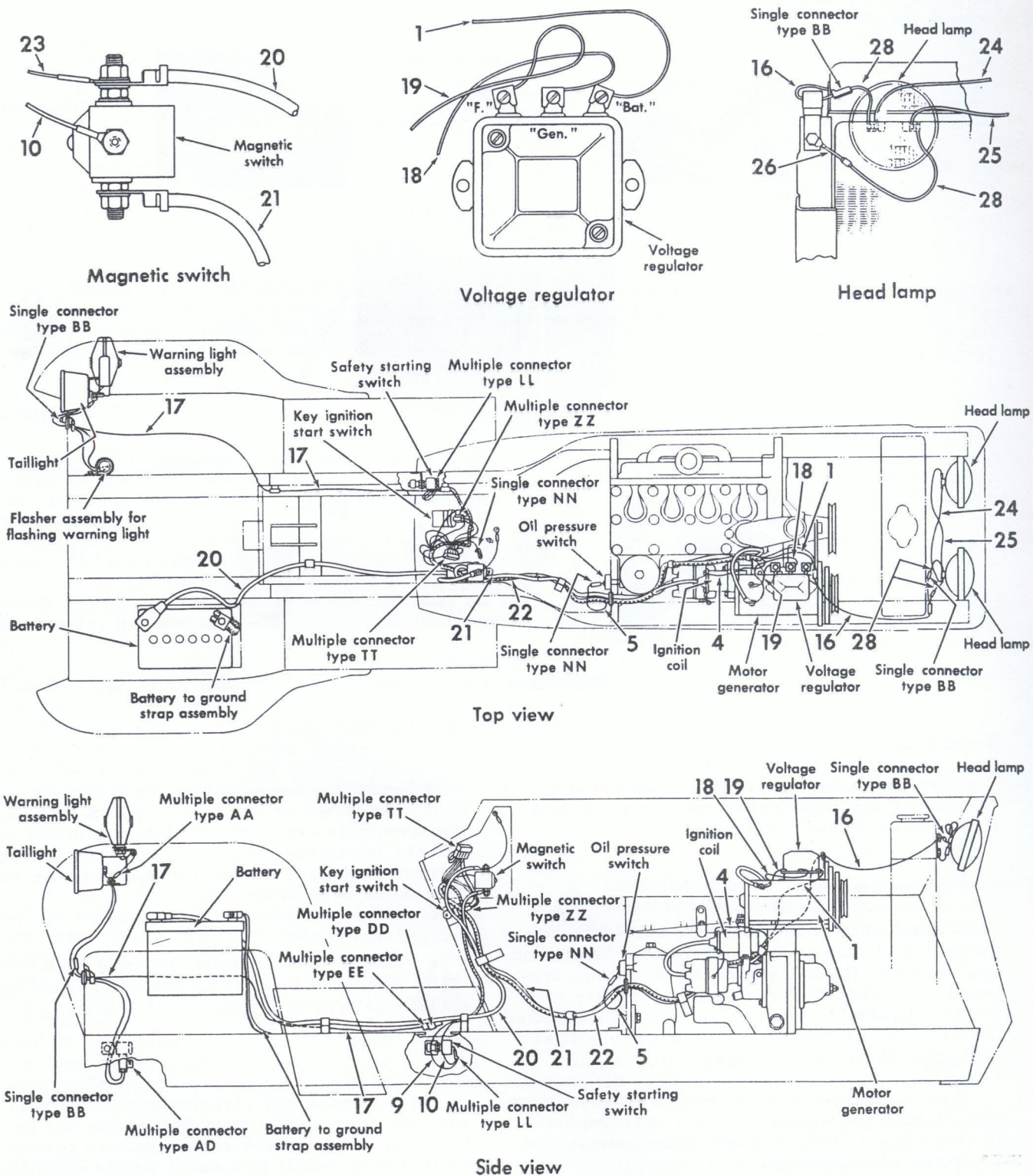


ELECTRICAL SYSTEM



Illust. 28
Electrical wiring diagram.

Valves

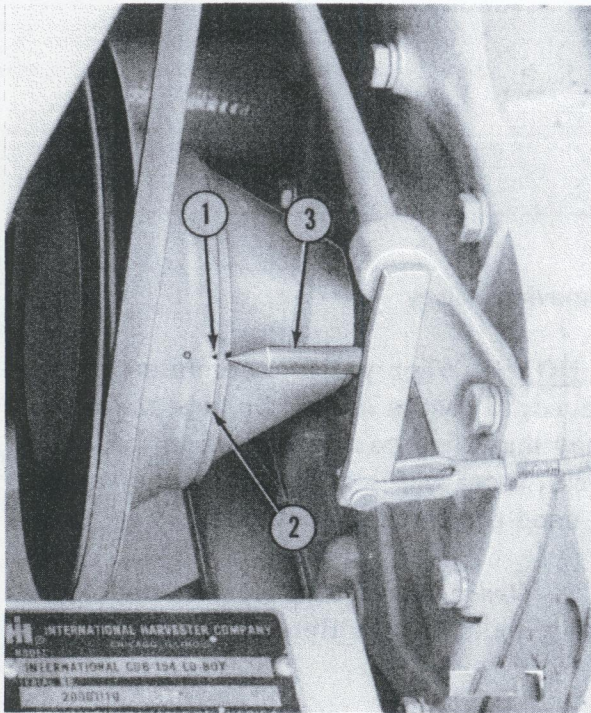
Valve Lash Adjusting Procedure

Following the simplified procedure in the chart below, all valves can be adjusted accurately. Note that the engine does not need to be cranked four times to position the piston of each cylinder on T.D.C. All

valves are adjusted by cranking the engine only twice.

Four valves are adjusted when the No. 1 piston is at T.D.C. (compression) and the remaining four are adjusted when the No. 4 piston is at T.D.C. (compression).

WITH	ADJUST VALVES (Engine Cold)							
No. 1 Piston at T.D.C. (Compression)	1	2	3		5			
No. 4 Piston at T.D.C. (Compression)				4		6	7	8



1. O mark
2. 16° mark
3. Timing pointer

1. Remove the intake and exhaust manifold assembly. Remove the valve tappet cover. With the cover removed, inspect the entire valve assembly for rust and dirt. Clean the assembly with cleaning solvent. Inspect for looseness in the valve assembly and for worn or broken valve springs.

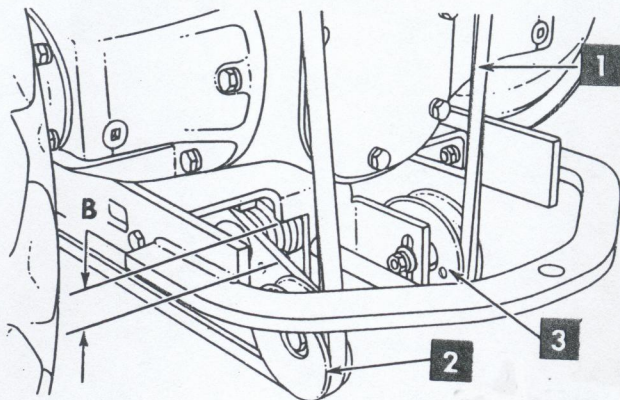
2. Remove the spark plugs from No. 1 cylinder (nearest the radiator) and No. 4 cylinder.

3. Place a thumb over the No. 1 spark plug opening and slowly hand crank the engine until an outward pressure can be felt. Pressure indicates the piston is moving toward top-dead-center of the compression stroke.

4. Continue cranking slowly until the O mark (1) on the fan drive pulley is in line with the timing pointer (3) on the crankcase front cover.

NOTE: Valve tappets have self-locking tappet screws. Adjustment requires two wrenches, one to hold the tappet and one to turn the tappet screw.

Drive Belt Tension



1. Main drive belt
2. Spring-loaded idler
3. Adjustable idler pulley

The drive belt tension is to be adjusted with the mower housing in the down position. Never tighten the drive belt when the mower is in a raised position, to do so may damage the idlers, belt or tractor or power take-off. The spring-loaded idler will keep the proper tension on the belt at any cutting height.

The belt tension should be initially set by positioning the idler arm approximately 6.35 mm (1/4 inch) from the idler support bracket as shown at "B". Readjust for proper tension by using the adjustable idler pulley so that the idler arm is 6.35 mm (1/4 inch) from the idler support bracket.

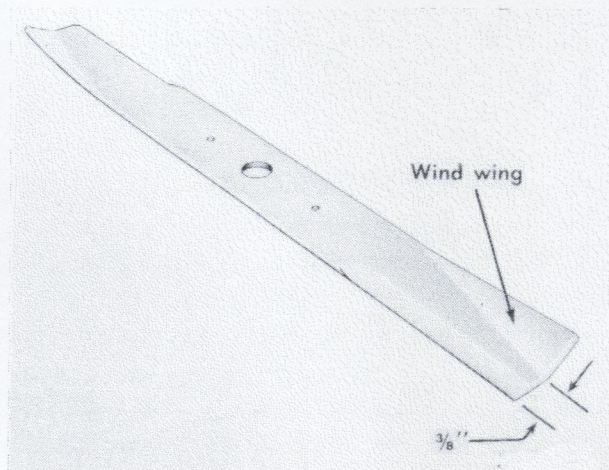
When the adjustable idler has reached the end of the slot and the distance from the idler arm and idler support bracket becomes greater than 19 mm (3/4 inch), then replace the belt.

Blade Care



injury.

CAUTION! Use care when sharpening blades to prevent personal



The cutting blade must be kept sharp at all times. The blade can be removed from the mower and sharpened on a grinding wheel.

Sharpen the ends evenly at a 25° angle (same as when new) so the blade remains balanced. However, if the cutting edge of the blade is within 9.55 mm (3/8 inch) of the wind wing, it is recommended that a new blade be installed. New blades are available at your International Harvester dealer.

Specifications

PUMP

Rated engine speed 2200 rpm
Pump delivery at rated engine speed 2.5 gpm @ 1600 psi
Reservoir (transmission case) capacity 7 qts.

Ball check spring

Assembled length - inch382
Assembled load - lbs.069 ± .010

VALVES

Control valve

Type Single acting

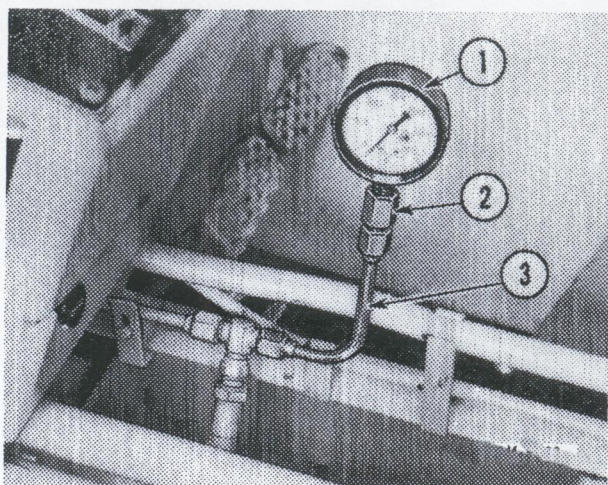
Circuit Relief Valve

Serial No. U018709 and below-non-adjustable,
service complete valve - psi 1550-1600
Above serial No. U018709 - adjustable - psi 1500-1600

HYDRAULIC CYLINDER

Type Single acting
Piston OD - inches 1.7466 - 1.7480
Cylinder ID - inches 1.749 - 1.752
Length of stroke - inches 5

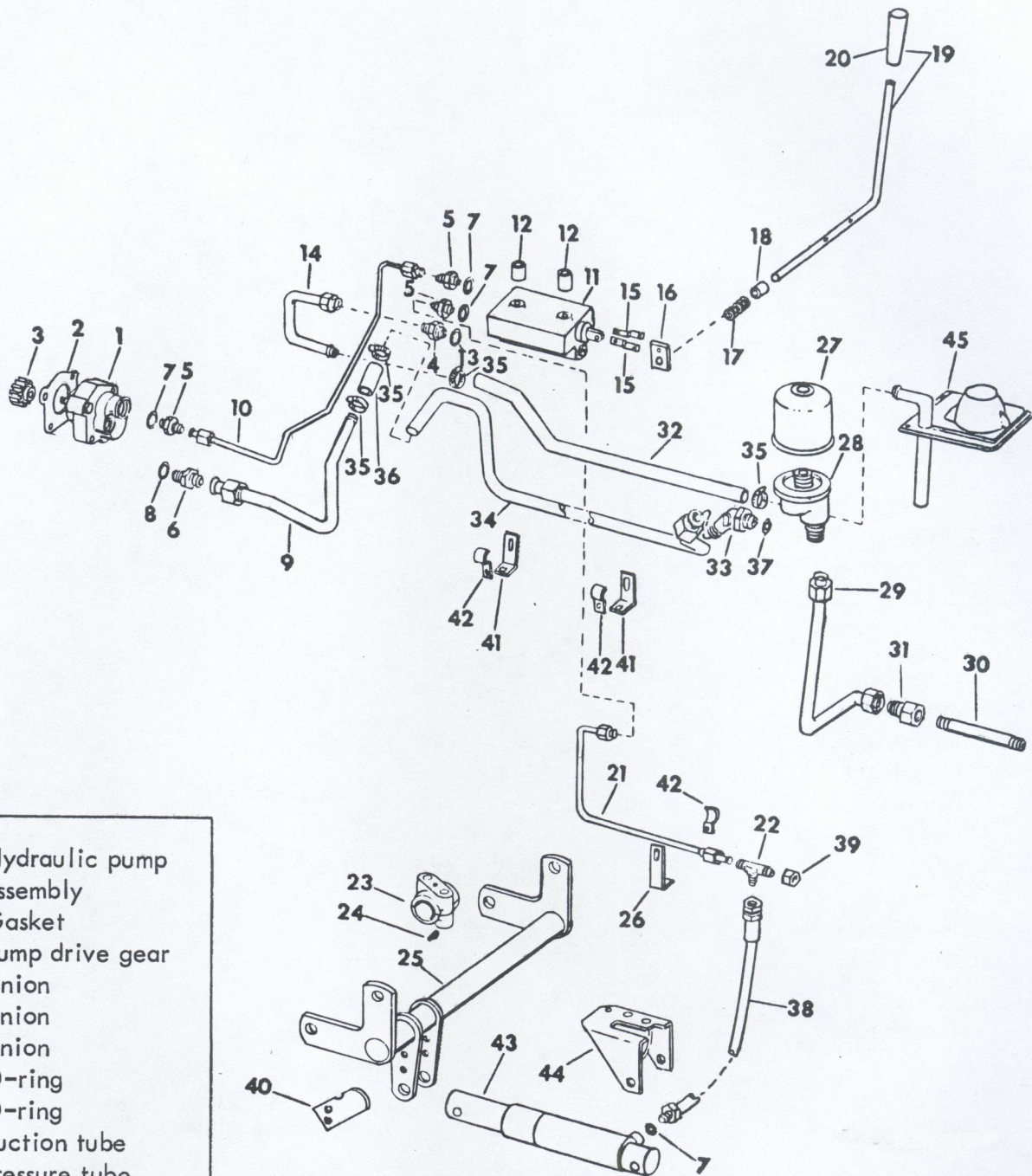
Hydraulic Lift



1. Gauge (FES 1-2)
2. Adapter (FES 94-3)
3. Tube connector (FES 94-2)

Checking the Hydraulic System

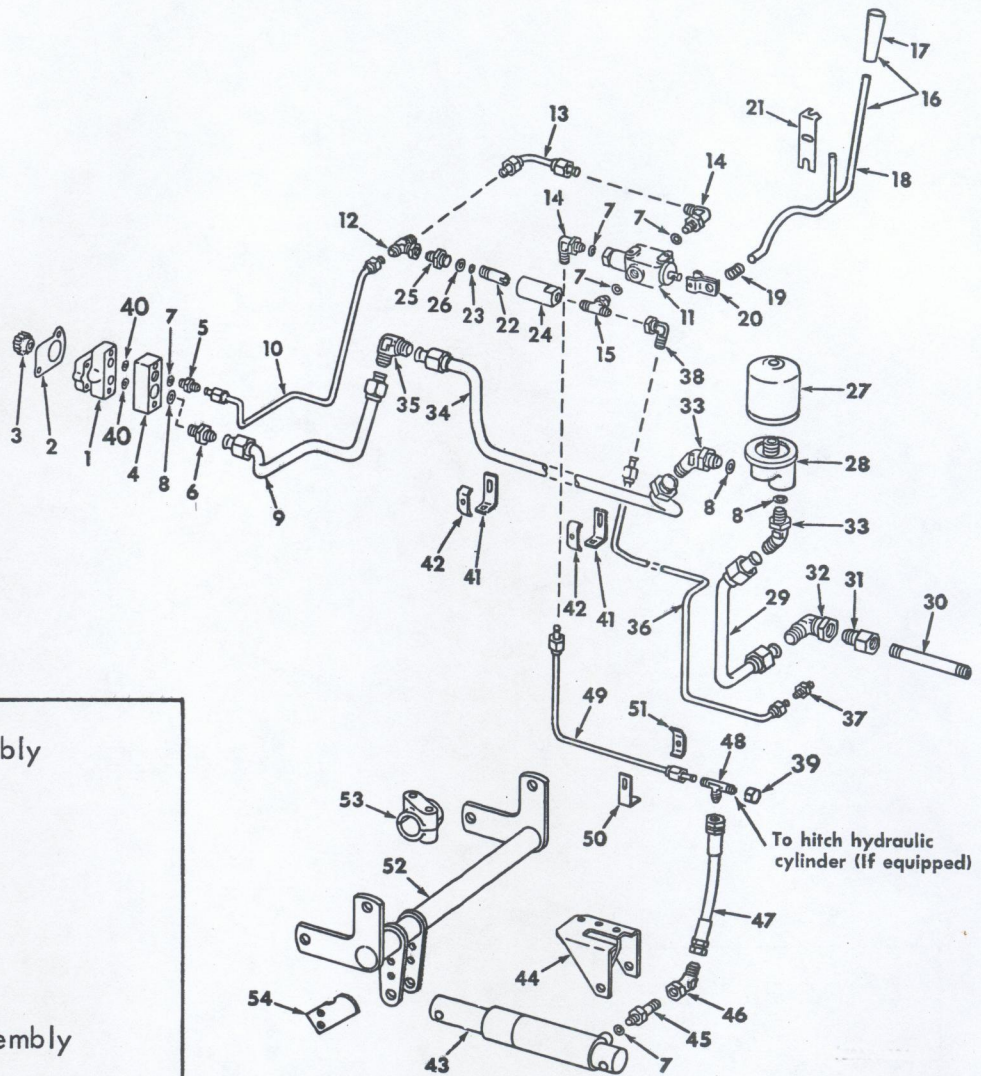
1. Check all fittings, lines and connections for leaks. Repair as necessary.
2. Fill the transmission housing to the specified level with Hy-Tran.
3. Remove the frame top cover. Install a 3000 psi gauge (FES 1-2) in the tee fitting using a tube connector (FES 94-2) and adapter (FES 94-3).
4. Start the engine and warm up to operating temperature. Check the specified circuit relief valve opening pressure. If the pressure will not build to specified psi, the circuit relief valve or the pump is at fault.



1. Hydraulic pump assembly
2. Gasket
3. Pump drive gear
4. Union
5. Union
6. Union
7. O-ring
8. O-ring
9. Suction tube
10. Pressure tube
11. Valve assembly
12. Spacer
13. O-ring
14. Return tube
15. Valve operating bar
16. Valve lever
17. Spring
18. Spacer
19. Handle
20. Handle grip

- | | | |
|-----------------------|------------------|------------------------------|
| 21. Tube | 29. Tube | 38. Hose |
| 22. Tee | 30. Nipple | 39. Cap |
| 23. Rockshaft bearing | 31. Connector | 40. Rockshaft stop |
| 24. Lube fitting | 32. Return hose | 41. Support |
| 25. Rockshaft | 33. Elbow | 42. Clamp |
| 26. Tube support | 34. Suction tube | 43. Hydraulic cylinder |
| 27. Filter | 35. Clamp | 44. Cylinder bracket |
| 28. Filter base | 36. Suction hose | 45. Gear shift housing cover |
| | 37. O-ring | |

Above Serial No. U018709.

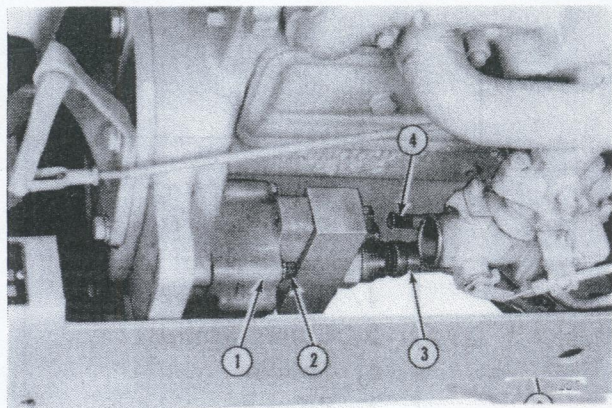


1. Hydraulic pump assembly
2. Pump gasket
3. Pump drive gear
4. Pump flange
5. Connector
6. Connector
7. O-ring
8. O-ring
9. Suction short tube assembly
10. Pressure long tube assembly

- | | | |
|--|--------------------------------------|--------------------------------------|
| 11. Single acting control valve assembly | 24. Circuit relief valve housing | 38. Elbow |
| 12. Tee | 25. Connector | 39. Cap |
| 13. Pressure short tube assembly | 26. O-ring | 40. O-ring |
| 14. Elbow | 27. Oil filter | 41. Tube clamp support |
| 15. Tee | 28. Oil filter base | 42. Tube clamp |
| 16. Valve handle | 29. Oil filter suction tube assembly | 43. Hydraulic cylinder |
| 17. Grip | 30. Nipple | 44. Cylinder mounting bracket |
| 18. Handle assembly | 31. Connector | 45. Union |
| 19. Valve handle spring | 32. Elbow | 46. Elbow |
| 20. Control valve operating bar assembly | 33. Elbow | 47. Hydraulic hose assembly |
| 21. Valve handle locator | 34. Suction long tube assembly | 48. Tee |
| 22. Circuit relief valve assembly | 35. Elbow | 49. Hydraulic cylinder tube assembly |
| 23. O-ring | 36. Return tube assembly | 50. Tube clamp support |
| | 37. Connector | 51. Tube clamp |
| | | 52. Rockshaft assembly |
| | | 53. Rockshaft bearing assembly |
| | | 54. Rockshaft stop bar |

Serial No. U018709 and below.

Hydraulic Pump



1. Hydraulic pump
2. Allen head cap screw (2)
3. Short tube suction assembly
4. Long tube pressure assembly

NOTE: Thoroughly clean the pump and lines before removal to prevent dirt from entering the hydraulic system.

1. Disconnect the hydraulic lines (3 & 4) from the hydraulic pump flange.
2. Remove the two Allen head cap screws (2) and remove the pump from the tractor.
3. Disassemble the pump and inspect for worn or damaged parts.

NOTE: An O-ring and gasket service package is available for pump service. If the pump requires more than this package for proper service, it will be necessary to replace the pump with a new assembly.

4. Install the pump assembly on the tractor. Be sure to use a new gasket. Tighten the cap screws securely and install the hydraulic lines.

Control Valve

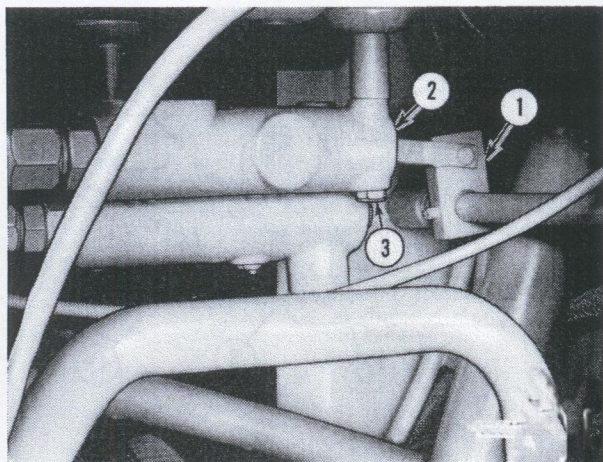
NOTE: Cover the PTO drive belts to prevent oil from getting on them.

1. Remove the cotter pin and disconnect the operating bar assembly (1).
2. Disconnect the hydraulic lines to the control valve (2) and remove the two cap screws (3) securing the valve to the pedestal assembly. Remove the valve from the tractor.

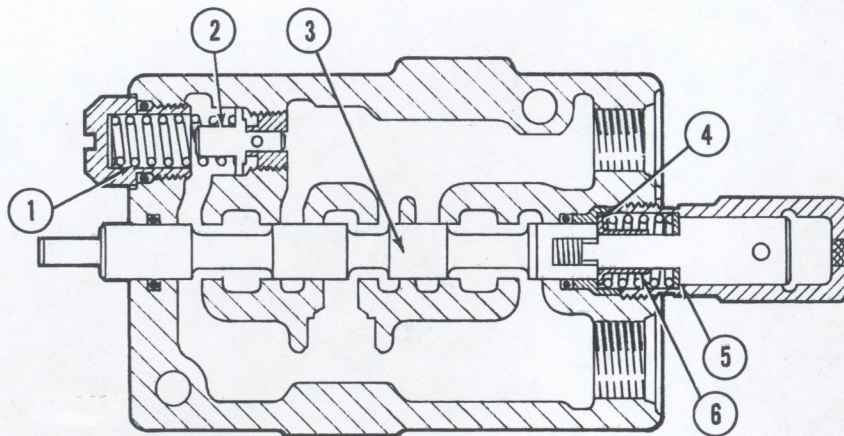
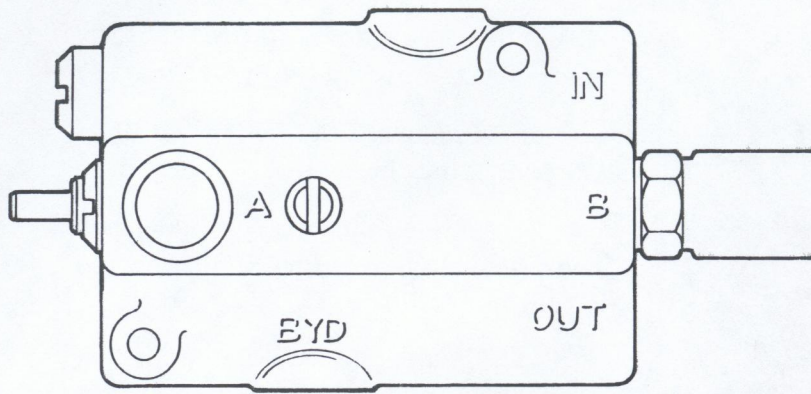
3. Disassemble the valve and inspect for worn or damaged parts.

NOTE: An O-ring and seal package is provided for service. If this package will not provide proper service, it will be necessary to replace the valve with a new assembly.

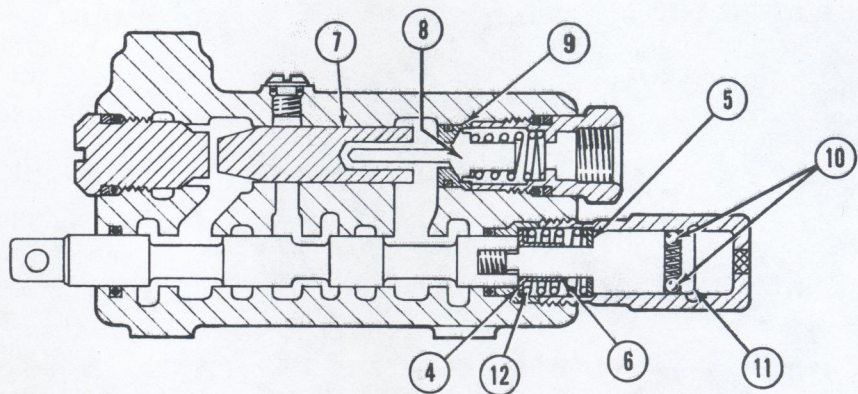
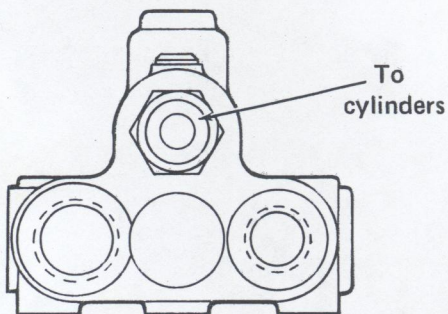
4. Install the control valve on the tractor and connect the hydraulic lines.



1. Operating bar assembly
2. Control valve
3. Cap screws

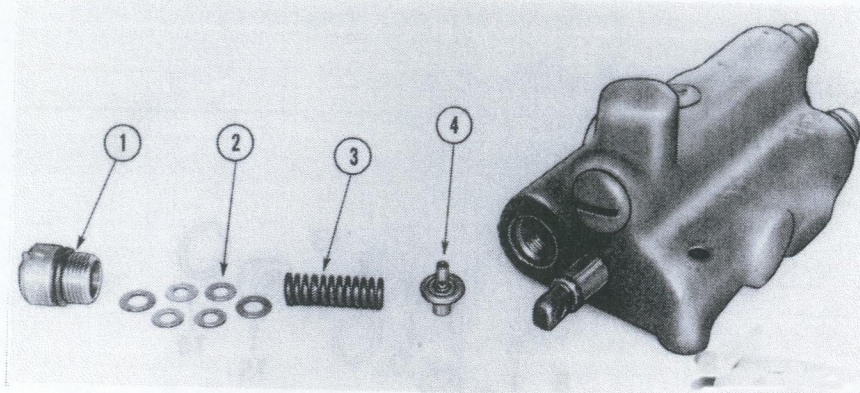


1. Poppet spring
2. Poppet, circuit relief
3. Valve spool
4. Inner washer
5. Outer washer
6. Spacer
7. Plunger
8. Unloading poppet
9. Seat
10. Ball
11. Detent cap
12. Spring



Hydraulic control valve cross section.

Above Serial No. U018709



1. Cap
2. Shims
3. Spring
4. Relief poppet

Cub 185 and Cub 154 above Serial No. UO18709.

The circuit relief valve is integral with the control valve. Circuit relief pressure may be adjusted by adding or re-

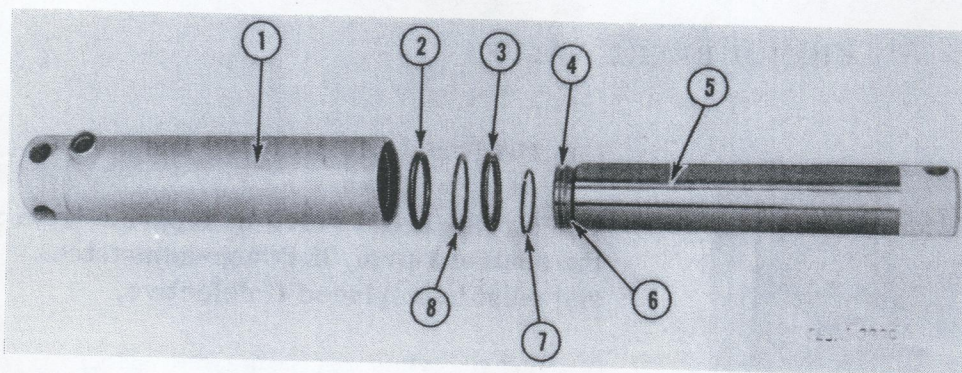
moving shims.

NOTE: When servicing the valve, cover the PTO belts to prevent oil from getting on them.

Hydraulic Cylinder (Cessna)

1. Remove the retaining ring (1) from its groove (2) and into the large groove (3).

1. Retaining ring
2. Retaining ring groove
3. Large piston groove



1. Body assembly
2. O-ring
3. Oil seal
4. Retaining ring groove
5. Piston rod
6. Large groove
7. Retaining ring
8. Back-up washer

2. Pull the piston rod (5) out of the body assembly (1).

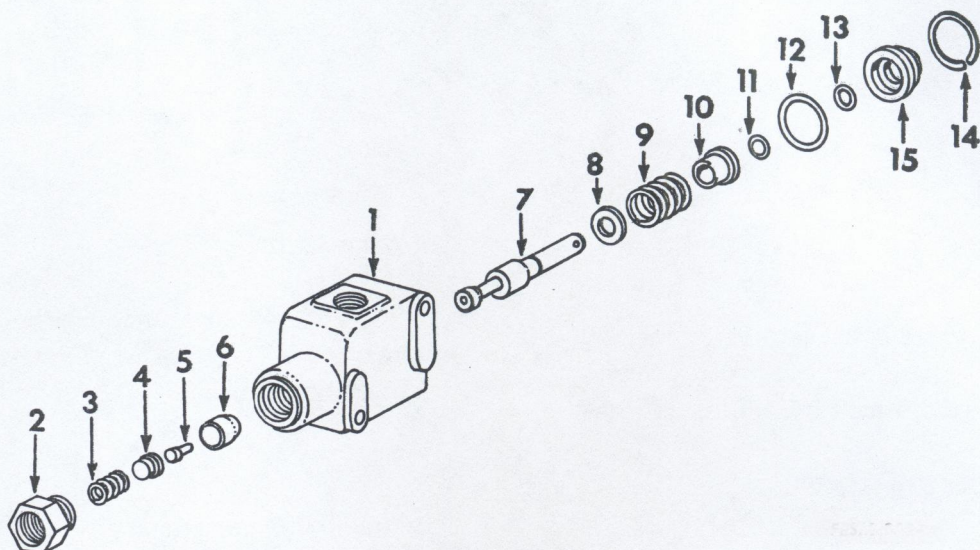
3. Remove the oil seal (3), back-up washer (8) and O-ring (2).

4. Check the piston rod and body for wear or damage and replace as necessary.

5. Install a new O-ring (2) and back-up washer (8) in the body.

Inspection and Repair

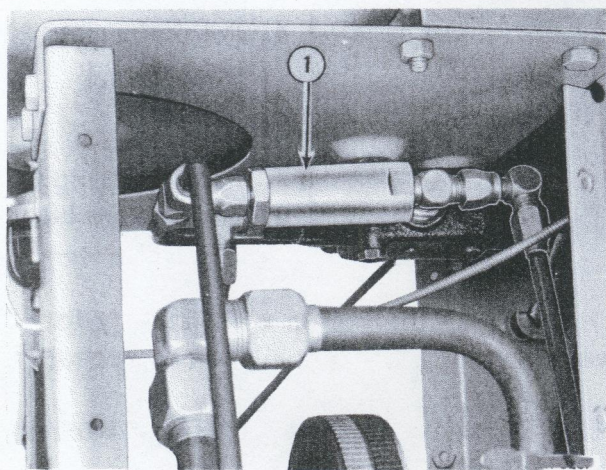
Disassemble the valve and inspect for wear or damage. Seal kits are available for service.



- | | | |
|---------------|-----------------|--------------------|
| 1. Valve body | 6. Poppet | 11. Snap ring |
| 2. Plug | 7. Valve spool | 12. O-ring |
| 3. Spring | 8. Washer | 13. O-ring |
| 4. Cap | 9. Spring | 14. Guide |
| 5. Plunger | 10. Deep washer | 15. Retaining ring |

Serial No. U018709 and below.

CIRCUIT RELIEF VALVE

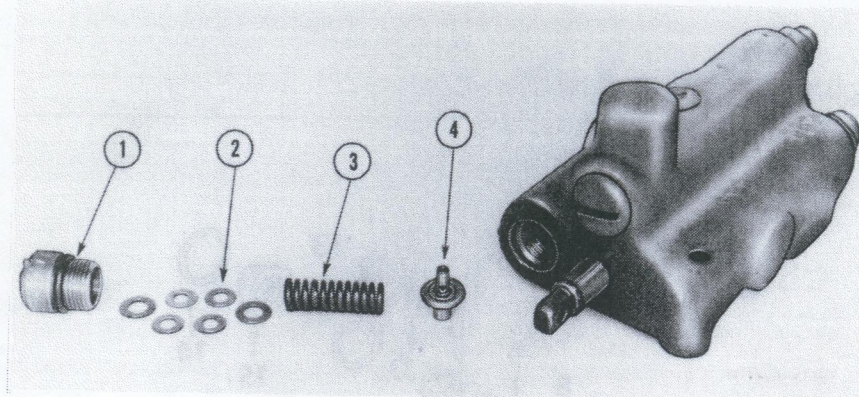


Cub 154 Serial No. U018709 and below.

The circuit relief valve is separate from the control valve. It is non-adjustable and must be replaced if defective.

NOTE: When replacing the valve, cover the PTO belts to prevent oil from getting on them.

1. Circuit relief valve



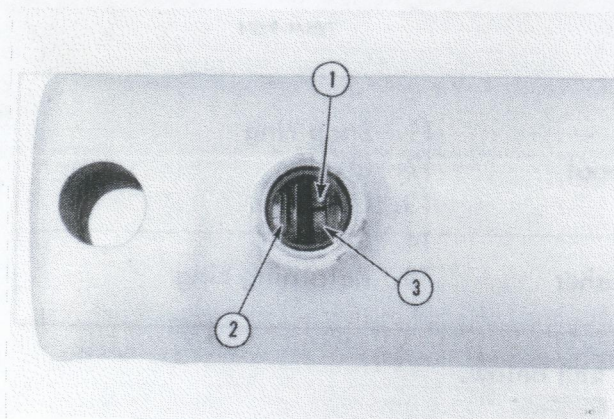
1. Cap
2. Shims
3. Spring
4. Relief poppet

Cub 185 and Cub 154 above Serial No. UO18709.

The circuit relief valve is integral with the control valve. Circuit relief pressure may be adjusted by adding or re-

moving shims.

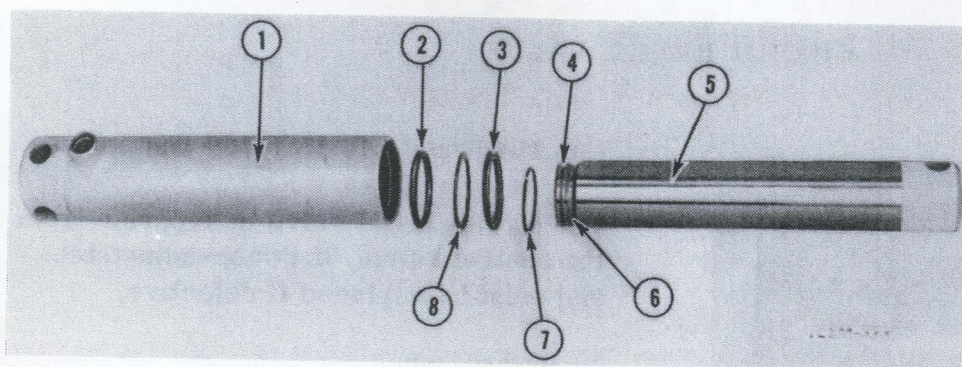
NOTE: When servicing the valve, cover the PTO belts to prevent oil from getting on them.



