FORD

Service Manual

FORD
NEW HOLLAND

Tractor Series
600, 700, 800, 900, 501, 601, 701, 801, 901, 1801, 2000, and 4000

1954 – 1964

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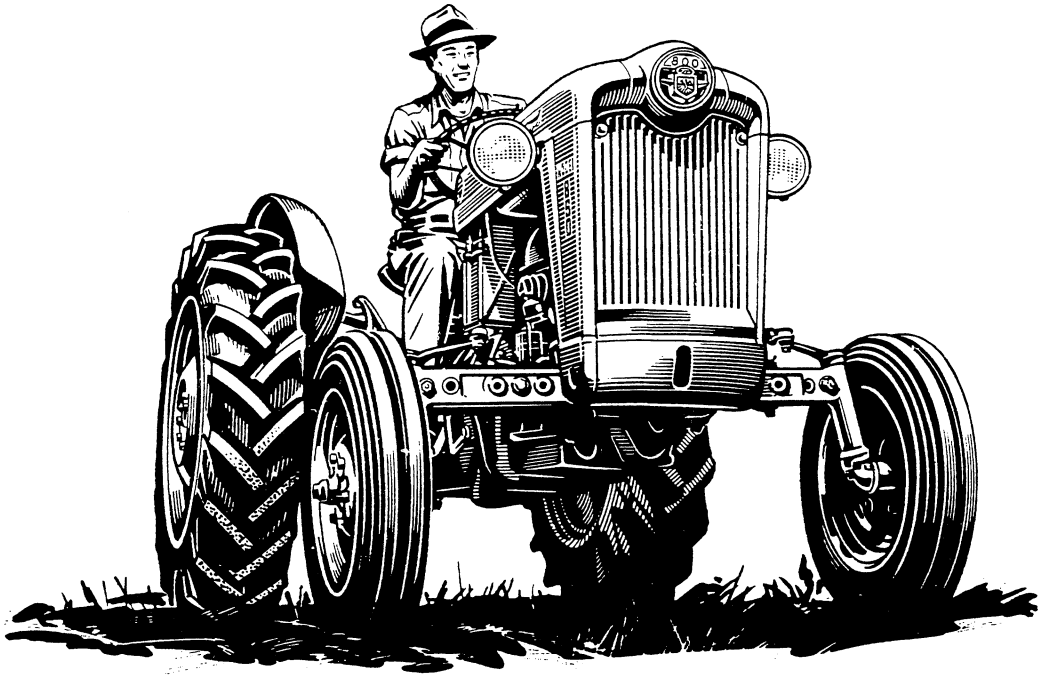

Reprinted

FORD TRACTOR SHOP MANUAL

for

TRACTOR SERIES

600-700-800-900

601-701-801-901-1801

501 follow Series 600, 601
2000 follow Series 600, 601
4000 follow Series 800, 801

Prepared by

TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
BIRMINGHAM, MICHIGAN

SE 8175

Litho in U.S.A.

FOREWORD

This manual contains complete service information on all Series 600 through 1801 Ford Tractors. The information contained herein will be useful to the inexperienced mechanics as well as the experienced ones.

Step-by-step procedures for removal, disassembly, inspection, repair, assembly, and installation are presented throughout the manual. Most of the major assemblies are shown disassembled, with each of the component parts arranged in the order of assembly. In many instances, a glance at the disassembled views will show you everything you need to know to assemble the parts.

Whenever possible, the special tools involved in the disassembly or assembly of the various units are illustrated.

Sections on Trouble Shooting, Specifications, and Special Tools are provided at the end of each chapter for quick reference.

The descriptions and specifications contained in this manual were in effect at the time the manual was approved for printing. The Tractor and Implement Division of Ford Motor Company reserves the right to discontinue at any time, or change specifications or design without notice or without incurring obligation.

TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
SERVICE DEPARTMENT

SELECT-O-SPEED TRANSMISSION SHOP MANUAL SUPPLEMENT

for

FORD TRACTOR SERIES 2000 AND 4000

(DIRECT DRIVE CLUTCH MODELS)

Prepared by

TRACTOR AND IMPLEMENT OPERATIONS (U.S.)

FORD TRACTOR DIVISION FORD MOTOR COMPANY

BIRMINGHAM, MICHIGAN

SE 8175–S1 96315

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Part TWO

CLUTCH, TRANSMISSIONS, REAR AXLE AND POWER TAKE-OFF

Chapter

II

Transmissions

7. DESCRIPTION AND OPERATION – SELECT-O-SPEED TRANSMISSION

The Select-O-Speed Transmission is available in three models. The basic transmission remains unchanged for all tractors, and the differences exist only in the following Power Take-Off options:

No P.T.O.

Single speed independent engine-driven P.T.O.

Two speed independent engine-driven P.T.O., and proportional ground speed P.T.O.

The transmission provides for ease of control and high efficiency in the utilization of engine power and engine fuel. It is a manually selected, hydraulically controlled system, which transmits power from the engine through four planetary gear sets, providing the ten forward speed ratios and two reverse speed ratios to the final drive of the tractor. Park and Neutral positions are also provided.

A brief description and the principles of operation of the major assemblies in the transmission are discussed in this section. All design and operational differences between the transmission models are fully explained.

PLANETARY GEAR TRAIN

For purposes of identification, the four planetary gear systems used in the transmission have been labeled from front to rear, "A", "B", "C", and "D", as shown in Figure 1. The ten forward and two reverse speeds are obtained by controlling the movement of the elements within the planetary gear systems.

Each of the planetary gear systems is comprised of three elements; a sun gear, a carrier with three pinions, and a ring gear, as shown in Figure 2. The three pinions are mounted within the carrier frame and rotate on needle bearings around pinion shafts, which are secured to the carrier frame. The sun gear, which is centered between the pinions, has external teeth. The ring gear, which encompasses the pinions, has internal teeth. All of the gears in the planetary system are constantly in mesh.

When a planetary system is connected to a source of power, all of the components in the system will rotate unless an external force is applied to hold an element. The sun gear, carrier, and the ring gear, can rotate on the central axis of the system and the pinions will rotate on their own axes at the same time as they are being carried around the central axis.

Planetary Gear Power Flow

Depending upon which element of a planetary system is held, power can be applied or taken out at the sun gear, carrier, or ring gear. The general flow of power through the planetary system will be as follows:

1. Applying power to the sun gear and holding the ring gear forces the pinions to rotate on their own axes and "walk" within the ring gear, taking the carrier

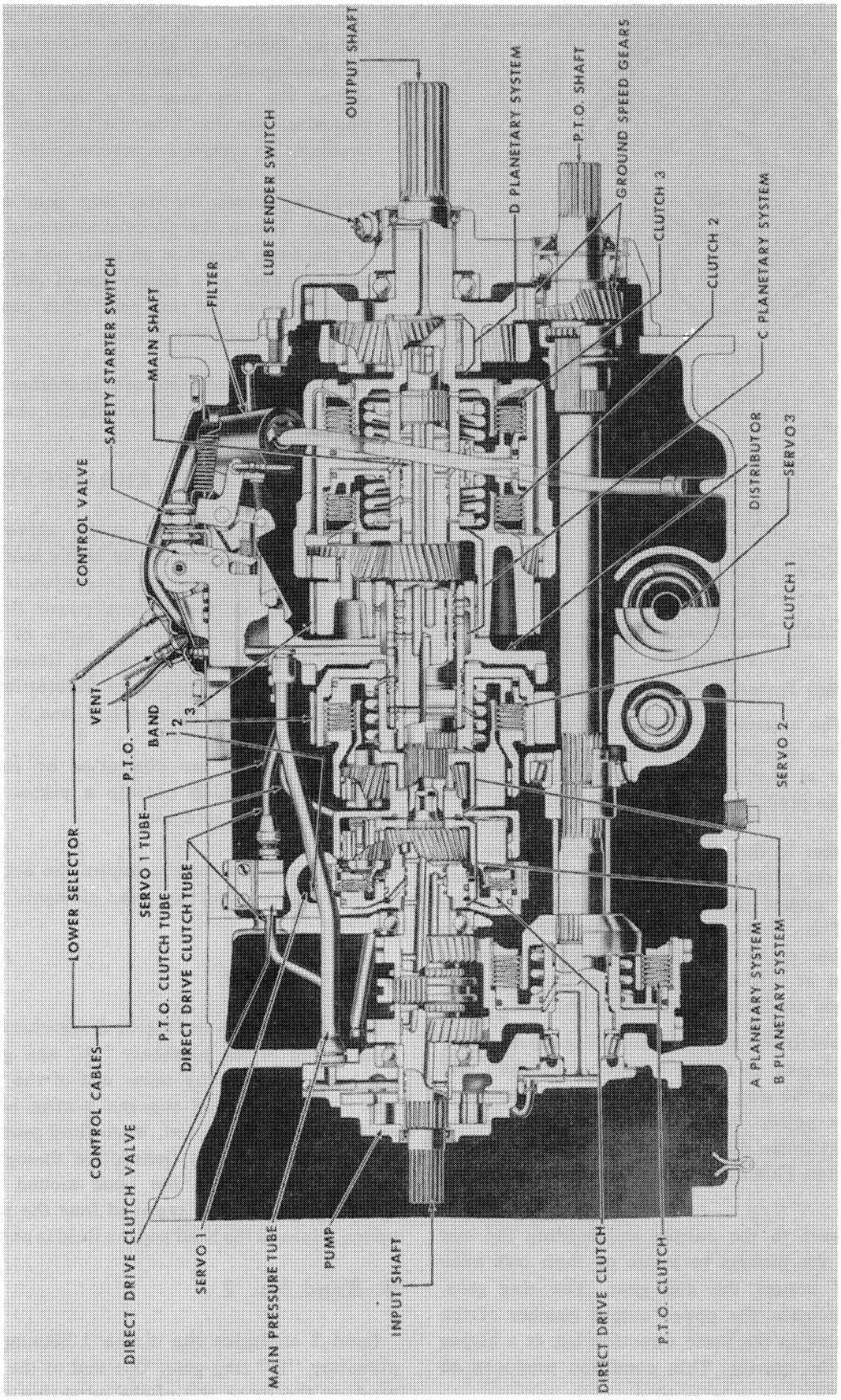

Figure 1
The Two Speed Independent P.T.O. and Proportional Ground Speed P.T.O. Select-O-Speed Transmission–Sectional View

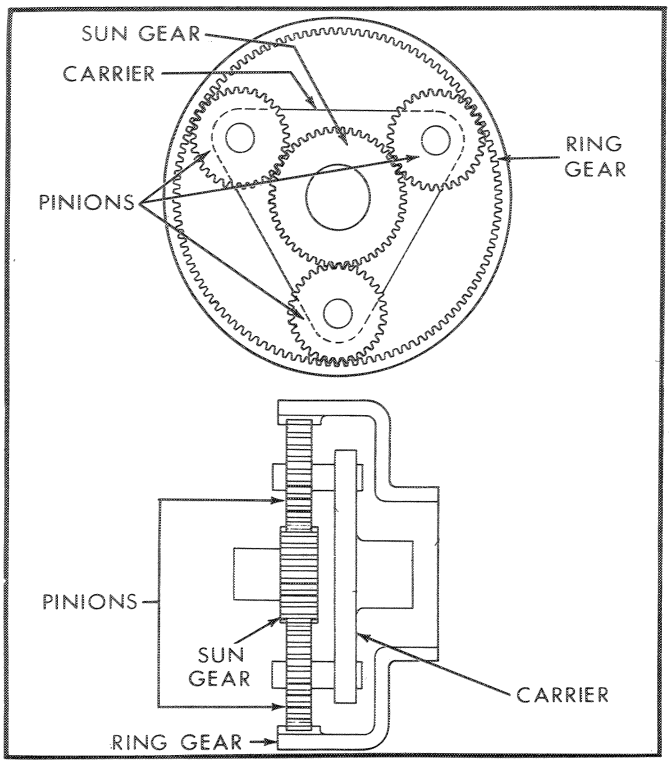

Figure 2
Planetary System – Front and Side View

with them. The carrier, therefore, becomes the power output member of the system, turning in the same direction but at a slower speed than the sun gear. This condition produces an underdrive ratio.

2. Applying power to the ring gear and holding the sun gear forces the pinions to rotate on their own axes and "walk" around the sun gear, taking the carrier with them. The carrier, therefore, becomes the power output member of the system, turning in the same direction but at a slower speed than the ring gear. This condition produces an underdrive ratio.

3. Applying power to the carrier and holding the ring gear forces the pinions to rotate on their own axes and "walk" within the ring gear. The sun gear, therefore, becomes the power output member of the system, turning in the same direction but at a higher speed than the carrier. This condition produces an overdrive ratio.

4. Applying power to the carrier and holding the sun gear, forces the pinions to rotate on their own axes and "walk" around the sun gear. The ring gear, therefore, becomes the power output member of the system, turning in the same direction but at a higher speed than the carrier. This condition produces an overdrive ratio.

5. Applying power to the sun gear and holding the carrier, forces the pinions to act as idlers, rotating in the opposite direction on their own axes. This drives the ring gear at a lower speed and in the opposite direction from the sun gear. This condition produces an underdrive reverse ratio.

6. Applying power to the ring gear and holding the carrier, forces the pinions to act as idlers, rotating in the same direction on their own axes. This drives the sun gear at a higher speed and in the opposite direction from the ring gear. This condition produces an overdrive reverse ratio.

