958
Green	over .6676 to .6678	over 16.958 to 16.963
White	over .6678 to .6680	over 16.963 to 16.968

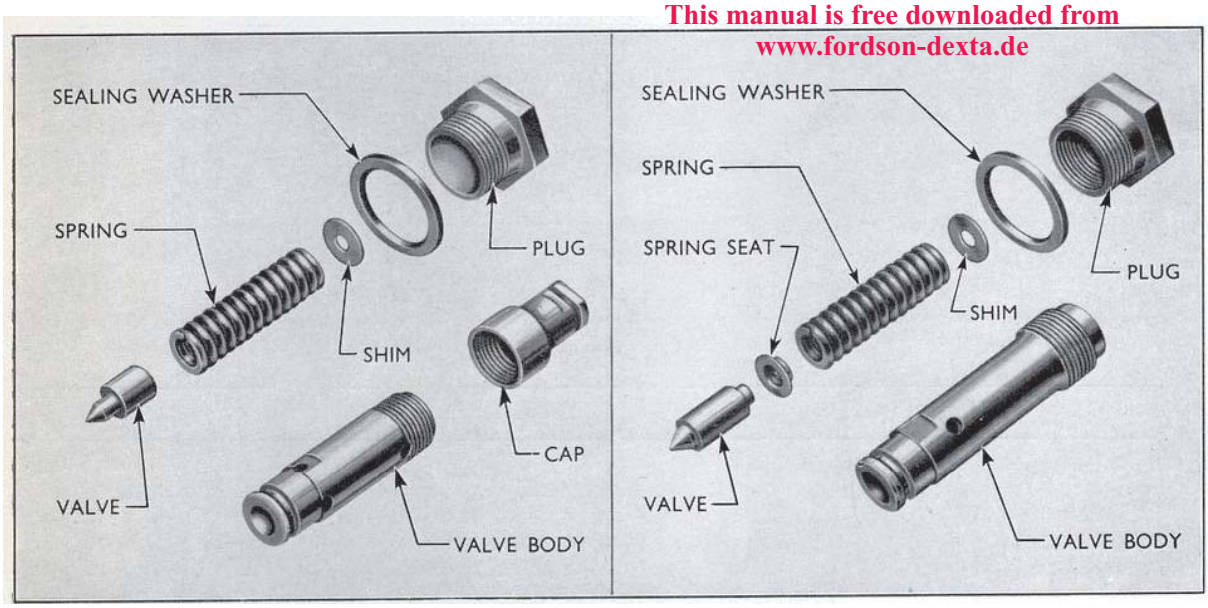
Hydraulic Pump Pressure Relief Valve

Effective with approximate Tractor Serial No. 957E-49624 a new pressure relief valve was introduced to increase the operating efficiency of the hydraulic lift. The valve is completely interchangeable as an assembly with the previous valve but the details must not be mixed (see Fig. 6).

With the new unloading valve the maximum operating pressure of the system is raised to 2,450 to 2,500 lb/sq. in. (172.24 to 175.77 kg/sq. cm.), the valve will then blow off and remain off its seat until the pressure drops below 300 lb/sq. in. (21.09 kg/sq. cm.). The table below gives details of current and previous parts, the part number of the pump being changed due to the new valve incorporated in it.

With effect from approximate Tractor Serial No. 957E-56886 a further change was made to the unloading valve spring, this spring is interchangeable with the previous spring but must not be mixed with the earliest springs.

Description	*Part Nos.*	
	Current Type	*Previous Type*
Pump assembly—H.P.L.	957E-994630-B	957E-994630-A
Valve assembly—H.P.L. pump unloading	957E-638-B	957E-638-A
Plug—H.P.L. pump unloading valve	957E-679-B	957E-679-A
Seat—H.P.L. pump unloading valve spring	957E-906	—
Valve—H.P.L. pump unloading	957E-994601-B	957E-994601-A
Body—H.P.L. pump unloading valve	957E-994608-B	957E-994608-A
Shim—H.P.L. pump unloading valve (.010 in.)	957E-994613-E	957E-994613-A
Shim—H.P.L. pump unloading valve (.025 in.)	957E-994613-F	957E-994613-D
Shim—H.P.L. pump unloading valve (.005 in.)	—	957E-994613-C
Shim—H.P.L. pump unloading valve (.015 in.)	—	957E-994613-B
Spring—H.P.L. pump unloading valve	957E-994717-B	957E-994717-A
Cap—H.P.L. pump unloading valve	—	957E-931



Previous type Current type

Fig. 59
Pressure Relief Valve Assemblies

Ram Cylinder Safety Valve

In line with the changes to the pump unloading valve the internal components of the ram cylinder safety valve were modified to raise the " blow-off " pressure to 2,750 to 2,850 lbs. per sq. in. (193.35 to 200.38 kg. per sq. cm.). This valve is fully interchangeable with the previous type and only the latest type is being supplied in service. As previously, this valve is a sealed unit and no attempt should be made to adjust it. If for any reason it is suspected to be faulty it should be removed and replaced with a new part.