Hydraulic Cylinder (Cessna)

1. Remove the retaining ring (1) from its groove (2) and into the large groove (3).

1. Retaining ring
2. Retaining ring groove
3. Large piston groove



1. Body assembly
2. O-ring
3. Oil seal
4. Retaining ring groove
5. Piston rod
6. Large groove
7. Retaining ring
8. Back-up washer

2. Pull the piston rod (5) out of the body assembly (1).

3. Remove the oil seal (3), back-up washer (8) and O-ring (2).

4. Check the piston rod and body for wear or damage and replace as necessary.

5. Install a new O-ring (2) and back-up washer (8) in the body.

6. Press a new oil seal (3) in place in the body (1).

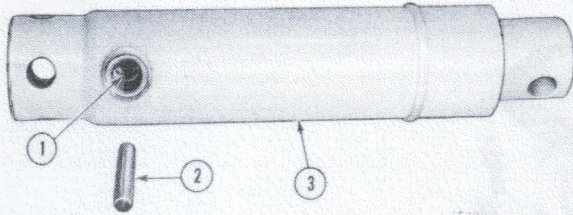
7. Install the retaining ring (7) in the large piston rod groove (6). Install the

rod (5) in the body (1) and then move the retaining ring (7) into its correct groove (4).

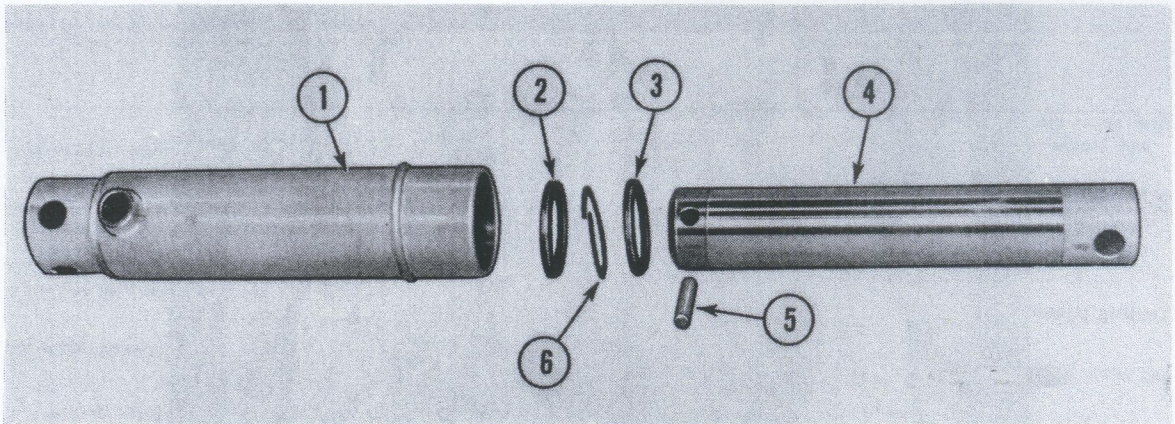
Hydraulic Cylinder (IH)

1. Remove the cylinder assembly from the tractor.

2. Position the piston so the stop pin is aligned with the cylinder port (1). Turn the cylinder (3) so the port (1) is pointing downward, and the pin (2) will fall out.



1. Cylinder port
2. Stop pin
3. Cylinder body



3. Remove the piston (4) from the cylinder body (1).

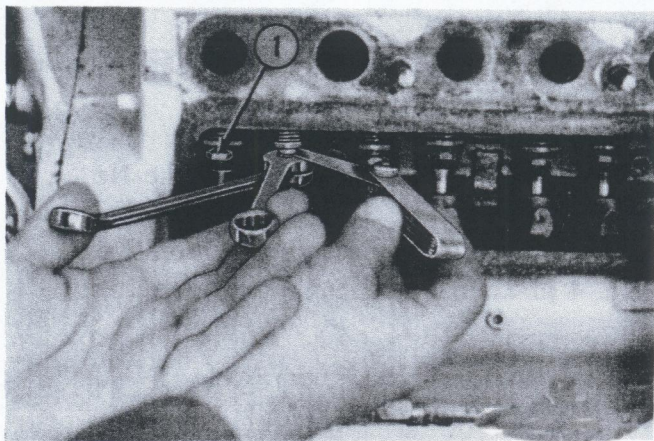
4. Remove the piston rod wiper (3), piston rod bracket washer (6) and quad ring (2) from the cylinder body (1).

5. Check the piston rod and cylinder body for wear or damage and replace as necessary.

6. Install a new piston rod bracket washer (6) and quad ring (2) in the cylinder body (1).

1. Cylinder body
2. Quad ring
3. Piston rod wiper
4. Piston rod
5. Stop pin
6. Piston rod bracket washer

7. Press a new piston rod wiper (3) in the body being sure the lip points outward.



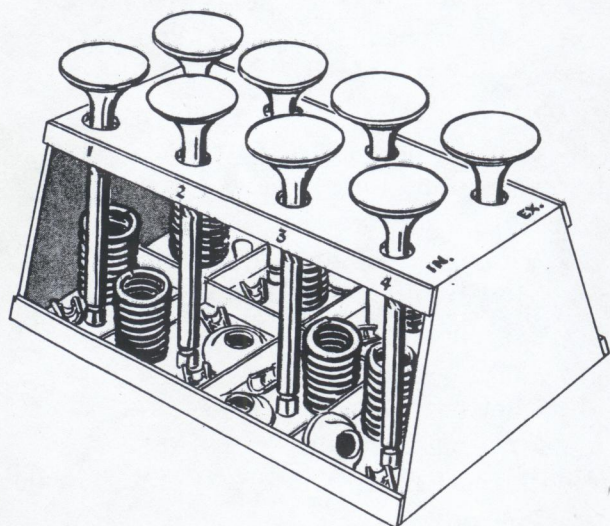
1. No. 1 valve

5. Insert the feeler gauge between the valve tappet and the valve stem. The specified clearance is .015 inch (engine cold). Turn the adjusting screw in or out as necessary to give a slight drag on the feeler gauge. Adjust the four valves specified in the chart on page 1-15.

6. Crank the engine until the No. 4 piston is on T.D.C. (compression) and the O mark (1) on the fan drive pulley is in line with the timing pointer (3). (Refer to illustration on page 1-15.) Adjust the remaining four valves.

7. Install the valve cover being sure to use a new gasket. Check for any oil leaks.

8. Install the intake and exhaust manifold assembly.



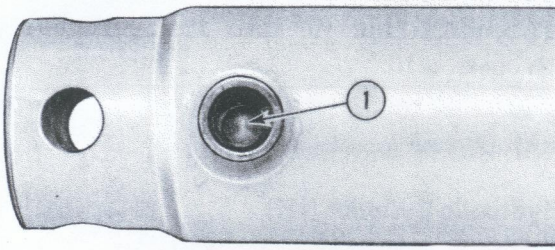
Removing Valves

NOTE: When valve assemblies are removed, all parts should be kept in order. They may then be reinstalled in the same ports, from which removed, if they are to be used for further service.

1. Drain the cooling system and remove the cylinder head. Refer to page 1-13.

2. Remove the intake and exhaust manifold assembly.

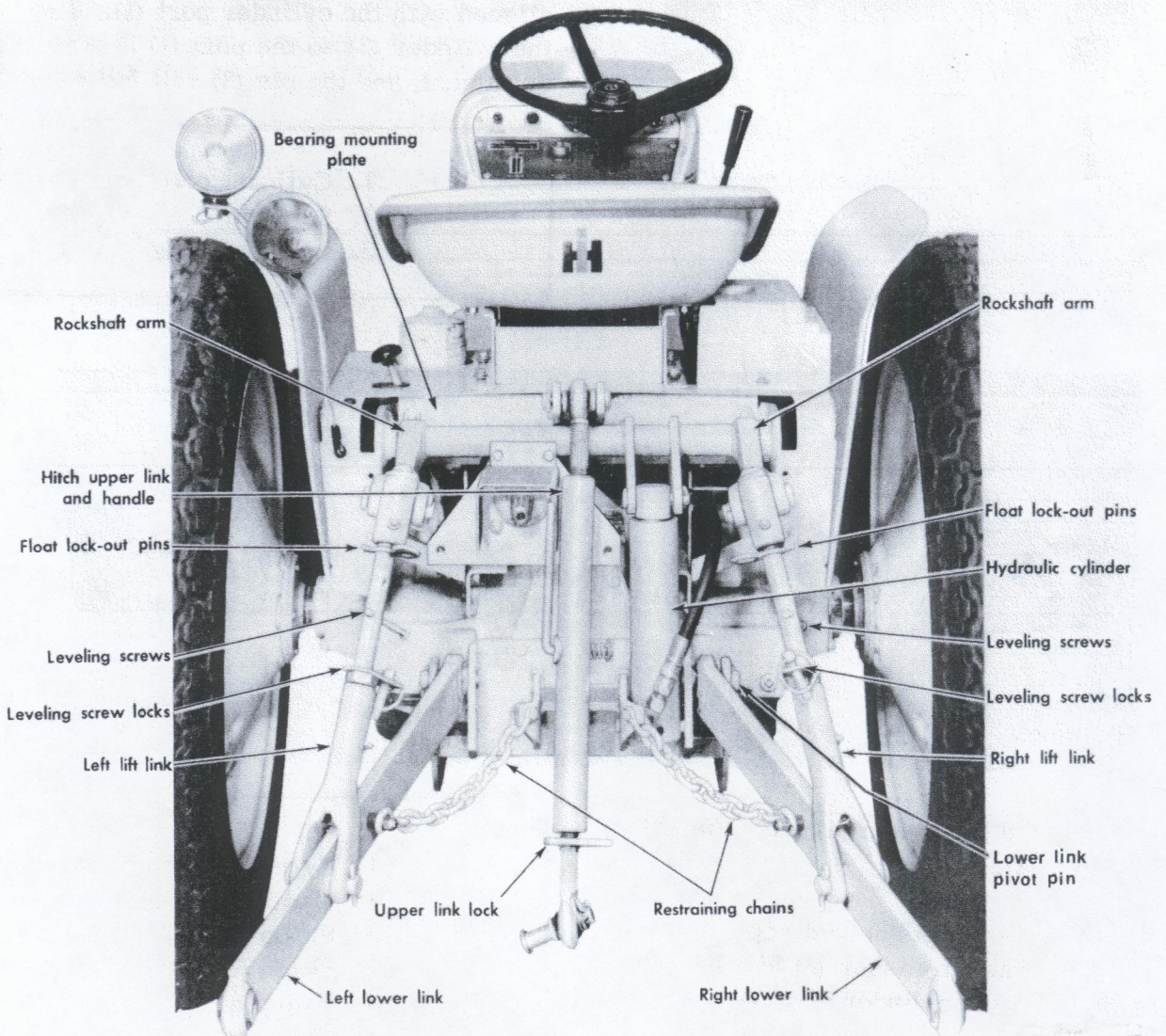
3. Remove the valve tappet cover, and turn down the tappet screws several turns so the springs may be removed easily and to prevent interference with valve stems after seats and faces are reground.



8. Lubricate the piston with Hy-Tran and then install it in the cylinder body. Align the stop pin bores with the cylinder port and install the stop pin (1).

9. Install the cylinder assembly on the tractor.

1. Stop pin



Removal

Detach the restraining chains and remove the pins in the lower links to remove the lower links.

To remove the upper link, remove the quick-attachable cotter pin and pin from

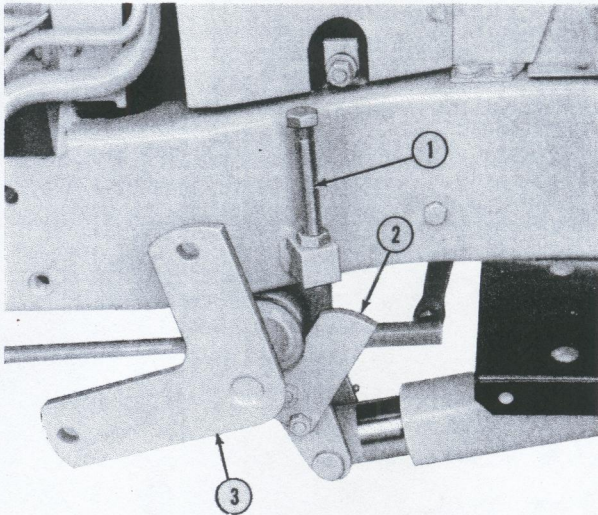
the upper link bracket.

To remove the rockshaft arm, detach the hydraulic cylinder from the rockshaft and remove the four bolts from the bearing mounting plates.

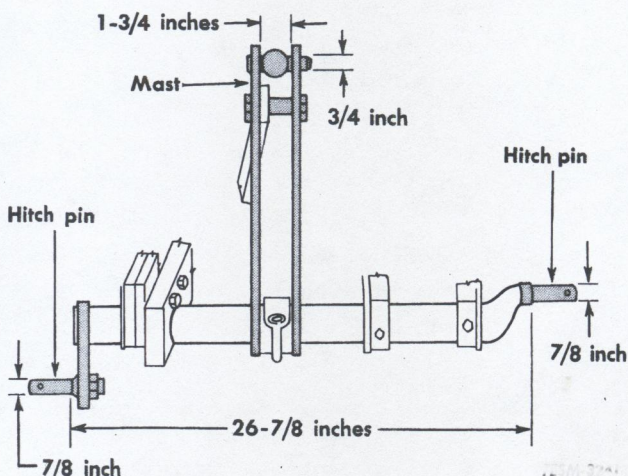
Reassembly is the reverse of disassembly.

Adjustments

The adjusting screw located at the left rockshaft arm controls the height or depth of equipment mounted on the tractor.



1. Adjusting screw
2. Stop bar
3. Rockshaft arm



Lift Links and Leveling Screws

The lift links are used to raise or lower the hitch lower links. The lift links can be adjusted from 16-3/8 inches to 18-7/8 inches, with a nominal length of 17-5/8 inches. The left and right lift links incorporate leveling screws which can be turned to obtain the desired position of the hitch sockets relative to one another. The desired working range or lift range can be obtained by adjusting both leveling screws. Leveling screw locks are provided to prevent the leveling screws from working down when operating equipment in the field.

NOTE: The height of lift can be varied by repositioning the lower link pivot pins in one of the three vertical holes in the lower mounting plate.

Hitch Upper Link

The hitch upper link can be shortened or lengthened with the handle on the hitch upper link. Rotate the handle perpendicular to the upper link and turn clockwise or counterclockwise to the desired length. After adjusting, rotate the handle back to the parallel position and tighten the upper link lock. The upper link can be adjusted from 19 inches to 28 inches.

Adjust the length of the upper link according to the instructions for the equipment being used.

The category 1 designation means that the hitch lower links are spaced to fit equipment hitching pins spaced 26-7/8 inches between the shoulders, the swivel sockets in the ends of the lower hitch links are the correct size to fit the 7/8 inch diameter equipment hitching pins, and the swivel socket on the hitch upper link is the correct size to fit the 3/4 inch hitching pin in the 1-3/4 inch space on the equipment mast.

SPECIFICATIONS

154 & 185 TRACTORS

Motor Generator

Delco Remy No.	Rotation Viewing Drive End	Brush Spring Tension	Field Current (80° F)		Cold Output (80° F)		
			Amps	Volts	Amps	Volts	AV-RPM
1 101 693	CW	22 – 26	1.5 – 1.6	12	15	14	3590
1 101 698	CW	22 – 26	1.5 – 1.6	12	12	14	4950

Voltage Regulator

Delco Remy No.	Circuit	Polarity Battery Ground	Cut Out Relay			Voltage Regulator	
			Air Gap In.	Point Opening In.	Closing Voltage Range	Air Gap In.	Voltage Range
1 118 991	A	N	.020	.020	11.8 – 14.0	.075	13.6 – 14.5

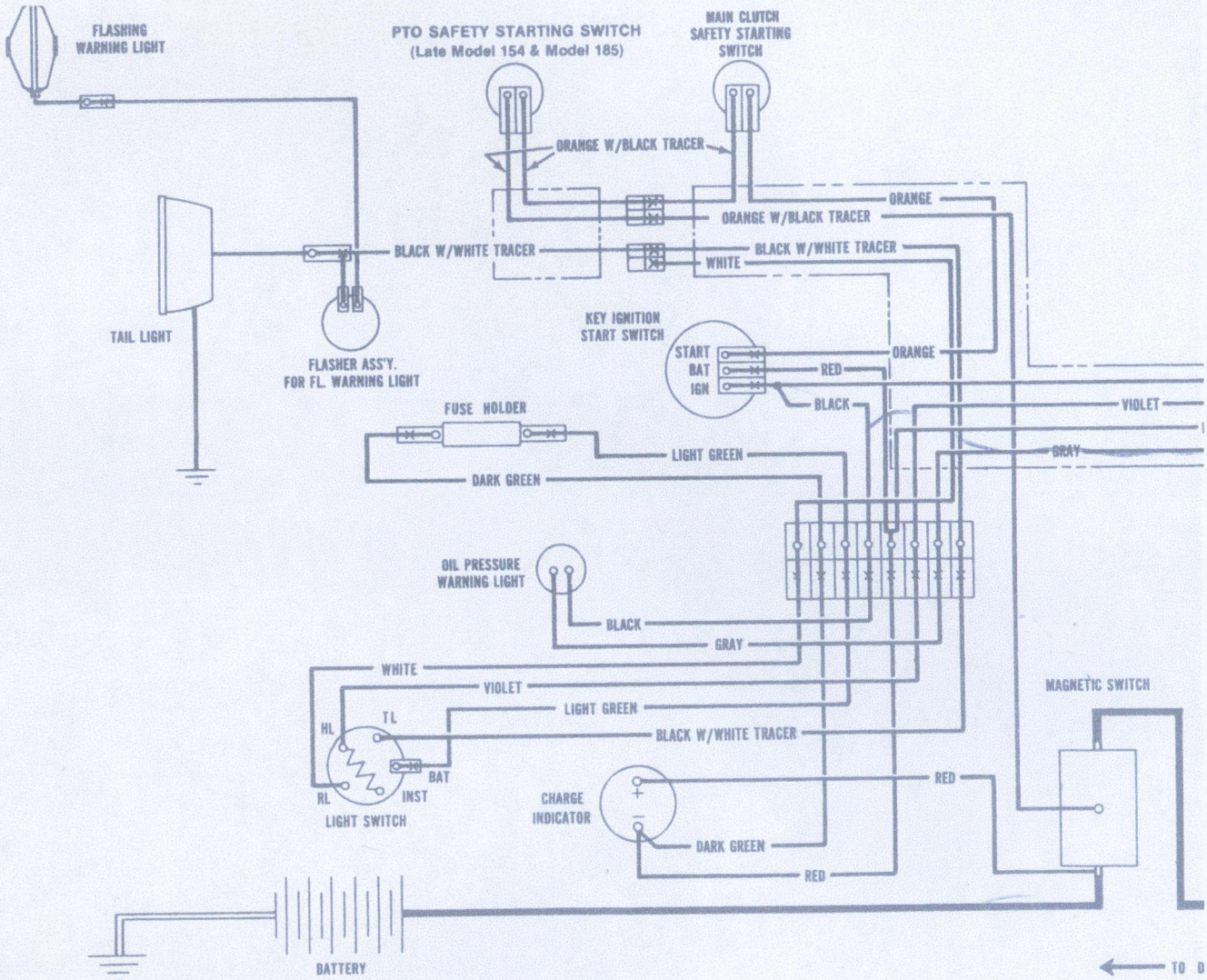
Distributor

Symbol or Code	Rotation Viewing Drive End	Degrees Of Automatic Spark Advance At Various Engine RPM's						
		400	800	1200	1600	1800	2000	2200
D	CCW	0 – 1	4 – 8	10 – 14	15 – 16	—	—	—

Electric IPTO Clutch

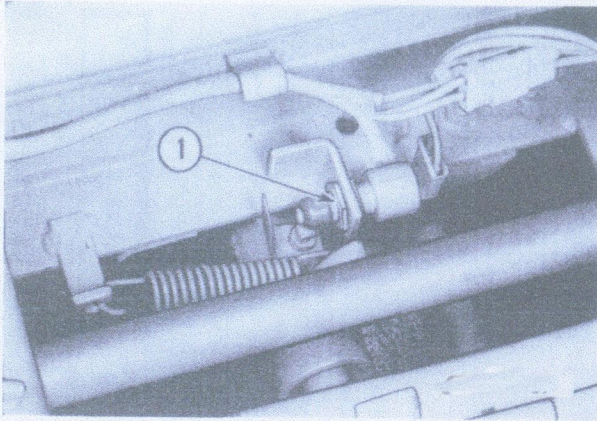
Voltage	Resistance	Current
12 D.C.	2.60	4.61 Amps

154 & 185 TRACTORS



SAFETY STARTING CIRCUIT

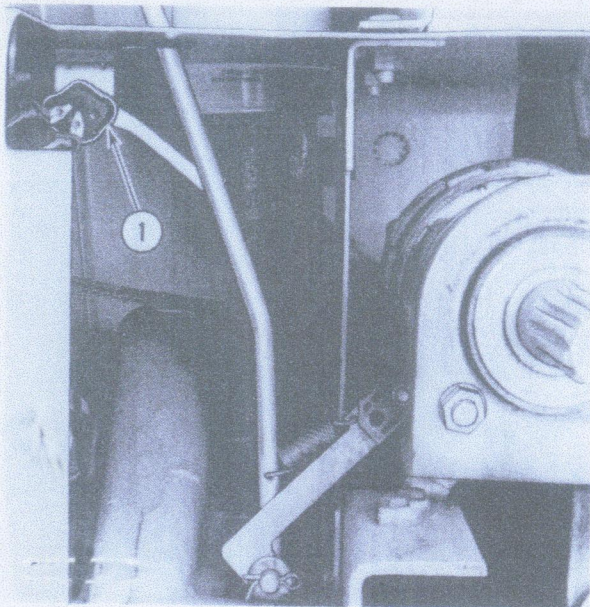
154 & 185 TRACTORS



1. Safety starting switch

The safety starting circuit on early production tractors consisted of a main clutch safety starting switch. Later production tractors are equipped with safety starting switches on both the main clutch and the PTO.

The main clutch must be disengaged to activate the main clutch safety starting switch. The switch is adjustable and should be positioned so that the activating arm depresses the switch just far enough to make contact but not bottomed out against the end.



The PTO safety starting switch is spring loaded to complete the circuit as long as the PTO is disengaged.

1. PTO safety starting switch

SPECIFICATIONS

184 TRACTOR

Alternator

Delco Remy No.	Ground	Rotation Viewing Drive End	Field Current 80° F		Cold Output At Specified Voltage				Rated Hot Output (Amps)
			Amps	Volts	Amps	Approx. RPM	Amps	Approx. RPM	
1 100 588	N	CW	4.0 – 4.5	12	22	2000	33	5000	37
1 102 920	N	CW	4.0 – 4.5	12	25	2000	38	5000	42

Cranking Motor

Delco Remy No.	Rotation Viewing Drive End	No Load Test				
		Volts	Amps		RPM	
			Min.	Max.	Min.	Max.
1 109 352	CW	9	60	85	6800	10300

Distributor

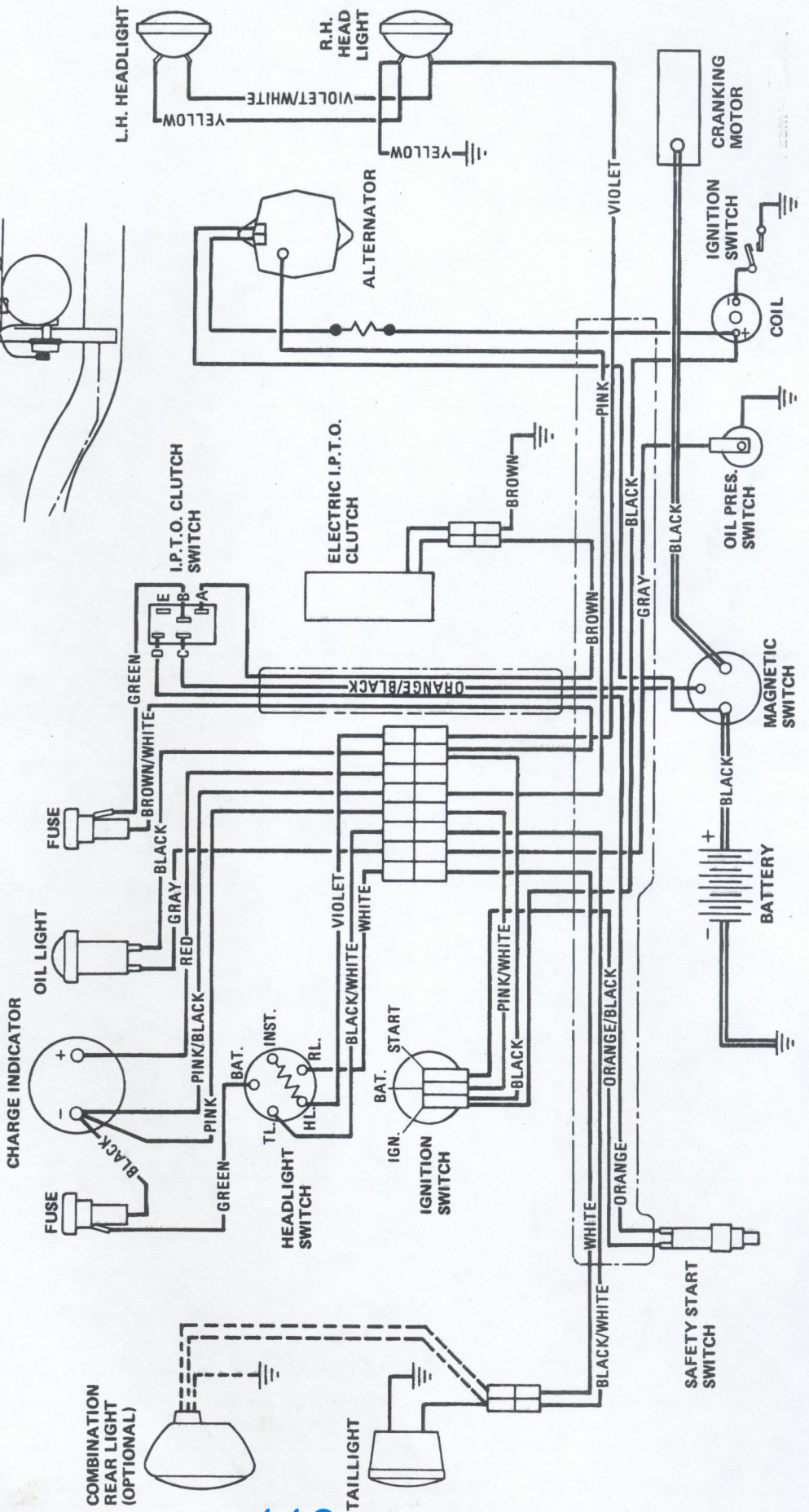
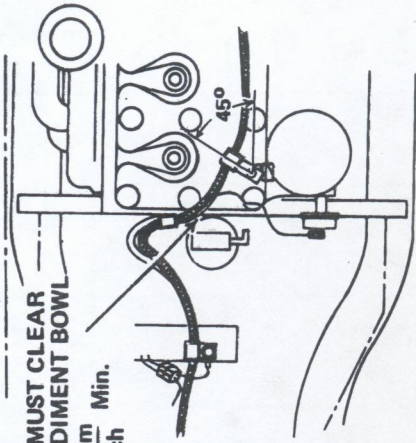
Symbol or Code	Rotation Viewing Drive End	Degrees of Automatic Spark Advance At Various Engine RPM's						
		400	800	1200	1600	1800	2000	2200
D	CCW	0 – 1	4 – 8	10 – 14	15 – 16	—	—	—

Electric IPTO Clutch

Voltage	Resistance	Current
12 D.C.	2.60	4.61 Amps

184 TRACTOR

CABLES MUST CLEAR FUEL SEDIMENT BOWL
By 13. mm Min.
.5 inch



SAFETY STARTING CIRCUIT

184 TRACTOR

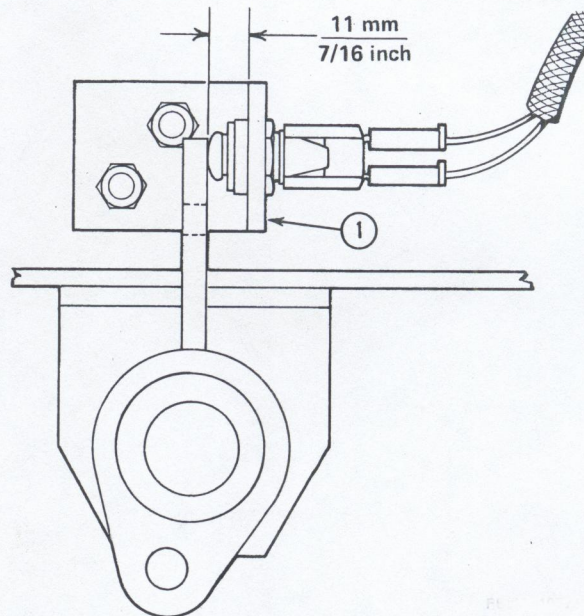
If the clutch pedal safety start switch requires replacement, proceed as follows:

1. Install the new switch into the bracket assembly.
2. Thread the rubber boot onto the switch and lock in place with the jam nut.

NOTE: Turn the rubber boot onto the safety switch approximately three turns.

Adjustment

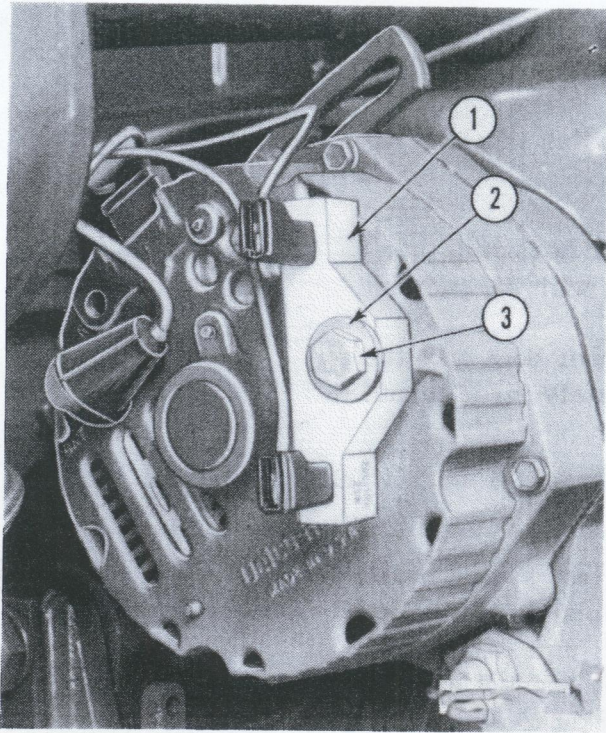
Position the safety start switch bracket so that when the clutch pedal is fully depressed a distance of 11 mm (7/16 inch) between the clutch pedal bracket and the safety start switch bracket exists.



1. Adjustable switch bracket

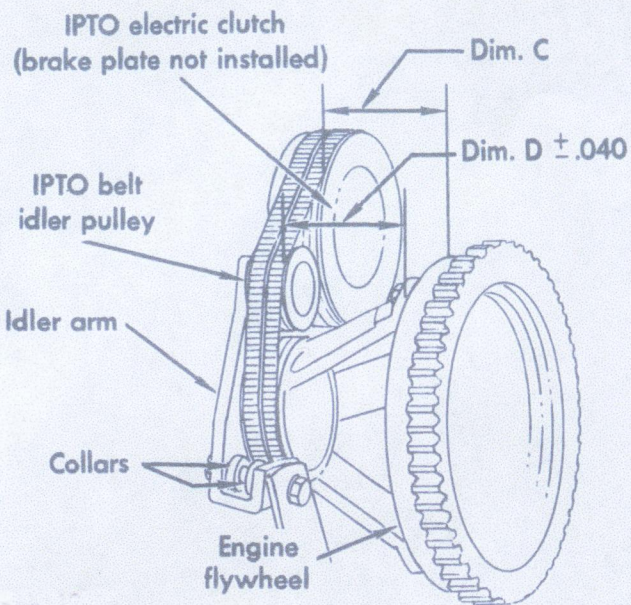
RESISTOR UNIT

184 TRACTOR



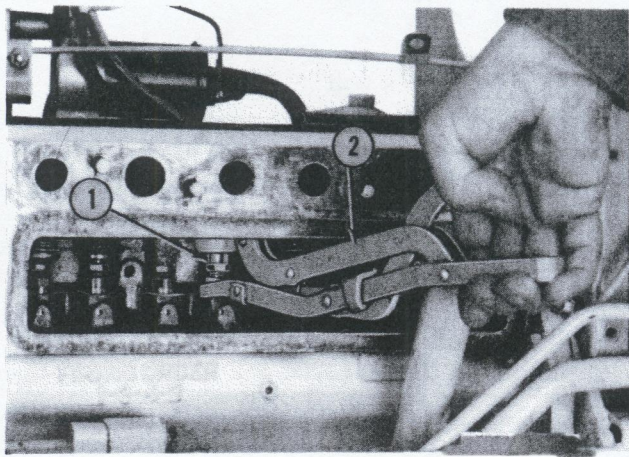
The resistor unit on the 184 tractor models, serial no. U046614 and above, requires a longer bolt and a plain washer instead of a lockwasher. The plain washer should be located between the bolt head and the resistor unit. Torque should not exceed 9-11 N·m (80-100 in. lbs.) to reduce the possibility of breakage of the ceramic resistor.

1. Resistor unit
2. Plain washer
3. Bolt, 5/16 x 1-1/4 inch



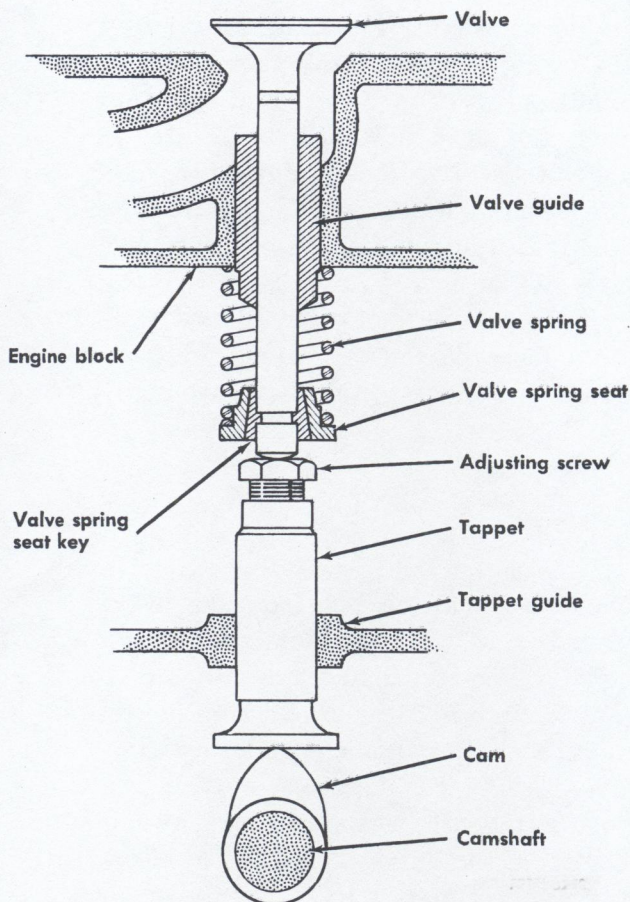
12. Measure from the forward edge of forward power take-off belt to face of flywheel at top of power take-off clutch pulley (Dim. C). Then measure from the forward edge of forward power take-off belt where the belt leaves the idler pulley to face of flywheel (Dim. D). Dimensions should be the same ± 1 mm ($\pm .040$ inch). If not, loosen the locking collars and slide the idler arm on the trunnion bushing until the above measurement is reached. After adjustment has been made, slide the locking collars against the inside surface of idler arm and tighten set screws to 20 inch lbs.

13. The clutch pedal must maintain a free travel distance of 28.5-31.7 mm (1-1/8-1-1/4 inch).



4. Compress the valve springs with a suitable tool and remove the valve spring seat keys (1). Be careful not to compress the springs more than necessary as they can be distorted.

1. Valve seat key
2. Valve spring compressor



5. Remove the valves, valve spring seats and valve springs. Be sure to keep valves in order so they may be installed in the same port.

NOTE: To remove the tappets the camshaft must be removed.

Inspection

General

Carbon deposits on the valves and valve seats are normal and cannot be avoided completely. However, such deposits are detrimental to engine efficiency and valve assembly life as the amount of carbon in the engine increases.

The rotating mechanism used on the exhaust valves greatly extends the service life of the valves.

Valves and valve seats should be examined for pitting, burning, warping and other defects.

The formation of carbon cannot be avoided. However, it can be held to a minimum by the use of only good grade fuels and accurate engine timing.

POWER TAKE-OFF

If your tractor is equipped with a power take-off, the following instructions and precautions should be carefully studied and followed.

The power take-off is powered direct from the engine. The power take-off lever should always be in the disengaged (depressed) position when not in use.

OPERATING THE POWER TAKE-OFF WITH THE TRACTOR STANDING STILL

1. The transmission gearshift lever must be in the neutral position.
2. Move the engine throttle lever to the speed desired.
3. Lift the power take-off lever to the engaged position.

OPERATING THE POWER TAKE OFF WITH THE TRACTOR IN MOTION



Caution! When operating power take-off driven machines not equipped with an overrunning clutch (such as a rotary brush cutter), the following precautions should be taken:

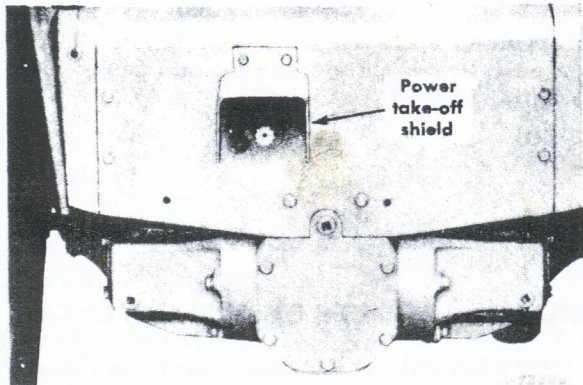
Slow down when approaching trees, fences, or ditches. Flywheel effect of the driven machine will drive the tractor forward after the engine clutch is disengaged. To stop the forward travel more quickly, retard the engine throttle control lever, disengage the engine clutch, move the gearshift lever to the neutral position, and apply the tractor brakes.



Caution! Always cover the power take-off exposed shaft with the guard when the power take-off is not being used. See Illust. 16.



Caution! Stop the power take-off before dismounting from the tractor.



Illust. 16

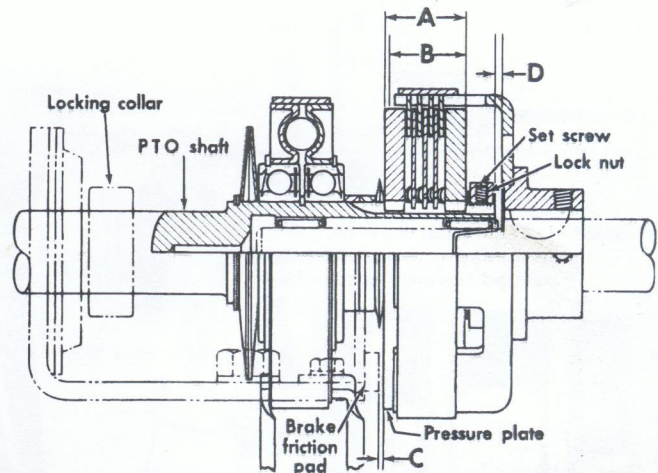
ADJUSTING THE POWER TAKE-OFF CLUTCH

Measure the clutch assembly in the disengaged position (A) in Illust. 16A. Measure the same assembly in the engaged position (B). The difference in the two measurements must be .050-inches. This adjustment is obtained by tightening or loosening the locknut. Use caution when tightening the locking setscrew. Over tightening will result in distortion of the needle bearing.