7. Locking any two units of a planetary system together results in a direct drive with no change in speed or direction of rotation.

BANDS AND SERVOS

The transmission uses three servo-operated brake bands, shown in Figure 1. The bands hold three planetary gear elements and operate in conjunction with the hydraulic packs for the various power flows through the transmission. The bands are made of steel and have metallic or asbestos composition linings bonded to the inside surface. For purposes of illustration and reference, the bands have been labeled 1, 2, and 3.

All three bands are controlled by corresponding hydraulic servos which contain a piston and rod, return spring, and spring retainer.

In operation, the servos control the action of the bands on the various planetary gear elements in the following manner:

A. Band No. 1

Band 1 encircles the direct drive clutch housing which is attached to the planetary "A" sun gear. One end of the band contacts the inner end of the adjusting screw and the opposite end engages a strut between the band and the servo piston rod. When fluid pressure is directed to the servo, force is transmitted through the piston rod and strut to tighten the band around the drum. When hydraulic pressure is removed from the piston, the servo spring releases the band and the fluid is exhausted to sump.

B. Band No. 2

Band 2 encircles the clutch 1 housing splined to the planetary "B" ring gear. One end of the band contacts a strut on the inner end of the adjusting screw. The other

GEAR RATIO	DIRECT DRIVE * CLUTCH	BAND SERVO			CLUTCH PACK		
		B_1*	B_2**	B_3**	C_1*	C_2*	C_3*
Park (P)	A		A	A	A		
R2		A		A	A		
R1	A			A			
Neutral (N)	A			A			
1st	A			A			A
2nd	A			A		A	
3rd		A		A			A
4th		A		A		A	
5th	A		A				A
6th	A		A			A	
7th		A	A				A
8th		A	A			A	
9th	A				A	A	
10th		A			A	A	

* *Pressure Applied*

***Spring Applied*

Figure 3
Application of Bands and Clutch Packs for each Gear Ratio

end of the band engages a strut between the band and servo 2 actuating lever. In operation, band 2 is mechanically applied by spring pressure until fluid pressure is directed to servo 2 to hydraulically release the band from the clutch housing. When the fluid pressure is removed, the spring discharges the fluid and applies the band.

C. Band No. 3

Band 3 encircles the planetary "C" carrier. One end of the band contacts a strut on the inner end of the adjusting screw and the opposite end engages the strut between the band and servo 3 actuating lever. In operation, band 3 is mechanically applied under spring pressure until fluid pressure is directed to servo 3 to hydraulically release the band from the carrier. When fluid pressure is removed, the spring discharges the fluid and applies the band.

The following chart shows the band application and the other planetary elements affected:

Band	*Applied*	*Planetary Element Involved*
1	Hydraulically	Sun Gear "A"
2	*Mechanically	Ring Gear "B" and Sun Gear "C"
3	*Mechanically	Carrier "C"

*Bands 2 and 3 are hydraulically released.

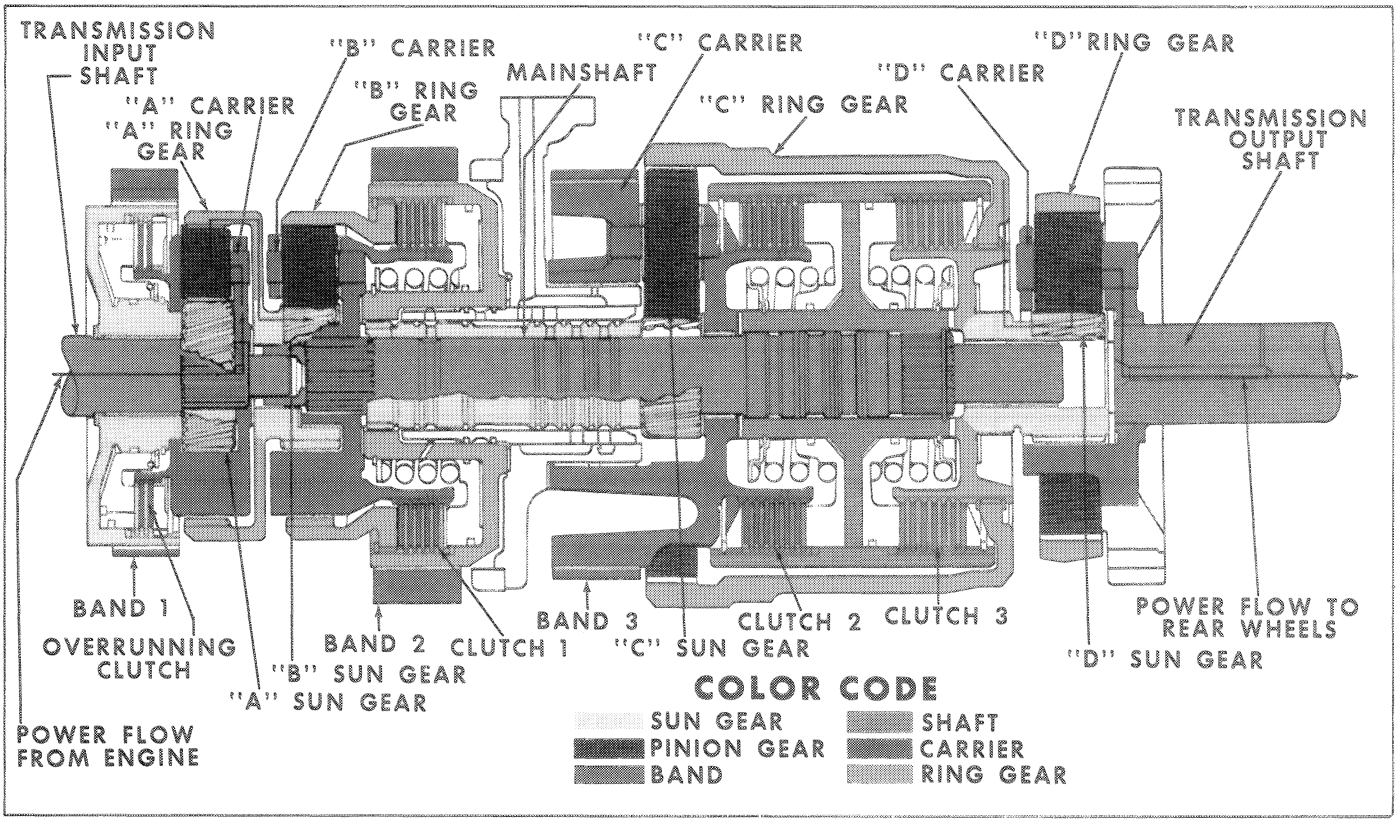

Figure 4
Select-O-Speed Planetary Gear Train

CLUTCH PACKS

In addition to the brake bands used to control planetary gear operation, the Select-O-Speed Transmission incorporates four multiple-disc clutch packs. For purposes of illustration and reference, the clutch packs have been labeled direct drive, 1, 2, and 3, as shown in Figure 1. These clutches are used to link two elements of one planetary system or the elements of adjacent planetaries together to obtain the desired power flow. The four hydraulically operated clutch packs in the transmission are all basically the same and are composed of the clutch housing, the clutch piston, the piston inner seal, the piston outer seal, a return spring and retainer, a series of steel and bronze plates, a pressure plate and retainer snap ring. The steel plates have external splines which engage with the clutch housing and the bronze plates have internal splines which engage a planetary gear element.

When fluid pressure is applied to a clutch pack, the pressure moves the piston compressing the return spring which in turn locks the steel and bronze plates together, engaging the clutch. The piston is returned to the released position by the return spring after hydraulic pressure has been removed. With the exception of the direct drive clutch, the steel clutch plates contain a slightly dished form to maintain positive separation while the clutch is released.

The function of each individual clutch assembly is listed in the following table:

Clutch	*Planetary Elements Combined*
Direct Drive	Sun "A" – Carrier "A"
1	Carrier "B" – Ring Gear "B"
2	Carrier "B" – Carrier "C"
3	Carrier "B" – Sun Gear "D"

TRANSMISSION POWER FLOWS

When certain combinations of elements in the planetary gear train of the transmission are held by the bands and

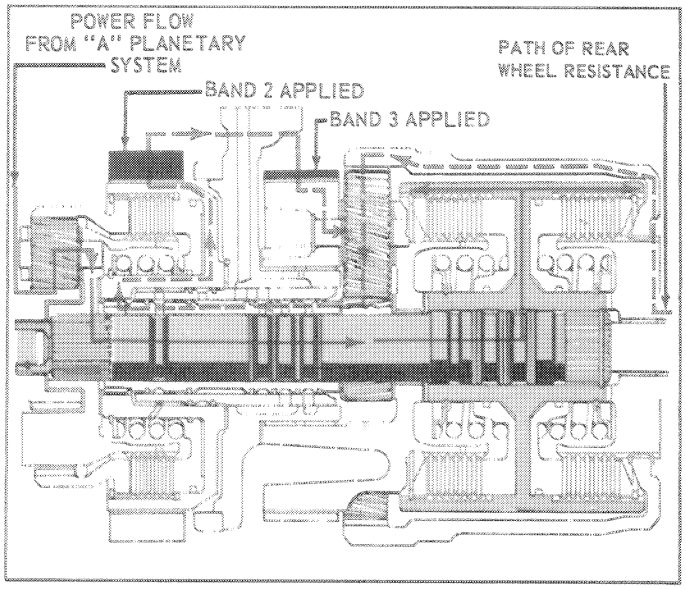

Figure 5
Power Flow – Park Position

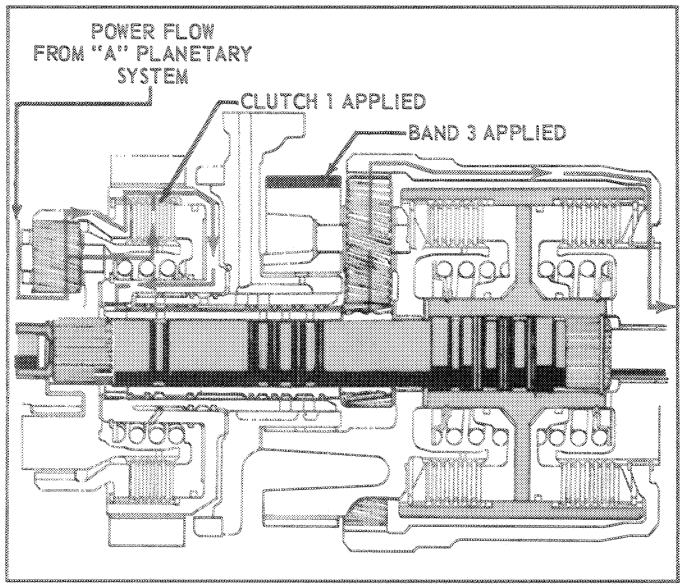

Figure 6
Power Flow – R_1 and R_2 Speed Ratios

others linked together by the clutch packs, the flow of power through the transmission provides ten forward speed ratios and two reverse speed ratios. All of the basic power flows are illustrated and described in this section. A chart illustrating the application of the bands and clutch packs for each gear ratio is shown in Figure 3.

A. Direct Drive and Overdrive

The power flow through the "A" planetary system, shown in Figure 4, is always the same. The carrier is splined to the transmission input shaft and power is taken out at the ring gear. The only function of the "A" planetary system is to transmit power from the engine to the "B" planetary system either at engine speed, for a direct drive condition, or at an increased speed, providing an overdrive condition. When the direct drive clutch is applied it locks the sun gear to the carrier and the "A" planetary system rotates as a unit at engine speed. When band 1 is applied to hold the sun gear, the direct drive clutch automatically releases and the rate of rotation increases as power is taken out at the ring gear.

B. Final Reduction

The "D" planetary system, shown in Figure 4, is always used to reduce the high speeds developed within the transmission to the required operating speeds and deliver the flow of power through the output shaft. The power will always enter the "D" planetary at the sun gear and go out through the carrier which is integral with the output shaft.

C. Primary Variable Reduction

The six basic speed ratios, five forward and one reverse, are obtained through the various combinations of holding or driving elements in the "B" and "C" planetary systems only. Therefore, ten forward speeds and two reverse speeds are made possible by the dual range characteristics of the "A" planetary system.

1. POWER FLOW – PARK POSITION

To provide the park position, which prevents any movement of the tractor, band 2 is applied to hold the "B" ring gear and "C" sun gear, and band 3 is also applied to hold the "C" carrier, as shown in Figure 5. With the "B" sun gear turning clockwise, the pinions "walk" around the "B" ring gear causing the "B" carrier, mainshaft, and housing for clutches 2 and 3, to rotate. Since neither clutch 2 nor clutch 3 is engaged, power is not transmitted to the "D" sun gear. Since "C" carrier is being held stationary by band 3 and the "C" sun gear is being held by band 2, the "C" planetary system is locked and will prevent the rear wheels from turning.