This change became effective in production at Tractor Serial No. 957E–59444.

Ram Arm

All tractors after Serial No. 957E–19962 incorporate a thrust washer fitted between the right-hand side of the ram arm and the adjacent cross-shaft bush. To accommodate this washer the overall width of the ram arm has been reduced, the two arms are completely interchangeable and there is no change in part number. If, however, the narrower arm is fitted, the thrust washer must be fitted.

D.A.R. VALVE ASSEMBLY

Hydraulic Pump Relief Valve Pressure Testing

To facilitate checking the hydraulic pump pressure relief valve on " Fordson Dexta " tractors fitted with D.A.R. valve assemblies, the following procedure should be adopted, the equipment being assembled as shown in Fig. 7.

1. Operate the tractor to bring the transmission oil to normal operating temperature. While running the tractor operate the D.A.R. valve actuating lever to clear the D.A.R. valve left-hand feed pipe of high pressure oil, i.e. move the actuating lever to the rear to pressurise the right-hand feed pipe and thereby release oil from the left-hand pipe.

2. Disconnect the left-hand pipe at its forward end and remove the pipe adaptor from the jack-tapping in the D.A.R. valve housing.

3. Screw the " T "-piece (Tool No. T.8503–1/f) of the hydraulic test equipment (Tool No. T.8503–1) into the jack-tapping using a suitable sealing washer between the " T "-piece and D.A.R. valve housing. Fit a ½ in. B.S.P. plug and sealing washer in the outer end of the " T "-piece.

4. Remove the rear axle filler plug and install the transparent plastic hose and shut-off valve of the hydraulic test equipment between the " T "-piece and the rear axle filler plug hole, ensuring that the shut-off valve is assembled the correct way round, i.e. " FLOW " arrow on valve body pointing towards rear axle filler plug hole.

5. Attach the swivel adaptor (Tool No. T.8503–1/g) to the pressure gauge (Tool No. T.8503), remove the sealing plug from the hydraulic pump pressure relief valve chamber and screw the swivel adaptor and gauge assembly into the tapped hole.

6. Fully open the shut-off valve, start the engine and run at 1,550 r.p.m.

7. Move the D.A.R. valve flow control knob into the fast flow position (against stop marked " F " on valve body) and hold the D.A.R. valve actuating lever in the forward position.

8. Slowly close the shut-off valve and observe the reading on the pressure gauge which should show a steady increase in pressure up to 2,450 to 2,500 lbs/sq. in. (172.24 to 175.77 kg/sq. cm.). At this pressure the relief valve should open and the pressure should drop to approximately 300 lbs/sq. in. (21.09 kg/sq. cm).

If, after at least three consistent readings the relief valve is found to open at above or below the specified pressure, remove and dismantle the pump relief valve. Rinse thoroughly in cleaning fluid, reassemble while still wet and re-check the opening pressure. Only after this procedure has been followed should the number of shims be changed to increase or decrease the pressure to that specified, two thicknesses of shims, .010 in. (.254 mm.) and .025 in. (.635 mm.) are available for this adjustment.

9. Reassemble the relief valve, install in the pump and re-check the opening pressure.

In the event of the relief valve not blowing off, the pump itself may be at fault and the pressure will not reach the specified figures. If this is suspected, the pump should either be replaced with one which is known to be correct, or dismantled to determine the cause.

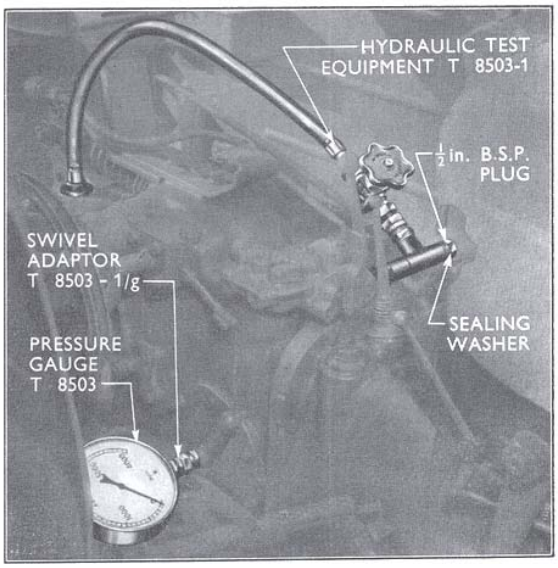


Fig. 60
Hydraulic Pump Test Equipment (With D.A.R. Valve)

NOTE.—Cleanliness is an absolute necessity when dealing with the hydraulic pump relief valve and when dismantling and reassembling the valve the parts should be rinsed in cleaning fluid to ensure that all traces of swarf and dirt are removed. Always reassemble the valve assembly while still wet.