Measurement (C), pressure plate (engaged position B) to friction pad, must be .040-inches. This is obtained through proper location of the brake plate at the slotted hole.

Measurement (D), shaft to drive cup clearance must be 1/8-inch. This is obtained by proper positioning of the shaft, then tightening of the breaing locking collar.

The power take-off is functioning properly when it requires 80 ft. lbs. torque to turn the shaft. A torque wrench can be applied through use of a 15/16-inch socket plus a 1/8-inch Allen wrench between the two splines.



Illust. 16A

ADJUSTING THE INDEPENDENT POWER TAKE-OFF BELT

The tension on the independent power take-off belt is correct when the belt can be deflected slightly, approximately 1/16-inch by finger pressure at a point midway between the pulleys. Do not overtighten.

Warpage, burning and pitting of valves is mainly directed against the exhaust valves which are exposed to the high temperature flow of exhaust gases. Such defects are generally caused by valves failing to seat tightly and evenly, permitting exhaust blow-by. This, in turn, can generally be traced to hard particles of carbon being present on the slopes of the valve seats. It may, however, be due to weak springs, insufficient valve clearance, or warpage and misalignment of the valve stem or guide.

Warpage, chiefly occurs on the valve stem due to its exposure to heat. Out-of-round wear occurs when the seat has been pounded by a valve head which is not in line with its stem or guide.

Misalignment is a result of wear, warpage, and distortion. Wear, when accentuated by insufficient lubrication, will eventually create sloppy clearances with resultant misalignment.

Warpage of the valves, and in known extreme instances, that of the crankcase, can result from the engine overheating due to a blocked, dirty or insufficiently filled cooling system.

Most frequently, however, warpage of a valve stem or a guide is due to uneven temperatures being applied along its length. The lower part of the guide and stem is near the combustion heat, and the upper portions are closer to cylinder head water passages. Valve materials are carefully chosen to withstand such varying temperatures. However, an engine that is allowed to operate continually in an overheated condition is definitely open to valve stem and guide distortion and warpage. Distortion can also be caused by failure to tighten

cylinder head bolts to the specified foot-pounds torque and in the sequence recommended. Valve clearances are also affected in this manner. Thus any abnormal wear, warpage or distortion affecting a valve guide will destroy its function as an accurate bearing to maintain the valve head concentric with its seat, and will prevent leak-proof seating.

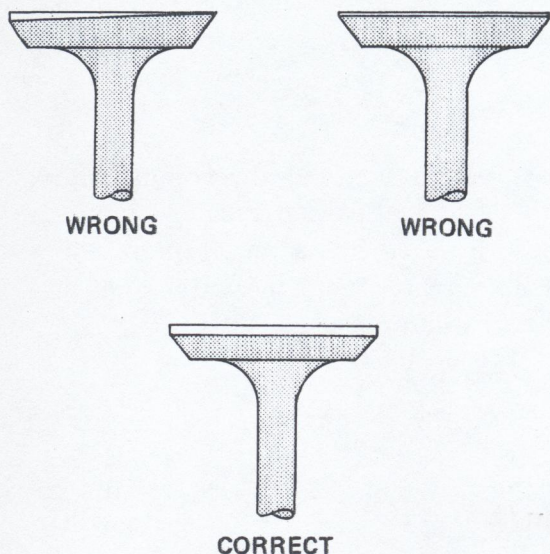
Oil and air sucked past worn intake valve stems and guides into the combustion chamber, cause excessive oil consumption, form excessive carbon, and dilute fuel.

Examine the engine for signs which may indicate the reason for the need of valve reconditioning. Dry and rusted valve springs are an indication that the oil passages to the valve levers may be blocked, causing wear on the valves and guides, and resulting in improper valve action. A defective gasket under the valve cover will permit the entrance of dirt which will cause undue wear on the valve stems and guides and damage to the valve springs.

Valves

1. Remove all carbon from the valve head and stem. Valve stems should be lightly polished with an extremely fine abrasive cloth sufficiently to remove the carbon deposits only. Because of the nature of the valve deposits, solvent cleaning ordinarily will not remove all the deposits from the valves. Wire brushes will do this job satisfactorily, but only brass wire brushes should be used since steel brushes may scratch the surface. Such scratches are likely to cause localized stresses in an operating valve and may eventually result in fatigue fractures of the valve. For similar reasons the use of coarse emery paper should be avoided.

2. Inspect each valve. See that the stem is not worn excessively and that the head is not burned or warped. Check the

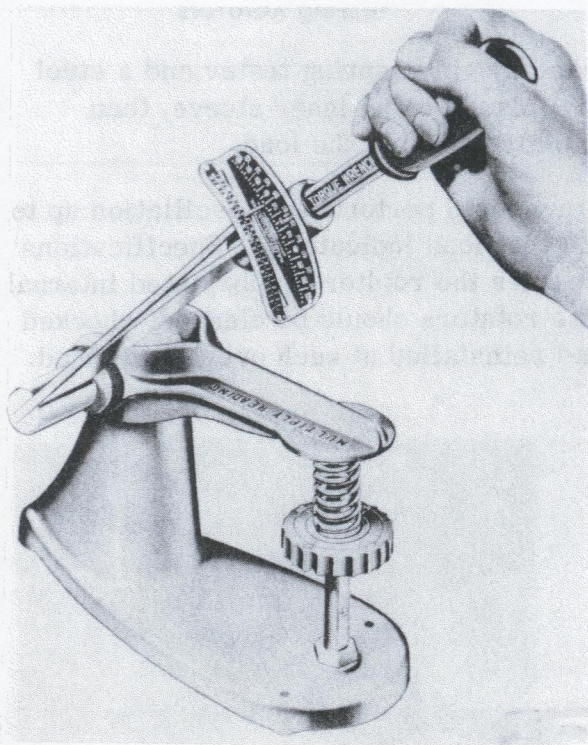


grooves in the stem to see that they have not lost the shoulders through wear, which prevents the valve seat retainer keys from fitting snugly.

3. All valves having bent, worn, warped or seriously pitted stems should be replaced. Replace any valve that cannot be satisfactorily refaced with a definite margin maintained. The amount of grinding necessary to true the valve face is a definite indication of the valve head warpage from the axis or centerline of its stem. With excessive warpage, a knife edge will be ground on part or all of the valve head due to the considerable amount of metal that must be removed to completely reface. Maximum heaviness in a valve head is required for strength and to provide as large an area as possible for heat dissipation. Knife edge valves lead to breakage and warpage.

4. Clean and examine all valve springs for rust, pitting, broken or set coils. Test each spring against the spring specifications (see "Specifications") using a spring load tester. Replace all springs that do not meet specifications.

5. Clean all valve spring seats with solvent, and examine them for rust, cracks and bending characteristics. Replace parts as necessary.

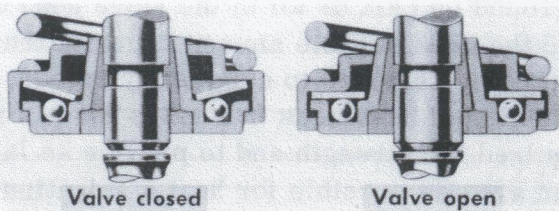


Valve Seat Retainer Keys

Clean parts thoroughly in solvent. Check the ribs in the inside of the keys to see that none are worn sufficiently to cause looseness. The keys must fit snugly into the valve stem groove. Check the keys for wear on the outside surface which might allow the valve spring retainer to slide over the key.

Valve Guides

Clean the bores of the valve guides, using a wire rifle brush and solvent. Blow out all carbon with compressed air. Position a light at the bottom of the guide bore, and examine the walls for burning, cracking and signs of excessive wear. Check the inside diameter of the guide bore at several points around its circumference and along its length. Replace any guides considered unserviceable or that appear close to a serviceable borderline.



NOTE: All valve reconditioning equipment requires the installation of a pilot in the valve guide to produce a seat concentric with the guide bore. For this reason the guides must be clean and meet the engine specifications before the valve seats can be reconditioned.

Valve Seats

Remove all carbon and any remaining gas-ket material from the crankcase surface. Inspect all valve seats for cracks. Remove the carbon from the valve seat recesses or counterbores.

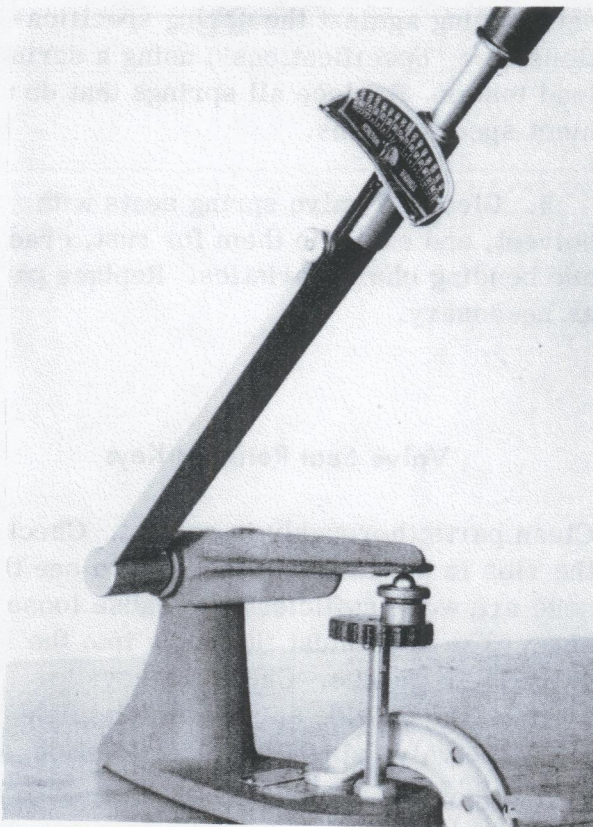
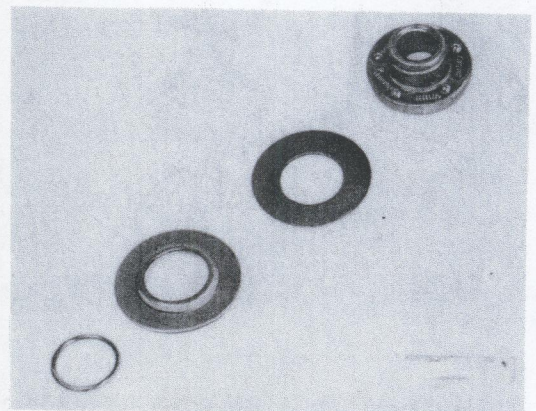
Rotocap

When the Rotocap is in operation, the valve spring is compressed (valve opened), the bellville washer is brought to bear on the steel balls. This causes the balls to roll down the ramp in the retainer thus rotating the valve.

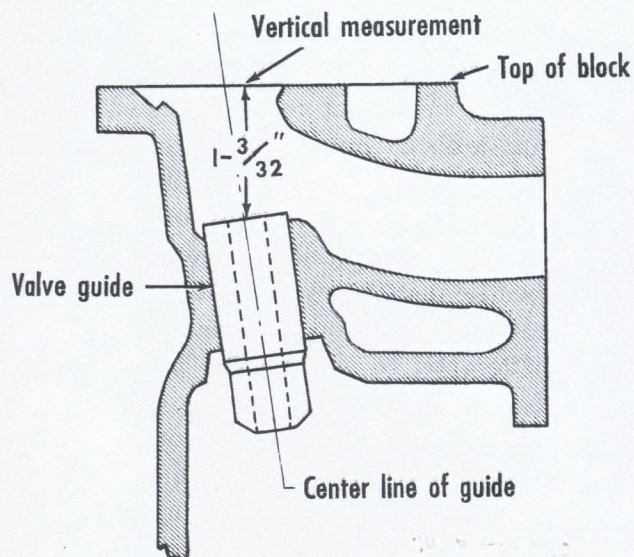
Testing Rotators

Use any valve spring tester and a steel ball placed on an inner sleeve, then rapidly oscillate the load.

You should perform this oscillation up to the test load indicated in "Specifications". Be sure the rotator is lubricated internally. The rotators should be cleaned, checked and reinstalled at each overhaul period.



Observing the operation of the valves prior to tear-down of the engine is beneficial in preventing unnecessary checking of worn rotators. Mark the valves with a pencil as movement is relatively slight.



Reconditioning

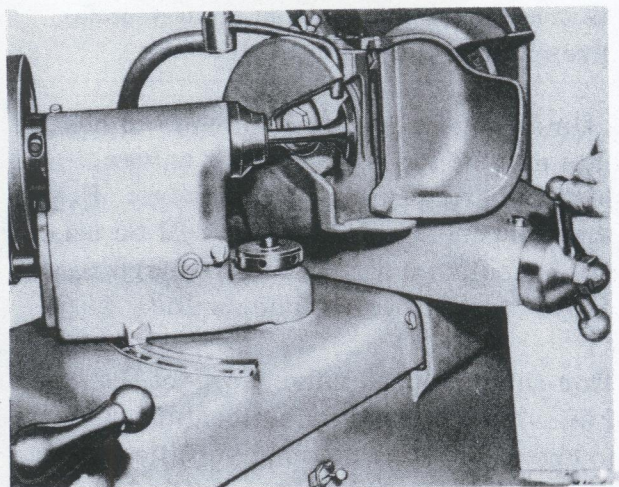
Valve Guides

1. Press the guides from the crankcase.
2. Install new guides from the top of the crankcase, and press them into the crankcase bores to a measured distance of 1-3/32 inch from the top surface of the block to the top center of the guide.
3. All guides furnished as service parts are reamed to size; however, as they are a press fit, it is necessary to burnish them after installation to remove any possible burrs or slight distortion caused by the pressing operation.

Valves

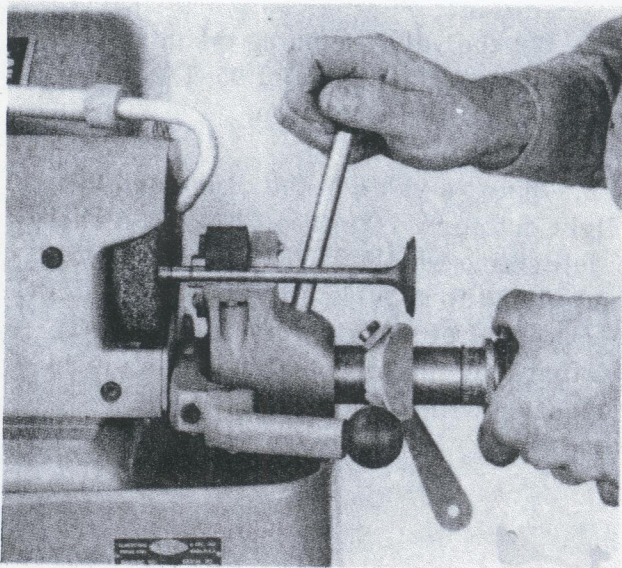
After being thoroughly cleaned and inspected, valves that are fit for continued use should be reconditioned as follows:

1. Set the valve refacing machine to grind the specified angle of 45-1/2 degrees and dress the grinding stone.
2. Insert a valve in the chuck and take a light cut across its face. This is a check to determine whether the valve can be reconditioned to service standards with a correct amount of margin maintained. Warp-age that may not be apparent in the visual inspection will be clearly definable.



Avoid taking heavy grinding cuts as this heats the valve head excessively, producing an unsatisfactory valve face, and necessitates dressing the grinding wheel frequently. Repeated light grinding cuts are preferred until a true face of even width is obtained around the valve. Avoid passing the stone beyond the face of the valve as this will cause ridging and grooving of the stone surface and make dressing of the stone necessary. Reject all valves with distorted heads which produce an uneven face and valves which grind down to a thin edge.

One of the principal difficulties in reconditioning valves is to obtain nearly identical angles on the valve seat and valve face. The importance of these angles in the grinding operation cannot be overemphasized, because it is impossible to produce a flat or square seat by lapping.



The grinding stones on both the valve refacing machine and valve seat grinder should be dressed before starting a reconditioning job.

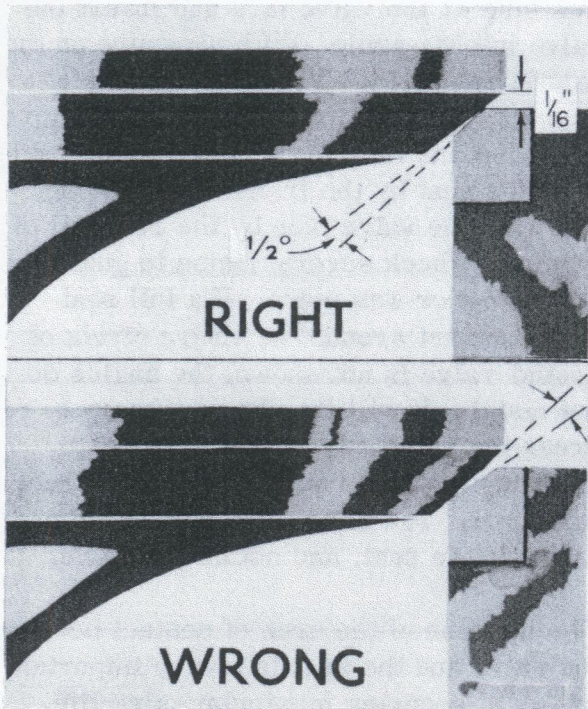
You will be unable to determine how closely the angle of the seat will match the valve face until the valve and seat have been ground and a check made with a very light tint of Prussian blue. If a full seat-width contact around the entire circle of seated valve is not shown, the angles do not match. It will then be necessary to redress the valve seat grinding stones, changing the angle sufficiently to correct the error. The correction should be made on the valve seat, and not on the valve. No more material should be removed from the valve face than is necessary to true it up and remove the burned or pitted portion. New valves should not be refaced, but should be checked for trueness. When a satisfactory match of valve seat and valve face angles has been obtained, the adjustment of both the valve refacer and the seat grinder should be locked in position, in order to eliminate this trial-by-error method on additional valves having the same angle.

At times unusually large amounts of heat scale may be found on exhaust valves, which is hard on the grinding stone. Frequent redressing of the stone will be necessary to maintain a smooth even surface and a uniform set of valve face angles.

After refacing each valve, inspect the end of the stem. If wear is noticeable, reface the end of the stem. Grind sufficiently to true-up the end of the stem.

Perhaps it has been noticed that on many International Harvester Farm Equipment engines, the valve face and seat are ground to an "interference angle". This means that the sum of the seat angle and the face angle do not equal 90 degrees.

This is done to avoid the possibility of grinding a reverse interference angle, and to help prevent the accumulation of combustion deposits on valve faces and seats. It is nearly impossible for anyone to grind perfectly matching angles.



Grinding of valves to an interference angle provides line contact of the valve face to the seat for the first few hours of operation, allowing the valve and seat to "wear in" to a good tight contact. Interference angle has the effect of increasing the pressure per square inch on the seat, thus causing any deposits which cling to the face or seat to be squeezed out of the way and eventually blown out.

Valve Seats

The primary purpose of a valve seat is to seal the combustion chamber against pressure losses and to provide a path to dissipate the heat accumulated in the valve head so as to prevent burning of the seat and warping of the valve head.

The location of the valve seat on the valve face and its width, controls the amount of valve head that protrudes into the combustion chamber. It is obvious that the greater the exposure within the combustion chamber, the higher the valve temperature; or in other words, the more heat it will collect. High valve temperature and poor heat dissipation also produce excessive valve stem temperatures. This will hasten the accumulation of carbon on the stems, causing them to stick in the guides.

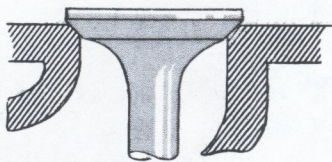
Refacing Seats

Remove all carbon, scale and oil before attempting to reface valve seats. The grinding stone, when placed against an oily seat, will become fouled, and uneven grinding will occur.

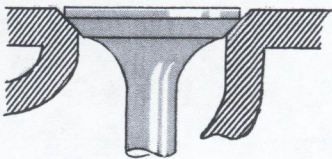
NOTE: Before installing the pilot, be certain that the valve guides are perfectly clean and meet the engine specifications. This is important; otherwise, an eccentric seat will be cut.

Dress the stone to the correct angle. Lightly lubricate and install the pilot of the correct size into the valve guide bore.

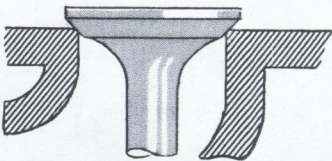
Lower the grinder head over the pilot shank until the stone just clears the valve seat. Turn on the power and very gently allow the stone to contact the valve seat. Very little pressure other than the normal weight of the stone should be used. Sudden hard pressure can cause cocking of the pilot in the guide and result in eccentric grinding. Raise the stone frequently from the valve seat to prevent overheating and



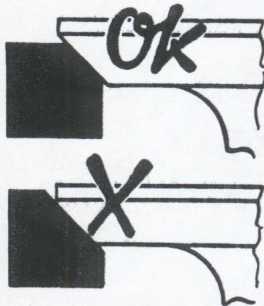
Correct Seat



Seat too wide



Seat too narrow



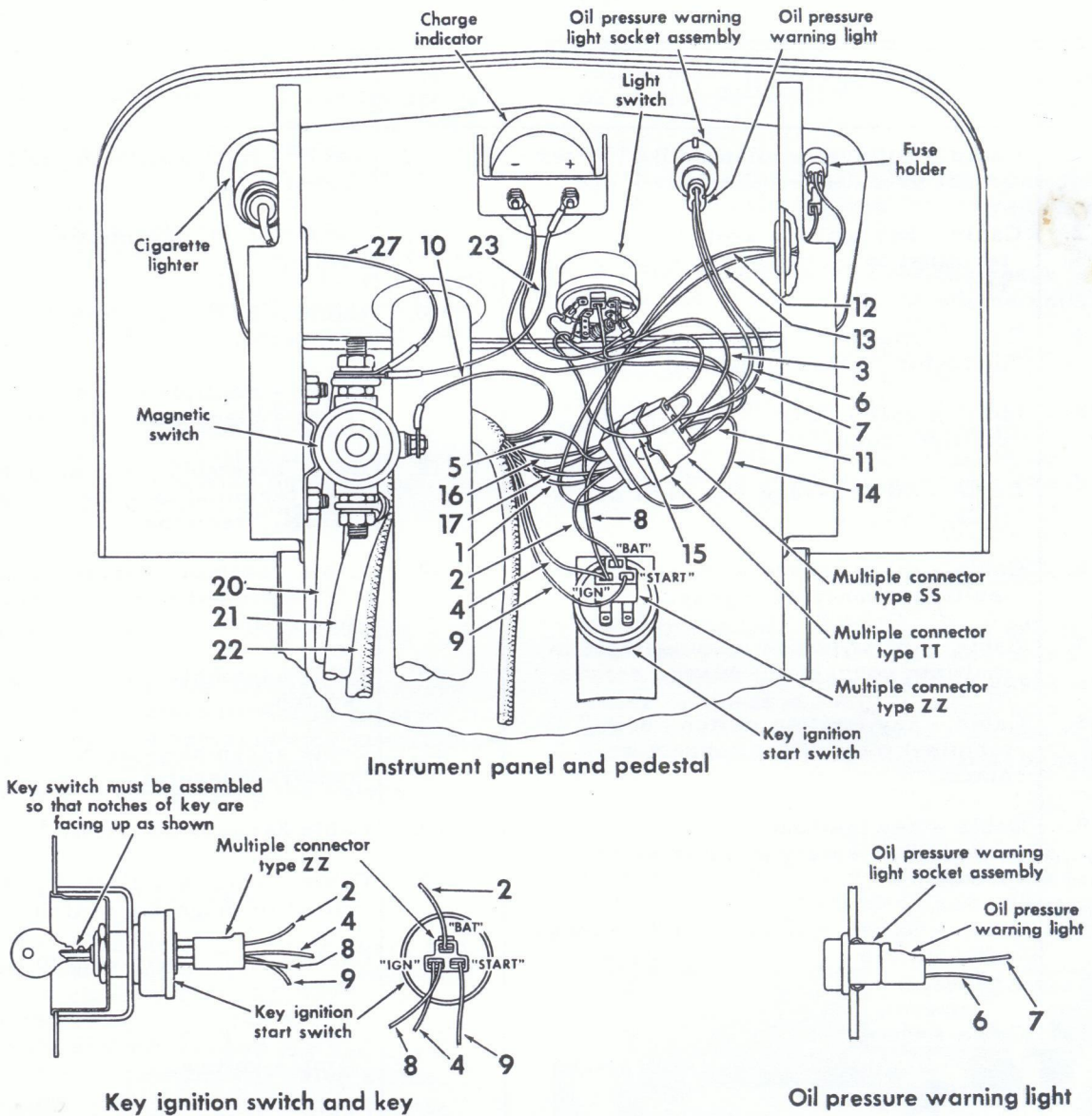
to clear away grinding dust. Grind the seat sufficiently to provide an even, smooth surface.

Check the seat concentricity, roundness and valve face contact using Prussian blue. Spread an extremely thin film of this blue on the valve face and insert the valve into its guide. With pressure on the exact center of the valve head, make a quarter turn rotation in the seat. Remove the valve and inspect the impression made upon the seat by the transfer of blueing, and upon the valve face by the removal of blueing. Check several times to guarantee that no error was made. If a full seat-width contact around the entire circle of seated valve is not shown, the angles do not match. It will then be necessary to re-dress the valve seat grinding stones, changing the angle sufficiently to correct the error. The correction should be made on the valve seat, and not on the valve.

The location of the area of contact between the valve and the seat is a very important factor in securing maximum valve life. Seating the valve with the sharp edge of the seat not contacting the valve face is undesirable. This sharp edge tends to break off face deposits which may lead to valve failure.

Similarly, the location of the upper line of contact well below the top of the valve face, is also undesirable because a large overhang prevents rapid cooling of the outer edge of the valve.

After grinding the seats it may be found that the seats are considerably wider than the specified width of $\frac{3}{64}$ inch. Valve seats that are too wide may be narrowed by grinding down the top edge of the seat with a stone mounted on the grinder head. The stone must be a smaller angle than the valve seat (15° preferably).



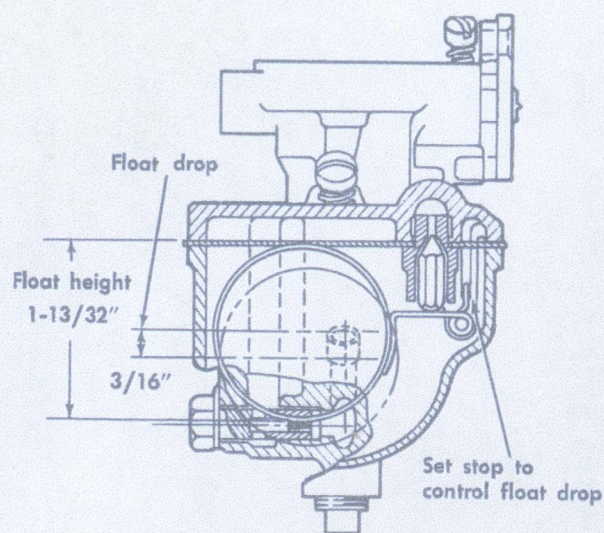
Illust. 29
Electrical wiring diagram.

Specifications

Carburetor	154	185
Type	Up draft	Up draft
Model and size - inch	IH - 3/4	Zenith 68YY7
Liquid level - inch	9/16 - 5/8	1/2
Float height - inches	1-13/32	1-5/32
Float drop - inch	3/16	—
Bleed	56	—
Main metering jet size . . . . .	.040 inch	21
Idle jet	75	12
Discharge nozzle	39	50 (drill size)
Venturi	19	17MM
Needle valve seat	52	35
Governor		
Engine rpm		
Low idle ± 25	475	600
High idle ± 25	2420	2510
Rated load ± 10	2200	2300
Governor spring		
Free length - inches	1-9/16	1-9/16
Test length - inches	2-5/32	2-5/32
Test load - pounds	39	39
Bumper spring		
Free length - inch	7/8	7/8
Test length - inch	5/8	5/8
Test load - pounds	10.5	10.5
Governor weight to pin clearance - inch . . . . .	.001 - .004	.001 - .004

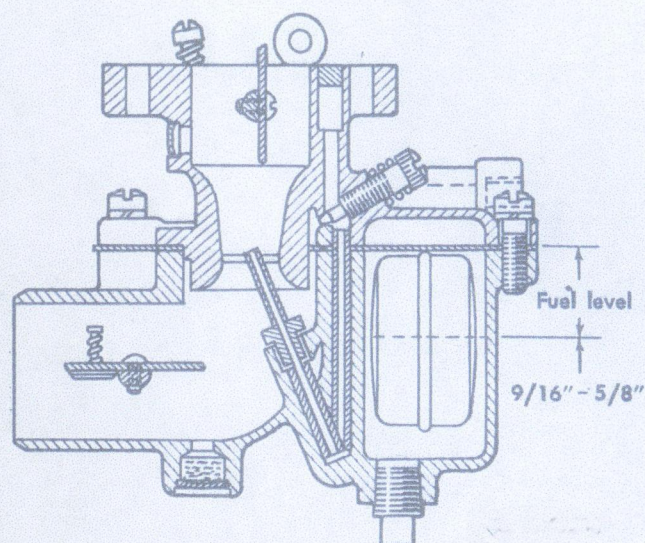
Float Assembly

Replace the float assembly if float is loaded with fuel or if the float lever axle bearing is worn excessively. Inspect top side of the float lever for wear where it

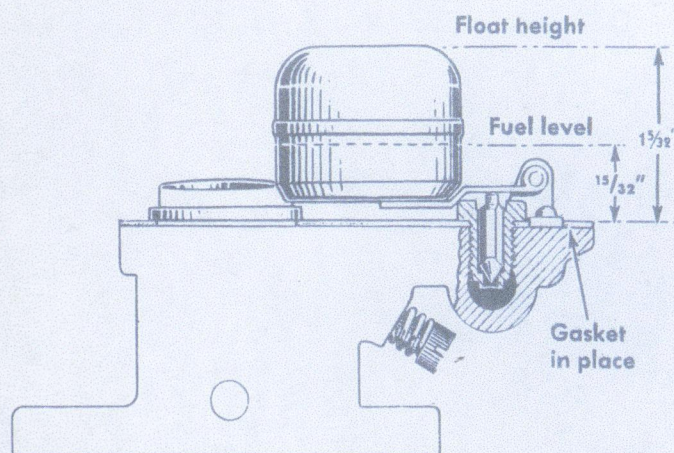
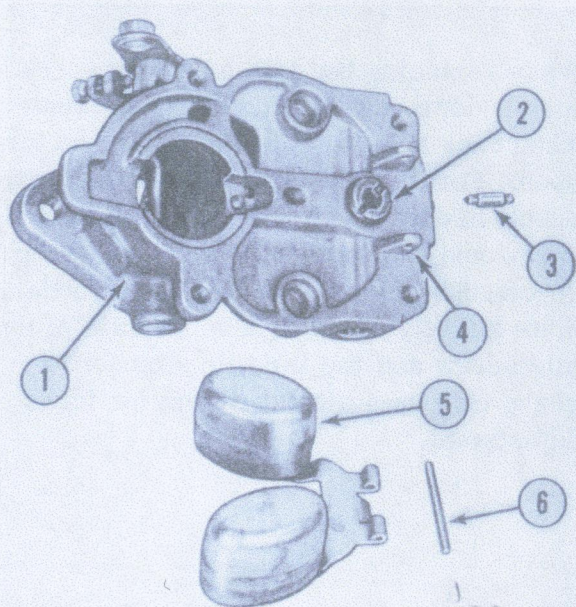


contacts the fuel needle valve.

The float axle should be replaced if any wear can be detected on its bearing surfaces.



IH CARBURETOR



- | | |
|--------------------|-----------------------|
| 1. Throttle body | 4. Float axle support |
| 2. Fuel valve seat | 5. Float |
| 3. Fuel valve | 6. Float axle |

Fuel Needle Valve and Seat

If any wear can be detected on the valve face, the needle valve and seat assembly should be replaced. The float assembly, its axle, and the fuel valve are responsible for maintaining a stable and correct fuel level; all parts must be maintained in good condition. Only slight bending of the float lever should be necessary to secure the correct float height. The float lever stop where used, should be adjusted to control float drop. Proper setting of float drop prevents the float from striking and wearing on the bottom of the bowl when operating over rough terrain.

Adjusting Screw and Seat

The idle adjusting needle point must be smooth and free from grooves, caused by being closed forcibly against its seat. Where this condition is found, a new screw should be used.

Venturi and Jets

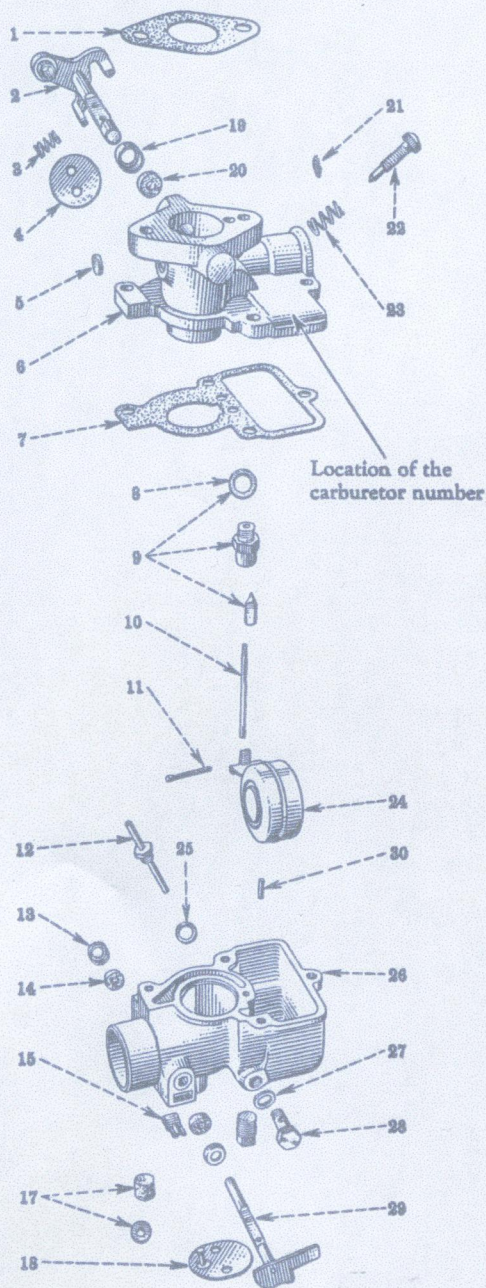
Inspect the venturi, jets and other calibrated openings for possible damage from improper probing in previous cleaning operations. Use the carburetor identifying part number to be found stamped on a metal disc riveted to the

throttle body when selecting replacement parts. Make sure you are using the parts catalog for the tractor and engine involved and that parts selected are from list headed with the carburetor identifying parts number. Failure to take this precaution when renewing parts could result in a carburetor completely out of calibration and an operation lacking power or economy.

ASSEMBLY AND ADJUSTMENT

Upon reassembly of the carburetor, be sure all new gaskets and seals are used throughout and are properly installed to insure gas tight connections. Use care when assembling fuel bowl to throttle body to prevent damage to the float assembly or the idle jet tube.

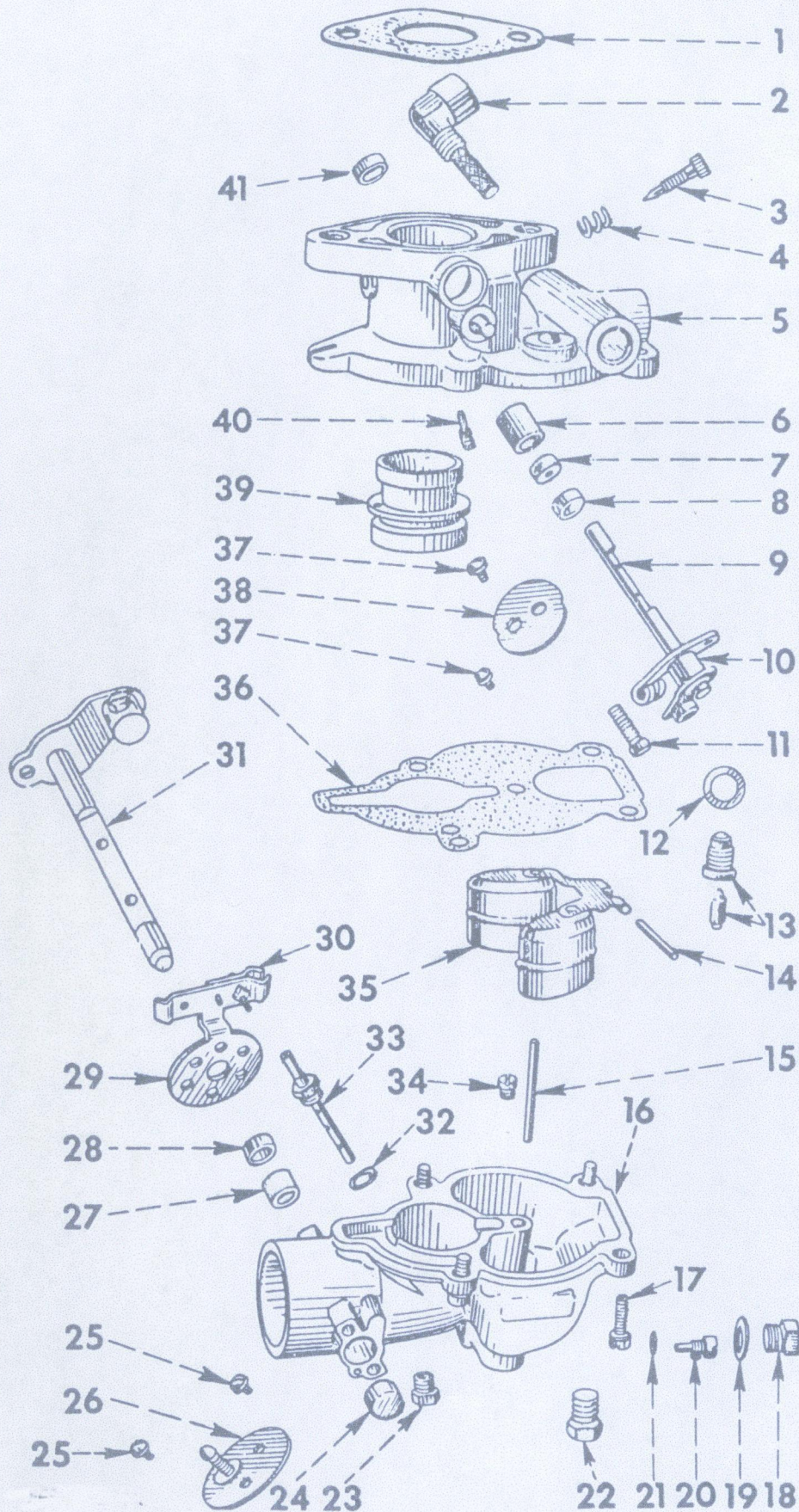
When replacing the idle adjusting screw, turn it down carefully until lightly seated. Then back it up to approximately one turn open. Forcible seating of the screw will result in damage to the tapered face of the screw and to its seat. The throttle stop screw should be set to hold the throttle plate slightly open. These settings of the idle screw and the throttle stop screw serve only as a starting point for idle adjustment.