2. POWER FLOW – REVERSE SPEED RATIOS

The basic reverse speed ratio is obtained with the direct drive clutch applied, applying band 3 to hold the "C" carrier, and linking the "B" carrier to "B" ring gear with clutch 1, as shown in Figure 6. Rotation of the "B" sun gear causes the "B" planetary system to turn clockwise as an assembly. The "C" sun gear is, there-

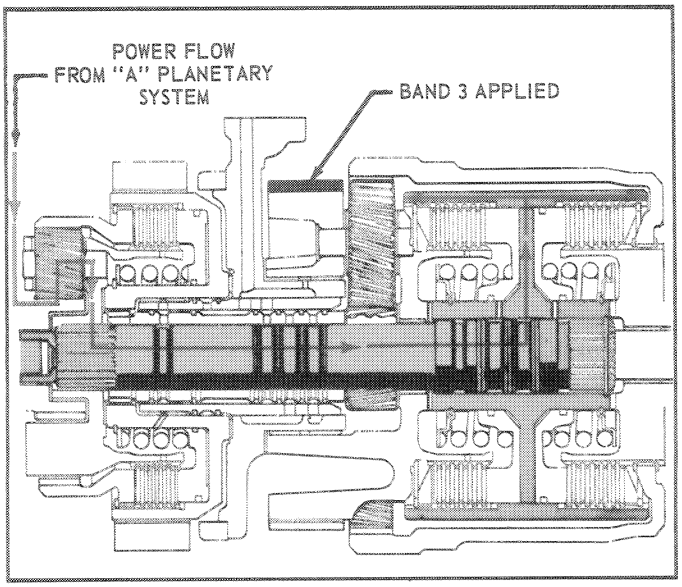

Figure 7
Power Flow – Neutral

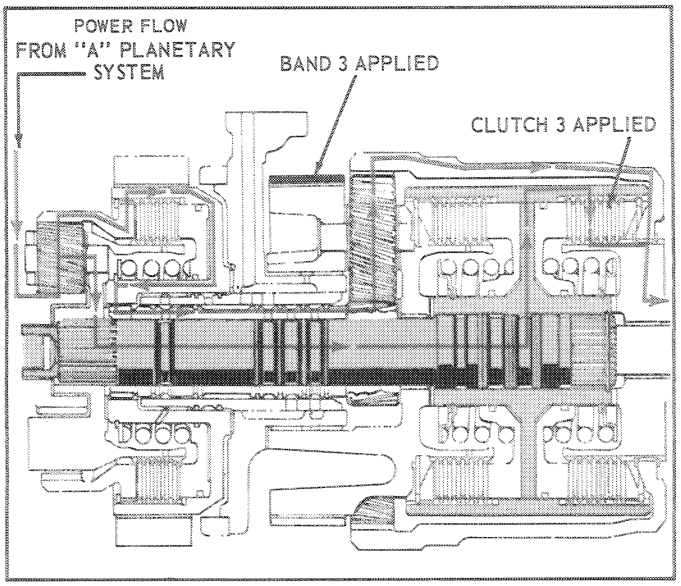

Figure 8
Power Flow – First and Third Speed Ratios

fore, driven clockwise resulting in the counterclockwise rotation of the "C" ring gear and "D" sun gear, which drives the "D" carrier and output shaft counterclockwise.

Reverse 2, being the overdrive ratio of reverse 1, is obtained by the application of band 1.

3. POWER FLOW – NEUTRAL

When the transmission is in neutral, only band 3 is applied to hold the "C" carrier, as shown in Figure 7. The clockwise rotation of the "B" sun gear causes the pinions to "walk" within the "B" ring gear, resulting in the rotation of the "B" carrier, mainshaft, and the housing for clutches 2 and 3. Since neither clutch is engaged, power is not transmitted to the "D" sun gear. The rear wheels are now free to turn as the "B" ring gear can rotate around the pinions.

4. POWER FLOW – FIRST AND THIRD SPEED RATIOS

The basic ratio is obtained with the direct drive clutch applied, holding the "C" carrier with band 3 and linking the "B" carrier to the "D" sun gear with clutch 3, as shown in Figure 8. This combination mechanically links both the "B" carrier and the "B" ring gear to the output shaft and results in a divided power flow. With the "B" sun gear turning clockwise, the "B" pinions will revolve counterclockwise and initiate the divided power flow to the "C" ring gear. On one side of the divided power flow, the "B" pinions spend a part of their rotation to "walk" clockwise around the inside of the "B" ring gear and thereby drive the "B" carrier, mainshaft, clutch 3, and "D" sun gear in a clockwise direction. On the other side of the divided power flow, the "B" pinions spend a part of their rotation to drive the "B" ring gear and the "C" sun gear in a counterclockwise direction. The "C" sun gear drives the "C" pinions which cannot orbit the central axis because band 3 is holding their carrier. Therefore, the "C" pinions rotate clockwise on their own axes and drive the "C" ring gear and the "D" sun gear in the same direction. Thus, two distinct drives are established between the "B" pinions and the "C" ring gear. This type of drive permits a high reduction ratio. Third speed, being the overdrive ratio of first, is obtained by the application of band 1.

5. POWER FLOW – SECOND AND FOURTH SPEED RATIOS

The basic speed ratio is obtained with the direct drive clutch applied, holding the "C" carrier with band 3 and linking the "B" carrier to "C" carrier with clutch 2, as shown in Figure 9. With both the "C" carrier and the "B" carrier being held, neither the "C" pinions nor the "B" pinions can orbit the central axis. Clockwise rotation of the "B" sun gear causes the "B" pinions to rotate on fixed axes driving the "B" ring gear and "C" sun gear in a counterclockwise direction. The "C" sun gear causes the "C" pinions to rotate on fixed axes, driving the "C" ring gear and "D" sun gear in a clockwise direction.

Fourth speed, being the overdrive ratio of second, is obtained by the application of band 1.

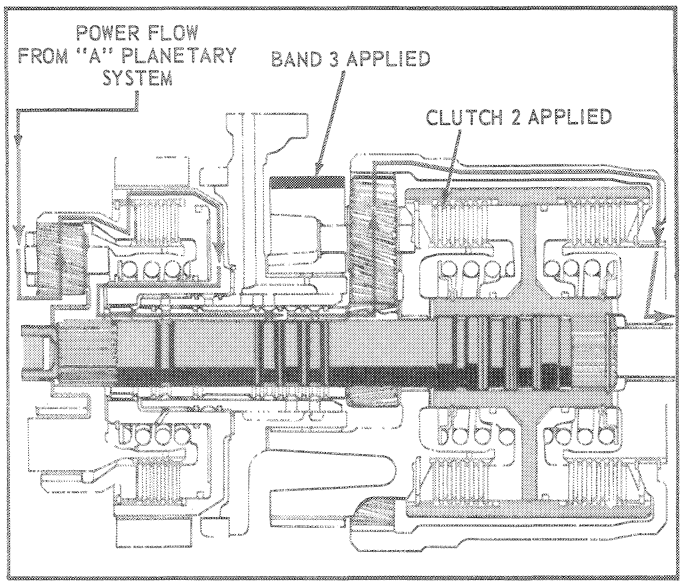

Figure 9
Power Flow – Second and Fourth Speed Ratios

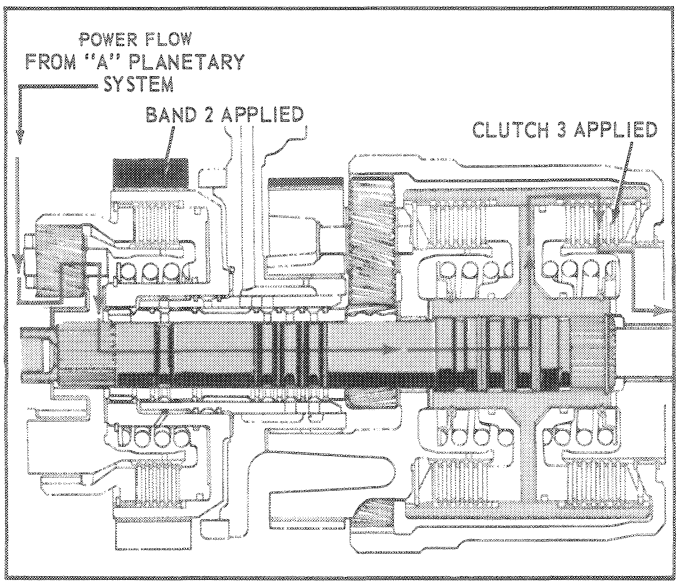

Figure 10
Power Flow – Fifth and Seventh Speed Ratios

6. POWER FLOW – FIFTH AND SEVENTH SPEED RATIOS

The basic speed ratio is obtained with the direct drive clutch applied, holding the "B" ring gear with band 2 and linking the "B" carrier to "D" sun gear with clutch 3, as shown in Figure 10. With band 2 holding the "B" ring gear, the clockwise rotation of the "B" sun gear causes the pinions to "walk" around the ring gear and drive the "B" carrier, mainshaft, and "D" sun gear in a clockwise direction.

Seventh speed, being the overdrive of fifth, is obtained by the application of band 1.

7. POWER FLOW – SIXTH AND EIGHTH SPEED RATIOS

The basic speed ratio is obtained with the direct drive clutch applied, holding the "B" ring gear and "C" sun gear with band 2, and linking the "B" carrier to "C" carrier with clutch 2, as shown in Figure 11. With band 2 holding the "B" ring gear, the clockwise rotation of the "B" sun gear causes the pinions to "walk" within the ring gear, driving the "B" carrier, mainshaft, and "C" carrier in a clockwise direction. Since the "C" sun gear is also being held, the pinions "walk" around the sun gear driving the "C" ring gear and "D" sun gear in a clockwise direction.

Eighth speed, being the overdrive of sixth, is obtained by the application of band 1.

8. POWER FLOW–NINTH AND TENTH SPEED RATIOS

The basic speed ratio is obtained with the direct drive clutch applied, linking the "B" carrier to "B" ring gear with clutch 1, and linking the "B" carrier to "C" carrier with clutch 2, as shown in Figure 12. As the "B" sun gear rotates clockwise, the complete "B" planetary system turns as an assembly, driving the mainshaft, "C" sun gear and "C" carrier at the same speed. This results in the "C" planetary system rotating as an assembly with the "C" ring gear driving the "D" sun gear clockwise at the same speed.

Tenth speed, being the overdrive of ninth, is obtained by the application of band 1.

HYDRAULIC CONTROL SYSTEM

A. Reservoir

The hydraulic fluid reservoir for this system is the transmission case which has a capacity of 11.5 quarts. The fluid pumped from the reservoir passes through a 40-mesh strainer screen which is easily removed for servicing. A plug on the bottom of the case drains the transmission.

B. Pump

The pump, shown in Figure 1, is a roller vane type which supplies fluid pressure through the main pressure tube to the pressure port in the distributor. The pump, driven by

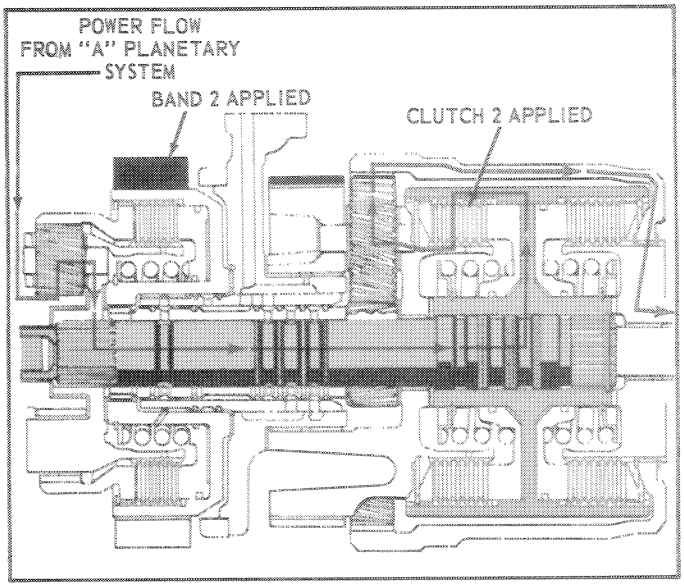

Figure 11
Power Flow – Sixth and Eighth Speed Ratios

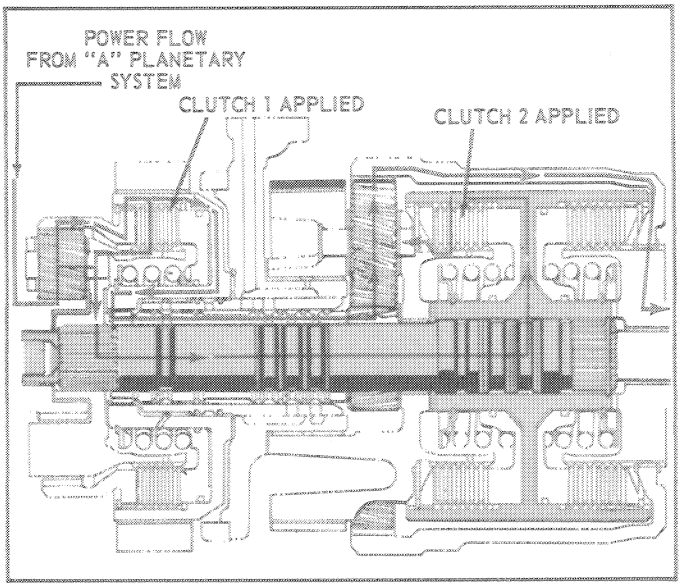

Figure 12
Power Flow – Ninth and Tenth Speed Ratios

the transmission input shaft, operates whenever the engine is running and will supply a sufficient quantity of fluid to maintain the required operating pressure and lubricate the entire transmission system.