10. When the relief valve pressure has been correctly set, release the pressurised oil from the left-hand feed pipe as described previously, remove the hydraulic test equipment and replace the pump relief valve chamber sealing plug, left-hand feed pipe adaptor, left-hand feed pipe and rear axle filler plug.

D.A.R. Valve Check Valve Testing

Whenever D.A.R. valve check valves and seats are renewed in service it will be necessary to test the sealing between the valve and seat to ensure satisfactory operation of the D.A.R. valve assembly (see Fig. 8).

A simple method of testing the sealing capabilities, using existing test equipment is outlined in the paragraphs below :—

1. Operate the tractor to bring the transmission oil up to normal operating temperature.

2. While the engine is running, release pressure oil from the feed line in which the check valve to be tested is situated, i.e. move the D.A.R. valve actuating lever rearward if the test is to be made on the front check valve and forward if the test is to be made on the rear check valve.

3. Disconnect the appropriate feed pipe at its front end and remove the pipe adaptor from the jack-tapping in the D.A.R. valve housing.

4. Screw the " T "-piece (Tool No. T.8503–1/f) of the hydraulic test equipment (Tool No. T.8503–1) into the jack-tapping, using a suitable sealing washer between the " T "-piece and the D.A.R. valve housing. Fit a ½ in. B.S.P. plug and sealing washer in the outer end of the " T "-piece.

5. Fit the hydraulic pressure gauge (Tool No. T.8503) into the top of the " T "-piece.

6. Run the engine at approximately 1,000 r.p.m., set the D.A.R. valve flow control knob in the slow flow position (against stop marked "S" on valve body), and move the actuating lever into the appropriate position to feed oil to the pressure gauge. Operate the lever approximately six times, raising the pressure on the gauge to maximum each time and then releasing it by moving the lever to feed oil to the other pipe. This sequence will allow the check valve to " bed " down on its seat.

7. Move the actuating lever into the appropriate position and raise the pressure on the gauge to above 2,000 lbs/sq. in. (140.6 kg/sq. cm.), release the actuating lever and check that the check valve and seat does not allow the pressure to drop below 1,250 lbs/sq. in. (87.9 kg/sq. cm.) in three minutes. Should the check valve and seat not pass this test they should be renewed.

8. Remove the hydraulic test equipment and replace the feed pipe adaptor and pipe.

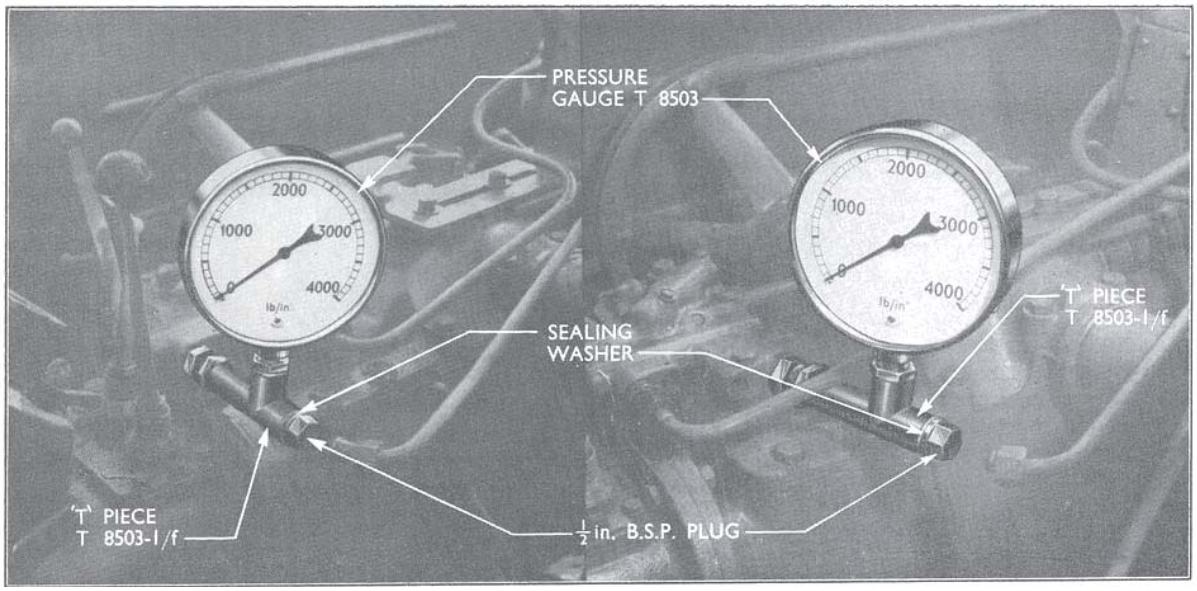


Fig. 61
D.A.R. Valve Check Valve Test