1. Gasket
2. Throttle lever and shaft assembly
3. Idle set screw retainer spring
4. Throttle butterfly
5. Throttle body expansion plug
6. Throttle body assembly
7. Fuel bowl gasket
8. Float needle valve cage gasket
9. Float needle valve cage assembly
10. Idle tube
11. Float lever pivot
12. Discharge nozzle
13. Choke shaft dust seal retainer
14. Butterfly shaft dust seal
15. Starting shutter friction spring
16. Not used
17. Drip hole filler replacement package
18. Starting shutter assembly
19. Butterfly shaft dust seal retainer
20. Starting shutter shaft dust seal
21. Strainer screen
22. Idle adjusting screw
23. Idle adjusting screw retainer spring
24. Float and lever assembly
25. Discharge nozzle gasket
26. Fuel bowl assembly
27. Main metering jet gasket
28. Main metering jet
29. Choke valve shaft
30. Main air bleed

Exploded view — IH carburetor.

1. Gasket
2. Elbow and strainer
3. Idle adjusting needle
4. Spring
5. Throttle body
6. Throttle shaft bushing (if used)
7. Throttle shaft seal
8. Seal retainer
9. Lever and shaft
10. Taper pin
11. Throttle stop screw
12. Fuel valve washer
13. Fuel valve and seat
14. Float axle
15. Idle filler tube
16. Fuel bowl
17. Screw
18. Lower plug
19. Fibre washer
20. Main jet
21. Washer
22. Drain plug
23. Drip plug filter
24. Plug
25. Screw
26. Choke plate
27. Washer
28. Packing retainer
29. Choke valve bracket
30. Bracket clamp
31. Lever and shaft
32. Fibre washer
33. Main discharge jet
34. Well vent jet
35. Float assembly
36. Gasket
37. Screws
38. Throttle valve plate
39. Venturi
40. Idling jet
41. Plug



PRINCIPLES OF OPERATION

The engine governor is of the fly-ball, variable-speed type. It is designed to maintain a selected engine speed within reasonably constant limits under varying load conditions, by proportioning the fuel to the load.

For its action, the governor depends upon centrifugal force developed by weights rotating about a shaft. A variable governor spring is used to counteract the centrifugal force or outward movement of the weights. This movement of the governor weights, through suitable linkage, controls the carburetor throttle opening.

When the operator starts the engine and sets the engine speed control lever for a desired speed, the governor weights move outward with the increasing speed until the centrifugal force on the weights counterbalances the tension of the governor spring. When this condition is reached, the carburetor throttle has also been moved to a position where the air-fuel mixture admitted is sufficient to maintain this desired speed.

The operator controls engine speed by use of the engine speed control lever, increasing or decreasing the governor spring tension -- not by direct connection with the carburetor throttle valve.

Increasing the governor spring tension moves the governor weights inward which, in turn, moves the throttle further open, thereby increasing the engine speed until the increased centrifugal force of the governor weights counterbalances the greater spring tension.

Decreasing the governor spring tension allows the centrifugal force to move the weights outward, closing the throttle and thereby decreasing the engine speed until the decreasing centrifugal force and the reduced spring tension again balance each other.

When a change in load occurs, there is a momentary change in engine speed. This causes the governor weights to move inward or outward, thereby opening or closing the throttle sufficiently to maintain a reasonably constant engine speed up to the full load capacity of the engine. The speed variation between fast idle and rated load speed will normally be about 10 percent in these tractor governors.

Adjustment is provided in the linkage between the governor and the carburetor to synchronize the position of the throttle with a position of the governor weights. This adjustment is most important, since it insures the full power response of a wide open throttle when the governor weights are collapsed by the reduction in speed due to application of a full load to the engine.

In review: With an engine supporting its load and maintaining a desired governed speed, three factors have reached an almost perfect balance. These are the forces of (1) governor spring tension (2) centrifugal force on governor weights, counteracting the effects of (3) load on the engine speed. Slight changes in load (within engine capacity) will cause slight changes in engine speed, upsetting the balance of forces and thereby opening or closing the carburetor throttle until the forces are again brought into balance.

After disassembly of the governor, start the cleaning of parts with a clean container of clean solvent. Wash ball bearings first. Do not spin bearings while washing. Turn them slowly back and forth while dipping the bearing up and down in the solvent to dislodge dirt. Blow out with compressed air, holding the parts to prevent the air blast from spinning them, to avoid possible scratching of balls and grooves. Flush again in clean solvent and blow-dry a second time. Examine under good light to determine if further cleaning is necessary. Add a few drops of oil to the balls and grooves, then, and only then, spin by hand to test for roughness and wear.

Wash and clean the remainder of the rotating parts in solvent, examining the weights, carrier and weight pins for damage or wear. Clearance between new weights and new pins for each governor is .001 to .004 inch. Clearances found to exceed those specified by 0.003 inch or more would be considered excessive and parts should be renewed.

Wash and clean the housing and remaining parts and examine each for damage or excessive wear. No attempt should be made to salvage old gaskets or seals. They should be carefully removed from the assembly and replaced with new to insure an oil tight, dust proof operation.

Where sludge accumulations are found in the governor housing, corrosion of bearing surfaces may have occurred. These rough bearing surfaces and their increased frictional drag are responsible for poor governor action. Excessive bearing clearance also results from sludge corrosion.

The decision on what new parts should be used to rebuild the governor assembly will be based upon the wear found and the condition of the following groups of parts:

1. Weights, pins, and weight carrier: Clearance in excess of 0.003 inch over that specified between pins and weights or carrier.

2. Governor shaft bearings and thrust bearing: Rough, pitted bearing surfaces of either plain or ball type bearings.

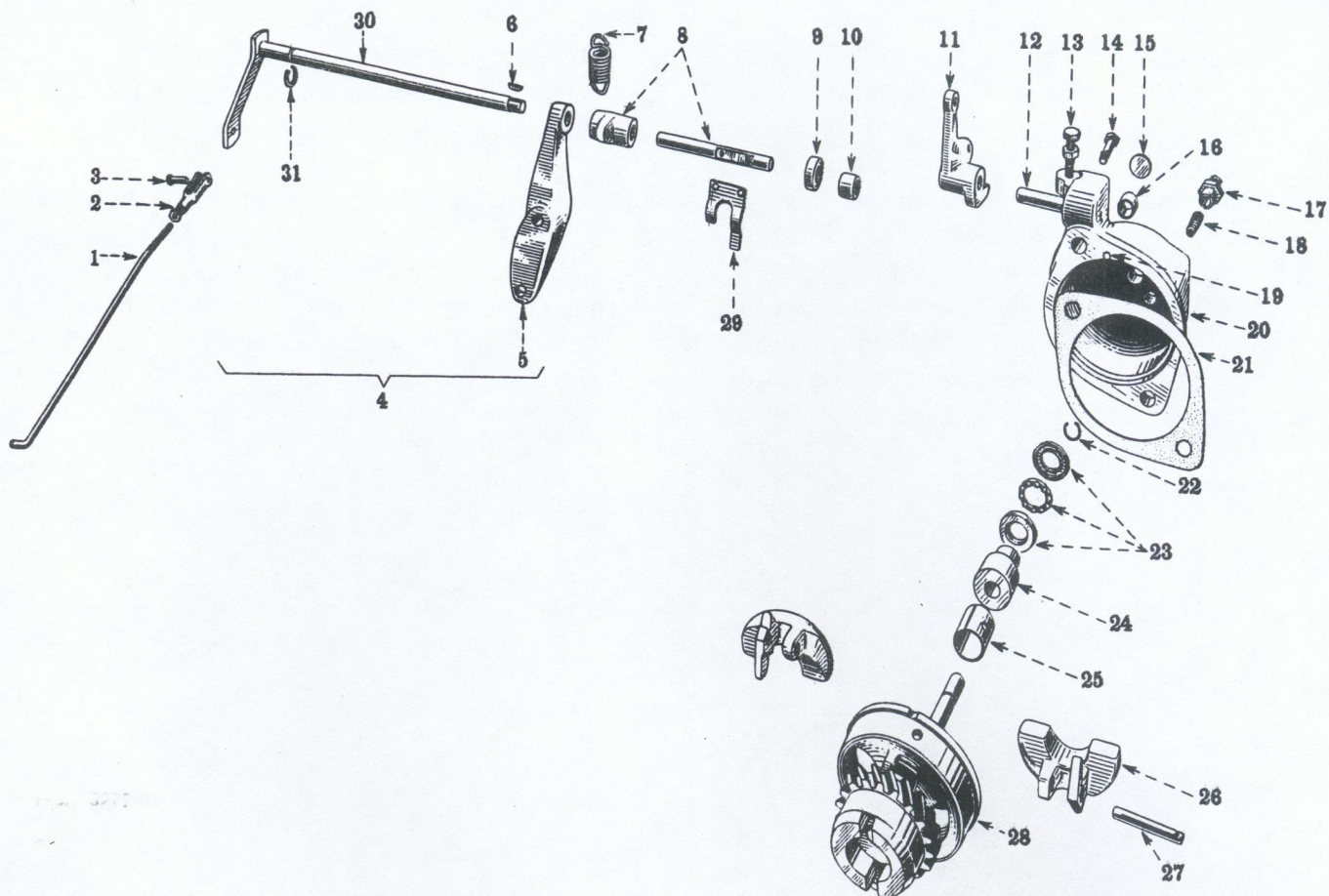
3. Rockshaft, rockshaft fork, bearings and levers: Worn or damaged rockshaft, rockshaft fork or spring levers. Rough, pitted bearings and bearing surfaces.

Where all three conditions are found, the use of new complete governor assembly should be considered, since the few parts which can be salvaged may not cover the labor cost of overhaul.

Where conditions 1 and 2 are involved, the rotating assembly, including new bearings, weights and pins, should be used.

Where only the governor weight and pin clearance is found questionable, only these individual parts need be replaced. In all cases new gaskets and new seals must be used to prevent entry of dirt and loss of oil.

Examine hook ends of governor springs and mating holes in spring levers for wear. Replace these parts where appreciable wear is found.

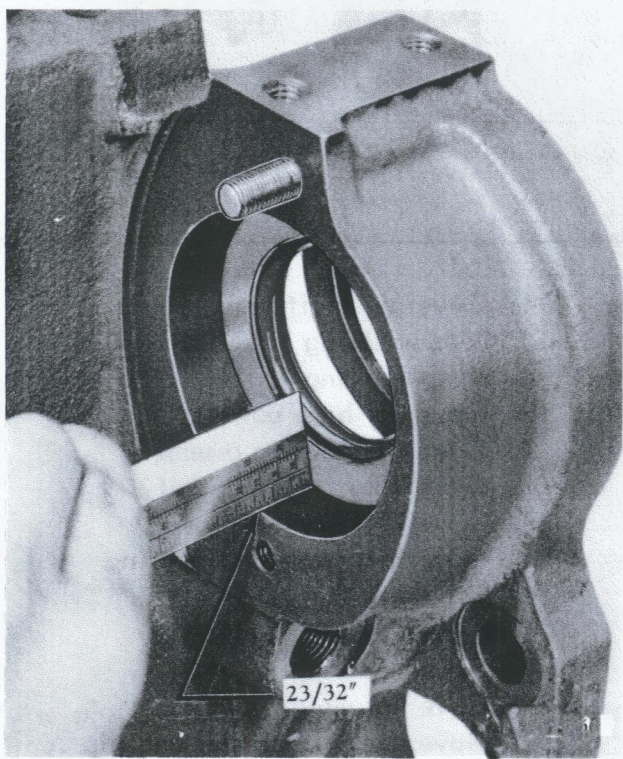


- | | |
|---|---|
| 1. Governor connecting rod | 16. Governor shaft bushing |
| 2. Adjusting rod end clevis | 17. Bumper spring body |
| 3. Rod end pin | 18. Bumper spring |
| 4. Rockshaft and bracket extension assembly | 19. Governor base dowel pin |
| 5. Rockshaft extension bracket | 20. Governor housing assembly |
| 6. Woodruff key | 21. Governor housing gasket |
| 7. Governor spring | 22. Governor sleeve stop ring |
| 8. Governor and spring rockshaft assembly | 23. Governor thrust ball bearing |
| 9. Rockshaft oil seal | 24. Governor thrust bearing |
| 10. Rockshaft bearing | 25. Governor base bushing |
| 11. Spring throttle lever | 26. Governor weight |
| 12. Throttle lever shaft | 27. Governor weight pin |
| 13. Speed change lever stop | 28. Governor with carrier and pin shaft |
| 14. Screw | 29. Governor tension fork |
| 15. Expansion plug | 30. Rockshaft extension assembly |
| | 31. Rockshaft extension stop ring |

Care must be taken in the reassembly of the governor rockshaft, rockshaft fork, bearings and seal to insure uniformly smooth movement of the rockshaft from one extreme of movement to the other. Lubricate the rockshaft oil seal thoroughly upon installation. Some slight friction resulting from drag of the oil seal on the shaft is unavoidable, but friction from any other source must be held to a minimum.

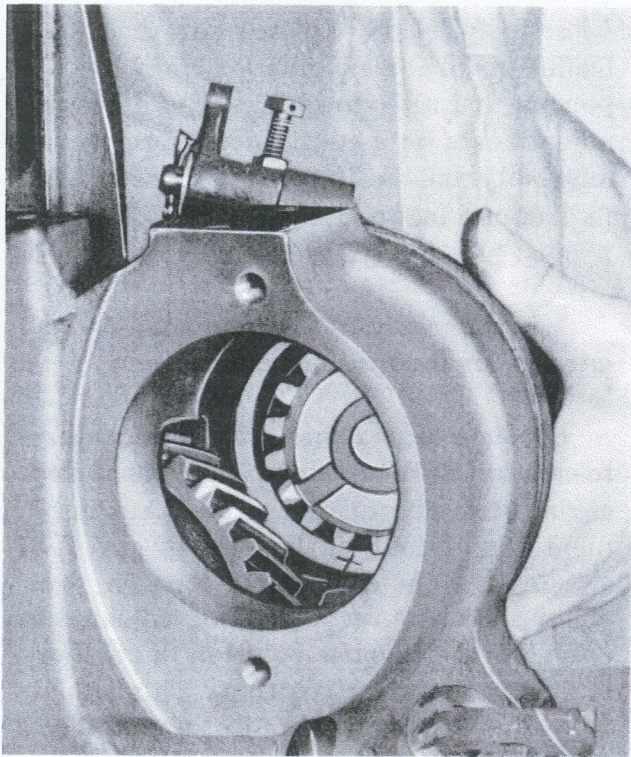
Any rough, jerking movement of the rockshaft must also be eliminated to prevent surging and erratic governor action.

Governor shaft end clearance is adjusted by placing 0.020 inch thickness of feeler gauge stock between drive gear and governor base when pressing the gear on the assembly. After gear is pressed in place, the end clearance should be within the range of 0.020 to 0.025 inch.



INSTALLATION

Install the governor - ignition drive oil seal with seal lip facing forward; the seal must be square in the crankcase bore and positioned $23/32$ inch in from the ignition mounting flange face. The seal mating surface on the outside diameter of the gear hub must be smooth and free of cuts or scratches to prevent rapid wear or damage to seal lip. Any sharp edges on gear hub slots should be removed to prevent damage to seal during installation of governor assembly.



Install the governor assembly and ignition unit using new mounting gaskets, insure proper ignition timing as follows:

1. With the engine positioned at top dead center of number one cylinder firing stroke, locate the single punch mark between teeth of idler timing gear. Use chalk to mark top surface of two teeth on each side of punch mark.

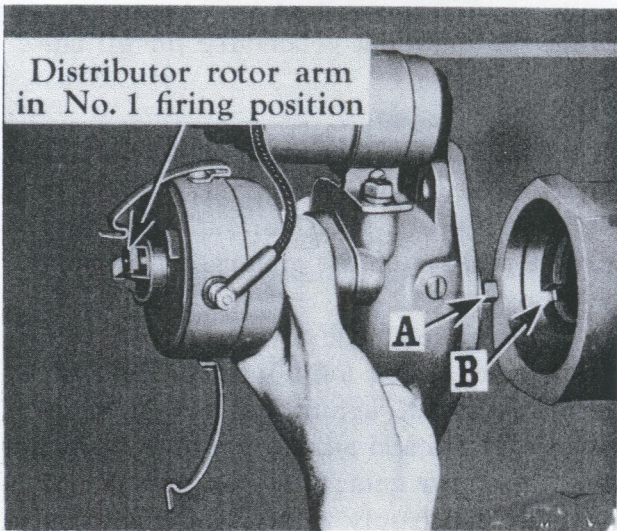
2. Chalk the rear end of the punch marked tooth on the governor drive gear.

3. Install the governor assembly, meshing the marked gear teeth.

4. Position the ignition unit distributor rotor arm and (A) drive shaft lugs for firing number one cylinder. Install ignition unit on engine, meshing (A) lugs and (B) drive slots.

NOTE: Remove spark plug cables 2, 3 and 4 and ground them to prevent any chance of accidentally starting the engine.

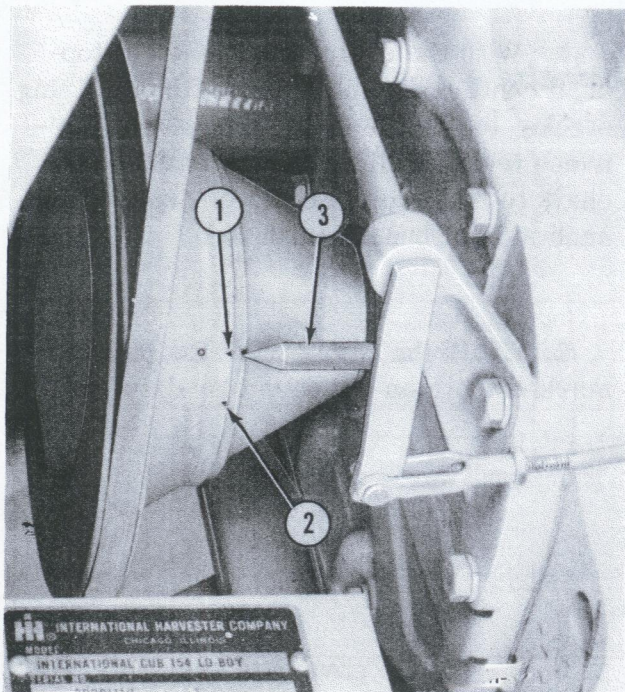
5. Remove the number one spark plug cable from the number one spark plug and position the end of the cable so a spark discharge to "ground" will be audible while hand cranking the engine.



Index to reference numbers in Illusts. 28 and 29.

Ref. No.	Description	Ref. No.	Description
1.	Cable - voltage regulator "BAT." terminal to multiple connector - red.	14.	Cable - light switch to multiple connector - light green.
2.	Cable - key ignition switch "BAT." terminal to multiple connector - red.	15.	Cable - switch to multiple connector - violet.
3.	Cable - multiple connector to charge indicator "NEG." terminal - red.	16.	Cable - R.H. headlamp to multiple connector - violet.
4.	Ignition coil - "POS." terminal to multiple connector.	17.	Cable - multiple connector to tail-light - black with white tracer.
5.	Cable - oil pressure switch to multiple connector - gray.	18.	Cable assembly - motor-generator "A" terminal to voltage regulator "GEN." terminal.
6.	Cable - oil pressure warning light to multiple connector - gray.	19.	Cable assembly - motor-generator "F" terminal to voltage regulator "F" terminal.
7.	Cable - oil pressure warning light to multiple connector - black.	20.	Cable assembly - battery to magnetic switch.
8.	Cable - key ignition switch "IGN." terminal to multiple connector - black.	21.	Cable assembly - magnetic switch to motor-generator.
9.	Cable - key ignition switch "START" terminal to safety starting switch - orange.	22.	Cable harness assembly.
10.	Cable - Safety starting switch to magnetic switch - orange with black tracer.	23.	Cable - charge indicator "POS." terminal to magnetic switch - red.
11.	Cable - charge indicator "NEG." terminal to multiple connector - dark green.	24.	Cable - R.H. headlamp to L.H. headlamp - yellow.
12.	Cable - fuse holder to multiple connector - dark green.	25.	Cable - R.H. headlamp to L.H. headlamp - yellow.
13.	Cable - fuse holder to multiple connector - light green.	26.	Cable - connector ground - yellow.
		27.	Cable - cigarette lighter to magnetic switch.
		28.	Cable - headlamp junction.

6. Advance or retard ignition distributor, until spark occurs as the O mark on fan drive pulley aligns with pointer while hand cranking engine.



1. O mark
2. 16° mark
3. Timing pointer

After installation of either new or overhauled governor assemblies, it is important that a thorough check of all four adjustments be made. The basic governor assembly may be in perfect condition, but in order to insure its full range of control it must be adjusted to its individual engine.

1. Synchronizing the governor-to-carburetor throttle movement.

Because of possible change in center-to-center distance between governor and carburetor, due to removal and replacement of manifold, carburetor or governor assemblies, the linkage between the governor and carburetor must be adjusted to establish the throttle position in relation to governor weight position. This adjustment insures the full power response of a wide open throttle when the governor weights are collapsed by reduction in rpm by application of heavy load. This governor-to-carburetor linkage must be free from binding throughout its range of movement. Adjustment procedure for all engines follows:

a. With engine stopped, advance the operator's engine speed control lever to about half speed position; sufficient to create tension on the governor spring.

b. Disconnect governor-to-carburetor control rod (either end). Hold carburetor throttle against its stop in wide-open position and adjust length of governor-to-carburetor control rod so that it may be reconnected freely without moving throttle lever or governor lever.

c. Shorten control rod one turn from the above condition, to compensate for wear, and reconnect.

d. After tightening the control rod clevis lock nut, check to be sure that both ends of the control rod are in the same plane, to eliminate possibility of binding on levers.

e. Move operator's engine speed control lever a few times between half speed and low speed position, checking the governor-to-carburetor control rod in all positions for interference or binding.

2. Low idle speed adjustment

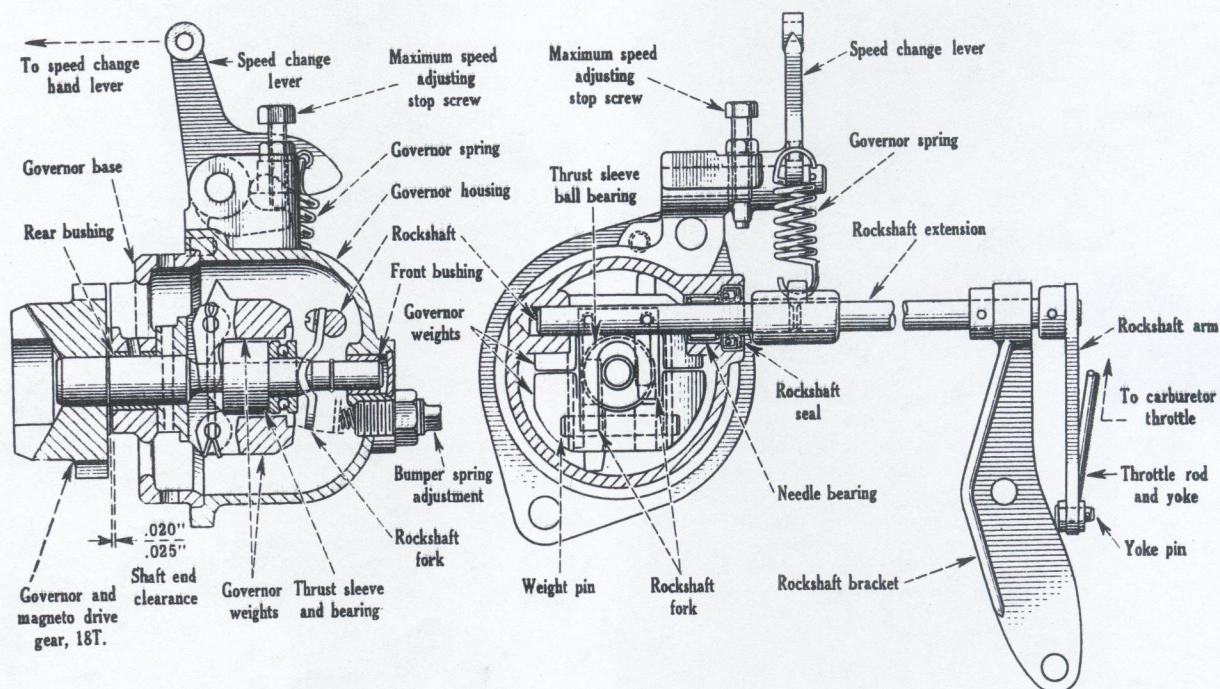
Smooth low speed engine operation depends upon careful adjustment of carburetor idle air-fuel mixture at the specified engine low idle speed. Good governor performance also is dependent on this smooth engine operation and free throttle shaft movement near closed throttle positions. Any tendency of the carburetor throttle to stick or bind in its low idle (closed) position will cause the governor to surge excessively. The governor is equipped with an adjustable bumper spring to counteract the effect of manifold vacuum on the closed position of the throttle.

Causes for binding or sticking of the throttle shaft are misalignment due to wear or interference due to improper assembly. Excessive tension adjustment of bumper spring, in an attempt to overcome these ills, will prevent the throttle from closing against its stop, resulting in greater than specified low idle speed. See carburetor "Inspection and Repair" portion of this manual section.

a. Start engine and allow it to reach operating temperature.

b. Place operator's speed change lever in the extreme low speed position. See that operator's speed change lever linkage will allow the throttle to close against its stop screw. Adjust speed change linkage if necessary. See also that governor bumper spring adjustment is not interfering with closing of throttle.

c. Adjust carburetor throttle stop screw to secure the specified low idle speed and set idle fuel mixture screw for smoothest engine operation.



d. Advance operators speed change lever for a few seconds and again idle the engine, rechecking adjustments for specified low idle speed and smoothest operation.

3. Adjusting governed fast idle speed.

To protect the engine from excessive speed, and also to provide sufficient speed to maintain the engine's rated load, the governed fast idle speed adjustment must be properly made. Be sure the service tachometer used is accurate. Do not expect the tractor tachometer to be sufficiently accurate for this operation. Adjustment procedure for all engines follows:

a. Before adjustment is attempted, the engine must be brought up to operating temperature. Engine lubricant viscosity should be correct for the season of use and should be near operating temperature.

b. With engine running and accurate service tachometer in use, advance operator's engine speed control lever to maximum speed position. Be sure also that operator's speed change linkage is being held firmly against the governor maximum speed stop adjustment; reset linkage if necessary.

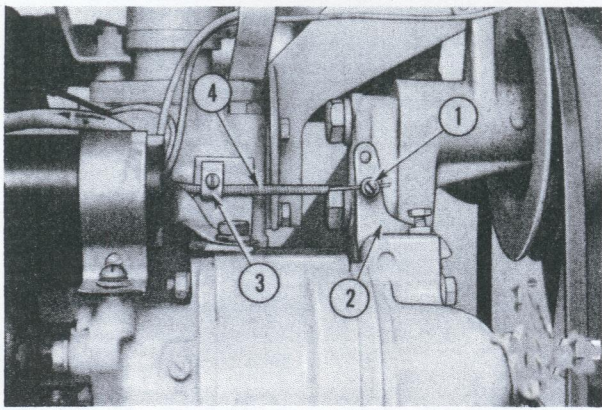
c. Adjust the governor maximum speed stop screw or adjustment to secure specified fast idle speed. Be sure that governor speed change linkage is being held against the stop screw in its new position when the tachometer reading is taken.

d. Place operators speed change lever in maximum speed position. Notice the fast idle speed on service tachometer. With thumb and finger, pull carburetor

throttle lever toward open position, sufficient to gain 50 rpm fast idle speed. Release throttle lever instantly; the governor will react by closing the throttle and opening again, seeking its balance. Under this condition two surges of the governor are considered normal. Excessive surging would indicate binding in carburetor throttle assembly or governor rockshaft and linkage assembly as outlined previously under carburetor and governor headings. This may be corrected by adjusting the bumper spring.

e. Bumper Spring Adjustment: The adjuster may be turned in one-half turn at a time, just sufficient to reduce surging to normal. Test, as in operation (d) above, after each slight adjustment. If screwed in too far, the bumper spring will prevent the throttle from closing to low idle stop screw. Where such extreme setting of bumper spring is found necessary, it would indicate excessive friction or sticking is occurring in throttle assembly or governor rockshaft assembly. This should be corrected and the bumper spring readjusted. After the bumper spring has been adjusted properly, lock it in place with the jam nut. Where use of the bumper spring is not required to control surging, screw in until it just touches at low idle speed and then backed out 1/4 turn and locked.

NOTE: Adjustment of the maximum speed stop, to allow increased tension to be placed on the governor spring by the operator's engine speed control lever, will result in increased engine speed. Adjustment to reduce tension which can be placed on the governor spring, will result in reduced engine speed.



Throttle Adjustment

1. Loosen the screw of the throttle control swivel pin (1) on the governor spring throttle lever (2).

2. Loosen the throttle control clamp (3) and position the throttle cable (4) in the lower part of the clamp. Leave the clamp loose.

3. Pull the cable wire thru the control swivel pin about 1/2 inch and tighten screw on control swivel pin.

4. Move throttle control lever to maximum speed position.

5. Pull throttle cable back to bring governor spring throttle lever against high idle stop screw. Tighten throttle control clamp.

6. Check engine rpm according to specifications.

- 1. Governor control swivel pin
- 2. Governor spring throttle lever
- 3. Throttle control clamp
- 4. Throttle cable

Specifications

Steering

Type Manual, cam and lever
Bearings Ball

Front Wheels

Bearings Ball
Toe-in - inch $1/4 \pm 1/16$
Camber angle $2-1/2^{\circ}$
Caster angle 0
Turning radius 9.4 ft.

Front Axle

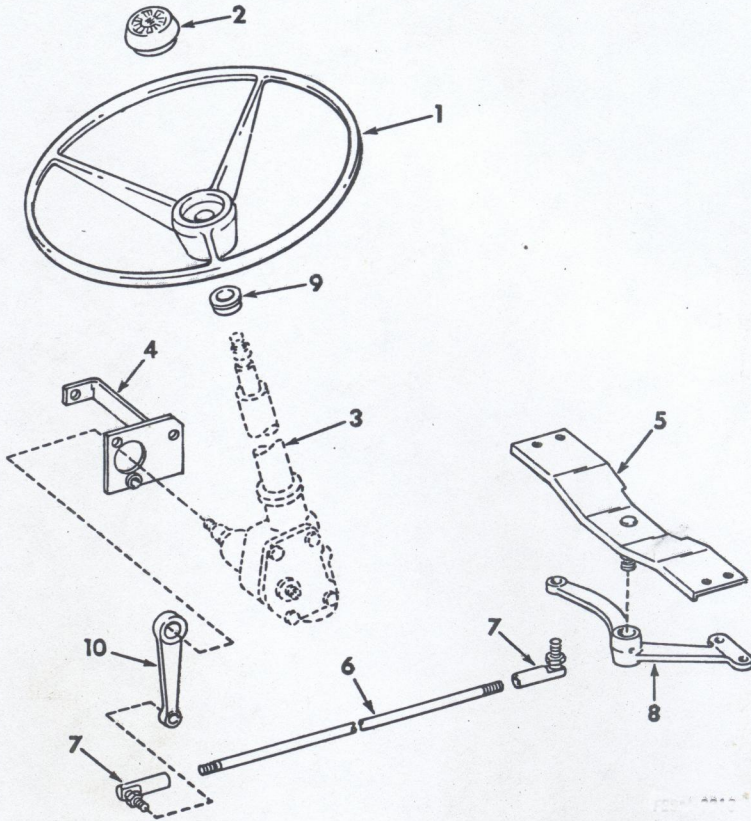
Construction I-beam, cast iron
Support Center pivot

Tire Size

Front - standard 4.00 x 12
Alternate 20 x 8.00 x 10
Rear - standard 8.3 x 24
Alternate 9.5 x 24 and 13.6 x 16

Wheelbase - inches 64
Tread - inches 42
Length, overall - inches 94
Width, overall - inches 52
Ground clearance - inches 13

Steering Assembly



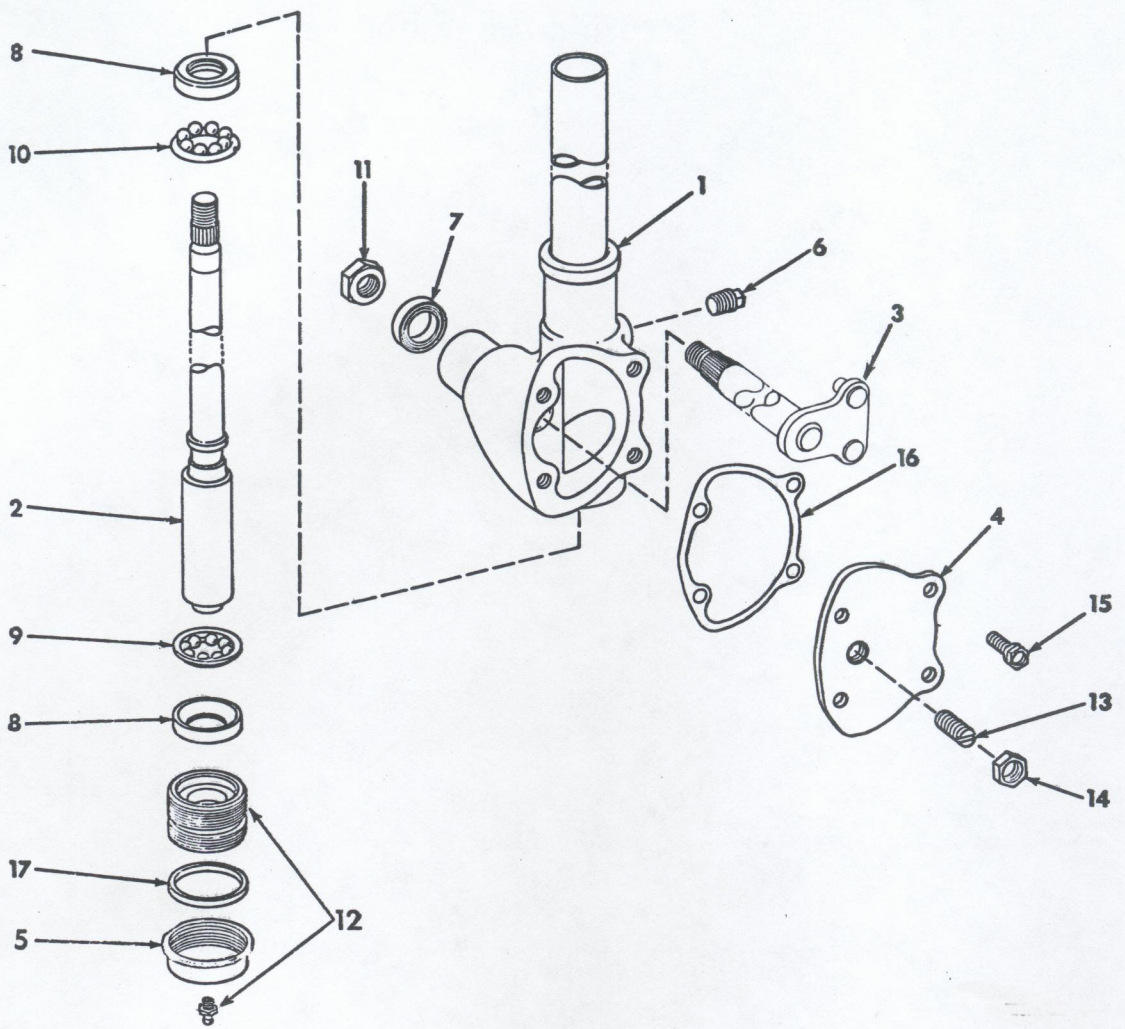
- 1. Steering wheel
- 2. Steering cap
- 3. Steering gear assembly
- 4. Steering gear support assembly
- 5. Steering lever support assembly
- 6. Drag link rod
- 7. Ball joint
- 8. Steering lever
- 9. Column upper bearing
- 10. Steering arm

Removal

1. Remove the steering cap (2) and nut. Using a puller, remove the steering wheel (1). Remove the dust seal and the column upper bearing (9).

2. Disconnect the drag link ball joint (7) from the steering arm (10).

3. Remove the cap screws in the steering gear support (4) and remove the steering gear assembly (3) from the tractor.



1. Housing and tube assembly
2. Cam and tube assembly
3. Lever and shaft assembly
4. Side cover
5. Lock nut
6. Pipe plug
7. Oil seal
8. Ball cup
9. Ball retainer

10. Retainer and ball assembly
11. Steering arm nut
12. Plug assembly
13. Adjusting screw
14. Adjusting screw lock nut
15. Cap screw
16. Side cover gasket
17. Seal

Disassembly

1. Remove the nut (11) securing the steering arm to the lever and shaft assembly (3).

Using a puller, remove the arm from the shaft.

2. Remove the side cover (4).

3. Pull the lever and shaft assembly (3) out of the housing and tube assembly (1). Remove the oil seal (7) from the housing.

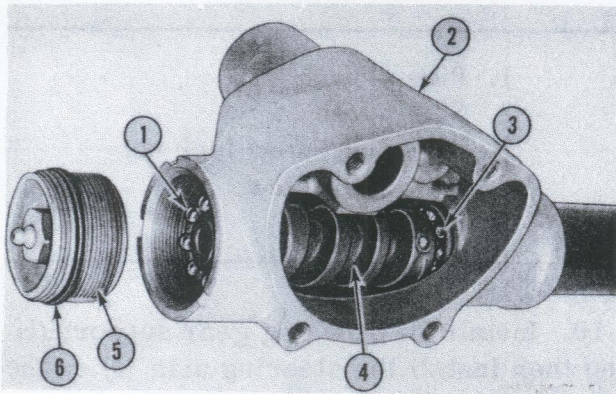
4. Bend the lock nut locking tab up and remove the lock nut (5).

5. Remove the plug assembly (12), ball cup (8) and retainer and ball assembly (9).

6. Remove the cam and tube assembly (2) from the housing.

7. Remove the second retainer and ball assembly (10) from the shaft. Remove the ball cup if it is to be replaced.

NOTE: Keep inner and outer retainer and ball assemblies identified for proper location as they are not interchangeable.



1. Retainer and ball assembly, outer
2. Housing and tube assembly
3. Retainer and ball assembly, inner
4. Cam
5. Plug assembly
6. Seal

Inspection and Repair

1. Wash all parts in cleaning solvent, then dry thoroughly.

2. Inspect the lever and shaft cam followers for wear and replace if necessary.

3. Inspect the bearings, ball cups and the cam and tube assembly for roughness and pitting.

4. Inspect the cam grooves for wear, roughness and galling. Replace the cam and tube assembly if necessary.

5. Inspect the housing for cracks and stripped threads.

6. Inspect the column upper bearing for wear or damage.

7. Be sure to install new gaskets and seals in reassembly.

Reassembly and Adjustments

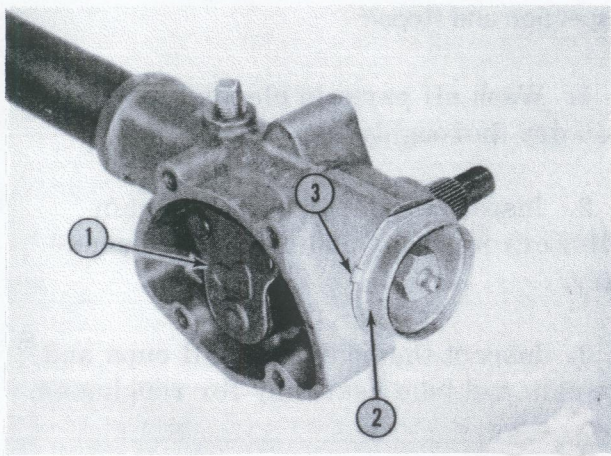
1. Thoroughly coat the ball bearings and ball cups with recommended chassis lubricant.