C. Distributor

The distributor is co-axially mounted on the transmission mainshaft and is secured to the center web of the transmission case, as shown in Figure 1. The distributor acts as bearing journals for the clutch 1 and "C" carrier assemblies. Further, it channels the fluid to and from the control valve assembly for all servos and clutch packs with the exception of the direct drive clutch. The main pressure tube connects the pressure side of the pump to a port in the front of the distributor. The control valve mounts directly on the distributor and all the fluid that is directed by the control valve to the clutch packs or band servos flows through ports in the top of the distributor to the following areas:

Cast iron sealing rings on the front distributor journal clutch 1.

Ports on the left side of the distributor for the interlock cover and servos 2 and 3. See Figure 49.

Ports in the distributor bore which align with sealing ring channels on the "C" sun gear and mainshaft for lubrication and clutches 2 and 3.

Ports in the front of the distributor for servo 1 and the P.T.O. clutch.

A third port in the front of the distributor is directly connected to the main pressure port for direct drive clutch operation.

D. Control Valve Assembly

The control valve assembly is mounted directly on top of the distributor, as shown in Figures 1 and 14, and consists of upper and lower body assemblies. The control valve is actuated by a flexible cable coming from the selector assembly which rotates the cable wheel and camshaft assembly attached to the valve upper body. See Figure 14. Six cam followers operate the six spool valves in the lower body which control the fluid flow to three clutch pistons and three band servos. A safety switch mounted on the control valve permits the tractor engine to be started only when the selector lever is in the park (P) position. This switch is actuated by the camshaft assembly. As the selector is moved to park (P), the cam closes the switch completing the circuit to the tractor starter switch. Four adjustable spring-loaded, plunger-type valves are incorporated in the valve upper body to control the system pressure, lube pressure, and regulate or sequence oil flow first to the direct circuit. In addition, in the valve lower body, feathering valves are incorporated to control the oil flow in the transmission and P.T.O. indirect circuits. All of the valve components are shown in Figures 77 and 78.

The control valve separates the hydraulic system into the following direct and indirect circuits. See Figure 13.

Direct Transmission Circuit: Servos 1, 2, and 3, and the direct drive clutch with their respective spool valves,

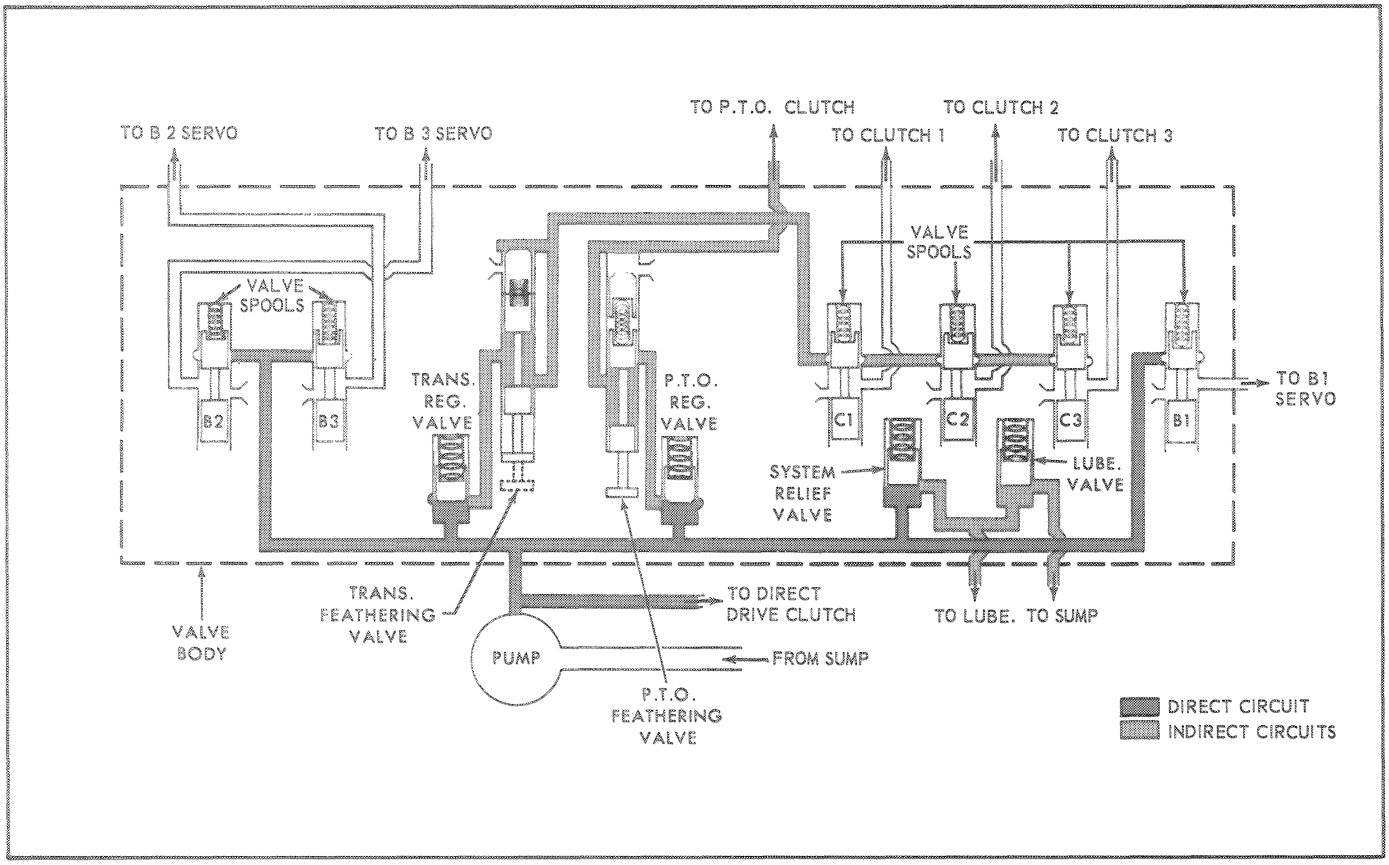

Figure 13
Control Valve Components and Circuits

are in a direct circuit with the pump.

Indirect Transmission Circuit: Clutches 1, 2, and 3, are in an indirect circuit with the pump, as their respective spool valves are separated from the pump by the transmission regulating and feathering valves.

Indirect P.T.O. Circuit: The P.T.O. clutch is in an indirect circuit with the pump, as it is separated from the pump by the P.T.O. regulating and feathering valves.

Indirect Lubrication Circuit: The transmission lubrication circuit is separated from the pump by the system relief valve.

The operation of the valve components is as follows:

System Relief Valve: The necessary operating pressure required in this system is regulated by a system relief valve located in the valve upper body. The valve is set to maintain 180 psi at an engine speed of 800 rpm.

Lubrication Relief Valve: The lubrication relief valve is located in the upper valve body. After the system pressure of 180 psi is attained, the excess fluid passes over the system relief valve to the lubrication relief valve. The lubrication valve is set to maintain 43 psi in the lubrication circuit. All of the fluid bypassing the lubrication relief valve is returned directly to sump through a filter and tube assembly.

The lube circuit consists of lube passages in the distributor and transmission main shaft. Lubrication is accomplished by controlled bleeding along the mainshaft. The rear support and "D" carrier receive lube oil through an orifice at the end of the lube passage in the mainshaft. A sender switch located in the rear support controls the lubrication warning lamp on the instrument panel at any time a low lube pressure condition exists. The sender switch closes the circuit whenever the pressure in the rear support is less than 2 psi.

Since the lubrication system is not pressurized until system pressure is attained, the lubrication warning lamp will flash on when the tractor is started and whenever the P.T.O. or transmission feathering valves are used. This drop in lube pressure is not detrimental for short periods of time as sufficient oil is available in the circuit for lubrication purposes.

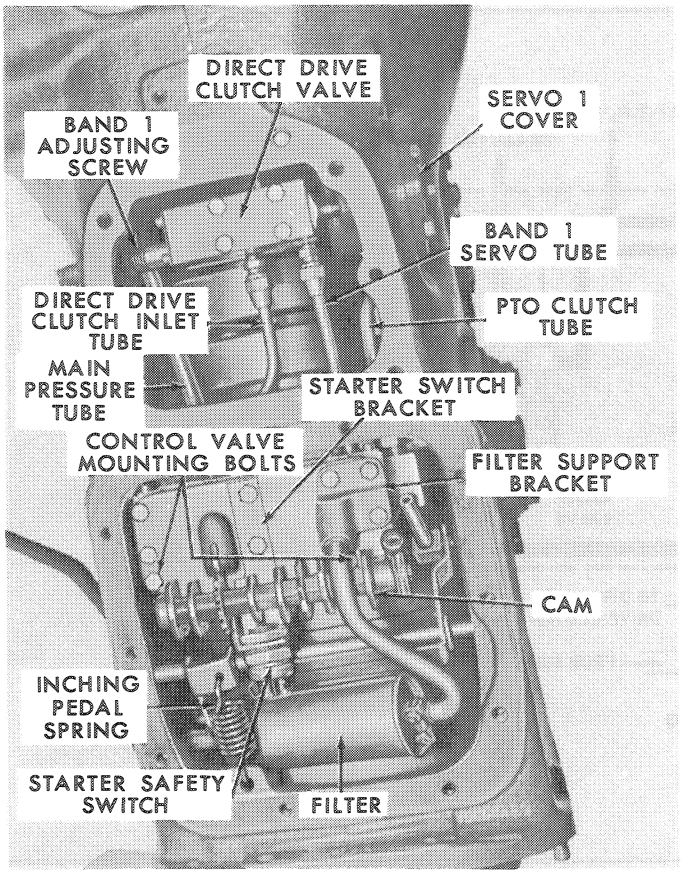

Figure 14
Transmission Cover Removed

Regulating Valves: Two regulating valves are located in the valve upper body. One is in the indirect transmission circuit containing the spool valves for clutches 1, 2, and 3. The other is in the P.T.O. clutch circuit. These valves are set at 150 psi, and operate as follows:

1. As pressure within the direct circuit is building up to 180 psi, both regulating valves remain closed and allow all of the fluid to be first directed to the servos. This eliminates the possibility of a temporary locked condition in the transmission during the gear ratio changes since the combination of bands 2 and 3 both applied is used in park (P). This arrangement also permits smoother shifting characteristics.
2. When the pressurized fluid in either the indirect transmission circuit or the indirect P.T.O. circuit is partially relieved by the action of either feathering valve, system pressure will tend to drop below the regulating valve's setting of 150 psi. To maintain sufficient pressure in the direct circuit and the transmission or P.T.O. indirect circuit, whichever is not being relieved, the regulating valves function as check valves to permit the servos and/or clutches in the unaffected circuits to operate satisfactorily.

Transmission Feathering Valve: The transmission inching pedal is located on the left side of the transmission case. It is used to maneuver the tractor very slowly or slightly, as required, when hitching or unhitching implements, and as a means of interrupting the power flow to the rear wheels. This pedal actuates a feathering valve located in the control valve lower body.

The feathering valve is located in the transmission indirect circuit ahead of the spool valves which control the fluid flow to clutches 1, 2, and 3. During normal operation, the feathering valve directs all of the fluid to the clutches, as shown at (A), Figure 15. When the pedal is completely depressed, fluid pressure is released from the clutch packs in the indirect circuit and engine power will not be transmitted to the rear wheels. This position of the feathering valve is shown at (C), Figure 15. When the pedal is raised slowly from the depressed position, fluid pressure will gradually increase and the elements in the indirect circuit will begin to engage. This is the "feathering" position of the valve, and is shown at "B", Figure 15.

P.T.O. Feathering Valve: In the P.T.O. model transmissions, the P.T.O. feathering valve is actuated by a "T" handle and rod assembly mounted in the right side of the tractor hood. The P.T.O. feathering valve, located in the control valve lower body, directs and controls the fluid pressure in the P.T.O. indirect circuit. When the handle is slowly pulled out, the feathering valve will move further into the control valve body. As the valve moves into the body, it opens a pressure port allowing fluid into the passage to the P.T.O. clutch. This fluid will at first be free to pass to sump. This position of the valve is shown at (B), Figure 15. As the valve continues to travel inward, the passage to sump will gradually be closed and increasing fluid pressure will be exerted on the P.T.O. clutch piston, causing the clutch to gradually engage. This position of the valve is shown at (A), Figure 15. This will facilitate the gradual starting of P.T.O.–operated equipment. When the feathering valve is in the extreme "OUT" position, with the control handle forward, the fluid pressure is entirely excluded from the P.T.O. circuit and the fluid in the P.T.O. clutch will be forced to return to sump by action of the P.T.O. piston return spring. The clutch will then be disengaged. This position of the valve is shown at (C), Figure 15.