2. Install the retainer and ball assemblies (1 and 3) and the ball cups on the cam and tube assembly (4).

3. Thoroughly coat the cam (4) with recommended chassis lubricant and then install it in the housing and tube assembly (2).

NOTE: Be sure the ball cups are in the housing squarely and are not "cocked".

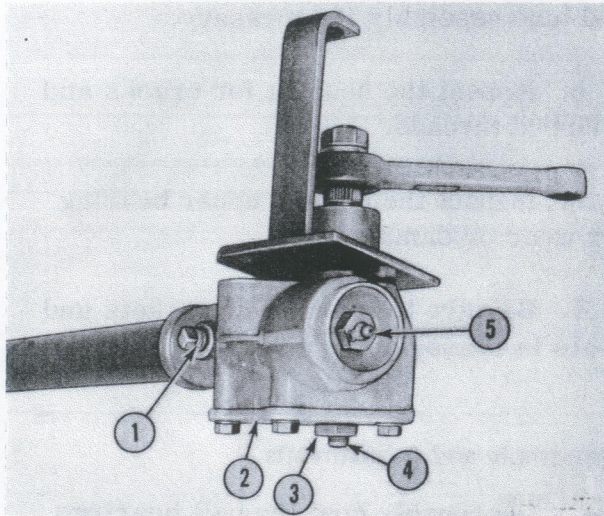
4. Install the plug assembly (5) and tighten until end play of the cam is removed but turns freely. Be sure to use a new seal (6).



5. Install the lock nut (2) and tighten securely. Stake the nut into a housing slot (3).

6. Install a new oil seal in the housing. Pack the housing with the recommended chassis lubricant (refer to Operator's Manual), and then install the lever and shaft (1) in the housing.

1. Lever and shaft assembly
2. Lock nut
3. Lock nut staked in housing slot

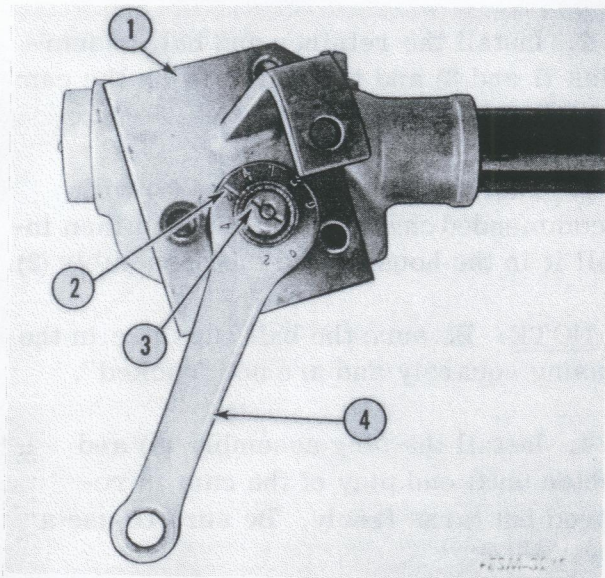


7. Install a new gasket and the side cover (2). Tighten the cap screws to 20 ft. lbs. torque.

8. Lubricate at the fitting (5) in the plug assembly slowly until lubricant begins coming out of the hole at the pipe plug.

9. "Center" the cam follower on the cam. Loosen the adjusting screw lock nut (3) and adjust the screw (4) inward to eliminate cam follower backlash. Tighten the lock nut securely. Turn the steering shaft full right and left to check for binding.

1. Pipe plug
2. Side cover
3. Adjusting screw lock nut
4. Adjusting screw
5. Fitting



10. Install the steering gear support (1) and then install the steering arm (4) on the lever and shaft assembly. Be sure the mark (2) on the steering arm is in line with the mark (3) on the shaft. Install the steering arm nut and tighten securely.

1. Steering gear support assembly
2. Steering arm mark
3. Shaft mark
4. Steering arm

11. Install the steering assembly in the tractor and tighten the steering gear support cap screws to 35 ft. lbs. torque. Be sure to install the spacers.

12. Install the column upper bearing, dust seal and steering wheel. Secure with the nut and tighten to 35 ft. lbs. torque.

13. "Center" the steering by turning the steering wheel full right and then turn full left while counting the number of turns. Turn the wheel to the right one-half of the above figure.

14. Adjust the drag link rod to place the front wheels in the straight ahead position and connect the rod to the steering arm. Install the lock nut and tighten securely.

15. Install the steering cap.

16. Adjust the front wheel toe-in to the specified $1/4$ inch $\pm 1/16$ inch ($1/4$ inch closer in front than in the rear) as follows:

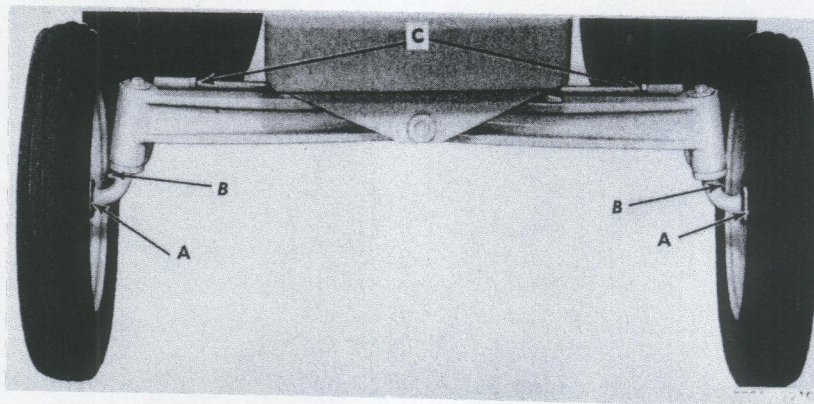
a. Place chalk marks at points "A" on each rim at hub height, and measure the distance between them.

b. Move the tractor forward a distance equal to one-half revolution of the front wheels. The chalk marks will now be at points "B".

c. Measure the distance between points "B". The distance between points "B" must be $1/4$ inch $\pm 1/16$ inch greater than at "A".

d. To adjust, disconnect the tie rod ball joints from the steering knuckle arms. Loosen the lock nuts "C" and turn the ball joints in or out as required. Be sure to make the tie rod adjustments equal, and be sure the steering knuckle arms stop on the axle.

e. Connect the tie rod ball joints to the steering knuckle arms. Tighten the lock nuts "C" securely.



Specifications

General

Model	C-60	
Number of cylinders	4	
Bore and stroke - inches	2-5/8 x 2-3/4	
Displacement - cubic inches	59.5	
Engine rpm (governed)	154	184 & 185
Low idle ± 25	475	600
High idle ± 25	2420	2510
Rated load ± 10	2200	2300
Compression ratio	7.5:1	
Compression pressure at cranking speed - psi	130	
Firing order	1-3-4-2	
Ignition timing	16° BTDC	
High idle	16° BTDC	
400 rpm	TDC	
Distributor point gap - inch . . . . .	.020	
Spark plug gap - inch . . . . .	.023	
<u>NOTE:</u> Proper ignition timing at high idle is essential for best performance and engine life. Therefore, the distributor should be set to give the <u>exact</u> timing at high idle. Any variance that may exist then will occur at the low idle end of the advance curve.		

Crankcase

Cylinder bore - inches	2.625 - 2.627
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Crankshaft and Main Bearings

Crankshaft

Type	Counter balanced
Number of main journals	3
Main journal diameter - inches	1.623 - 1.624
Crankpin diameter - inches	1.498 - 1.499

Main Bearings

Type	Tri-metal, precision
Running clearance - inch .....	.002 - .003
Thrust bearing location	Center
Thrust bearing side clearance - inch .....	.004 - .008
Bearing OD and spread	
Front and rear - inches	1.777 + .020
Center - inches	1.777 +.002 to .015

Camshaft

Drive	Helical gear
Cam lobe lift (total) - inch .....	.232 \pm .002
Journal diameter	
Front - inches	1.871 - 1.872
Center - inches	1.746 - 1.747
Rear - inch .....	.872 - .873
Crankcase bearing bore diameters	
Front - inches	1.8740 - 1.8755
Center - inches	1.7490 - 1.7505
Rear - inch .....	.8740 - .8755

Front Wheels and Bearings

Removal

1. Lock the brake and block the rear wheels. Jack up the front axle.
2. Remove the hub cap.
3. Remove the cap screw and flat washer from the outer end of the spindle.
4. Slide the wheel and bearings off the spindle.

NOTE: The bearings are a press fit in the wheel or hub and a slip fit on the spindle.

Disassembly

Wheel bearings can be driven from the wheel hub with a hammer and long drift punch. Drive from the inside toward the outside.

Inspection and Repair

1. Inspect the entire wheel and hub for wear or damage.
2. Inspect the bearings and seals and replace as necessary.
3. Bearing fit to wheel or hub must be tight. If not, replace the wheel.

Reassembly and Installation

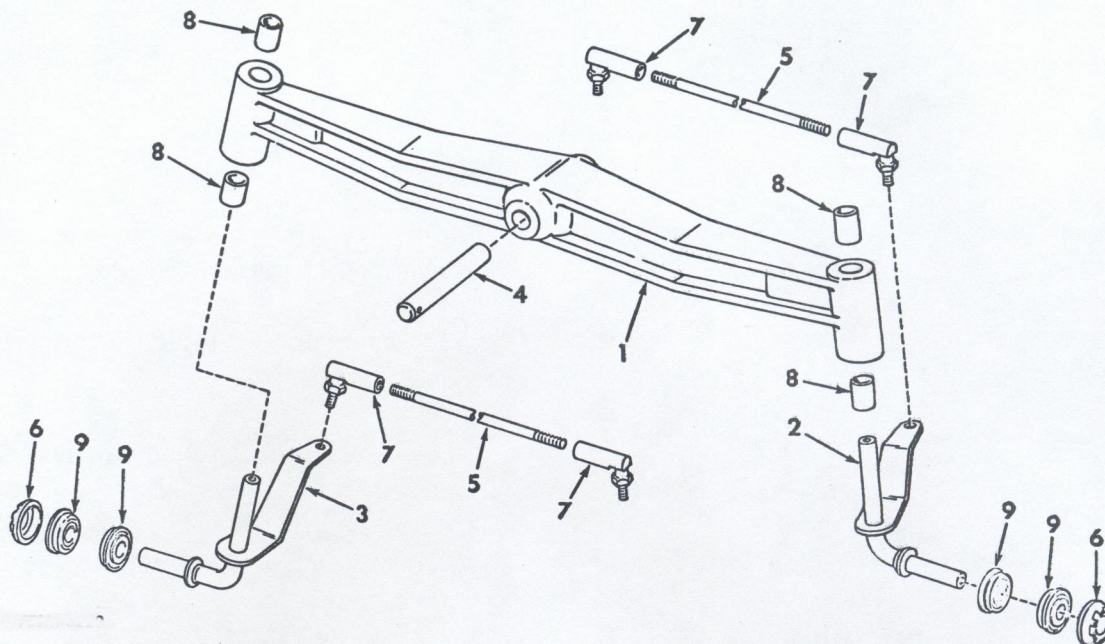
1. If the bearings were removed, lubricate and press in new ones. Be sure force is directed to the outer race only.
2. Slide the wheel and bearing assembly over the spindle and secure with the cap screw and flat washer. Tighten the cap screw to 80 ft. lbs. torque.
3. Install the hub cap.

Front Axle

Steering Knuckle Removal

1. Lock the brake, jack up the front of the tractor and support it on a suitable stand.
2. Remove the front wheels.

3. Disconnect the tie rod ball joints (7) from the left and right steering knuckles (2 and 3).
4. Remove the cap screw and flat washer and remove the steering knuckle from the axle.



1. Front axle assembly
2. L.H. steering knuckle assembly
3. R.H. steering knuckle assembly
4. Front axle pivot pin
5. Tie rod
6. Hub cap
7. Ball joint
8. Bushing
9. Wheel ball bearing assembly

Removal of Front Axle

1. Disconnect the tie rod ball joints from the steering lever.
2. With the front of the tractor frame supported on a suitable stand, drive out the retaining pin from the front of the axle pivot pin (4).
3. Remove the pivot pin and then remove the front axle (1) from the tractor.

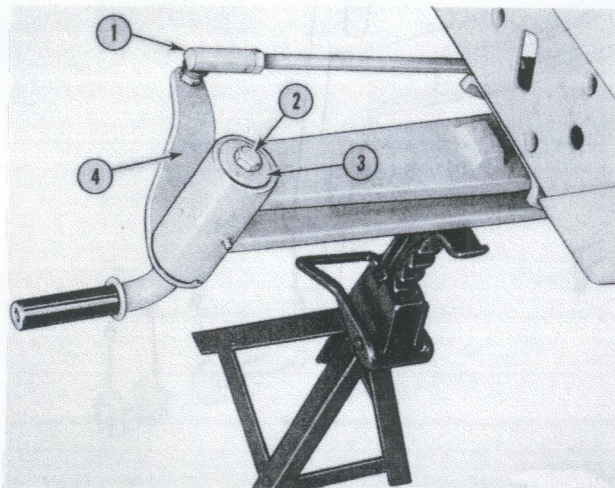
Inspection

Thoroughly clean all parts. Inspect all parts closely for wear or damage and replace as necessary.

Installation of Front Axle

1. Apply chassis lubricant liberally to the axle pivot pin and its bore in the axle.
2. Position the axle in its support bracket channel. Align the pivot pin holes and insert the pin.

3. Align the retaining pin holes (through the pivot pin and front collar of the support bracket) and drive the retaining pin through both parts.



- 1. Ball joint
- 2. Cap screw
- 3. Washer
- 4. Steering knuckle arm

4. Connect the tie rod ball joints to the steering lever. Be sure to tighten the lock nuts securely.

Installation of Steering Knuckles

1. Thoroughly lubricate the steering knuckle shaft.

2. Install the R.H. and L.H. steering knuckles in their respective bores in the axle and secure with the cap screws (2) and flat washers (3). Tighten the cap screws securely.

3. Connect the tie rod ball joints (1) to the steering knuckle arms (4). Be sure to tighten the lock nuts securely.

4. Install the front wheels and check the toe-in adjustment. Refer to page 3-7.

THREE-POINT HITCH

The three-point hitch provides a fast and convenient means for attaching rear-mounted equipment conforming to A.S.A.E. and S.A.E. specifications. You can mount International Harvester Company three-point equipment or most Category 1 (one) three-point equipment of other manufacturers. However, the power take-off specifications are not standard to A.S.A.E. and S.A.E. specifications.

The three-point hitch is activated by a hydraulic cylinder connected to the rear rockshaft. Hydraulic power is supplied by a 2-1/2 g.p.m. pump.

Semi-mounted and fully mounted equipment is controlled by the hydraulic lift control lever located at the right side of the instrument panel, and is spring loaded. To raise the equipment move the lever back toward the tractor seat. To lower the equipment move the lever forward. See Illust. 11A.

For free to float operation, move the control lever all the way forward to the detent position.

The three-point hitch consists of two hitch lower links and a hitch upper link to connect the equipment to the tractor. See Illust. 12. The left and right hitch lower links are connected by pivot pins attached to the lower mounting plate. They are suspended by lift links from the rockshaft arms.

The hitch upper link is connected by a pivot pin attached to the rockshaft bearing plate. See Illust. 12.

LIFT LINKS AND LEVELING SCREWS

The lift links are used to raise or lower the hitch lower links. The lift links can be adjusted from 16-3/8-inches to 18-7/8-inches, with a nominal length of 17-5/8-inches. The left and right lift links incorporate leveling screws which can be turned to obtain the desired position of the hitch sockets relative to one another. The desired working range or lift range can be obtained by adjusting both leveling screws. Leveling screw locks are provided to prevent the leveling screws from working down when operating equipment in the field. See Illust. 12.

Remove the power take-off pulley and shield when using the three-point hitch and install standard shield.

The right and left lift links are made rigid or free to float by positioning the float lock-out pins in the holes in the lift links. See Illust. 12.

Note: The height of lift can be varied by repositioning the lower link pivot pins in one of the three vertical holes in the lower mounting.

HITCH UPPER LINK

The hitch upper link can be shortened or lengthened with the handle on the hitch upper link. See Illust. 12. Rotate the handle perpendicular to the upper link and turn clockwise or counterclockwise to the desired length. After adjusting, rotate the handle back to the parallel position and tighten the upper link lock. The upper link can be adjusted from 19-inches to 28-inches.

RESTRAINING CHAINS

Restraining chains are used to prevent excessive lateral movement of the hitch lower links.

Two sets of holes are provided in the lower links to attach the restraining chains. Use the set of holes most compatible with the operation and the type of equipment being used.

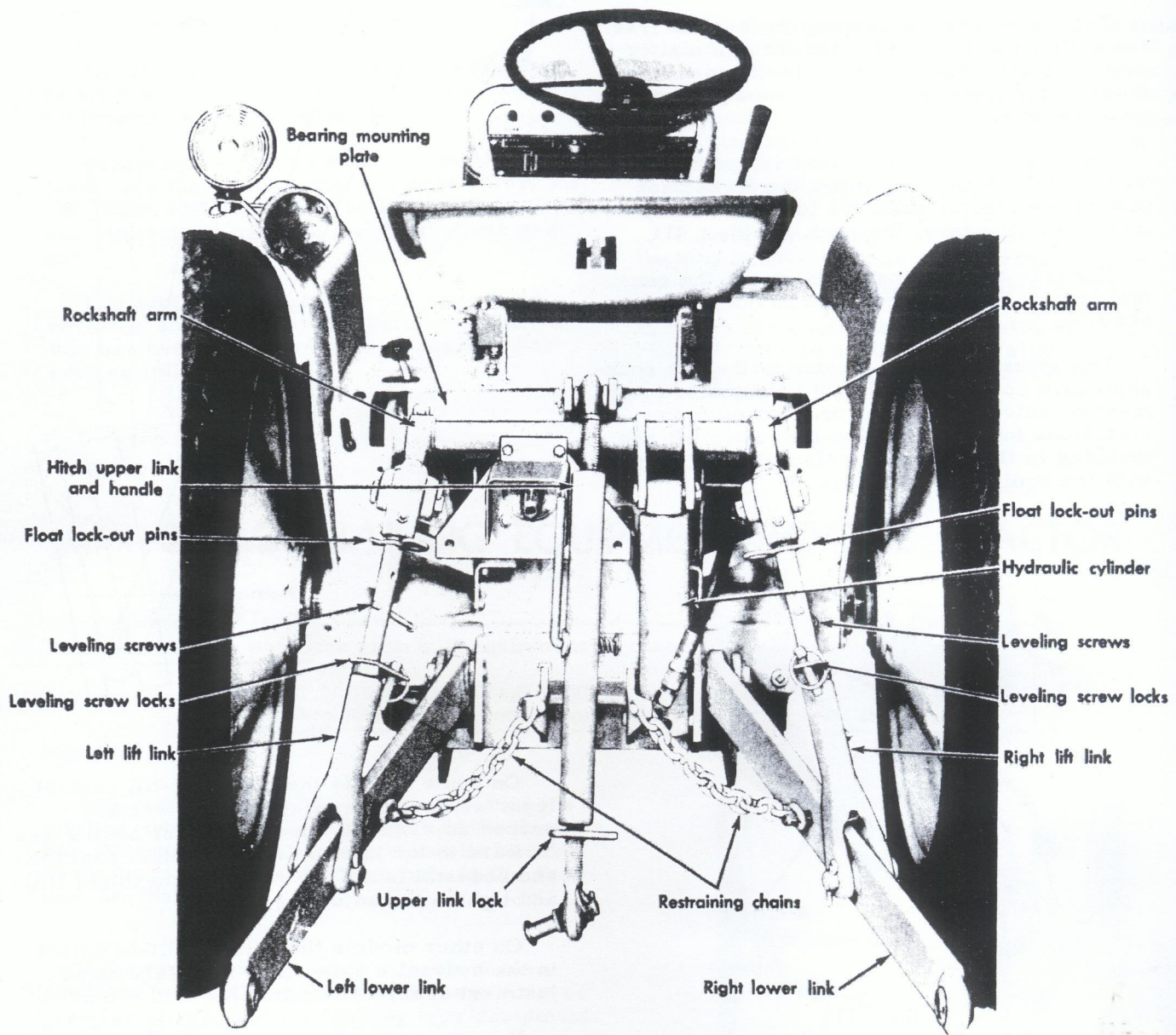
"FREE TO FLOAT" POSITION

Place the (quick-attachable) float lock-out pins in the lower holes on the left and right lift links. Also, check the leveling screw locks to make sure they are tight. See Illust. 12.

"RIGID" HITCH POSITION

The right and left lift links are made rigid by placing the (quick-attachable) float lock-out pins in the upper holes in the left and right lift links. Also, check the leveling screw locks to make sure they are tight. See Illust. 12.

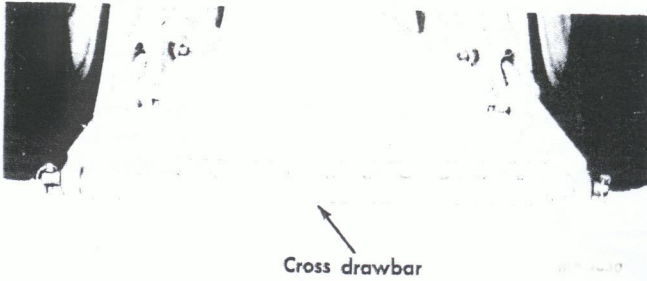
THREE-POINT HITCH



Illust. 12
Principal parts of three-point hitch.

THREE-POINT HITCH

CROSS DRAWBAR (Optional)



Illust. 14

Adjust the left and right lift links to equal length to obtain the desired drawbar height.

Insert the ends of the cross drawbar into the hitch lower link swivel sockets. Remove the linch pins from the storage holes in the leveling screw locks and insert them through the holes in the ends of the drawbar.

Remove and store the upper link when using the cross drawbar.



Caution! When the cross drawbar is used for trailing-type equipment, place the float lockout pins in the upper holes in the left and right lift links. Also, make sure the leveling screw locks are tight. Also, attach the hitch lock bar. See page 15 and Illusts. 15 and 15A.

Note: The cross drawbar is not to be used with power take-off equipment.

POWER TAKE-OFF

When using direct connected power take-off driven equipment, the left and right lift links must be set as specified in the equipment manual.

COUPLING THE EQUIPMENT

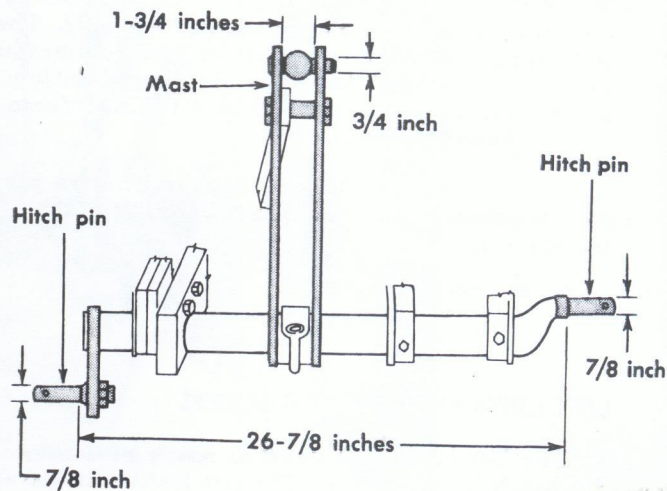
Coupling equipment to the tractor is relatively simple, but requires a little thought and practice to do the job quickly and without lost motion. New hitches and equipment often need to be "broken in" to work best.

Hitching is easier if the equipment and the tractor are on reasonably level ground.

Back the tractor straight in until the swivel sockets at the ends of the lower links are in line with the equipment hitching pins. Put the swivel socket on the left equipment pin and insert the linch pin from the storage hole in the leveling screw locks. See Illust. 12. Similarly assemble the right swivel socket and the linch pin, adjusting the leveling screws if necessary.

Remove the hitching pin from the upper link. Adjust the hitch upper link so the swivel socket lines up between the hitching pin holes in the mast. Put the hitching pin through the mast holes and the swivel socket to the hitch upper link. Insert the linch pin. See Illust. 12.

Adjust the length of the upper link according to the instructions for the equipment being used.



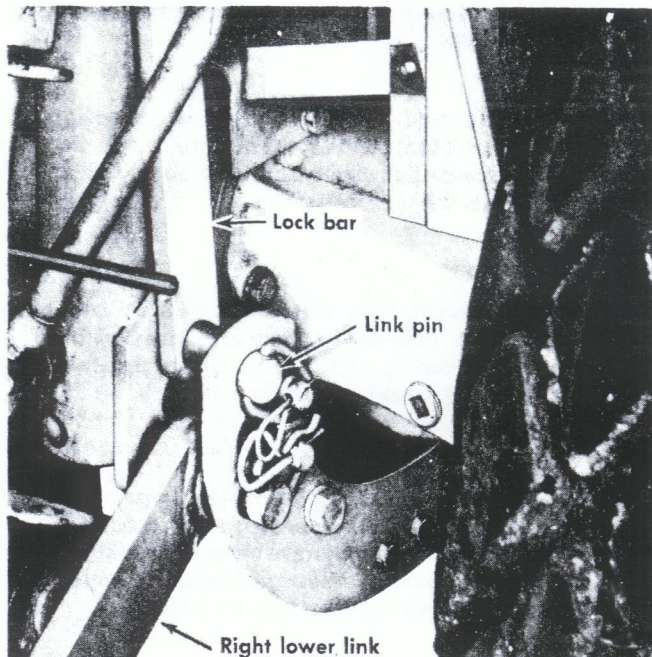
Illust. 14A
Dimensions for Category 1 equipment.

The category 1 designation means that the hitch lower links are spaced to fit equipment hitching pins spaced 26-7/8-inches between the shoulders, the swivel sockets in the ends of the lower hitch links are the correct size to fit the 7/8-inch diameter equipment hitching pins, and the swivel socket on the hitch upper link is the correct size to fit the 3/4-inch hitching pin in the 1-3/4-inch space on the equipment mast. See Illust. 14A.

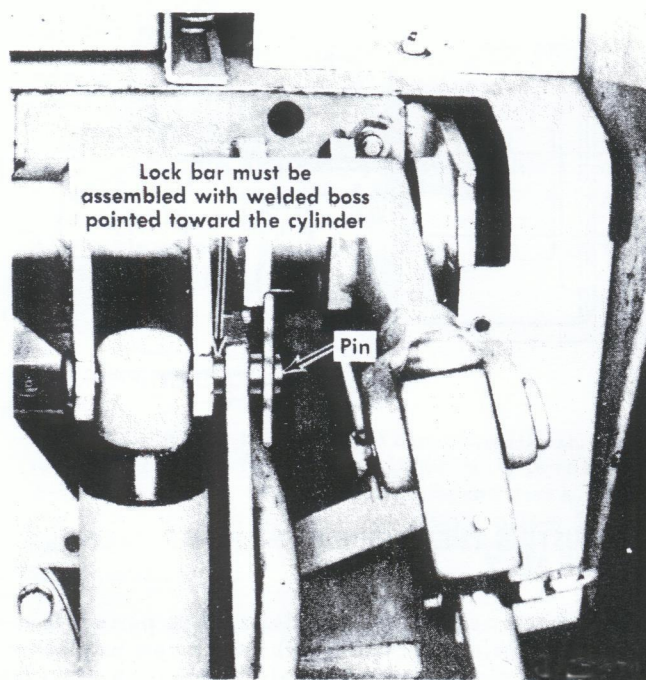
UNCOUPLING THE EQUIPMENT

Lower the equipment to the ground. Remove the lynch pins from the three hitching points of the equipment. If the pins are difficult to remove, slightly raise or lower the hitch until the pins are free.

HITCH LOCK



Illust. 15



Illust. 15A

Whenever the hydraulic lift is to be used, the three-point hitch should be locked in the transport position.

This is necessary since the hitch and the hydraulic lift are both activated by the hydraulic lift control lever.

To lock the hitch in the drawbar position, use the third lower link pin provided with the tractor to pin the lock bar in the highest hole at the right lower link attaching points. The right lower link must be in the lowest position. Remove the pin and spacer from the upper cylinder mounting and insert the pin through the upper hole in the lock bar and resecure with quick attachable cotter pin. See Illusts. 15 and 15A.

When using the three-point hitch the lock bar should be stored in the tool box.

REMOVING THE THREE-POINT HITCH LINKAGE

If for any reason the three-point hitch linkage is to be removed, proceed as follows:

Detach the restraining chains by removing the cotter pins and headed pins from the chain clevis at the lower mounting plate. This will release the lower links from the tractor.

To remove the upper link, remove the quick-attachable cotter pin and pin from the upper link bracket.

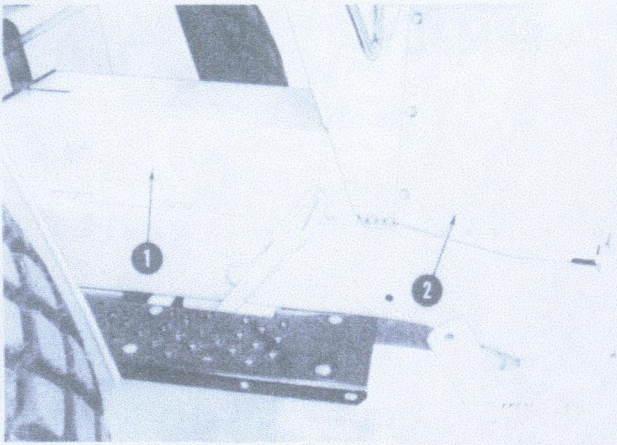
If for any reason it becomes necessary to remove the rockshaft arms, detach the hydraulic cylinder from the rockshaft and remove the four bolts from the bearing mounting plate. See Illust. 12.

INSTALLING THE THREE-POINT HITCH LINKAGE

Reassemble the linkage parts in the reverse order of removal. Tighten all bolts securely when reassembling the hitch.

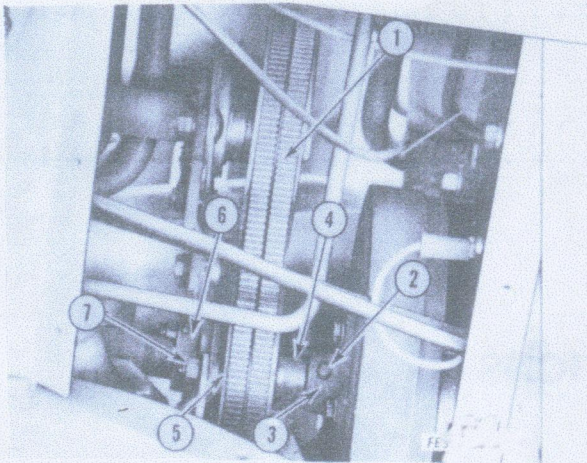
Main Clutch Shaft and Engine Clutch— Serial No. U018709 and Below (154 Tractors)

Removal and Disassembly



1. Remove the frame top cover (1) and pedestal side sheet sections (2).

1. Frame top cover
2. Pedestal side sheet sections



2. Drive out the pin (2) or remove the socket head bolt and nut from the clutch coupling (3).

3. Loosen two cap screws on the shaft and pulley adjuster and loosen the PTO drive belt tension. Loosen four cap screws (2) securing the front main shaft bearing support to the frame (See Illust. on page 4-3). Remove the drive belts (1) from the top pulley.

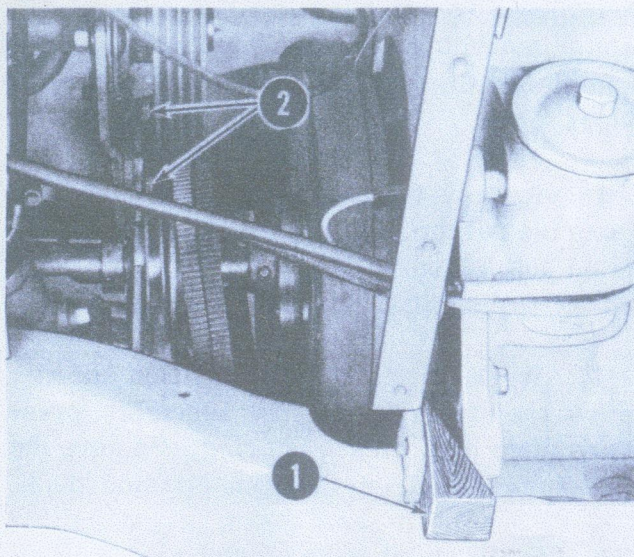
4. Loosen the bearing locking collar (6).

5. Remove the nuts (7) from the bearing flange bolts.

6. Remove the clutch coupling cap screws.

7. Slide the main shaft forward into the clutch coupling (3).

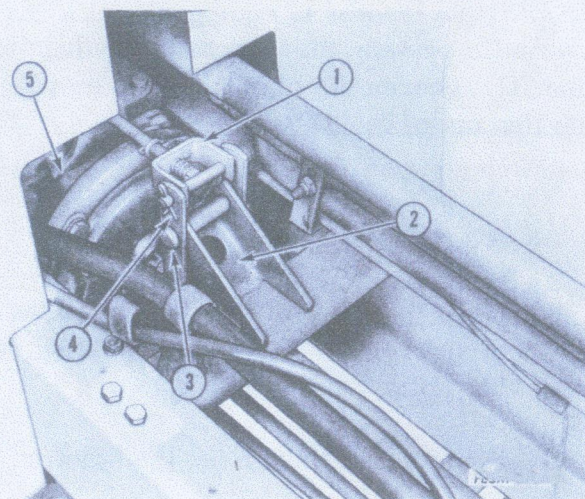
1. PTO drive belts
2. Pin (or nut and socket head bolt)
3. Clutch coupling
4. Main clutch shaft
5. Pulley
6. Bearing locking collar
7. Nut (2)



8. Remove six cap screws securing the engine to the frame (four in rear and two in front).

9. Move the engine forward approximately 1/2" and insert small wooden wedges (1) between the frame and engine to hold the engine forward.

- 1. Wooden wedge
- 2. Cap screw (two on each side)



10. Remove the clutch brake yoke (1) from the clutch release yoke (4).

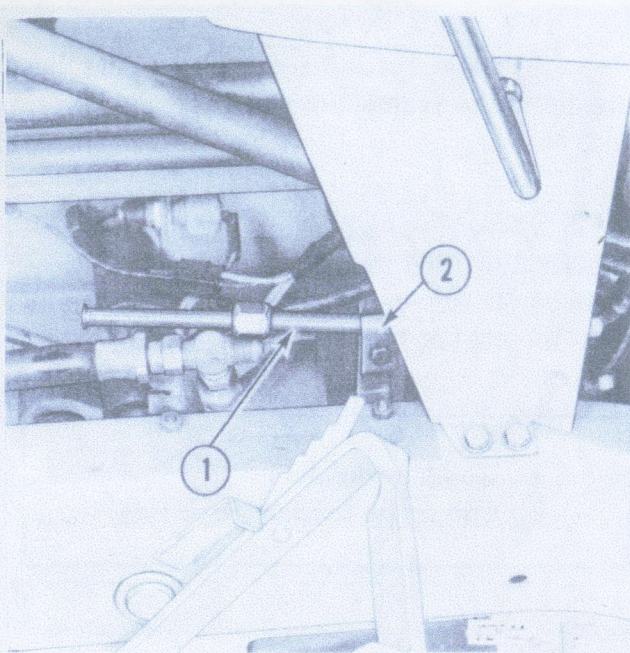
11. Remove the pin (3) securing the clutch release yoke (4) to the clutch release bracket (2).

12. Remove the pin securing the clutch release yoke to the clutch adjusting rod. Remove the release yoke.

13. Remove the bolts and nuts securing the clutch release bracket to the frame and remove the bracket.

14. Remove the clutch brake assembly (5) from the transmission case.

- 1. Clutch brake yoke
- 2. Clutch release bracket
- 3. Pin
- 4. Clutch release yoke
- 5. Clutch brake assembly



1. Hydraulic line
2. Clamp

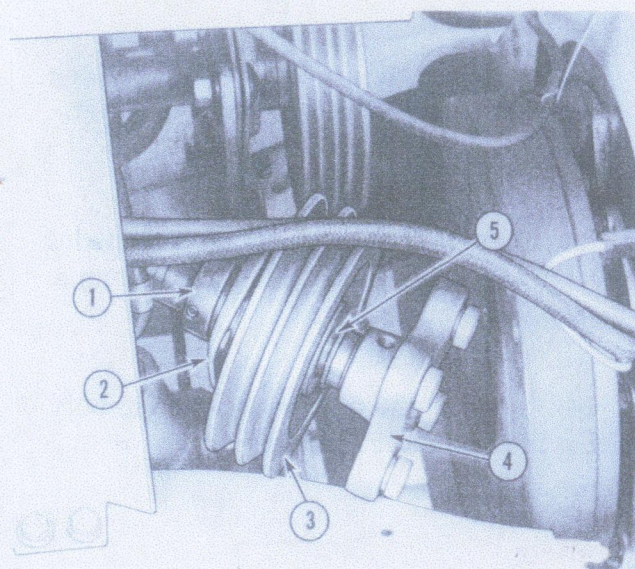
15. Remove the six cap screws in the clutch assembly. Move the pressure plate and clutch disc assembly forward on the shaft.

16. Remove the socket head bolt and nut or drive out the pin in the rear pressure plate hub. Move the pressure plate rearward on the transmission shaft.

17. Work the shaft out of position and remove the clutch driven disc assembly, pressure plate and release bearing. Remove the pressure plate from the transmission shaft.

18. If the clutch is to be serviced, remove the lever pivot pin and disassemble the release levers, pressure springs and lever brackets.

19. If the tractor is equipped with a hydraulic system, disconnect the hydraulic line (1). Loosen the clamp (2) and move the line out of the way.



20. Move the front of the shaft over the flywheel and remove the clutch coupling (4), snap ring (5) and pulley (3).

21. Remove the shaft from the tractor.

22. Remove the key from the shaft.

23. Remove the bearing flanges, bearing and bearing locking collar.

1. Locking collar 4. Clutch coupling
2. Bearing flange 5. Snap ring
3. Pulley

Camshaft - Continued

Thrust taken by	Thrust plate
Number of bearings	3 (bored in crankcase)
Bearing running clearance	
Front and center - inch . . . . .	.002 - .0045
Rear - inch . . . . .	.001 - .0035
End clearance - inch . . . . .	.003 - .012

Connecting Rods

Type	I-Beam
Side clearance - inch . . . . .	.005 - .012
Bearing running clearance - inch . . . . .	.002 - .003
Bearing type	
Upper end	Bronze bushing
Lower end	Tri-metal, precision
Bearing OD and spread - inches	1.625 + .025
Piston pin bushing ID - inch (installed) . . . . .	.6879 - .6882

Pistons

Type	Cam ground
Material	Aluminum alloy
Overall length - inches	2.875
Diameter - inches	2.6230 - 2.6234
*Skirt clearance, bottom - inch . . . . .	.0016 - .0024
	(measured at 90° from pin hole)
Number of rings per piston	3
Piston pin hole bore - inch . . . . .	.6877 - .6880
Width of ring groove - inch	
Top compression . . . . .	.0955 - .0965
Second compression . . . . .	.0955 - .0965
Oil control . . . . .	.1880 - .1890
Ring clearance in groove - inch	
Top compression . . . . .	.0020 - .0035
Second compression . . . . .	.0020 - .0040
Oil control . . . . .	.0015 - .0030

Piston Pins

Type	Full floating
Diameter - inch . . . . .	.6875 - .6876
Length - inches	2.185 - 2.195
Clearance between end of pin and retainer ring - inch . . . . .	.010 - .030
Clearance in rod bushing - inch . . . . .	.0003 - .0007
Clearance in piston - inch . . . . .	.0001 - .0005

Inspect the shaft for excessive wear. Pressure plate, bearings, pulley and clutch coupling must fit properly. Excessive clearances will result in failure. Replace the shaft and/or parts if necessary.