Valve Spools: Six interchangeable spring-loaded, off-and-on valve spools direct fluid pressure to three clutch packs in the indirect circuit and the three servos. The spools are located in the control valve lower body and are controlled by the six cam followers. As combinations of valve spools are moved into the control valve body, fluid pres-

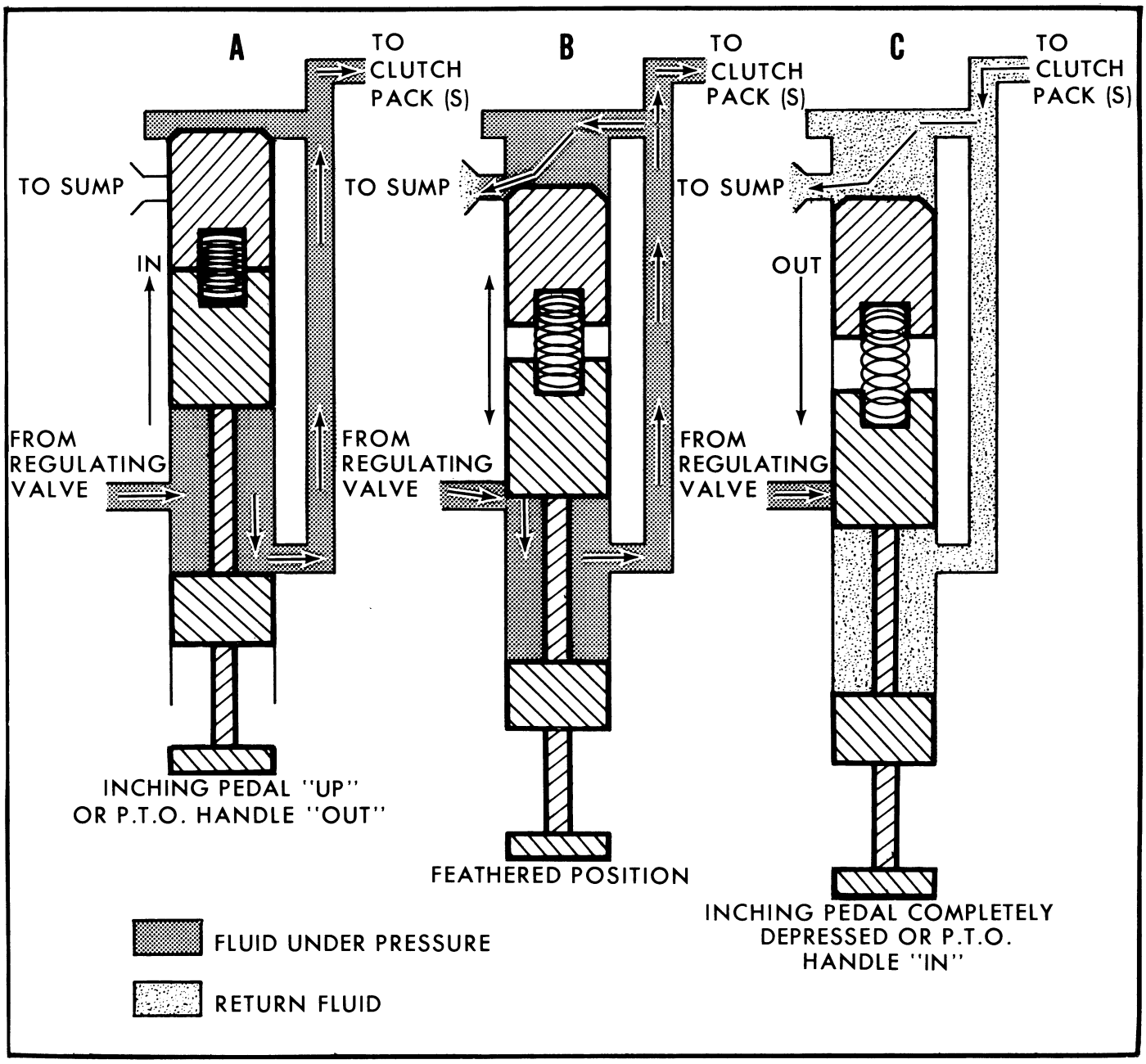

Figure 15
Feathering Valve Operation

sure is directed to the specific clutch pistons, and/or band servos to obtain the various speed ratios. Refer to Figure 13. When the force is removed from the cam follower, the spool automatically returns to the "OUT" position by spring action, and the clutch pack or band servo fluid is dumped to sump through the return ports in the valve body.

E. Direct Drive Clutch Valve

The direct drive clutch pack locks together the "A" sun gear to the "A" carrier, resulting in the "A" planetary gear set rotating as an assembly for direct drive gear ratios. Since band 1 is used to hold the "A" sun gear for the overdrive ratios, it is essential that both band 1 and the direct drive clutch are not simultaneously applied; otherwise, a lock-up condition would occur in the "A" planetary system. For this reason the fluid flow to the direct drive clutch pack is controlled by a hydraulic interlock arrangement. The interlock or direct drive clutch valve, as shown in Figures 14 and 16, is located in the servo 1 opening in the inside of the transmission case. Direct drive clutch valve actuation is therefore directly

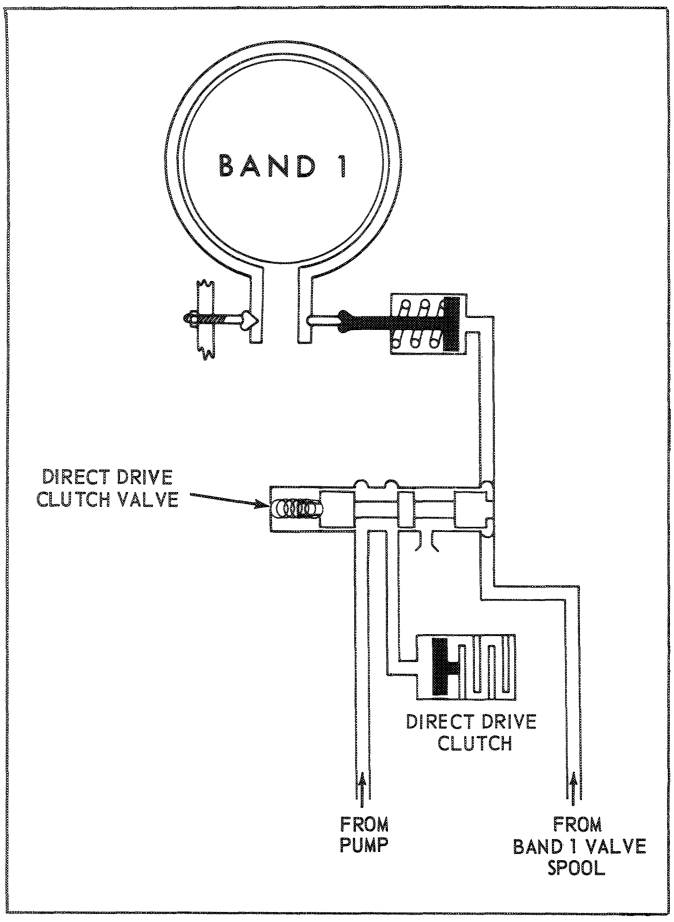

Figure 16
Direct Drive Clutch and Valve

determined by the position of the band 1 spool valve, which controls the fluid flow to servo 1.

Direct Drive Gear Ratios: In the direct drive gear ratios, pump fluid flows to the direct drive clutch pack without entering the control valve, Figure 16. A passage and opening in the distributor leading off the main pressure passage permits pump fluid to flow through tubing to the direct drive clutch valve and on to the front adapter plate. A passage in the adapter plate directs the fluid to a drilled passage in the transmission input shaft. Cast iron shaft sealing rings are used on the input shaft at both the direct drive clutch and adapter plate locations to seal the fluid flow. See Figure 1.

Overdrive Gear Ratios: When an overdrive gear ratio is selected, band 1 valve spool is mechanically moved to the open position and control valve fluid flows directly to band 1 servo to apply the band. The fluid that flows to servo 1, however, first passes through one end of the direct drive clutch valve exerting pressure against the end of the spool. This causes the spool to be shuttled or forced to the left, shutting off the fluid flow to the direct drive clutch pack. The clutch pack fluid is then dumped to sump through the port in the direct drive clutch valve. Whenever a direct drive gear ratio is selected, servo 1 fluid is dumped to sump and the force exerted by the direct drive clutch valve return spring moves the spool to the right, opening up the direct drive clutch passage.

F. Filter Assembly

The filter assembly, shown in Figure 14, will remove foreign material that is carried in suspension in the transmission fluid. The filter element is a replaceable pleated paper type with a pressure relief valve located in the filter inlet set at 7 to 9 psi to permit the filter to bypass fluid if the element becomes clogged. The filter element is to be replaced after the first 50 hours and every 1200 hours thereafter.

G. Interlock Assembly

The cover assembly for servos 2 and 3, located on the left side of the transmission, as shown in Figure 17, incorporates a hydraulic interlock which functions to prevent bands 2 and 3 from being applied simultaneously when shifting between fourth and fifth speeds. The fluid flow from these servos must be controlled as the application of both bands will cause a braking action as bands 2 and 3 are applied in park (P).

Fluid pressure directed to either servo 2 or servo 3 travels from the distributor into passages in the servo 2 and 3 cover. Valves located in the passages as shown in Figure 18, are mechanically linked to the piston of the opposite servo.

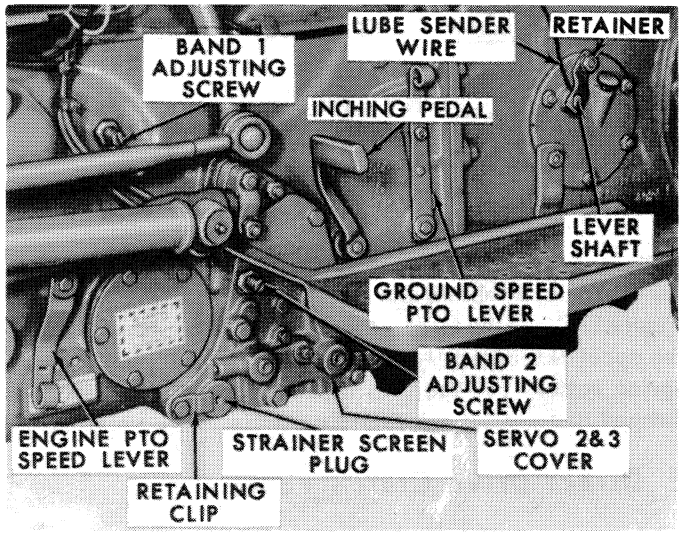

Figure 17
Left Side of Transmission

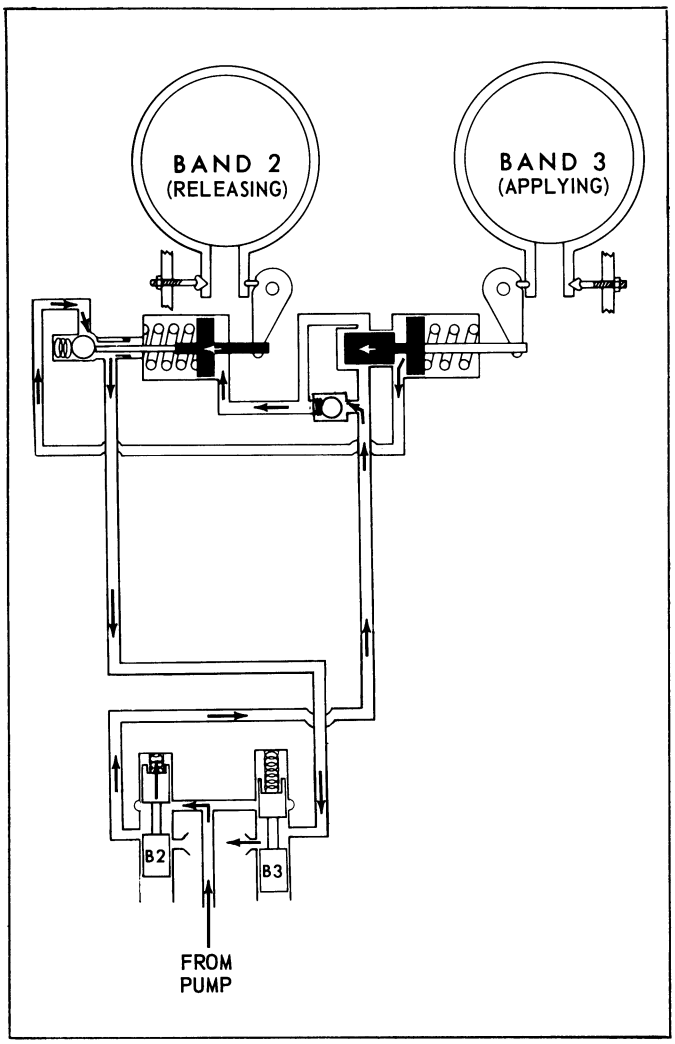

Figure 18
Hydraulic Interlock in Servo 2 and 3 Cover

When shift from fourth to fifth speed is made, band 3, which has been mechanically applied, must be hydraulically released and band 2 must mechanically apply. As the fluid pressure directed to servo 3 acts on the piston and compresses the springs, the valve attached to the piston is withdrawn from its position, blocking the fluid passage to servo 2 in the cover. This permits the fluid from servo 2 to return to sump and allows the mechanical application of band 2. When shifting from fifth speed to fourth speed, the reverse action takes place and band 2 must be hydraulically released and band 3 must mechanically apply. As fluid pressure is directed to servo 2, the spring pressure is overcome and the piston and piston rod move outward toward the cover, releasing the band. At the same time the servo rod contacts the plunger which unseats the ball check valve located in the fluid passage to servo 3. Now the fluid in servo 3 is permitted to exhaust to sump and band 3 will be applied by spring pressure.

As shown in Figure 18, fluid pressure directed to either servo will quickly unseat the ball check valve in its path. Thus, the interlock assembly only functions to "control" fluid return to sump, thereby preventing a possible lock-up condition when changing between the fourth and fifth speed ratios.

The transmission always goes to park (P) whenever the system pressure is eliminated. When this occurs, bands 2 and 3 apply gradually as metering orifices at the check valves permit the fluid to bleed out under the return spring pressure of the servos. The orifice through which fluid is metered from servo 2 is the clearance between the O.D. of the spool attached to servo 3, and its bore in the servo 2 and 3 cover. The metering orifice controlling the fluid from servo 3 is the clearance between the O.D. of the smallest diameter of the interlock valve seat for servo 3 and the bore in the interlock cover in which the seat is pressed. Figure 92 illustrates the valve seat. Both clearances are closely held to maintain controlled bleeding.

H. Hydraulic Control System Operation

Proper transmission operation is determined by the hydraulic control system which controls the flow of fluid pressure to the clutch packs and servos. The details of the fluid action to actuate these components for each gear ratio are given below. Figure 19 illustrates in schematic form the hydraulic system for the park (P) position.

Park Position: When the selector lever is in park (P), the six valve spools in the control valve lower body are in the "OFF" position and there is no delivery of fluid pressure, past the control valve assembly other than lubrication. The direct drive clutch shuttle valve spool is moved to the right by the return spring and pump pressure is directed to apply the direct drive clutch. Bands 2 and 3 remain mechanically applied to hold the "C" planetary system and prevent any movement of the rear wheels.

Reverse Speed Ratios: In the basic reverse speed ratio (R_1), the direct drive clutch shuttle valve spool is moved to the right by the return spring and pump pressure is directed to apply the direct drive clutch. The valve spools B2 and C1 are moved inward and fluid pressure is directed to apply clutch 1 and release band 2. Band 3 remains mechanically applied. The overdrive reverse ratio (R_2) is obtained when valve spool B1 is also moved inward to open the passage from the control valve to the direct drive clutch valve and servo 1. This permits servo 1 fluid pressure to move the direct drive clutch shuttle valve spool to the left, closing the passage to the direct drive clutch while at the same time applying band 1.

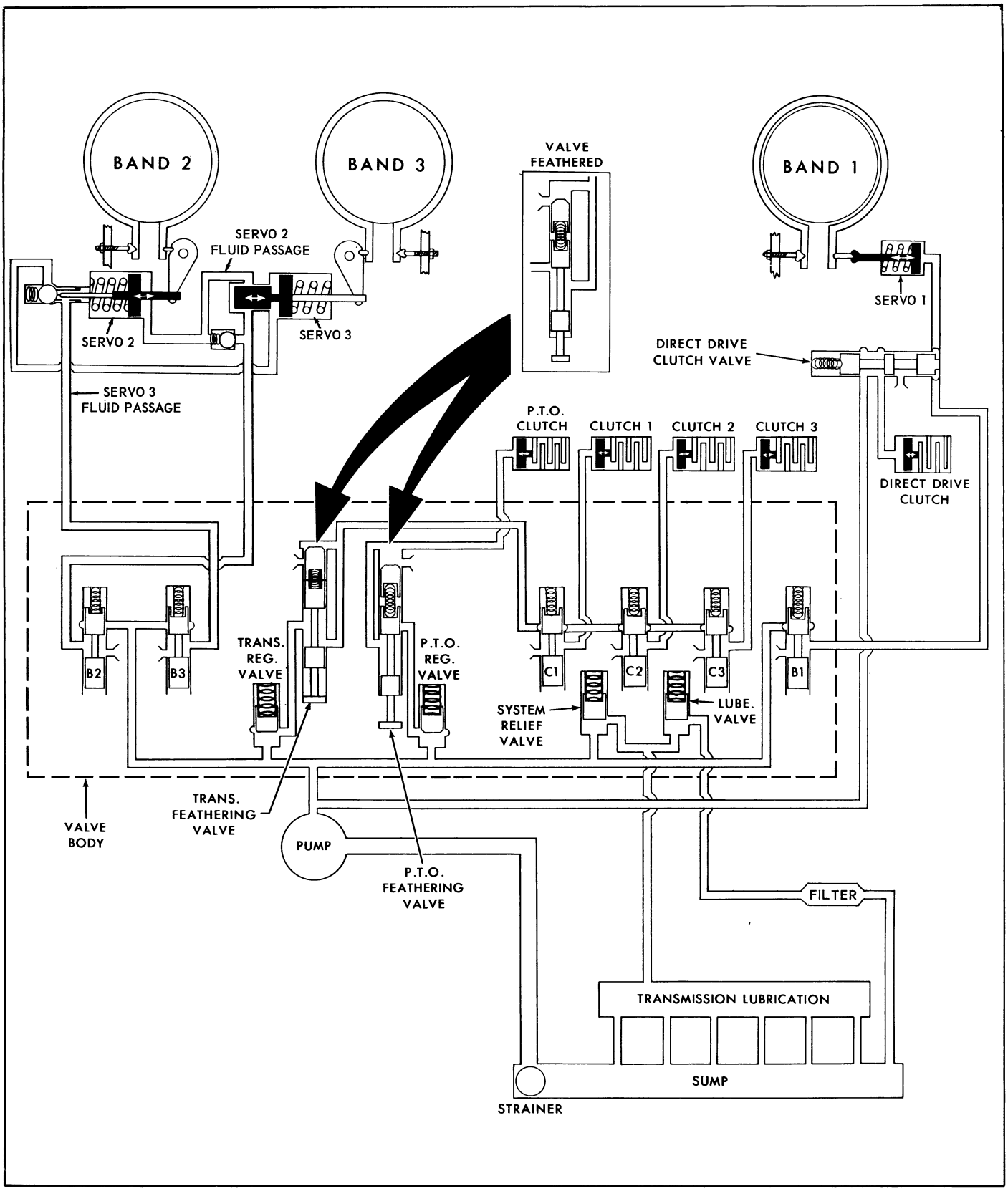

Figure 19
Transmission Circuits

Neutral: In the neutral position, the direct drive clutch shuttle valve spool is positioned to the right by the return spring and pump pressure is directed to apply the direct drive clutch. The valve spool B2 is moved inward and fluid pressure is directed to servo 2, hydraulically releasing band 2. With only band 3 mechanically applied, power cannot be transmitted to the rear wheels; however, the tractor is free to roll forward or backward.

First and Third Speed Ratios: In the first speed ratio, the direct drive clutch shuttle valve spool is positioned to the right by the return spring and pump pressure is directed to apply the direct drive clutch. The valve spools B2 and C3, which control the fluid passages to servo 2 and clutch 3 are moved inward. Hydraulic pressure releases band 2 and applies clutch 3 which, combined with band 3, being mechanically applied, gives this forward speed. The third speed ratio (overdrive of first speed) is obtained when valve spool B1 is also moved inward to open the passage from the control valve to the direct drive clutch valve and servo 1. This permits servo 1 fluid pressure to move the direct drive clutch shuttle valve spool to the left, closing the passage to the direct drive clutch while at the same time applying band 1.

Second and Fourth Speed Ratios: In the second speed ratio the direct drive clutch shuttle valve spool is positioned to the right by the return spring and pump pressure is directed to apply the direct drive clutch. The valve spools B2 and C2 are moved inward to permit hydraulic pressure to reach clutch 2 and servo 2. Band 2 is now hydraulically released. Clutch 2 is hydraulically engaged and band 3 is mechanically applied to establish this forward speed. The fourth speed ratio (overdrive of second speed) is obtained when valve spool B1 is also moved inward to open the passage from the control valve to the direct drive clutch valve and servo 1. This permits servo 1 fluid pressure to move the direct drive clutch shuttle valve spool to the left, closing the passage to the direct drive clutch while at the same time applying band 1.

Fifth and Seventh Speed Ratios: In the fifth speed ratio the valve spools B3 and C3 in the control valve lower body are moved inward to open the passages to clutch 3 and servo 3. Now, band 3 is hydraulically released and band 2 is mechanically applied to combine with clutch 3 and give this forward speed. The seventh speed ratio (overdrive of fifth) is obtained when valve spool B1 is also moved inward to open the passage from the control valve to the direct drive clutch valve and servo 1. This permits servo 1 fluid pressure to move the direct drive clutch shuttle valve spool to the left, closing the passage to the direct drive clutch while at the same time applying band 1.

Sixth and Eighth Speed Ratios: In the sixth speed ratio, the direct drive clutch shuttle valve spool is positioned to the right by the return spring and pump pressure is directed to apply the direct drive clutch. The spool valves B3 and C2 which control the passages to servo 3 and clutch 2 are moved inward. Band 3 is hydraulically released, clutch 2 is hydraulically applied, and band 2 is mechanically applied to combine with clutch 2 and give this forward speed. The seventh speed ratio (overdrive of fifth) is obtained when valve spool B1 is also moved inward to open the passage from the control valve to the direct drive clutch valve and servo 1. This permits servo 1 fluid pressure to move the direct drive clutch shuttle valve spool to the left, closing the passage to the direct drive clutch while at the same time applying band 1.

Ninth and Tenth Speed Ratios: In the ninth speed ratio, the direct drive clutch shuttle valve spool is positioned to the right by the return spring and pump pressure is directed to apply the direct drive clutch. The valve spools B2, B3, C1, and C2, are moved inward, allowing hydraulic pressure to actuate servos 2 and 3, and clutches 1 and 2. With bands 2 and 3 hydraulically released, this forward speed is obtained by the application of clutches 1 and 2. The tenth speed ratio (overdrive of ninth) is obtained when valve spool B1 is also moved inward to open the passage from the control valve to the direct drive clutch valve and servo 1. This permits servo 1 fluid pressure to move the direct drive clutch shuttle valve spool to the left, closing the passage to the direct drive clutch while at the same time applying band 1.

TRANSMISSION CONTROLS

A. Gear Ratio Selector Assembly

The selector assembly, shown in Figure 20, mechanically transmits the speed selections through a flexible cable to the control valve in the Select-O-Speed Transmission. A wheel attached to the camshaft on the control valve rotates as the selector extends or retracts the cable. The camshaft is accurately indexed for each transmission gear ratio by a detent which engages notches in a detent cam on the camshaft.

A selector indicator is fixed to and rotates with the selector lever shaft. The corresponding ground speeds in each gear ratio at 1200, 1750, and 2200 engine rpm are shown on the dial. A lamp is installed in the top of the selector assembly to illuminate the dial whenever the tractor key is "ON."

The selector assembly permits shuttle-type operation as

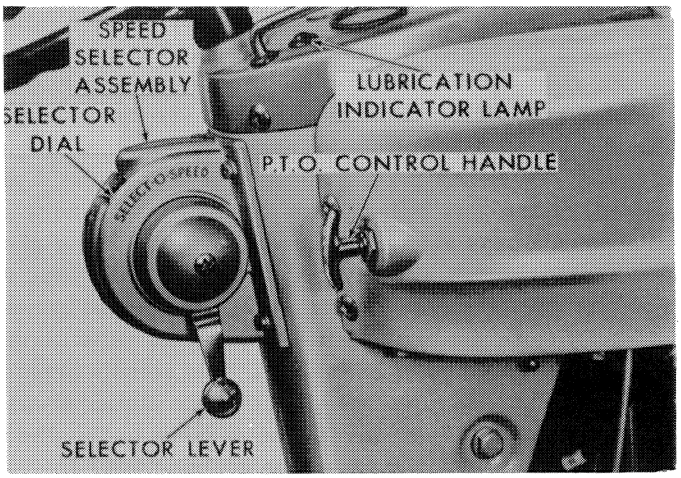

Figure 20
Speed Selector Assembly

screw stops can be installed in the R_1, R_2, 3rd, 5th, or 7th gear selections as desired. Refer to Figure 23. Also, a bypass shuttle plate is available to permit the selector lever to override the neutral notch. The selector lever and notched cover may be installed on either side of the assembly for right-hand or left-hand operation.

B. P.T.O. Control Assembly

The P.T.O. control assembly located on the right rear hood panel, shown in Figure 20, operates the P.T.O. clutch pack in the transmission. The control consists of a slider mechanism and T-handle attached to a flexible cable. The cable, which is enclosed in a conduit, is threaded into a slider assembly in the transmission cover. The slider, in turn, is linked to the feathering valve rocker assembly. When the T-handle is pulled out, the rocker contacts and forces the P.T.O. feathering valve spool into the control valve upper body. The handle mid-position is the feathering point which permits P.T.O. clutch slippage by bleeding oil to sump for easing into loads. In the full "OUT" position, the feathering valve directs all the P.T.O. clutch circuit fluid to apply the clutch pack.

C. Engine Speed P.T.O. Lever

In the two speed P.T.O. transmissions, either 540 or 1000 rpm A.S.A.E. standard P.T.O. speeds can be obtained at 1750 engine rpm. This is accomplished by a sliding coupling arrangement on the transmission input shaft, as shown in Figure 1. The engine speed P.T.O. shift lever, when in the forward position as illustrated in

Figure 21
Loosening the Adjusting Screw Locknut

Figure 17, selects the 540 rpm speed by sliding the shifter collar rearward on the shaft which causes the rear input shaft gear to drive the clutch housing. The 1000 rpm speed is obtained by moving the lever to the rear and selecting the forward set of gears. A neutral, or middle, position disengages the gears and should be used when operating the tractor without P.T.O. equipment.