Check the front bearing for roughness of operation, damage or excessive wear and replace if necessary.

Check the bushing in the pressure plate for wear or damage. Replace if necessary.

Check the clutch disc facings and pressure plates for excessive wear. Replace if necessary.

Check the clutch pressure springs for breakage. Pressure spring specified free length is 1.210 inch. Test springs for compression. They must exert 85 to 95 lbs. at .810 inch after one compression to .690 inch. Replace any springs that do not meet specifications.

NOTE: To provide improved performance, it is recommended that the later model drive line components be installed.

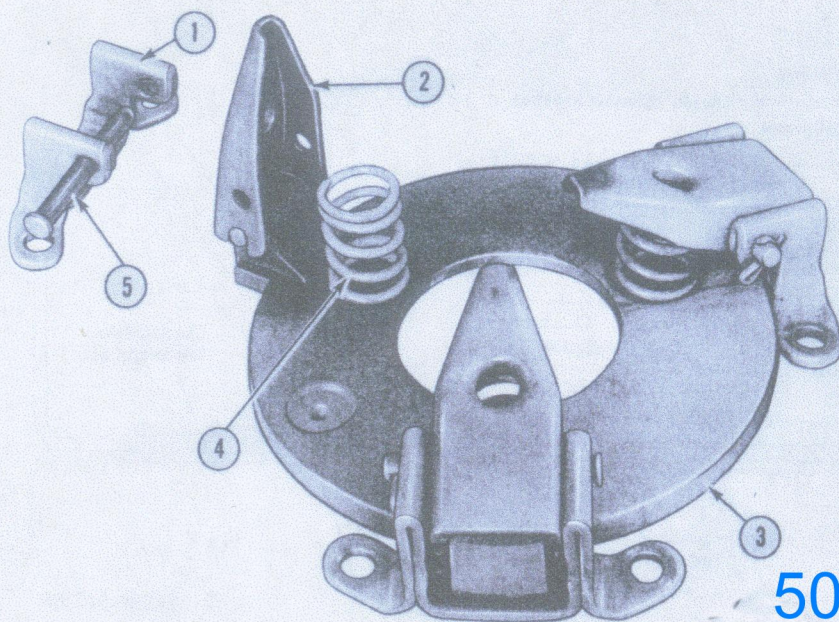
1. Install the bearing locking collar, bearing and bearing flanges on the shaft. Do not tighten the locking collar at this time.

2. Install the key on the shaft.

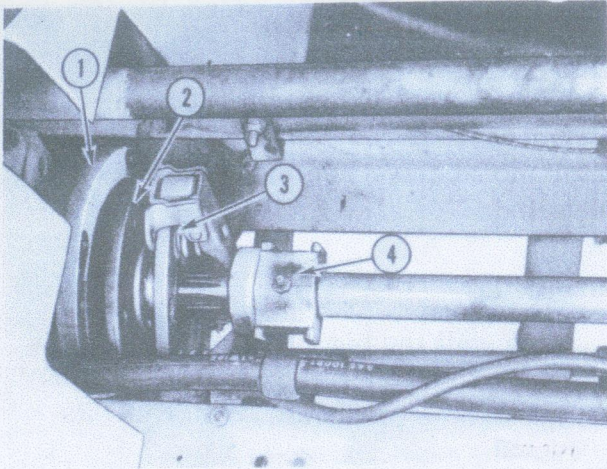
3. Install the shaft in the tractor.

4. Install the pulley, snap ring and clutch coupling on the shaft.

5. If the engine clutch was disassembled, assemble the release levers (2), pressure springs (4) and lever brackets (1) on the pressure plate (3) and install the lever pivot pin (5).



1. Lever bracket
2. Release lever
3. Pressure plate
4. Pressure spring
5. Lever pivot pin



1. Pressure plate
2. Clutch disc assembly
3. Pressure plate assembly
4. Release bearing

6. Install the rear pressure plate (1) on the transmission shaft.

7. Install the clutch release bearing (4), pressure plate (3) and clutch disc assembly (2) on the shaft.

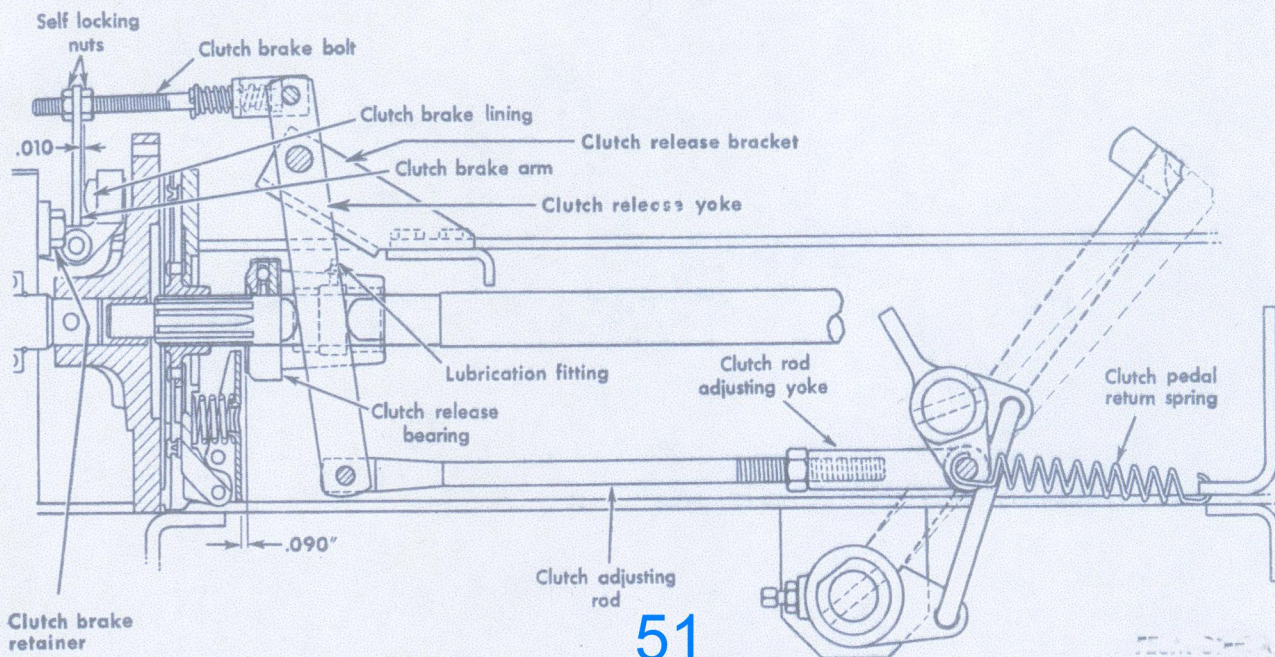
8. Install the socket head bolt and nut in the pressure plate hub and transmission shaft. Tighten the nut securely.

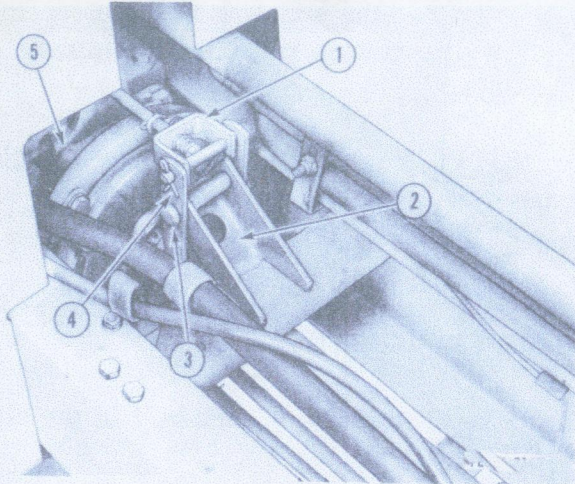
9. Install the six cap screws holding the clutch assembly together and tighten to 25 ft. lbs. torque.

10. Install the clutch brake retainer on the transmission case and tighten the cap screws to 80 ft. lbs. torque.

11. Install the clutch release bracket on the frame and tighten the nuts and bolts securely.

12. Install the clutch release yoke to the clutch adjusting rod and secure with the pin.





1. Clutch brake yoke
2. Clutch release bracket
3. Pin
4. Clutch release yoke
5. Clutch brake assembly

13. Install the pin securing the clutch release yoke (4) to the clutch release bracket (2).

14. Assemble the clutch brake yoke (1) to the clutch release yoke (4) and secure with the pin.

15. Install the belts on the lower pulley.

16. Move the engine rearward to its operating position. Install the six cap screws securing the engine to the frame and tighten them securely.

17. Slide shaft forward into the pilot hole in the coupling retainer, and install the four cap screws in the clutch coupling and tighten securely.

18. Install the bearing flange bolts and nuts. Tighten only snug.

19. Slide the shaft rearward and install the socket head bolt and nut and tighten securely.

If the engine flywheel does not have a 1 inch pilot hole, proceed with the following steps:

a. Install the cap screws in the clutch coupling and tighten until snug.

b. Install the nut and bolt in the clutch coupling.

c. Using a dial indicator, check the shaft run-out while cranking the engine. Be sure indicator reading is taken on smooth area of shaft.

NOTE: Removal of the spark plugs will make cranking of engine easier.

d. Tap the coupling in the direction required to reduce run-out to minimum possible.

NOTE: If minimum run-out of .004 inch cannot be obtained, replace the clutch coupling and/or shaft.

e. Securely tighten the cap screws in the clutch coupling (3).

f. Install the nut and bolt in the clutch coupling hub (3).

20. Securely tighten the bolts and nuts (7) in the bearing flanges.

21. Tighten the 4 cap screws securely in the cross member slotted holes.

22. Tighten the bearing locking collar (6).

23. Install the PTO drive belts (1) in the pulley grooves.

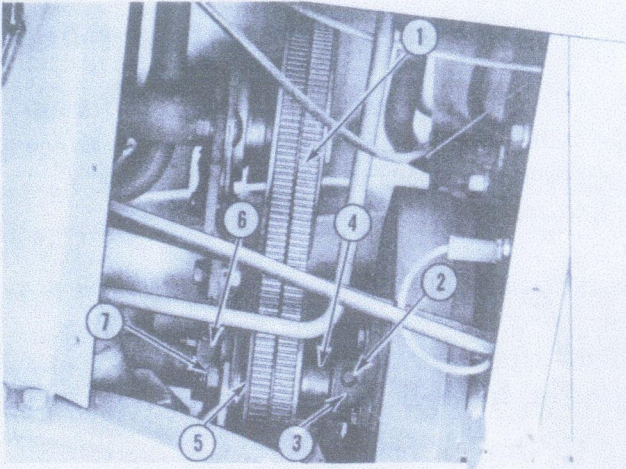
24. Tighten the drive belts enough to prevent slippage and then tighten the cap screws in the pulley adjuster.

NOTE: Do not over-tighten the belts.

25. Connect the hydraulic line (if equipped) and tighten the support clamp.

26. Adjust the clutch.

27. Install the frame top cover and pedestal side sheet assemblies.

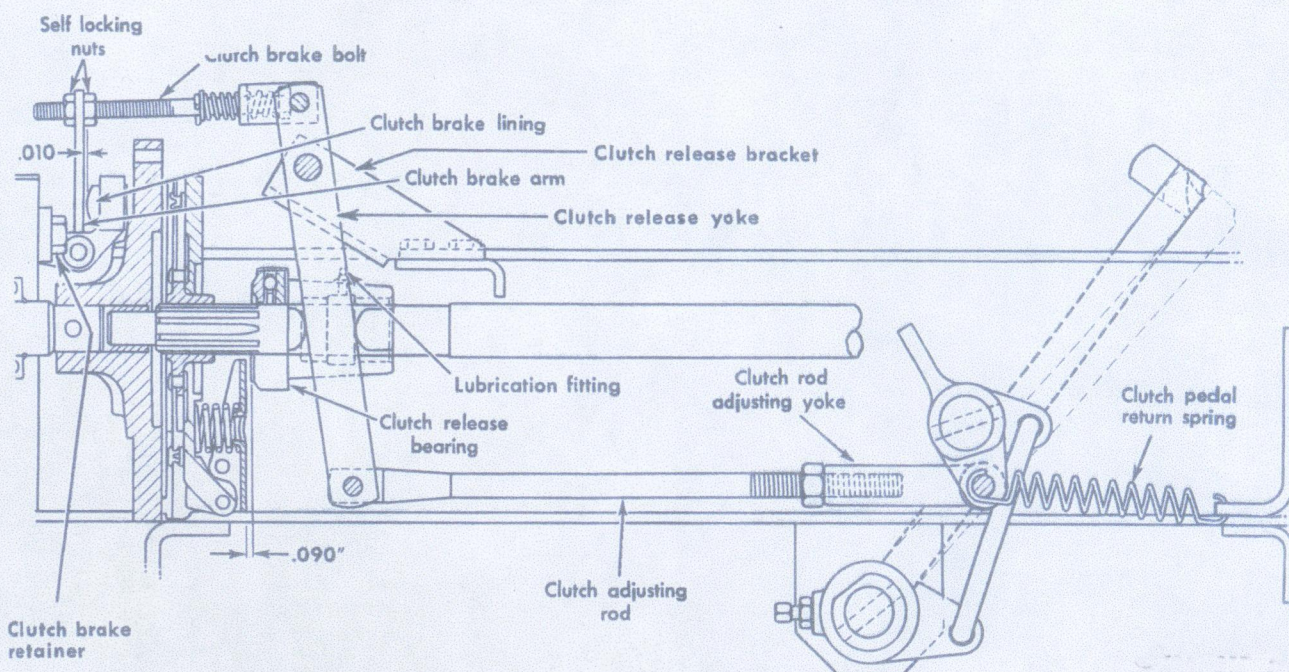


- 1. PTO drive belts
- 2. Pin (or socket head bolt and nut)
- 3. Clutch coupling
- 4. Main clutch shaft
- 5. Pulley
- 6. Bearing locking collar
- 7. Nut (2)

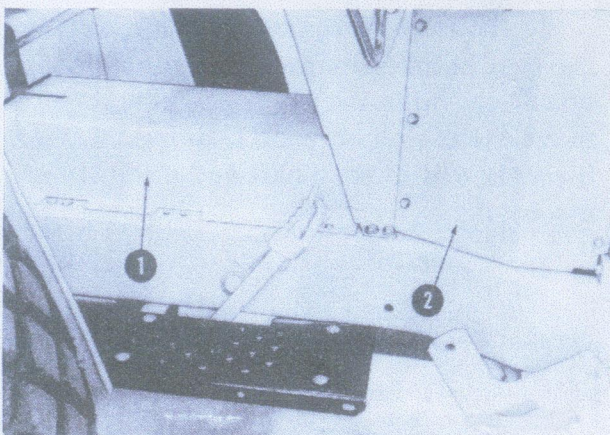
Adjustments

Remove the frame top cover. The clutch linkage should be adjusted to provide .090 inch clearance between the release fingers and the bearing. Adjust by loosening the two nuts on the clutch rod adjusting yoke and positioning the clutch adjusting rod to give the specified free travel. Retighten the nuts.

After adjusting the clutch pedal free travel, check the clearance between the clutch brake arm and the clutch brake lining. A clearance of .010 inch is specified. To adjust, loosen the self locking nuts on the clutch brake bolt. Adjust the clutch brake bolt to obtain the specified .010 inch clearance. Retighten the self locking nuts. Install the frame top cover.



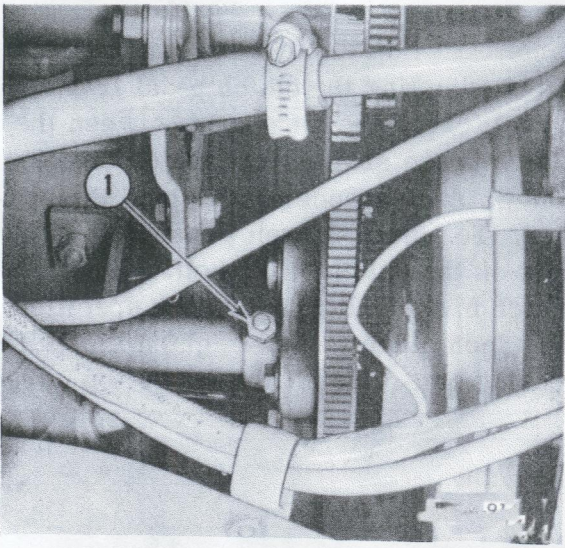
Main Clutch Shaft and Engine Clutch— Above Serial No. U018709 (154 & 185 Tractors)



Removal and Disassembly

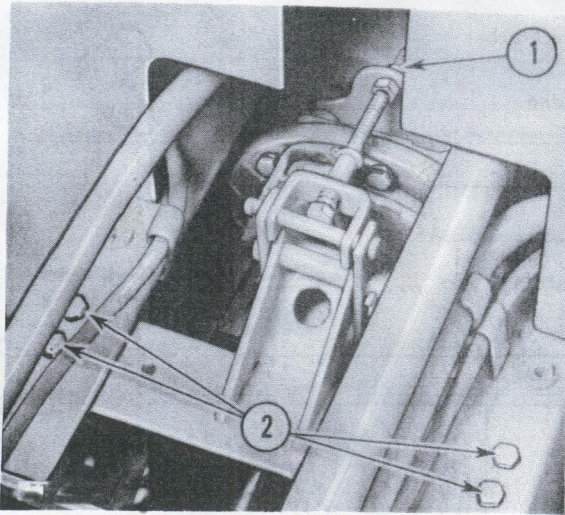
1. Remove the frame top cover (1) and pedestal side sheet sections (2).

1. Frame top cover
 2. Pedestal side sheet sections



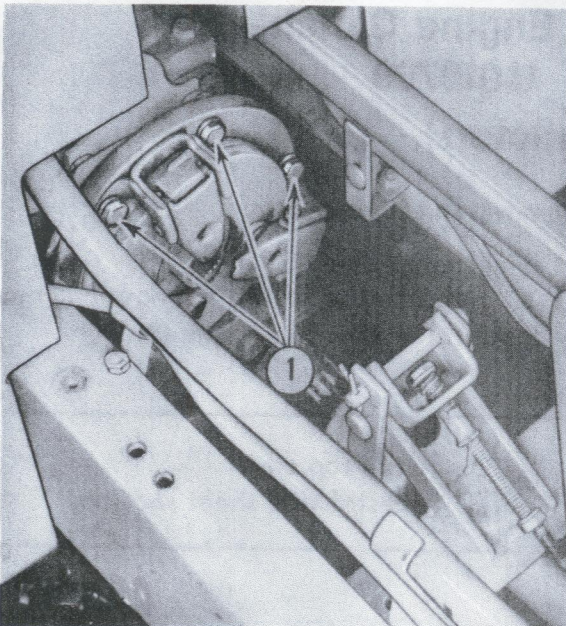
2. Remove the Allen head bolt from the clutch shaft coupling and slide the shaft ahead.

1. Allen head bolt



3. Remove the pin securing the clutch rod to the clutch release yoke. Remove the nut from the end of the clutch brake bolt. Remove the four bolts securing the clutch release bracket to the frame and slide the clutch release bracket ahead.

1. Clutch brake bolt nut
2. Clutch release bracket bolts



4. Remove the six bolts securing the pressure plate assembly to the input flywheel. Remove the pressure plate assembly and the clutch disc.

5. To remove the drive shaft, remove the four bolts from the front clutch shaft coupling. Slide the shaft ahead and remove the clutch release bearing. Lower the rear end of the shaft and slide it to the rear.

1. Pressure plate bolts

Inspection and Repair

Inspect the shaft for excessive wear. Pressure plate, bearings, pulley and clutch coupling must fit properly. Excessive clearances will result in failure. Replace the shaft and/or parts if necessary.

Check the bushing in the pressure plate for wear or damage. Replace if necessary.

Check the clutch disc facings and pressure plates for excessive wear. Replace if necessary.

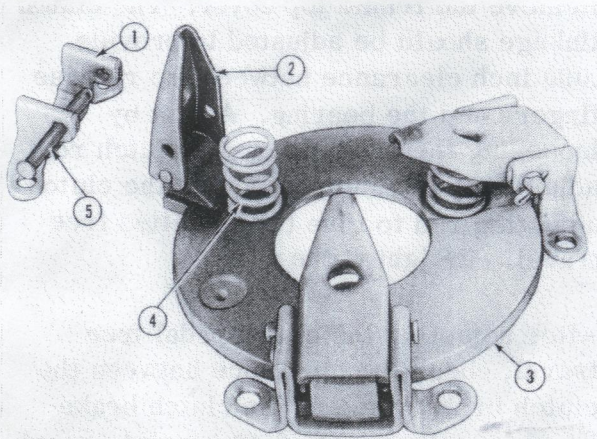
Check the clutch pressure springs for breakage. Pressure spring specified free length is 1.210 inch. Test springs for compression. They must exert 85 to 95 lbs. at .810 inch after one compression to .690 inch. Replace any springs that do not meet specifications.

Reassembly and Installation

1. Place the shaft in its approximate position inside the frame. Slide the front clutch shaft coupling onto the shaft.

2. Slide the shaft ahead and install the clutch release bearing and bracket assembly onto the shaft.

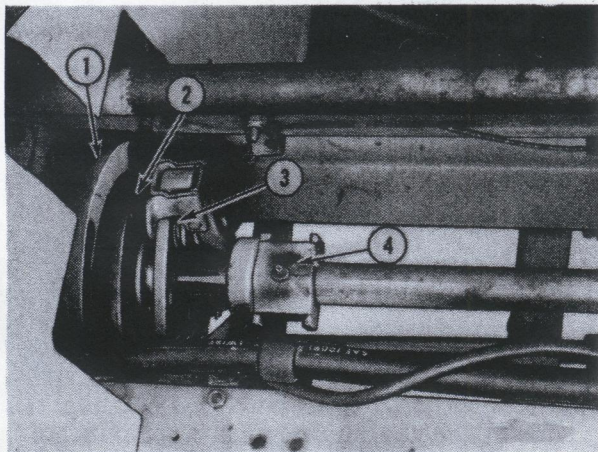
3. If the engine clutch was disassembled, assemble the release levers (2), pressure springs (4) and lever brackets (1) on the pressure plate (3) and install the lever pivot pin (5).



- | | |
|-------------------|--------------------|
| 1. Lever bracket | 4. Pressure spring |
| 2. Release lever | 5. Lever pivot pin |
| 3. Pressure plate | |

4. Install the rear pressure plate (1) on the transmission shaft.

5. Install the socket head bolt and nut in the pressure plate hub and transmission shaft. Tighten the nut securely.



6. Install the pressure plate (3) and clutch disc assembly.

7. Install the six cap screws holding the clutch assembly together and tighten to 25 ft. lbs. torque.

8. Install the clutch release bracket on the frame and tighten the nuts and bolts securely.

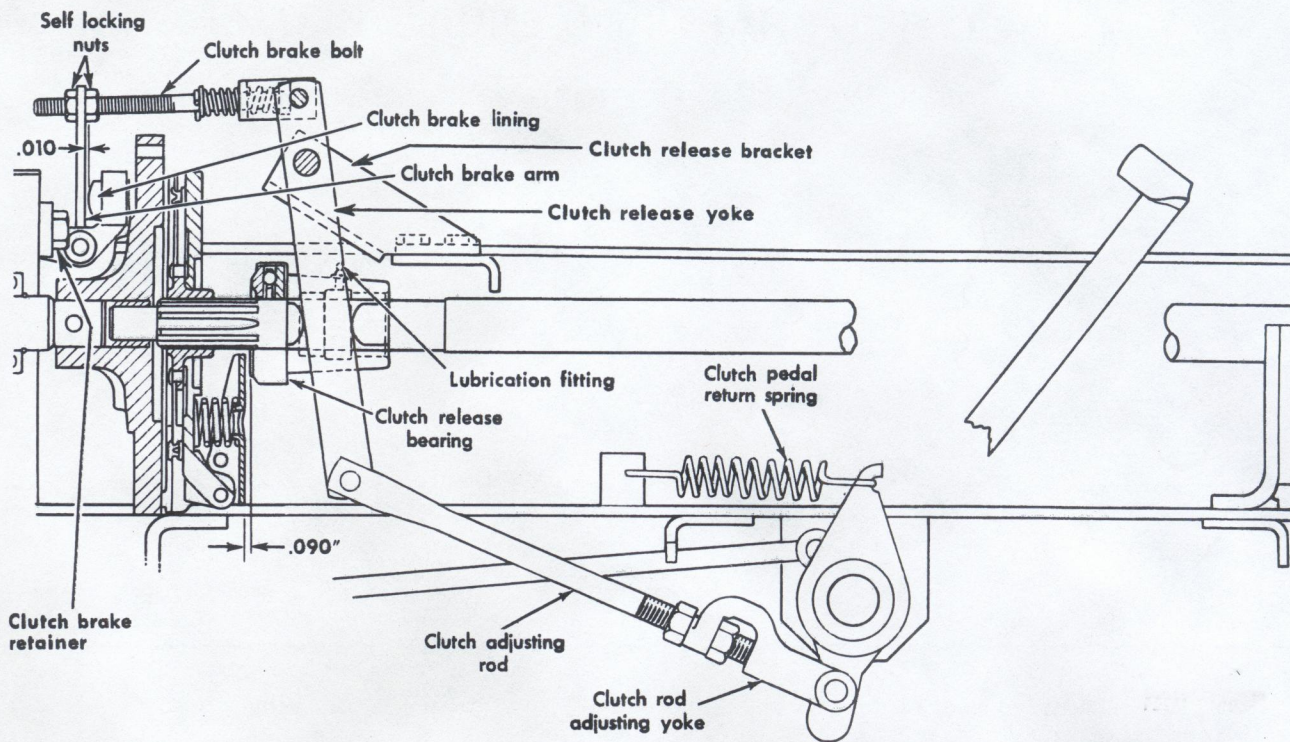
9. Install the clutch release yoke to the clutch adjusting rod and secure with the pin.

1. Pressure plate
2. Clutch disc assembly
3. Pressure plate assembly
4. Release bearing

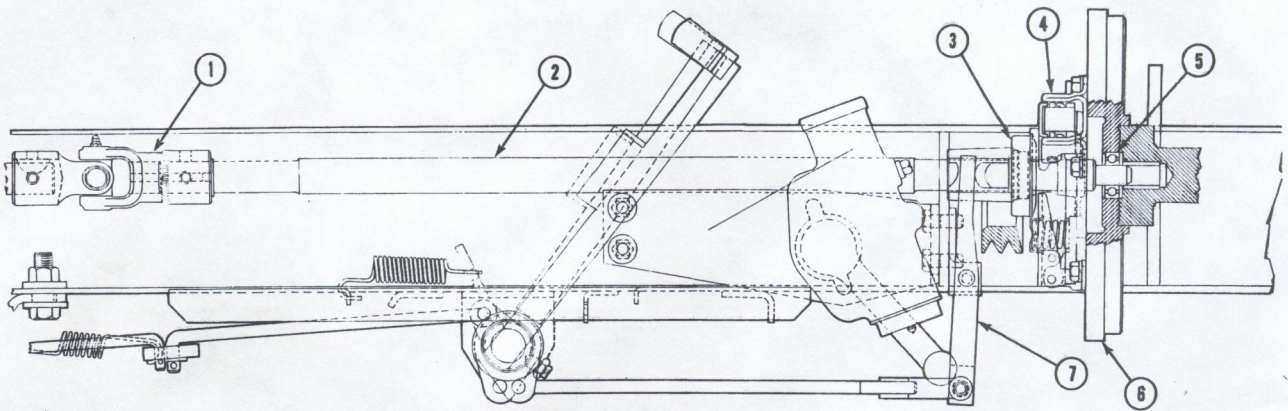
Adjustments

Remove the frame top cover. The clutch linkage should be adjusted to provide .090 inch clearance between the release fingers and the bearing. Adjust by loosening the two nuts on the clutch rod adjusting yoke and positioning the clutch adjusting rod to give the specified free travel. Retighten the nuts.

After adjusting the clutch pedal free travel, check the clearance between the clutch brake arm and the clutch brake lining. A clearance of .010 inch is specified. To adjust, loosen the self locking nuts on the clutch brake bolt. Adjust the clutch brake bolt to obtain the specified .010 inch clearance. Retighten the self locking nuts. Install the frame top cover.



MAIN CLUTCH SHAFT AND ENGINE CLUTCH (184 Tractor)



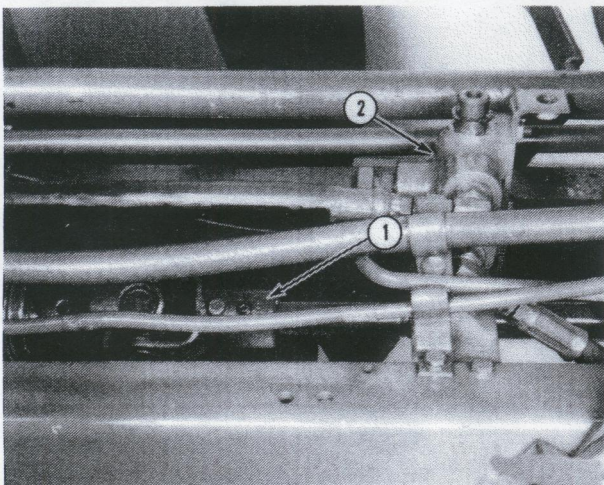
1. Main drive shaft knuckle
2. Main drive shaft
3. Clutch release bearing
4. Engine clutch assembly

5. Pilot bearing
6. Engine flywheel
7. Clutch release arm

Removal and Disassembly

1. Disconnect the battery cables from the battery.

NOTE: Remove the ground cable first to reduce electrical hazards.



1. Main drive shaft knuckle
2. Hydraulic selector control valve

2. Remove the pedestal side sheets and the frame top cover.

3. Remove the set screws from the drive shaft knuckle. Move the snap ring forward from the groove. Slide the long end of the knuckle onto the shaft until the cross of the knuckle is against the end of the drive shaft and clear of the transmission or creeper input shaft.

Lift out the drive shaft when connected to the transmission and lower the drive shaft out from the tractor when connected to the creeper drive.

NOTE: If the tractor is equipped with a hydraulic selector control valve then it will have to be removed when the drive shaft connects to the transmission input shaft only.

Piston Rings

Compression

Number per piston 2

Type

Top Chrome

Second Plain

Width of ring

Top - inch0930 - .0935

Second - inch0925 - .0935

End gap

Top - inch007 - .017

Second - inch007 - .017

Oil Control

Type Chrome, wide slot

Number per piston 1

Width - inch1860 - .1865

End gap - inch007 - .020

Valves

Head diameter

Intake - inches 1.089 - 1.099

Exhaust - inch901 - .911

Face angle - degrees 45-1/2

Stem diameter

Intake - inch3095 - .3105

Exhaust - inch3095 - .3105

Clearance in guide

Intake - inch001 - .003

Exhaust - inch0015 - .0035

Valve Seats

Seat angle - degrees 45

Seat width

Intake - inch 3/64

Exhaust - inch 3/64

Valve Guides

Length - inches 1.34

Inside diameter

Intake - inch3115 - .3125

Exhaust - inch3120 - .3130

Installed height below crankcase surface - inches 1-3/32

Valve Springs

Free length

Intake - inches 1-31/32

Exhaust - inches 1-7/16

Test length

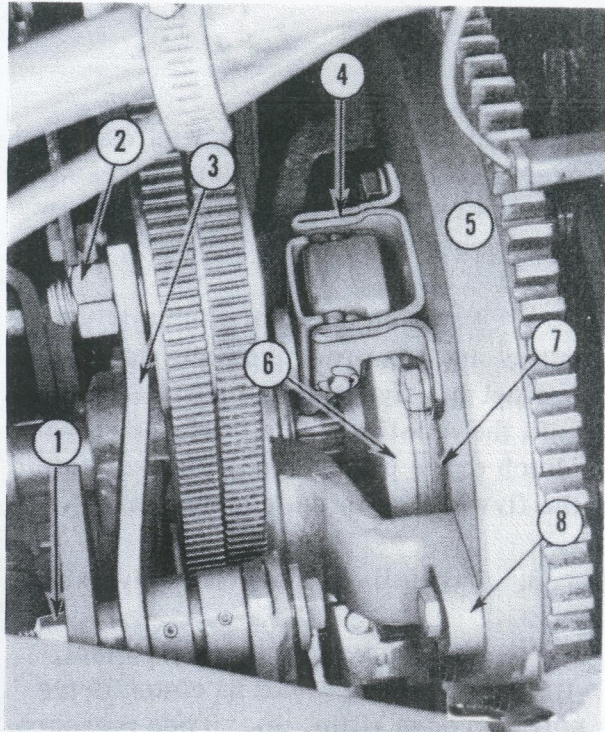
Intake - inches 1-1/4

Exhaust - inches 1-3/16

Test load

Intake - pounds 23

Exhaust - pounds 14 - 16



4. Relieve the clutch belt tension by pushing in on the idler tension arm nut with a 3/4 inch wrench and then slip the drive belts off the tension arm pulley.

5. Remove the idler pulley from the idler arm.

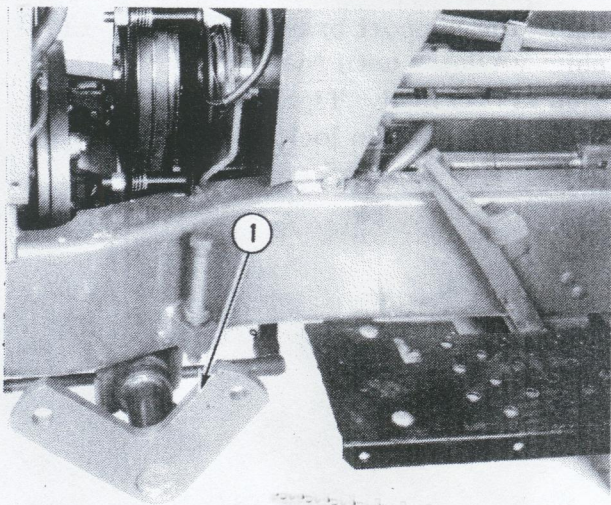
6. Remove the bolt securing the idler tension arm to the tractor frame and lower out the idler tension arm and the idler spring.

NOTE: Do not use any hand tools on the idler tension spring since this could damage the spring and result in early failure.

NOTE: Rotate the main drive clutch to obtain the necessary clearance for lowering the idler arm out of the frame.

1. Idler tension arm mounting bolt
2. Idler tension arm nut
3. Idler tension arm
4. Release lever assembly

5. Engine flywheel
6. Pressure plate
7. Clutch disk
8. Clutch drive pulley



7. Remove the rockshaft from under the tractor.

8. Disconnect the clutch release arm from the clutch release bearing. Remove the clutch release bearing.

9. Remove all the capscrews from both the clutch drive pulley and the pressure plate assembly. Then lower both the clutch pulley and pressure plate out of the tractor at the same time.

10. If necessary, remove the flywheel and press out the pilot bearing.

1. Rockshaft

Inspection

Clean and inspect all parts. Replace worn or damaged parts.

Reassembly and Installation

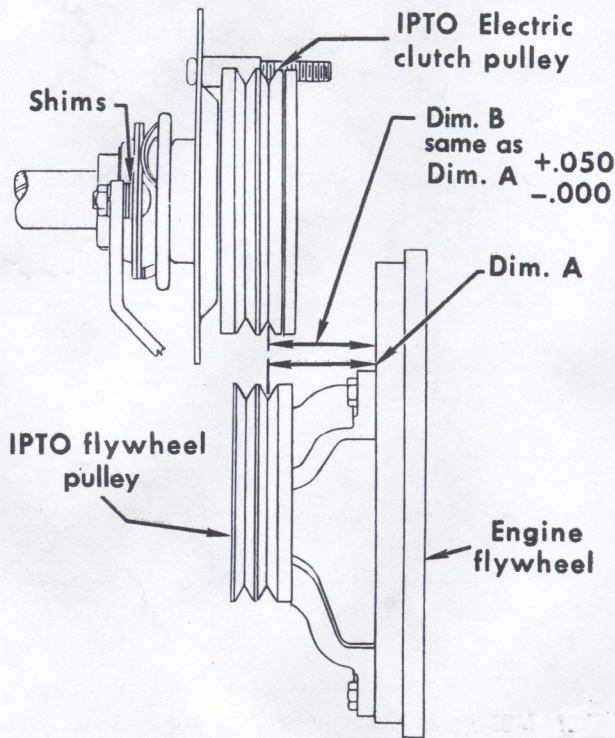
1. If the engine clutch was replaced assemble the release levers, pressure springs and lever brackets on the new pressure plate.

2. Position both the clutch drive pulley and the pressure plate assembly against the flywheel and position in place with the existing drive shaft. Secure the clutch drive pulley and pressure plate to the flywheel with the capscrews.

3. Carefully remove the drive shaft.

4. With clutch pulley on flywheel, measure from flywheel to clutch drive pulley groove (Dim. A). Then measure from flywheel to corresponding location of IPTO clutch pulley groove (Dim. B). This dimension should be the same as dimension "A" + 1.3 mm (+.050 inch). If not, make the following adjustment.

5. Loosen the locking collar on rear bearing of power take-off shaft; then loosen the nuts mounting the front bearing to the support bracket and install shim washers until the required dimension is obtained. Tighten the bolts and recheck. Tighten locking collar on power take-off shaft rear bearing.



6. Install the clutch release bearing and release arm.

7. Apply "Never Seez Compound" to the keyway end of the drive shaft before installing the knuckle. Assemble the key in the shaft and slide the long end of the knuckle onto the shaft until the cross of the knuckle is against the end of the shaft.

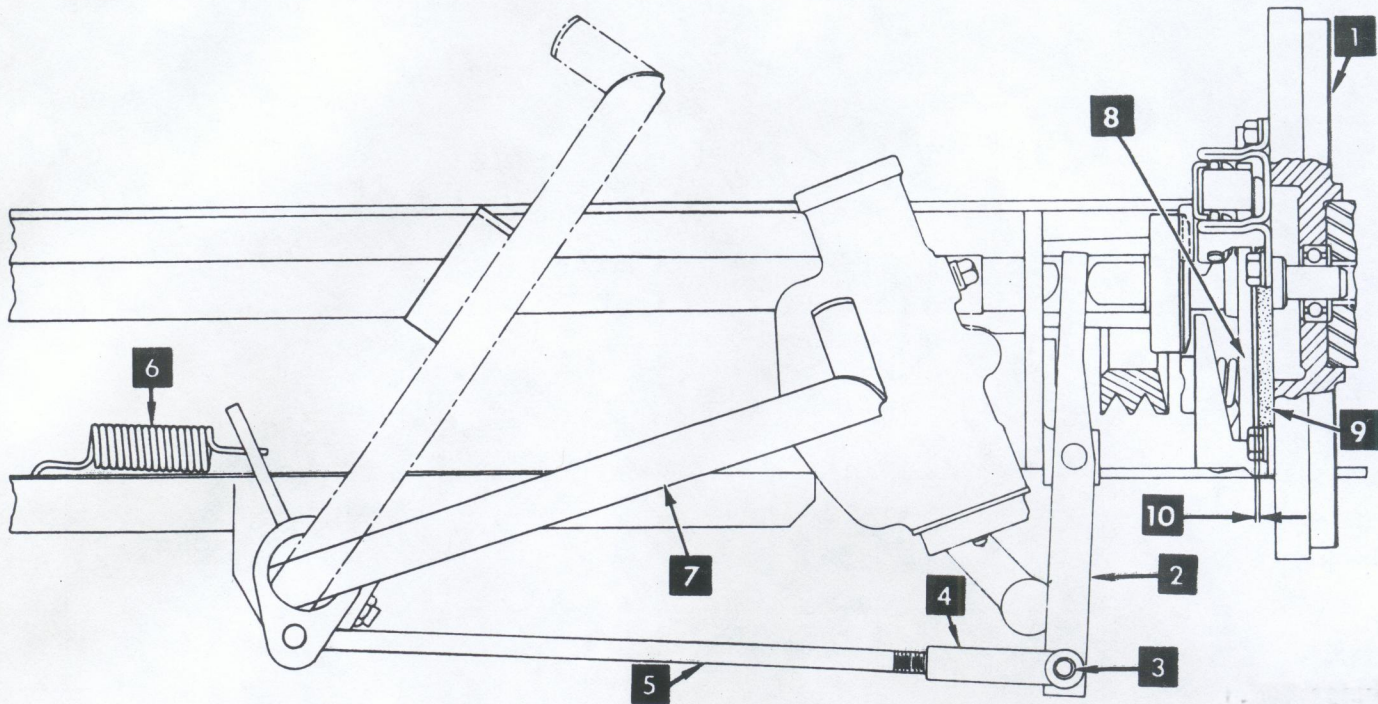
8. Install the shaft back into the tractor drive clutch assembly. Slide the knuckle onto the transmission or creeper input shaft until it seats against the shaft shoulder. Position the snap ring in the shaft groove and slide the drive shaft back until the snap ring shoulders against the knuckle. Tighten the set screws over the shaft. Then tighten the set screws over the Woodruff keys.

9. Install the rockshaft.

10. Install one end of the idler spring to the idler arm and the other end to the spring bracket under the tractor. Lift the idler arm up through the opening between the main drive clutch and the tractor frame and remount the idler arm.

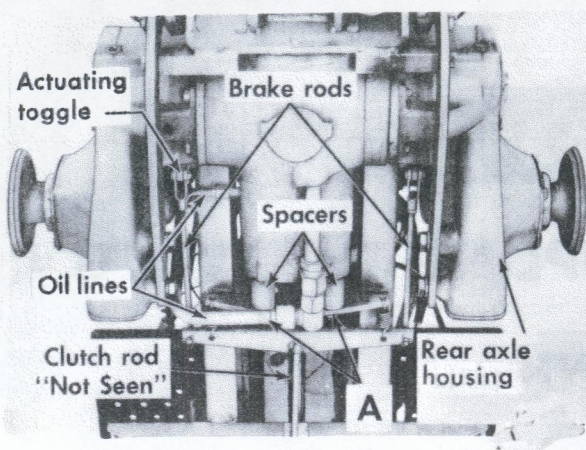
11. Install the idler pulley on the idler arm and torque the pulley nut to standard specifications. Then reinstall the drive belts, making certain belts and pulleys are free of grease and oil.

Main Clutch Adjustment



- | | |
|-------------------------------|-----------------------|
| 1. Engine flywheel | 7. Clutch pedal |
| 2. Clutch release lever | 8. Pressure plate |
| 3. Headed pin and cotter | 9. Clutch plate |
| 4. Clevis | 10. Dimension is: |
| 5. Clutch rod | 38 to 51 mm |
| 6. Clutch pedal return spring | (.015 to .020 inches) |

With the clutch depressed, check clearance between clutch plate and pressure plate. If clearance is less than 38 mm (.015 inch) or more than 51 mm (.020 inch), adjustment is necessary. To adjust, remove cotter pin and header pin, shorten or lengthen clutch rod by turning clevis until correct clearance is reached.



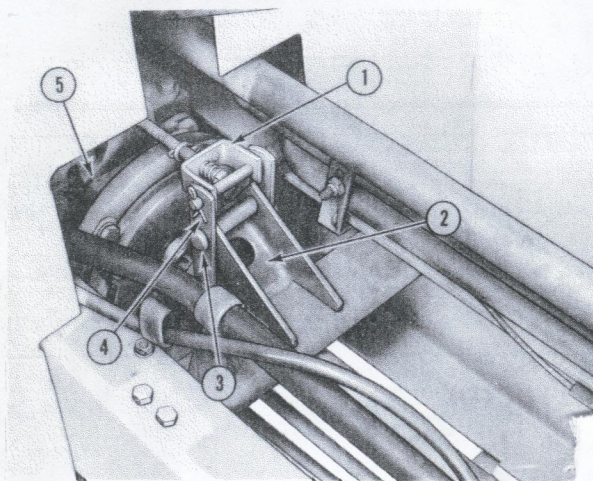
2. Remove the two cap screws (A) and spacers' (no spacers w/creeper drive) securing the front of the transmission to the frame.

3. Disconnect the brake rods from the actuating toggles.

4. Disconnect the oil lines to the transmission and drain the Hy-Tran fluid.

5. Remove the shift lever knob.

6. Remove the frame top cover and the pin securing the clutch brake yoke (1) to the clutch release yoke (4).



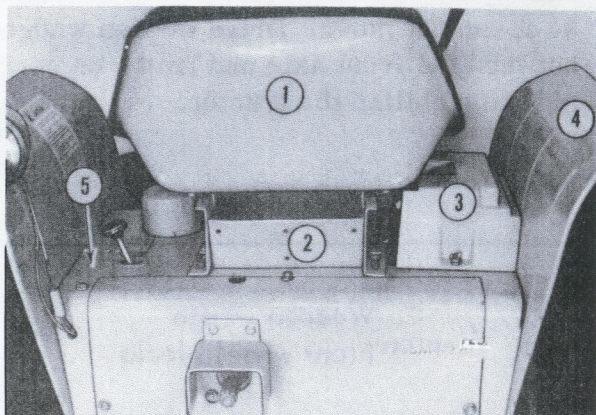
1. Clutch brake yoke
2. Clutch release bracket
3. Pin
4. Clutch release yoke
5. Clutch brake assembly

SPLITTING The TRACTOR

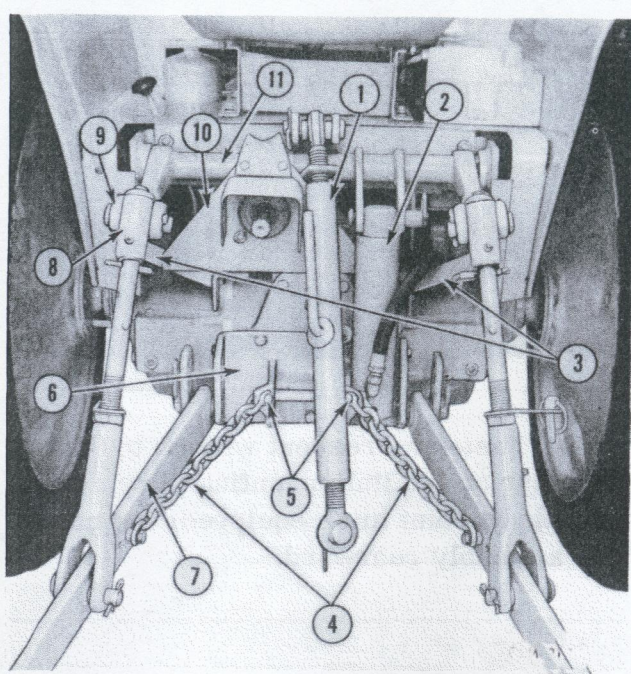
7. Remove the seat (1), and seat support assembly (2) as a unit.

8. Remove the battery (3).

9. Remove the fenders (4) and rear frame cover assembly (5) as a unit.



1. Seat
2. Seat support assembly
3. Battery
4. Fenders
5. Rear frame cover assembly



10. Remove the seat support sheet assemblies. If the tractor is equipped with three point hitch, remove the rockshaft support assembly as follows:

- (a) Remove the pins from the upper and loser ends of the hydraulic cylinder (2).
- (b) Remove the limiter chain shackle pins (5).
- (c) Remove the lower link assemblies (7) from the link mounting plate assembly (6).
- (d) Remove the rear shield braces (3).
- (e) Remove the rockshaft support assembly.

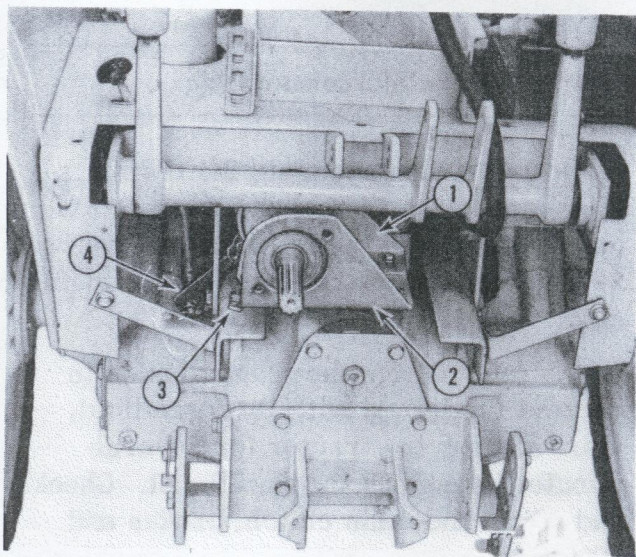
1. Upper link assembly
2. Hydraulic cylinder
3. Rear frame shield braces
4. Limiter chains

5. Chain pins
6. Link mounting plate
7. Lower link assembly
8. Lift link swivel

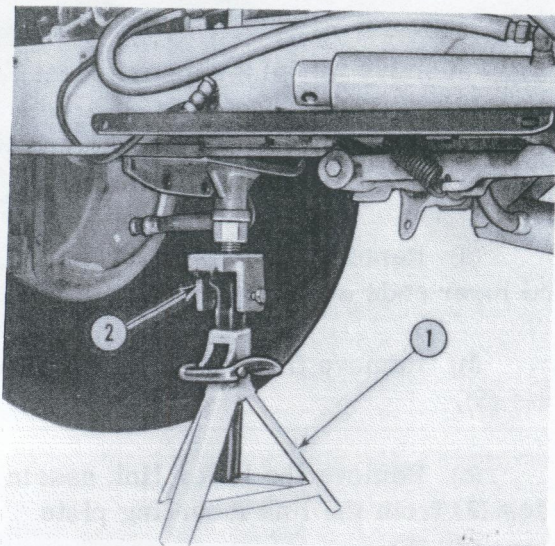
9. Rockshaft arm swivel
10. Shield support
11. Rockshaft support assembly

11. Remove the IPTO as follows:

- (a) Remove the PTO rear shield and support and engage the PTO clutch.
- (b) Remove the PTO brake support (1) and the shaft bearing mounting bracket support (2). Loosen the clutch cleat bracket cap screws (3).
- (c) Disconnect the clutch control arm (4).
- (d) Remove the PTO clutch assembly from the tractor.

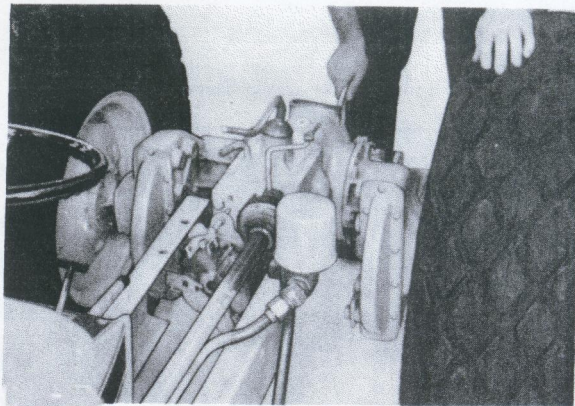


1. Brake support
2. Shaft bearing mounting bracket
3. Clutch cleat bracket
4. Clutch control arm



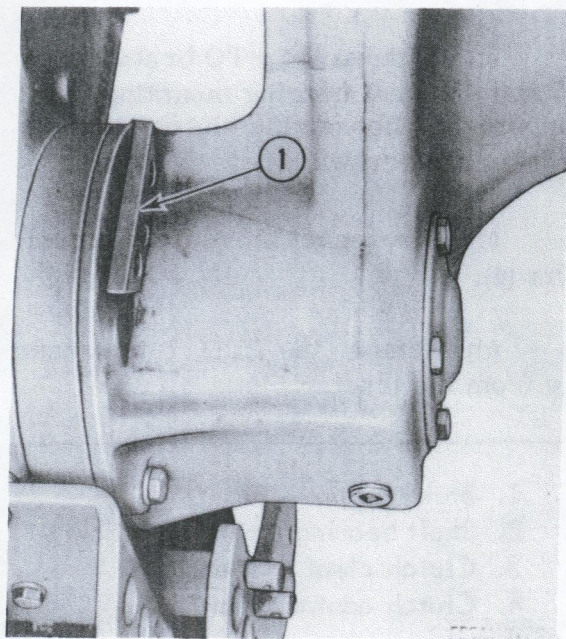
12. Support the frame of the tractor using one jack stand FES 142-4 with an adapter (2), FES 142-13 and remove the cap screws from both sides that secure the transmission case to the frame. Raise the rear of the frame to clear the axle housing.

1. Jack stand FES 142-4
2. Adapter FES 142-13



13. Fasten a crescent wrench to the drawbar or the link mounting plate assembly (three point hitch equipped) and move the assembly rearward.

Recoupling the Tractor



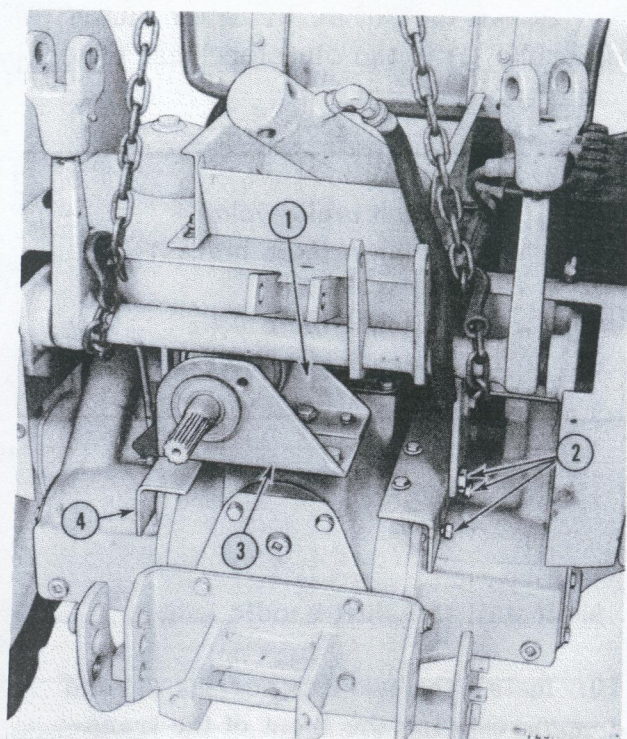
1. Be sure to install the reinforcement block (1) on the R.H. final drive assembly if it was removed.

2. Recouple the tractor by reversing the splitting procedure.

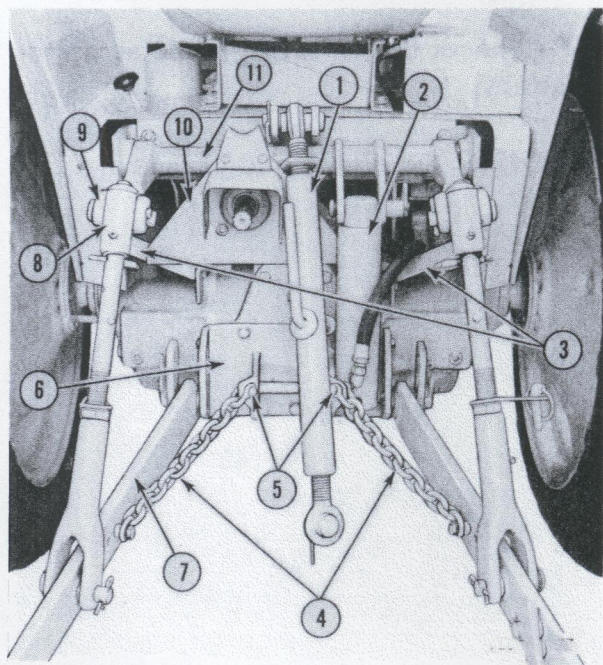
1. Reinforcement block

NOTE: When securing the transmission case to the frame, the two 1-3/8" cap screws go in the left side and the two 2-7/8" cap screws are used on the right side.

3. After filling the transmission to correct fluid level with Hy-Tran fluid, start and run the tractor for several minutes. Recheck the fluid level. Check and adjust the main clutch, brakes and IPTO unit.



1. PTO brake support
2. Cap screws
3. PTO shaft bearing mounting bracket
4. Cap screws (not shown)



1. Upper link assembly
2. Hydraulic cylinder
3. Rear frame shield braces
4. Limiter chains
5. Chain pins
6. Link mounting plate
7. Lower link assembly
8. Lift link swivel
9. Rockshaft arm swivel
10. Shield support

2. Recouple the split sections of the tractor being sure the drive shaft splines mate with the transmission input splines.

3. Install the cap screws (2 and 4) securing the transmission case to the frame and tighten securely.

NOTE: The two 1-3/8" cap screws go in the left side and the two 2-7/8" cap screws are used on the right side.

NOTE: If Tractor is equipped with a creeper drive and PTO, install PTO clutch assembly. Refer to Section 8. Install fenders, seat, and seat support assembly.

4. If the tractor is equipped with independent power take-off, install the bearing mounting bracket support (3) and the PTO brake support (1).

5. Install the rear shield braces (3).

6. If the tractor is equipped with three point hitch, proceed as follows:

(a) Install the upper link assembly (1).

(b) Install the hydraulic cylinder (2) and secure the upper and lower ends with pins.

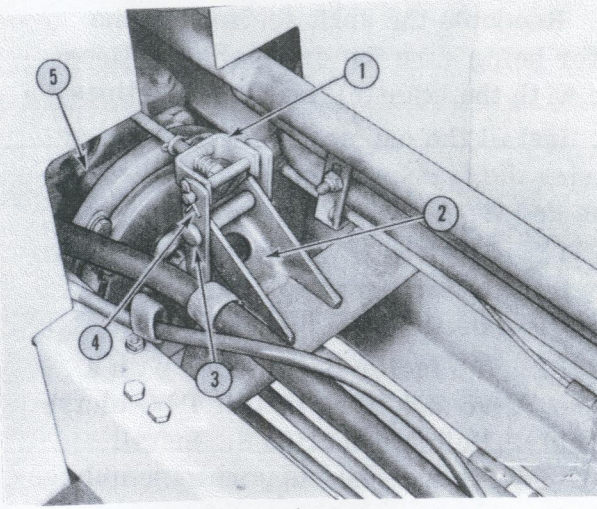
(c) Install the lower link assembly (7) and the lower link pins.

(d) Assemble the lift link swivels (8) to the rockshaft arm swivels (9).

(e) Install the limiter chains (4) and chain shackle pins (5).

7. Install the rear PTO shield support (10) (if so equipped).

8. Install the pin securing the clutch brake yoke (1) to the clutch release yoke (4).



- 1. Clutch brake yoke
- 2. Clutch release bracket
- 3. Pin
- 4. Clutch release yoke
- 5. Clutch brake assembly

9. Install the shift handle knob.

10. Install the two cap screws (A) and spacers securing the front of the transmission to the frame and tighten securely.

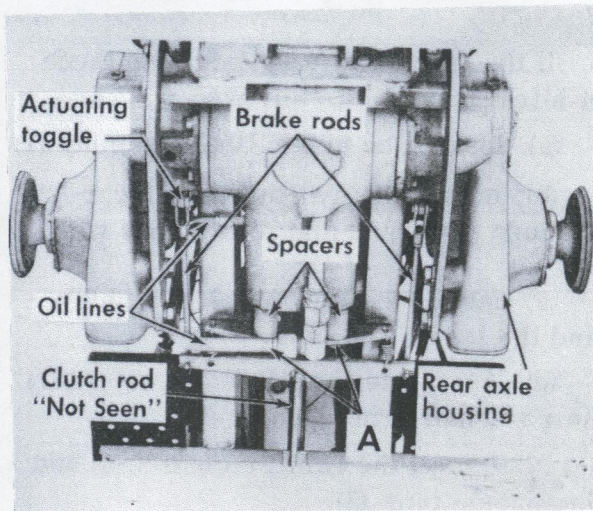
11. Connect the transmission oil lines.

12. Connect the brake rods to the actuating toggles.

13. Fill the transmission to the correct level with Hy-Tran fluid.

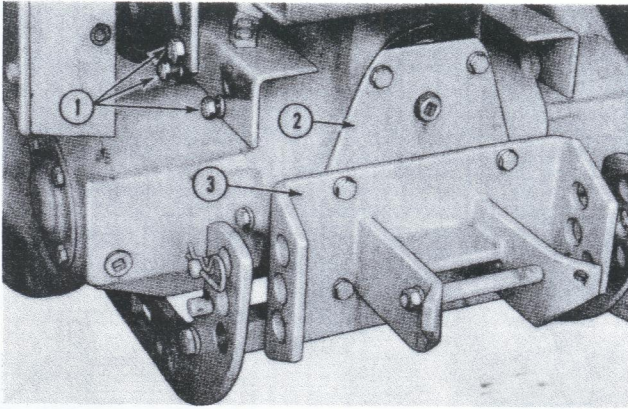
14. Connect the battery ground strap to the battery.

15. Adjust the clutch and brakes.



Removal and Disassembly

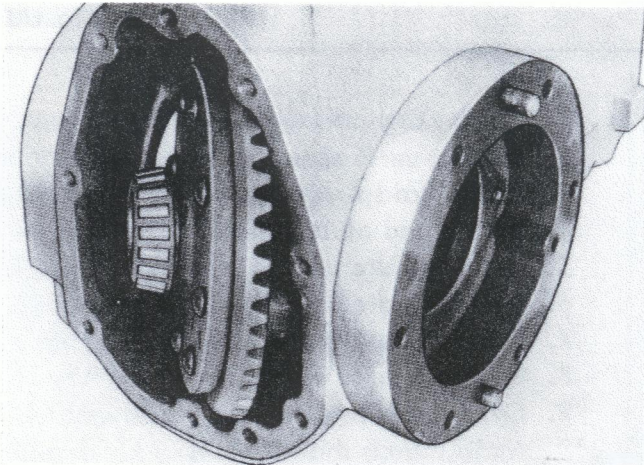
Differential



1. Split the tractor. Refer to Section 5.
2. Remove the final drive assemblies. Refer to Section 7.
3. Remove the hitch link mounting plate (3) (if so equipped) and the transmission rear cover plate (2).

1. Cap screws (both sides)
 2. Rear cover plate
 3. Link mounting plate assembly

4. Remove the bearing retainers and shims from each side of the differential. Be sure to keep the shims with each retainer and identified for each side.



5. Turn the differential into position as shown and remove it from the transmission case. If the assembly will not clear the side of the transmission case, it will be necessary to remove the R. H. bearing cone.

Valve Tappets

Diameter - inch	.591 - .592
Length - inches	2.370 - 2.380
Clearance in crankcase - inch	.0007 - .0032
Valve lash (engine cold) - inch	.015

Valve Timing

Intake opens - degrees	10 before TDC
Intake closes - degrees	45 after BDC
Exhaust opens - degrees	45 before BDC
Exhaust closes - degrees	5 after TDC

Cylinder Head

Bolt diameter - inch	3/8
Torque - ft. lbs.	45

Timing Gears

Crankshaft pinion	18 teeth
Camshaft gear	36 teeth
Idler gear	36 teeth
Governor-ignition gear	18 teeth
Type of teeth	Helical
Backlash - inch	.003 - .006
Idler shaft retainer bolt tension	90 ft. lbs.

Lubrication System

Oil pressure at 2200 rpm - psi	30
--------------------------------	----

Oil pump

Type	Gear
Drive	Direct from camshaft
Gear backlash - inch	.003 - .006
Number of teeth	

Idler gear	13
Drive gear	13

Oil pressure valve regulating spring

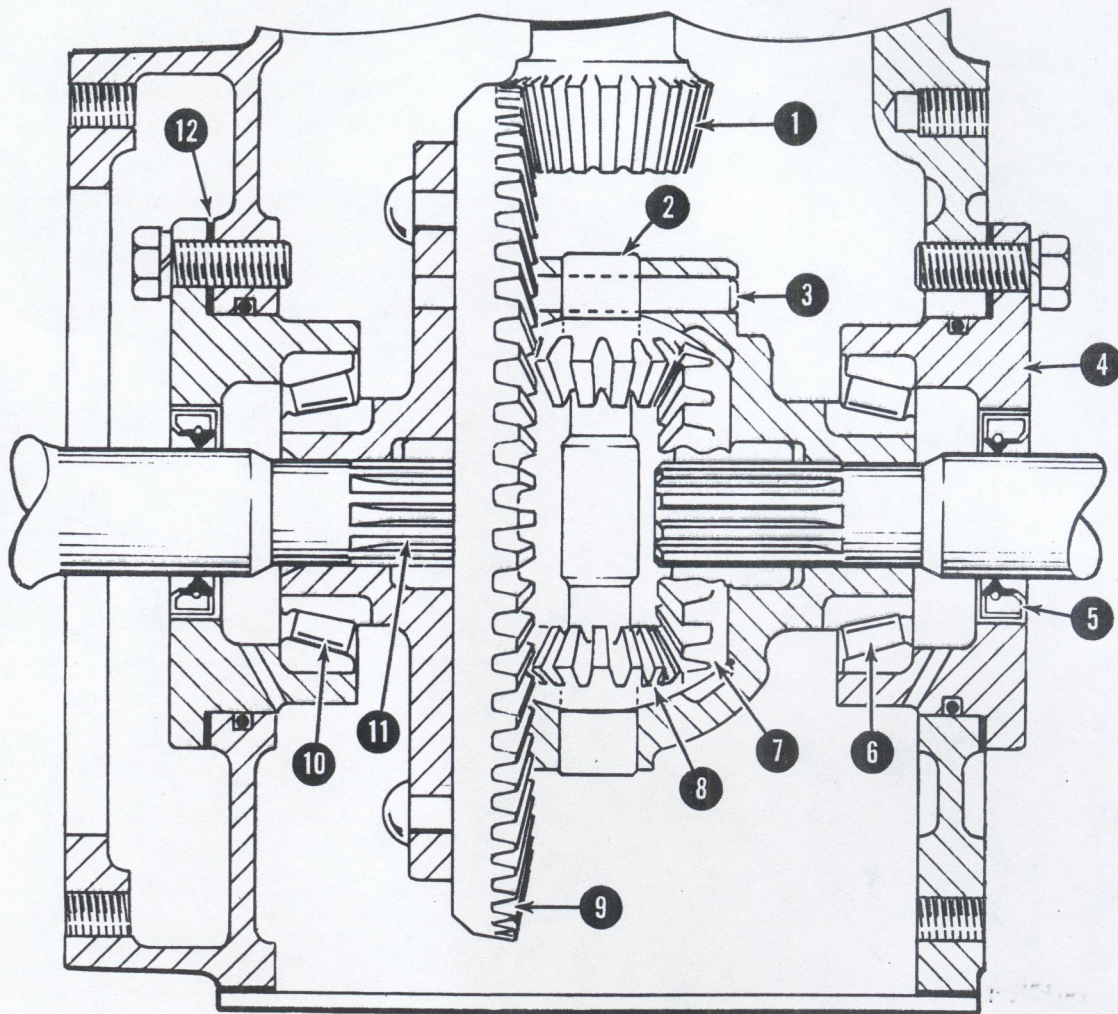
Free length - inches	2-31/32
Test length - inches	2-15/32
Test load - pounds	9-1/2

Pressure regulating valve

Valve diameter - inch	.6205 - .6215
Location	In crankcase

Special Torques (foot pounds)

Cylinder head	45
Main bearing	55
Connecting rod	16
Flywheel	45
Idler gear retainer bolt	90
Manifold	20
Crankshaft pulley	80
Spark plugs	30



1. Bevel pinion
2. Pinion shaft
3. Lock pin
4. Bearing retainer
5. Oil seal
6. R.H. bearing
7. Side gear (2)
8. Pinion (2)
9. Drive gear
10. L.H. bearing
11. Differential shaft
12. Shims

6. Drive out the pinion shaft lock pin (3) and remove the pinion shaft (2).

7. Remove the pinion gears (8) and side gears (7).

8. If the differential drive gear (9) requires separate replacement, press out the eight retaining rivets.

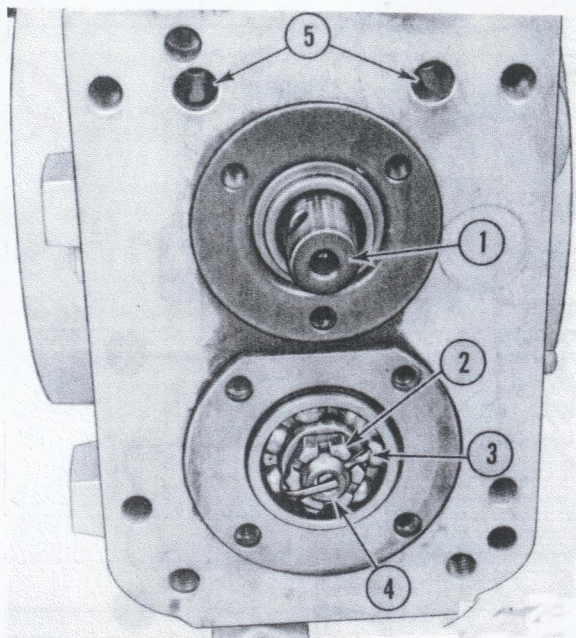
9. Remove the bearing cones (6 and 10) from the differential carrier if they are to be replaced.

10. Remove the bearing cups from the bearing retainers if replacement is necessary.

11. Remove the oil seals (5) from the bearing retainers (4).

Disassembly

Transmission



1. Remove the differential as previously described on page 6-4.

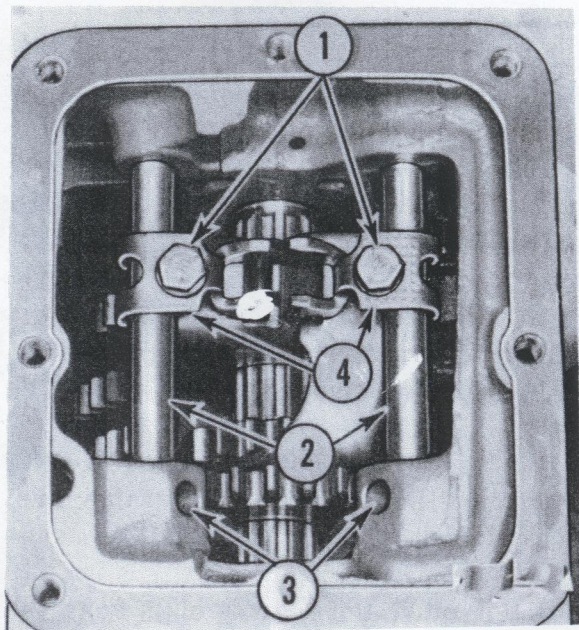
2. Remove the gear shift lever and cover assembly.

3. Remove the countershaft bearing retainer cap.

4. Remove the cotter pin (3) from the countershaft nut (2).

5. Shift the transmission into two gear speeds to lock the transmission, then remove the nut from the countershaft.

- 1. Spline and clutch shaft
- 2. Countershaft nut
- 3. Cotter pin
- 4. Countershaft
- 5. Shifter rod bores

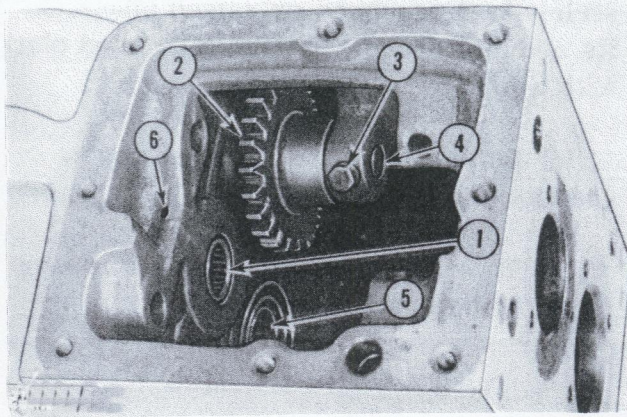


6. Shift the transmission into the neutral position and remove the shifter fork set screws (1).

7. Using a brass rod, drive the shifter rods (2) forward and out of the case, and remove the shifter forks (4).

CAUTION: Cover the shifter poppet ball holes (3) to prevent the balls and springs from flying out as the rods are removed.

- | | |
|----------------------------|----------------------|
| 1. Shifter fork set screws | 3. Poppet ball holes |
| 2. Shifter rods | 4. Shifter forks |



1. Spline and clutch shaft rear bearing
2. Reverse idler gear assembly
3. Set screw
4. Expansion plug
5. Countershaft rear bearing
6. Oil passage

8. Remove the countershaft bearing retainer and shims. Be sure to keep the shims with the retainer for use in re-assembly.

9. Remove the spline and clutch shaft front bearing retainer and oil seal.

10. Move the spline and clutch shaft forward and out of the transmission case as the gears are removed. Keep the gears in correct order for proper reassembly.

11. Move the countershaft rearward and out of the transmission case as the gears and spacers are removed. Note the sequence of spacers and gears for reassembly.

12. To remove the reverse idler shaft and gear assembly, remove the set screw (3) and remove the shaft, reverse idler gear assembly (2) and expansion plug (4). Press the bushing out of the reverse idler gear if the bushing is to be replaced.

13. Remove the bearings (1 and 5) from the transmission case if they are to be replaced.

Inspection and Repair

1. Wash all parts in cleaning solvent and dry with compressed air. Do not spin bearings.

2. Check all bearings for looseness, wear, roughness, pitting and scoring, and replace if necessary.

3. Check the gears and shafts for wear and burrs. Remove any burrs with a fine stone.

4. Inspect the housing for cracks, restricted oil passages or raised places on its machine faces. Smooth off raised places with a file.

5. Be sure to install new oil seals, gaskets and O-rings.

6. Thoroughly lubricate all parts with Hy-Tran before reassembly.

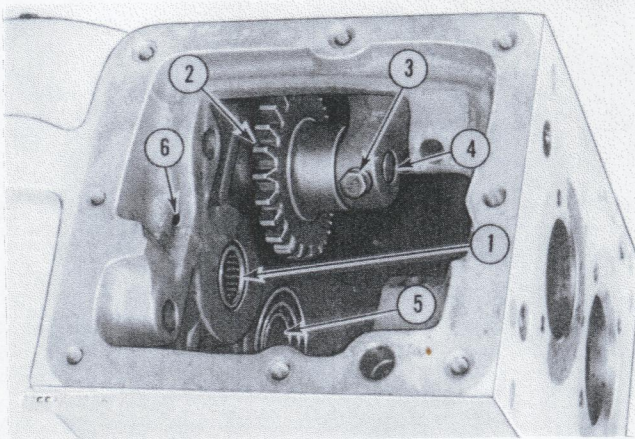
Reassembly and Installation

Transmission and Differential

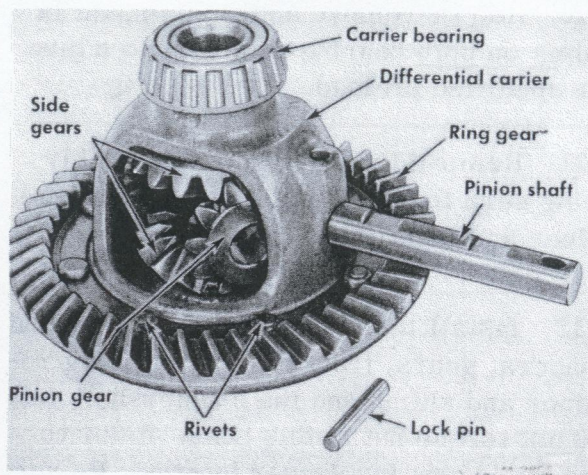
1. Be sure all bearings are thoroughly lubricated before reassembly.

2. Be sure to replace all gaskets, O-rings and oil seals.

3. Install new bearings (1 and 5) in the transmission case if they were removed. **BE SURE** the spline and clutch shaft rear bearing (1) is installed with its oil passage aligned with the oil passage (6) in the case.



1. Spline and clutch shaft rear bearing
2. Reverse idler gear assembly
3. Set screw
4. Expansion plug
5. Countershaft rear bearing
6. Oil passage



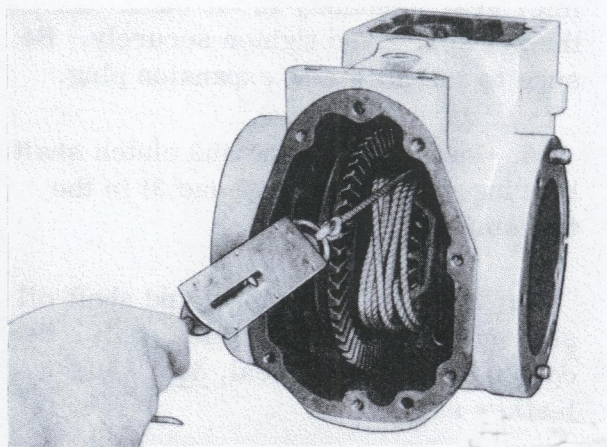
4. Assemble the side gears and the pinion gears in the differential case assembly.

5. Install the pinion shaft and drive the pinion shaft lock pin into place.

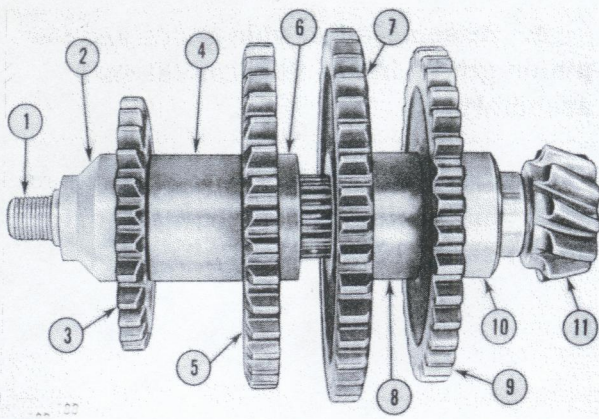
6. Install the differential assembly in the transmission case. The drive gear must be on the left with the teeth facing right.