D. Ground Speed P.T.O. Lever

In the two speed P.T.O. transmissions, a P.T.O. speed relationship proportional to the tractor forward travel, is obtained by driving the P.T.O. shaft from the output side of the transmission. Figure 1 illustrates the P.T.O. drive gear mounted on the "D" carrier which is integral with the output shaft through a sliding coupling arrangement. The coupling is moved by a shifter fork connected to the ground speed level.

The lever illustrated in Figure 17 in the rearward position, disengages the coupling from the gear for standard P.T.O. operation.

An interlock arrangement, shown in Figure 30, prevents both engine and ground P.T.O. relationships from being engaged at the same time.

8. MAINTENANCE AND ADJUSTMENTS

The transmissions are filled at the factory with Ford Hydraulic Fluid, Specification M-2C-41. Always use this type fluid when adding or changing fluid, as the use of an improper or inferior product may affect the operation of the transmission.

MAINTENANCE

A. Transmission Fluid Level Check

The fluid level in the transmission should be checked during pre-delivery and at 50-hour intervals thereafter, using the following procedure.

1. Make certain that the tractor is level.
2. Shut off the tractor engine.
3. Clean the area surrounding the fluid level and filler plug, shown in Figure 22, and remove the plug.
4. Check to be sure that the fluid is up to the level of the filler plug opening. If necessary, add enough fluid through this opening to provide the proper level, and replace the plug.

B. Transmission Fluid and Filter Change

It is important that the transmission fluid and filter be changed at the 50-hour inspection and at 1200 hour intervals thereafter. It is also recommended that the fluid be changed whenever foreign material is found in, or is known to have entered the transmission. New fluid, Ford Specification M-2C-41, should always be used whenever the transmission has been disassembled for servicing.

The following procedure should be followed when changing the transmission hydraulic fluid. For filter removal refer to page 35.

1. Remove the drain plug from the bottom of the transmission case and drain the fluid into a suitable container.
2. Loosen the hex head bolt, shown in Figure 17, which secures the strainer screen plug in the interlock cover by means of a retaining clip.

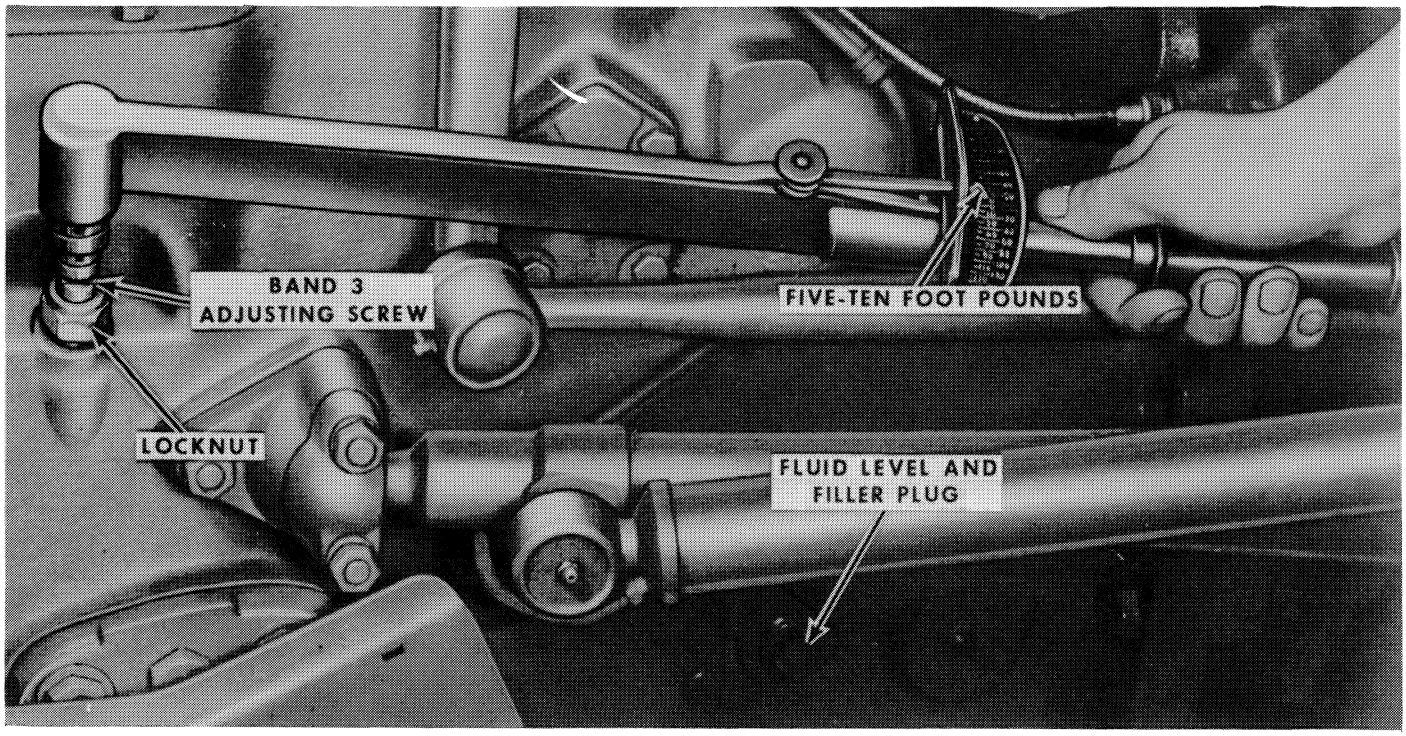

Figure 22
Adjusting the Bands

3. Remove the plug by pulling outward. Thoroughly clean the screen and discard the "O" ring.

   NOTE: *It may be necessary to thread a 1/4" – 20 bolt into the plug to provide a means of initially withdrawing this assembly.*

4. Place a new "O" ring on the plug, install the screen plug in the interlock cover with the hole to the top and secure with the retainer and hex head bolt.

5. Replace the drain plug in the bottom of the case.

6. Clean the area surrounding the fluid level and filler plug, Figure 22, then remove the plug and add 12 quarts of Ford Specification M-2C-41 Hydraulic Fluid to the transmission through this opening.

   NOTE: *If the transmission cover has been removed, the fluid can be easily poured through this larger opening.*

7. Replace the fluid level and filler plug. Run the engine at a fast idle speed to bring the fluid up to normal operating temperature.

8. With the traction coupling locked in the disengaged position, shift the selector lever through all speeds. Stop the engine and check the fluid level.

ADJUSTMENTS

A. Traction Coupling

The transmission output shaft incorporates a coupling sleeve which can be shifted to disengage the power from the differential pinion shaft. It will be necessary to disengage the traction coupling whenever the tractor is to be moved without the engine running as bands 2 and 3 mechanically apply to hold the rear wheels. ***It is also recommended that the traction coupling be disengaged and the retainer be in place and securely tightened*** before any servicing or adjusting of the transmission or of the complete tractor is undertaken with the engine running.

The traction coupling sleeve is manually disengaged by turning the lever shaft, shown in Figure 17, clockwise to move the splined sleeve forward on the transmission output shaft and away from the pinion shaft. Engagement is made when the lever shaft is turned counterclockwise which brings the coupling sleeve rearward to connect with the splined pinion shaft.

1. To turn the lever shaft, the retainer which is held in place by the nut and washer as shown in Figure 17, must be removed.

2. The retainer can be used as a handle to rotate the shaft in the desired direction. There are alternate positions for installing the retainer in the engaged or disengaged positions of the coupling sleeve.

3. If the retainer does not align properly, turn it both end for end and side for side.

B. Band Adjustments

The three brake bands should be adjusted during predelivery and again at the 50-hour inspection. Thereafter, the bands should be adjusted after each 600 hours of operation. Before adjusting the bands, make certain the fluid in the transmission is at the proper level. The bands are all adjusted in their released position as follows:

1. Disconnect the traction coupling making sure it is properly secured in the disengaged position.

2. Operate the tractor until the transmission reaches normal operating temperature (120° F.) and then adjust the throttle to obtain 800 engine rpm.

3. Refer to the chart and move the gear selector lever to apply the band. Hold the band adjusting screw as shown in Figure 21, and loosen the lock nut two full turns.

4. Referring to the chart, select the correct released gear ratio for the band involved. Tighten the adjusting screw to 5–10 ft. lbs. and back the screw off the proper number of turns. Refer to Figure 22. Band 1 is to be adjusted with the tractor engine "off."

Band	*Released Gear Ratio*	*Screw Torque (ft. lbs.)*	*Turns Backed Off*	*Applied GearRatio*
1	Engine Off	5–10	1	3rd
2	Neutral	5–10	3/4	Park
3	5th	5–10	3/4	Park

5. Select the gear ratio to apply the band involved and prevent the adjusting screw from turning. Tighten the lock nut to 20–25 ft. lbs. while holding the adjusting screw.

   NOTE: *Overtightening the lock nut will distort the copper sealing washer.*

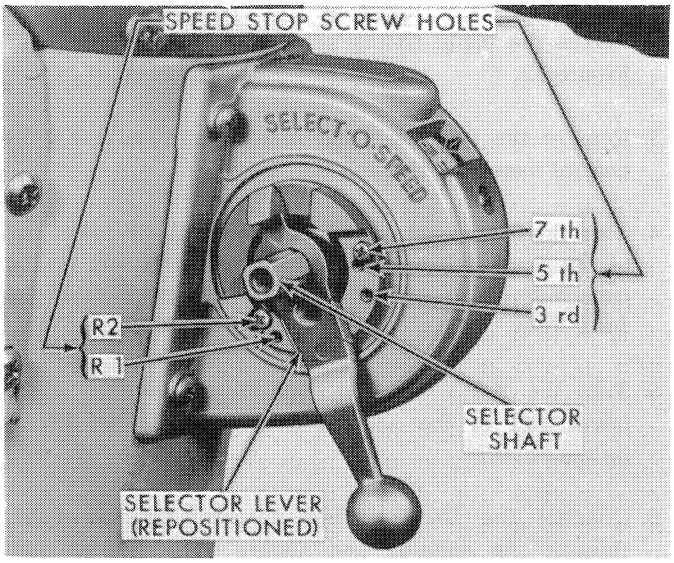

Figure 23
Repositioning the Selector Lever

C. Repositioning the Selector Lever

In the event it is more convenient for the operator to make the speed selections with his left hand rather than his right hand, the lever may be repositioned as follows:

1. Remove the notched cover and spring from the right end of the selector shaft and the solid cover from the left end.

2. Move the control lever to the left end, as shown in Figure 23, and secure with the notched cover and spring.

3. Install the solid cover on the right end of the shaft.

D. Pre–Set Selections

Some operations will require a limited range of transmission speed ratios and often they will alternate between forward and reverse speeds. Therefore, five tapped holes have been incorporated in both sides of the selector housing which accommodate two stop screws, as shown in Figure 23. The screws can be placed in one of three specific holes which will stop the selector lever at third, fifth, or seventh speed, and in one of two other holes, to stop the lever in either R_1 or R_2, as shown in Figure 23. A bypass plate, available as an accessory, is installed over the neutral notch to prevent the lever from stopping at the Neutral position. When the use of these stops is desired, they should be installed on the control lever side of the selector assembly. When they are not desired, they should be carried on the tractor by installing them on the side opposite the control lever. When shipped from the factory, the control lever is installed on the right side of the selector assembly and the stop screws are carried under the selector shaft left cover.

E. Selector Lever Alignment

For positive identification of speed selections, selector alignment is important. The individual speed identifications on the dial should always register with the pointers in the selector housing. The following adjustment makes it possible to compensate for normal wear in the selector assembly and for slight wear of the flexible selector cable.

1. Remove the selector shaft left cover to expose the shaft and hex nut as shown in Figure 24.

   NOTE: *If the selector lever is on the left side, remove it and mount it on the right side while making the adjustment.*

2. Move the selector lever to the neutral position and, with a suitable wrench, such as a deep well socket, loosen the nut while holding the lever securely in the detent, as shown in the Insert, Figure 24.

3. The dial can now be moved in either direction as required, to register the dial with the pointers without

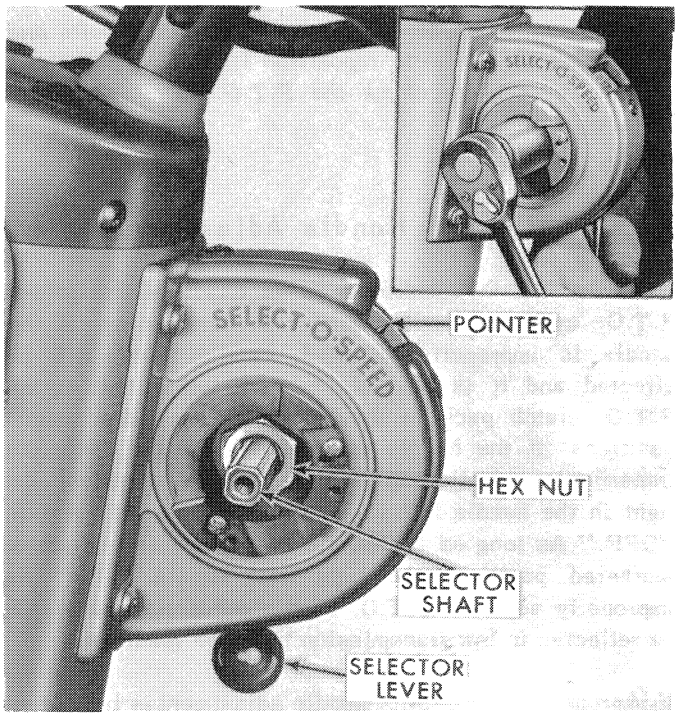

Figure 24
Alignment of the Selector Assembly

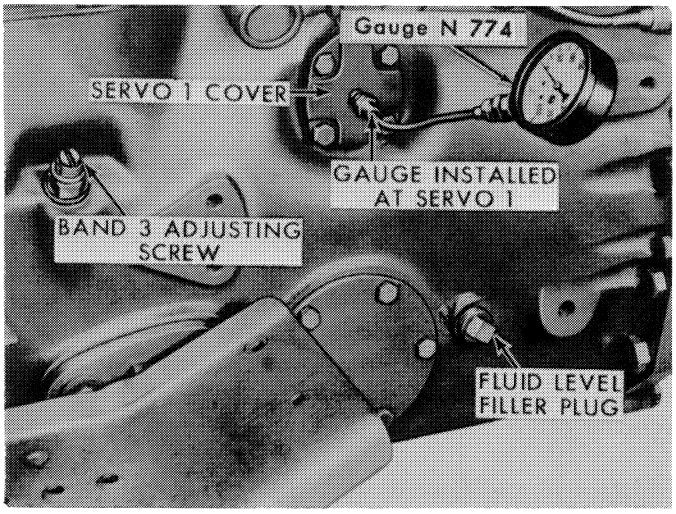

Figure 25
Guage Installed in Servo 1

changing the relationship of the flexible cable with the control valve assembly.

4. With the dial in the proper position, hold the lever and tighten the hex nut to 25–35 ft. lbs. torque.

5. Check for proper dial registration adjustment in all speed selections and replace the shaft cover.

NOTE: *If the selector is difficult to operate, binding at the transmission cover may exist. This can be overcome by loosening the cover mounting bolts and tapping the cover to reposition it. Before tightening the cover bolts, check the P.T.O. handle for ease of operation.*

F. P.T.O. Control Handle Adjustment

Correct P.T.O. handle travel is essential for proper P.T.O. operation and transmission functioning. If the handle is improperly adjusted, handle travel will be affected and it is possible to continually feather the P.T.O. clutch pack in the handle engaged–disengaged positions. If the handle is properly adjusted, with the transmission functioning properly, the transmission lube light in the handle full in and out positions will remain "OFF." As long as the handle is in the intermediate or feathered position, the light will remain "ON." An improperly adjusted P.T.O. handle adjustment will also be reflected in low transmission pressure readings.

If improper P.T.O. control handle adjustment is indicated:

1. Pull the P.T.O. handle to its out position.

2. Disconnect the lower P.T.O. conduit fitting and loosen the upper fitting behind the tractor hood. See Figure 32.

3. Remove the upper jam nut and washer and push the control assembly through the opening.

4. Turn the P.T.O. handle clockwise until the lower end of the conduit can be raised above the fitting on the transmission cover. Pull the handle to make sure it is fully "out."

5. Turn the P.T.O. handle counterclockwise until the lower end of the conduit just contacts the fitting on the cover.

6. Connect the lower fitting, reinstall the assembly through the opening and secure with the jam nut. Tighten the upper conduit fitting.

7. Recheck lube light operation to determine if adjustment overcame the difficulty.

NOTE: *If the P.T.O. control handle is difficult to operate, binding may exist at the transmission cover. This can be overcome by loosening the cover mounting bolts and tapping the cover to reposition it. Before tightening the cover bolts, check the speed selector for ease of operation.*

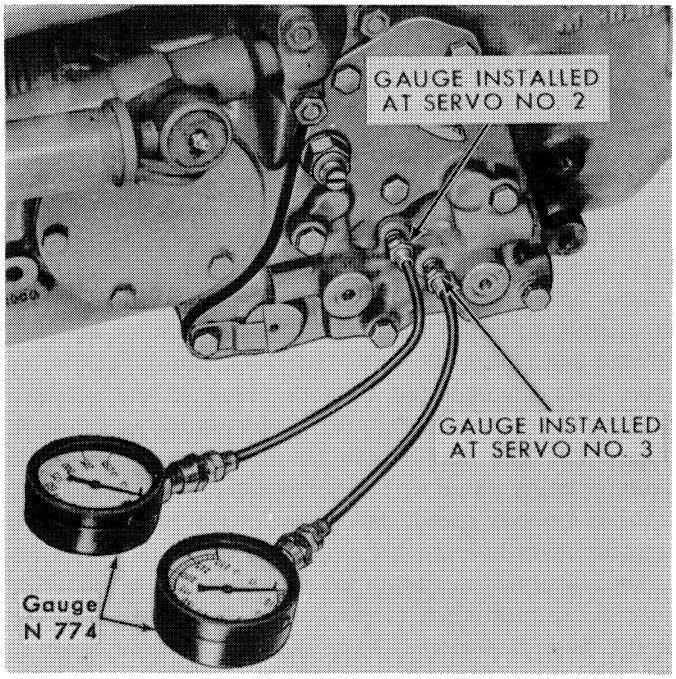

Figure 26
Guages Installed In Servos 2 and 3

G. Control Valve Adjustment

Valve adjustment is to be performed when:

The transmission pressures have been checked and it has been determined that valve adjustment is required.

The valve body has been reassembled after servicing, so that the correct pressure settings can be made.

The procedure for adjusting the valve and checking valve pressures in this section is also effective for trouble shooting purposes to determine:

The condition of the transmission hydraulic system.

If transmission malfunctioning is the result of incorrect pressure settings or other circuit difficulties.

ADJUSTING THE VALVE

1. Lock the traction coupling in the disengaged position.
2. Remove the hex head plugs from Servos 1, 2, and 3, and install the pressure gauges. See Figures 25 and 26.
3. Start the tractor engine and warm up the transmission fluid to 120° F. Operate the engine at 800 rpm when checking pressures.

NOTE: *It is essential that the engine is operating properly so that accurate pressure readings are obtained.*

4. Remove the transmission cover and control valve, as covered on page 35.
5. Remove the screws which secure the retainers to the upper valve body and remove the retainers.

   NOTE: *If the plungers have been removed, the plunger heads should be initially set flush with the valve body. If the valve body halves have been disassembled, the halves are to be aligned as covered on page* 58.
6. Remount the valve assembly on the distributor and secure the filter to the valve.
7. With the valve in park (P) position, start the engine by grounding the safety starter switch wire. Operate the engine at 800 rpm.
8. Referring to Figure 27, locate the valve plunger to be adjusted. Use an offset screwdriver or the retainer removed in step 5, as shown in Figure 28, to turn the adjusting screws. The procedure is detailed under "Checking Valve Pressures." The following chart summarizes this procedure for ready reference.
9. When the control valve has been properly adjusted, remove the filter and control valve and install the retainers removed in step 5. If necessary, turn the adjusting screws inward so that the slots in the screws will align with the retainers.
10. Install the valve body, filter, and transmission cover as outlined on pages 35 and 36.

CHECKING VALVE PRESSURES

The procedure for checking valve pressures requires following steps 1 through 3 on page 22 "Adjusting the

	Gear Ratios	*Inching Pedal*	*P.T.O. Handle*	*Lube Light*	*PRESSURE READINGS*		
					Servo 1	*Servo 2*	*Servo 3*
System Relief Valve	All*	Up or Down	In or Out	Off	*180 ± 10	*180 ± 10	*180 ± 10
Transmission Reg. Valve	Neutral	Midway	In	On		150 ± 5	
P.T.O. Regulating Valve	Neutral	Up	Midway	On		150 ± 5	
Lube Relief Valve	All	Up	Out	Off		**	

* 180 ± 10 psi should exist at each servo location when pressurized in accordance with the chart on page 23, as the transmission selector is shifted through all the gear ratios. A difference of more than 3 psi should not exist between servo locations.

** Proper lube pressure exists if the lube sender light remains off when system relief pressure is recorded at 180 psi. If pressure is recorded in the rear support opening, a pressure reading from 2 – 12 psi should exist.

NOTE: *When adjusting the regulating valves, the neutral position is obtained by rotating the valve camshaft three positions from park (P) in the direction shown in Figure 28.*

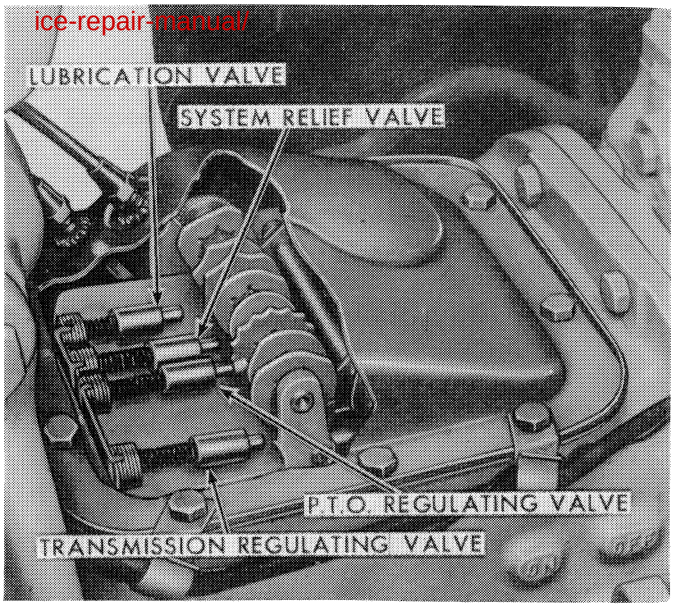

Figure 27
Control Valve Assembly

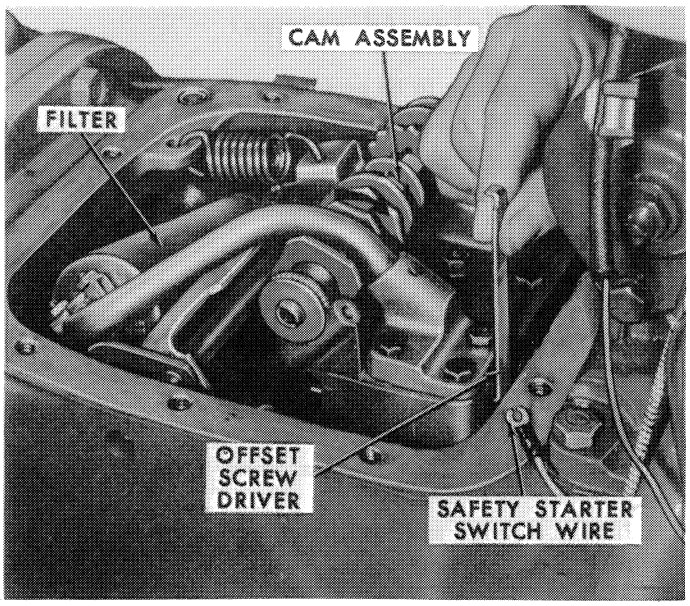

Figure 28
Adjusting Valve Pressures

Control Valve" and following the specific instructions under each heading below.

It should be noted that the chart on page 22 summarizes this checking procedure and therefore may be referred to, after the procedure is understood.

System Relief Valve Pressure: Shift the selector lever through each gear ratio (P.T.O. handle in) noting the pressure readings at the three servo locations. If the respective servos are pressurized at 180 ± 10 psi in accordance with the following chart, the system relief valve is functioning properly. If the pressures are consistently out of specification, adjust the valve.

PRESSURE GAUGE READINGS

Gear Ratio	*Band 1 Servo*	*Band 2 Servo*	*Band 3 Servo*
P			
R_2	180	180	
R_1		180	
N		180	
1st		180	
2nd		180	
3rd	180	180	
4th	180	180	
5th			180
6th			180
7th	180		180
8th	180		180
9th		180	180
10th	180	180	180

NOTE: *If the pressure checks are used to diagnose transmission malfunctioning, proceed as follows:*

1. Record the pressure readings and compare them with the five Hydraulic Conditions covered on pages 26 and 27.

2. If a pressure differential of more than 3 psi is noted between servo readings, refer to Hydraulic Condition 5.

3. Pull the P.T.O. handle out. If the pressure drops, a leak is occurring in the P.T.O. clutch circuit.

Transmission Regulating Valve Pressure: Shift the selector lever to neutral and hold the inching pedal in the mid-position so that the lube light flashes on. This indicates the transmission feathering valve is bleeding oil to sump and that system pressure is not being maintained. The transmission regulating valve is acting as a check valve and if properly adjusted will maintain 150 ± 5 psi in the transmission direct circuit. The pressure setting will be reflected at servo 2 gauge. If the pressure reading is not to specification, adjust the valve.

NOTE: *The P.T.O. handle must be fully in and the inching pedal should be positioned so as to obtain the lowest possible gauge reading.*

P.T.O. Regulating Valve Pressure: Shift the selector lever to neutral and pull the P.T.O. handle to its mid-position so that the lube light flashes on. This indicates the P.T.O. feathering valve is bleeding oil to sump and