7. Press the R. H. bearing on the differential carrier if it was removed during disassembly.

8. Be sure to install new O-rings and oil seals. Install the bearing retainers and shims. Install the cap screws and tighten to 45 ft. lbs. torque.



9. Check bearing preload before installing the transmission countershaft. Preload is correct when a steady pull of one to eight pounds is necessary to rotate the differential assembly.



- | | |
|-------------------|-----------------------|
| 1. Countershaft | 7. 1st Speed gear |
| 2. Spacer | 8. Spacer |
| 3. 3rd Speed gear | 9. Reverse speed gear |
| 4. Spacer | 10. Spacer |
| 5. 2nd Speed gear | 11. Bevel pinion |
| 6. Spacer | |

10. Add or remove an equal amount of shims on both bearing retainers to adjust for specified preload.

11. Remove the differential assembly being sure to keep the shims with each retainer and identified for each side.

12. Install the transmission countershaft, spacers, gears, front bearing, bearing retainer and shims and the countershaft nut. Do not torque nut at this time. Refer to Specifications for spacer lengths. Be sure to install a new O-ring and gasket.

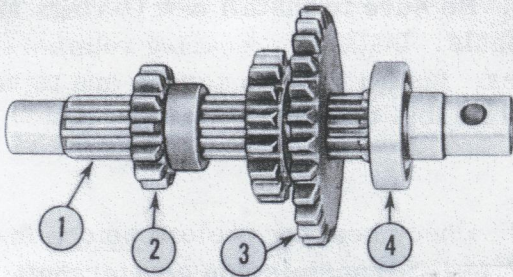
13. If the reverse idler bushing is to be replaced, press the bushing into the gear until the edge is flush with the gear face. Ream the bushing to the specified I. D. of .612 to .613 inch.

14. Install the reverse idler shaft and idler gear assembly in the case. Install the set screw and tighten securely. Be sure to install a new expansion plug.

15. Install the spline and clutch shaft (1), bearing (4) and gears (2 and 3) in the transmission case.

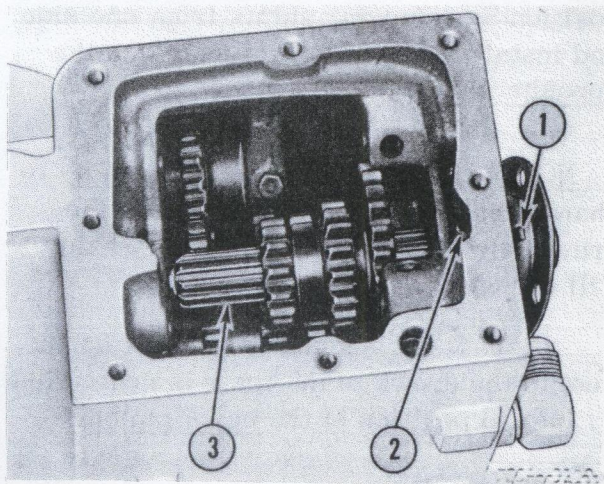
16. Install a new gasket and shaft oil seal on the clutch and spline shaft. Use a double lip neoprene seal, do not use a leather seal.

17. Install the cap screws and tighten to 25 ft. lbs. torque.

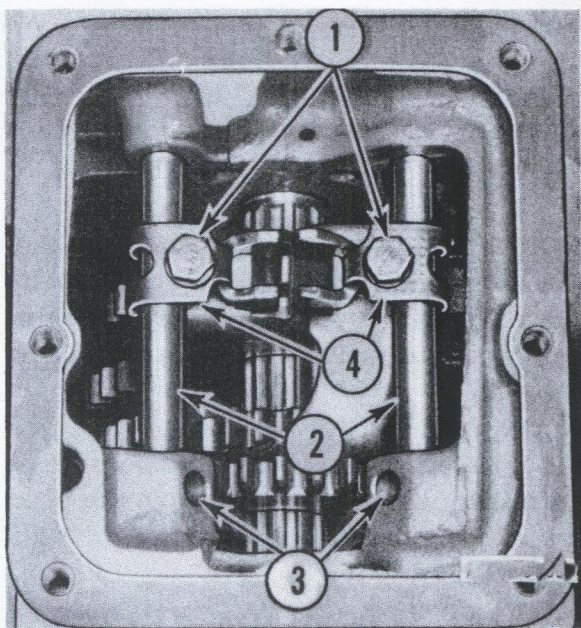


- | |
|---------------------------------------|
| 1. Spline and clutch shaft |
| 2. 1st and reverse speed sliding gear |
| 3. 2nd and 3rd speed sliding gear |
| 4. Shaft front bearing |

NOTE: Be sure the slot in the oil seal (1) is aligned with the oil passage (2) in the case.



- 1. Shaft oil seal slot
- 2. Oil passage
- 3. Spline and clutch shaft



- 1. Shifter fork set screws
- 2. Shifter rods
- 3. Poppet ball holes
- 4. Shifter forks

18. Install the gear shift poppet springs and balls in their bores (3).

19. Depress the springs and balls and install the shifter forks (4) and shifter rods (2).

20. Lock the forks in place with the set screws (1) and tighten securely.

21. Be sure to install new expansion plugs in the front shifter rod bores.

22. Shift the transmission into two speeds to lock the gears, and then tighten the countershaft nut to 85 to 100 ft. lbs. torque.

23. Install the cotter pin in the nut and countershaft. Install the bearing retainer cap and gasket and tighten the cap screws to 25 ft. lbs. torque.

24. Install the differential assembly in the case. The drive gear must be on the left with teeth facing right.

25. Install the R. H. carrier bearing if it was removed.

26. Keeping preload shim pack correct as previously established, install the bearing retainers and cap screws and tighten to 45 ft. lbs. torque.

27. Check the backlash between the drive gear and bevel pinion and the gear teeth bearing pattern as follows.

(a) Apply a thin coat of red lead or prussian blue to the bevel pinion teeth faces, then rotate the gears by hand and observe the bearing pattern.

Some deflection will occur under load. Allowance is made in gear design to prevent concentration of load on tooth edges.

(b) Hand testing and very light loads should provide a pattern as shown in Figure "B". When load and deflection increases the pattern will progress as in Figure "A".

(c) The desirable (no load) pattern in Figure "B" is the result of adjusting the differential drive gear lateral position to the specified range of .003" to .005" backlash.

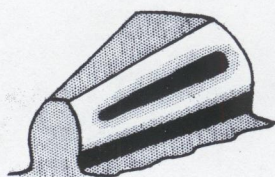


Figure A

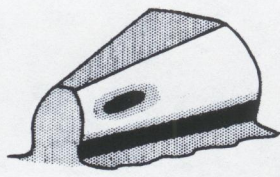


Figure B

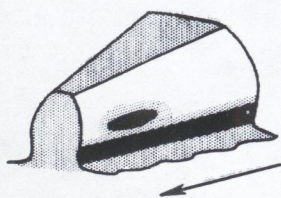


Figure C

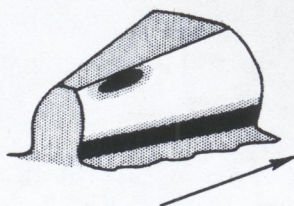


Figure D

(d) Adjust the drive gear lateral position by removing shims from one side and installing the shims removed on the opposite side.

NOTE: Do not add or remove shims to change the total amount of shims in the previously established shim pack as this will change the bearing preload.

(e) Tooth bearing position from the root to the crown of the tooth is controlled by lateral position of the bevel pinion.

(1) If low tooth bearing position on the bevel pinion is indicated (as shown in Figure "C") the pinion must be adjusted towards the drive gear.

(2) If high tooth bearing position on the bevel pinion is indicated (as shown in Figure "D"), the pinion must be adjusted away from the drive gear.

(f) Adjust the bevel pinion by adding or removing shims between the bearing retainer and the transmission case.

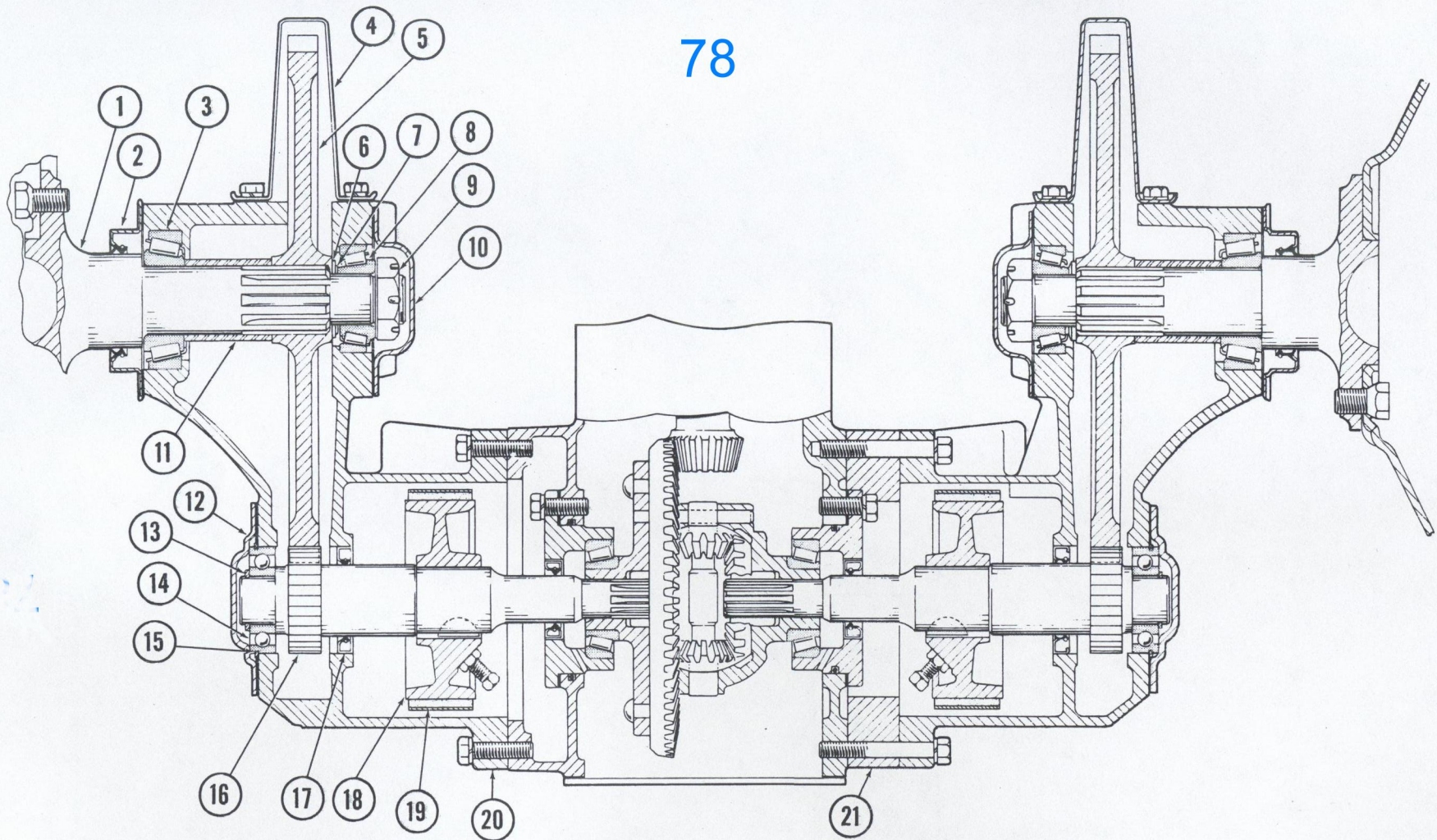
NOTE: If it is necessary to move the bevel pinion in or out to correct "Root-to-crown" bearing, the drive gear must also be moved laterally to maintain the specified backlash.

28. Install the final drive assemblies on the transmission case. Be sure the spacer is in place on the R. H. final drive. (Refer to Section 7.)

29. Install the gear shift lever and cover assembly.

30. Install the transmission rear cover plate and the link mounting plate assembly (if equipped).

31. Recouple the tractor. Refer to Section 5.

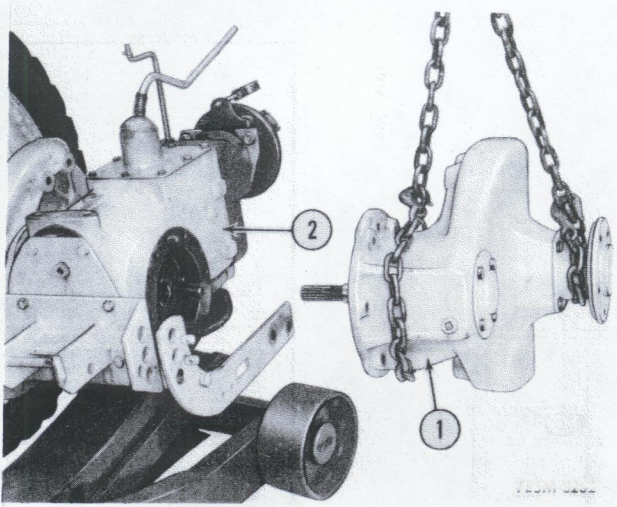


- | | | |
|----------------------|----------------------------|---------------------------------|
| 1. L. H. axle | 8. Inner bearing | 15. Bearing snap ring |
| 2. Oil seal | 9. Axle nut | 16. Differential shaft and gear |
| 3. Outer bearing | 10. Bearing cap | 17. Oil seal |
| 4. Housing pan | 11. Bearing spacer | 18. Brake drum |
| 5. Drive gear | 12. Shaft bearing retainer | 19. Brake band |
| 6. Drive gear spacer | 13. Bearing lock ring | 20. L. H. rear axle housing |
| 7. Shims | 14. Bearing | 21. Rear axle spacer |

Final Drive

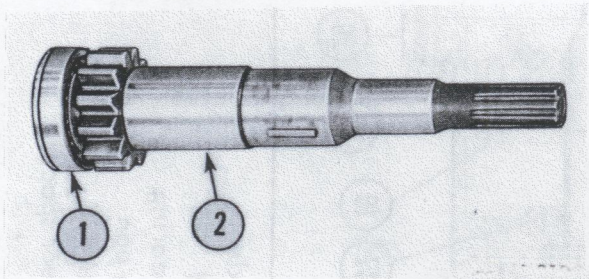
REMOVAL – Final Drive

1. Split the tractor. Refer to Section 5.
2. Remove the drain plugs in each rear axle housing and drain the lubricant.
3. Support the transmission and remove the rear wheels.
4. Remove the cap screws securing the rear axle housings to the transmission case.
5. Support the transmission and final drive assemblies and remove the assemblies from the transmission.

- 
1. Final drive assembly
 2. Transmission assembly

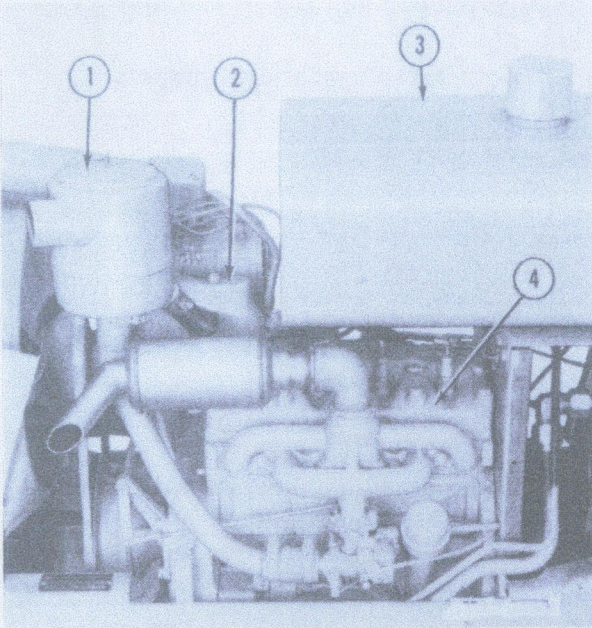
DISASSEMBLY – Differential Shaft

1. Remove the bearing retainer cap.
2. Loosen the lock nut and set screw securing the brake drum to the differential shaft and remove the brake assembly from the shaft.
3. Remove the differential shaft from the rear axle housing.
4. Remove the retaining ring and pull the ball bearing assembly (1) off the shaft (2).
5. Remove the oil seal from the housing.

- 
1. Bearing
 2. Differential shaft

CYLINDER HEAD

Removal



1. Remove the pipe plug in the water inlet elbow and drain the coolant.

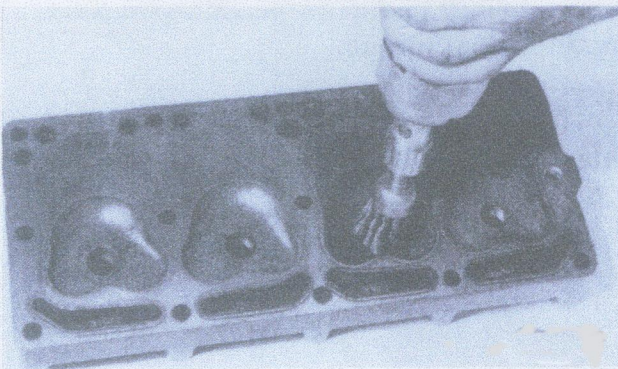
2. Remove the hood, fuel tank (3), air cleaner (1) and water outlet elbow (2).

3. Remove the spark plugs.

4. Remove the cylinder head cap-screws and lift off the cylinder head and gasket.

- 1. Air cleaner
- 2. Water outlet elbow
- 3. Fuel tank
- 4. Cylinder head

Inspection And Repair



1. Check the head and gasket for "blow-by" or compression leaks.

2. Remove carbon from combustion chamber cavities with a wire brush.

3. Clean cylinder head combustion cavities with cleaning solution.

4. Carefully inspect head for cracks.

DISASSEMBLY – Rear Axles

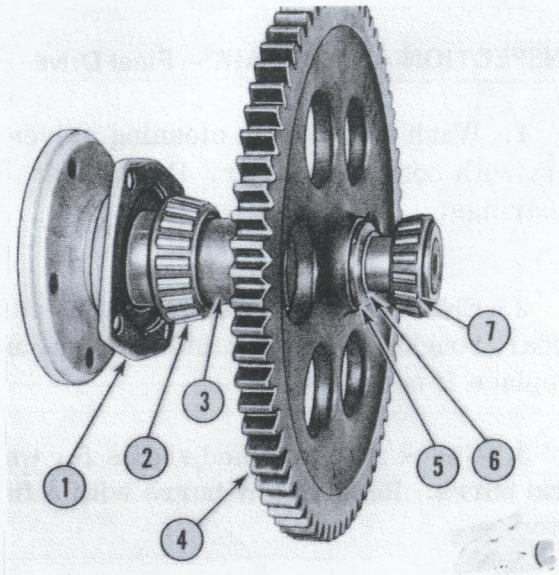
1. Remove the rear axle housing pan and gasket.
2. Remove the rear axle bearing cap.
3. Remove the cotter pin from the rear axle nut. Block the rear axle drive gear to prevent the shaft from turning and remove the nut.
4. Remove the cap screws securing the rear axle oil seal to the housing.
5. Press the rear axle out of the housing and remove the rear axle drive gear, spacers and shims. Be sure to retain the shims and spacers for use in reassembly.
6. Remove the outer bearing and remove the oil seal.

INSPECTION AND REPAIR – Final Drive

1. Wash all parts in cleaning solvent and dry with compressed air. Do not spin bearings.
2. Check all bearings for looseness, wear, roughness, pitting and scoring, and replace if necessary.
3. Check all gears and shafts for wear and burrs. Remove any burrs with a fine stone.
4. Replace all gaskets and oil seals.
5. Check for any damaged or worn snap ring retainers, and replace if necessary.
6. Lubricate bearings and gears before reassembly.

REASSEMBLY — Rear Axles

NOTE: Install the rear axles before installing the differential shafts.



1. Outer oil seal
2. Outer bearing
3. Spacer
4. Rear axle drive gear
5. Spacer
6. Shim
7. Inner bearing

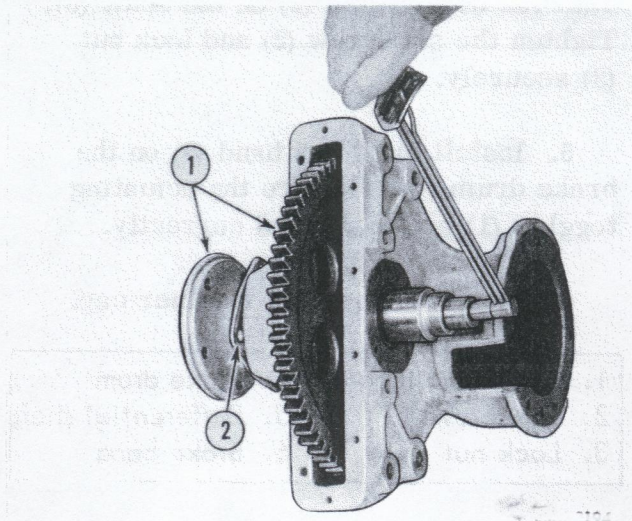
1. Be sure to replace the outer oil seals (1) and gaskets.

2. Press the outer bearing (2) on the rear axle. Be sure the bearing bottoms against the shoulder on the shaft.

3. Install the rear axle assembly in the housing. Be sure the spacers (3 and 5) and shims (6) are installed in the proper order.

4. Press the inner bearing (7) on the shaft.

5. Install the rear axle nut and tighten securely.



1. Rear axle assembly
2. Rear axle oil seal

6. Check for specified bearing pre-load as follows:

a. A drag torque of 10 to 20 inch pounds is necessary to rotate the rear axle assembly before the outer oil seal is bolted in place. Read rolling torque, not starting torque.

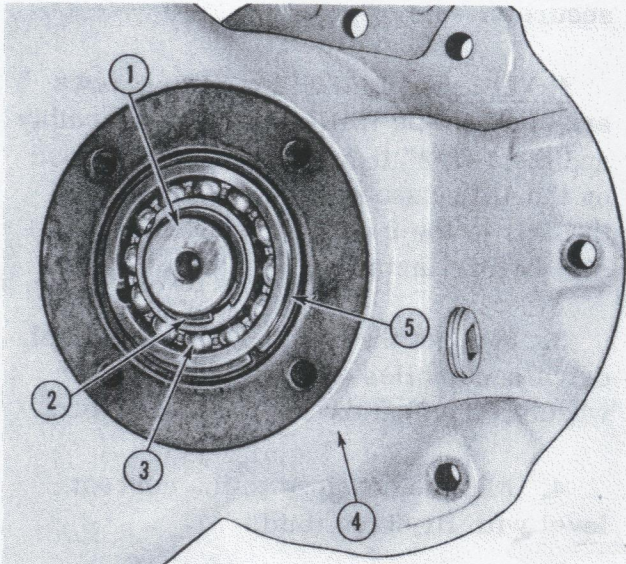
b. To adjust for specified pre-load, remove the rear axle assembly from the housing and add or remove shims.

7. Install the cotter pin in the rear axle nut.

8. Bolt the outer oil seal in place.

9. Install the bearing cap.

10. Install the axle housing pan and gasket.



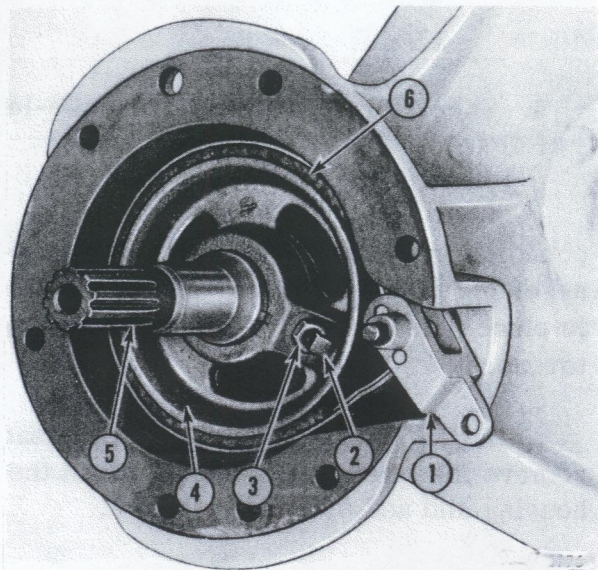
- | | |
|-----------------------|----------------------|
| 1. Differential shaft | 4. Rear axle housing |
| 2. Lock ring | 5. Snap ring |
| 3. Bearing | |

REASSEMBLY – Differential Shafts

1. Install a new oil seal.

2. Press the ball bearing assembly (3) on the shaft (1) and install the bearing lock ring (2).

3. Install the differential shaft (1) in the housing (4) and be sure the outside snap ring (5) is against the housing (4).



4. Align the brake drum keyway with the key on the differential shaft and install the brake drum (4) on the shaft (5). Tighten the set screw (2) and lock nut (3) securely.

5. Install the brake band (6) on the brake drum (4). Be sure the actuating toggles (1) are positioned correctly.

6. Install the bearing retainer cap.

- | | |
|----------------------|-----------------------|
| 1. Actuating toggles | 4. Brake drum |
| 2. Set screw | 5. Differential shaft |
| 3. Lock nut | 6. Brake band |

INSTALLATION - Final Drive

1. Be sure the spacer is on the R.H. final drive assembly and install the final drive assemblies on the transmission case.

2. Install the cap screws and tighten securely.

NOTE: The 2-7/8" long cap screws are used on the R.H. final drive assembly and the 1-7/8" long cap screws are used on the L.H. assembly. Apply sealer to the bolt in the 9 o'clock position on right side before installing.

3. Support the transmission and final drive assemblies and install the rear wheels. Tighten the lug bolts securely.

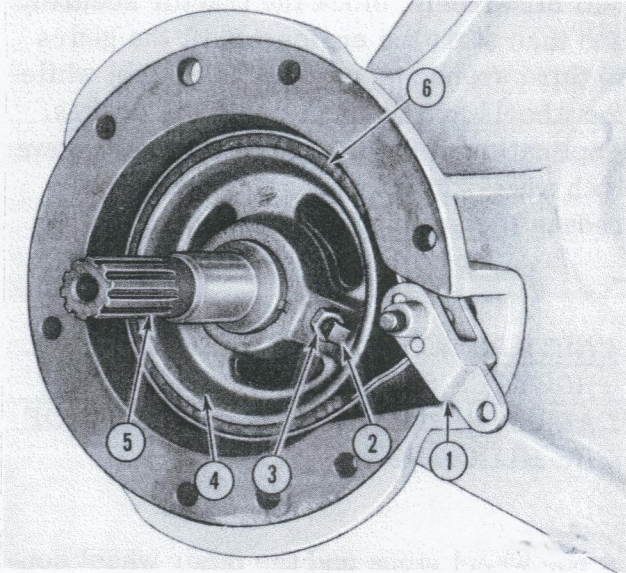
4. Fill the housings to the correct level with Hy-Tran fluid.

5. Recouple the tractor. Refer to Section 5.

Brakes

REMOVAL — Brakes

1. Split the tractor. Refer to Section 5.



2. Remove the final drive assemblies. Refer to page 7-4.

3. Remove the brake bands (6) from the brake drums (4).

4. Loosen the lock nut (3) and set screw (2) and remove the brake drum (4) from the differential shaft (5).

1. Actuating toggle
2. Set screw
3. Lock nut
4. Brake drum
5. Differential shaft
6. Brake band

INSPECTION AND REPAIR — Brakes

1. Inspect the brake band and drum for damage and excessive wear. Replace them if there is any doubt of their serviceability.

2. Inspect the control rods for wear at their connecting pivot points.

3. Check the pedal return spring ends for wear.

INSTALLATION — Brakes

1. Align the keyway in the brake drum with the key on the differential shaft and install the drum on the shaft. Tighten the set screw and lock nut securely.
2. Install the brake band on the drum.
3. Install the final drive assembly on the transmission case. Refer to page 7-8.
4. Recouple the tractor. Refer to Section 5.

BRAKE ADJUSTMENT — Single Pedal Brakes

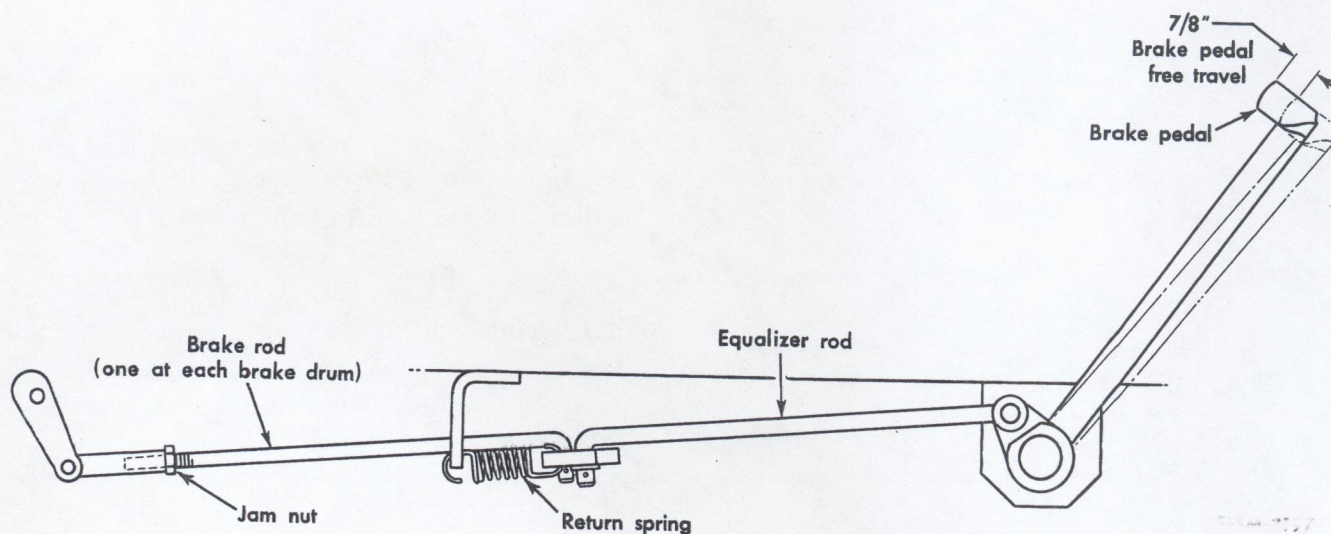
To adjust the brakes, jack up the rear end of the tractor. Loosen the jam nuts at the end of the brake rods and remove the cotter pins at the brake equalizer rod. Unhook the brake rods and turn them in or out of the clevises. The brakes should not drag before they take hold. Adjust the brake

linkage so there is brake pedal free travel, by hand, of approximately 7/8 inch.

It is very important to have the brakes equalized. To check the equalization of the brakes, jack up both rear wheels so they will turn freely, block the tractor securely and then start the engine. Shift the gears to third speed and engage the clutch; while the wheels are turning, apply the brakes. Application of the brakes should slow down both wheels at the same time and also reduce the speed of the engine.

CAUTION: AVOID HIGH SPEED THROTTLE SETTINGS THAT MIGHT CAUSE THE TRACTOR TO SLIP OFF OF THE BLOCKING.

If one wheel stops and the other wheel continues to revolve when the brakes are applied, adjust the brake rod on the wheel that stops so both wheels stop simultaneously when the brakes are applied.



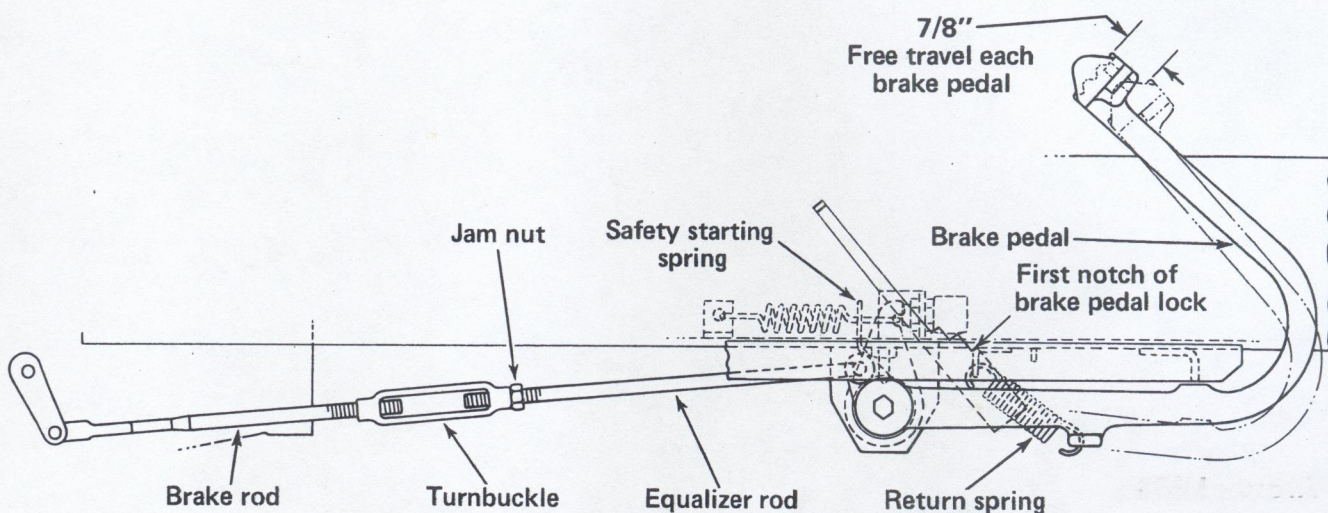
Single pedal brakes.

To check the brakes for proper adjustment, latch the pedals together, engage the first or second notch of the brake pedal lock against the platform, place the transmission in first gear, and set the engine at low idle. Release of the clutch should stall the engine without moving the tractor.

To adjust the brakes, jack up the rear end of the tractor. Loosen the jam nuts at the end of the equalizer rods and turn the turnbuckles in or out. Brakes are properly adjusted when each wheel drags slightly when turned.

It is very important to have the brakes equalized. To check the equalization of the brakes, jack up both rear wheels so they will turn freely, block the tractor securely and then start the engine. Shift the gears to third speed and engage the clutch; while the wheels are turning, lock the brake pedals together so they operate in unison, and apply the brakes. Application of the brakes should slow down both wheels at the same time and reduce the speed of the engine.

If one wheel stops and the other wheel continues to revolve when the brakes are applied, adjust the turnbuckle on the wheel that stops just enough so both wheels stop simultaneously when the brakes are applied.



Two pedal brakes.

Checks Before Removal

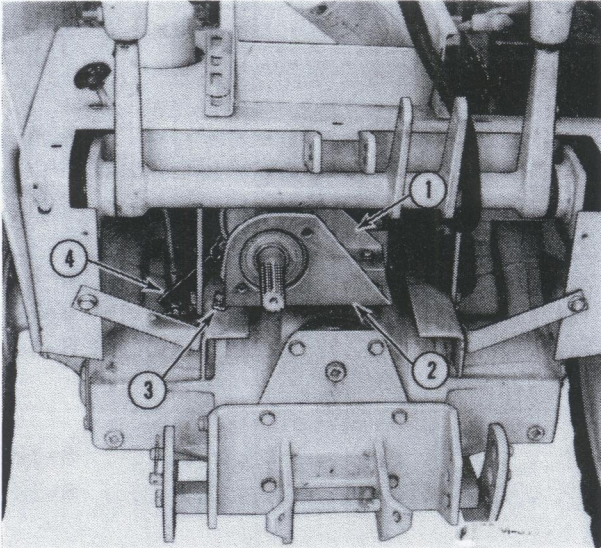
(154 & 185 Tractors)

Check the tension on the drive belts.
See page 8-11.

Engage the PTO unit and secure the PTO drive shaft to prevent it from turning. A torque wrench is applied to the rear PTO

shaft using a 15/16 inch socket plus two 1/8 inch Allen wrenches between splines. The PTO clutch assembly must withstand a minimum of 80 ft. lbs. torque before any slippage occurs.

Removal



1. Brake support
2. Bearing mounting bracket support
3. Clutch cleat bracket
4. Clutch control arm

IPTO Clutch Assembly

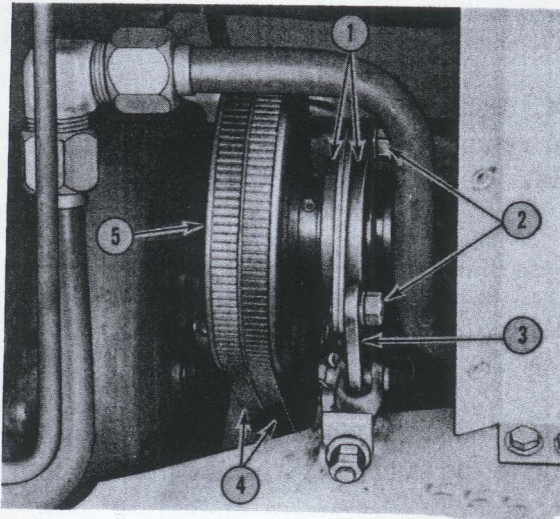
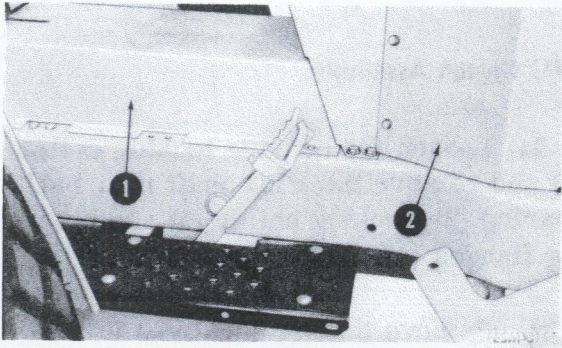
1. Remove the PTO rear shield and support.
2. Remove the PTO brake support (1) and the shaft bearing mounting bracket support (2). Loosen the clutch cleat bracket cap screws (3).
3. Disconnect the clutch control arm (4).
4. Remove the PTO clutch assembly from the tractor.

NOTE: Tractors equipped with a 3 pt. hitch will require removal of the rock-shaft to remove the clutch assembly.

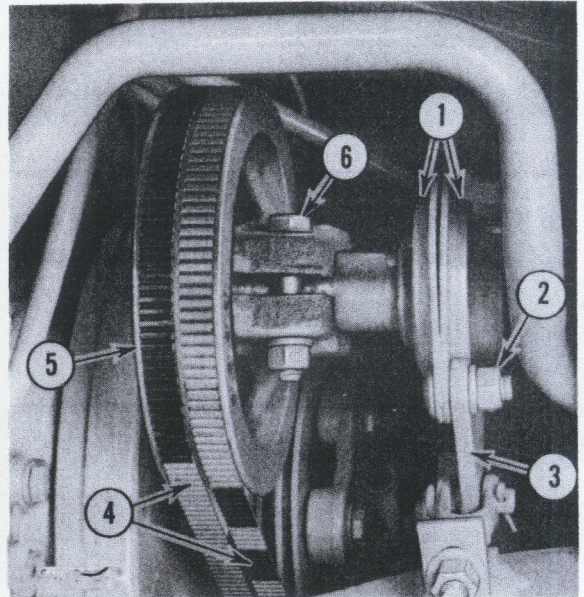
IPTO Drive Shaft

1. Remove the frame top cover (1) and pedestal side sheet sections (2).

- | |
|---|
| <ol style="list-style-type: none"> 1. Frame top cover 2. Pedestal side sheet sections (2) |
|---|



U018709 and Below.



Above U018709.

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Bearing flanges 2. Nuts 3. Shaft and pulley adjuster | <ol style="list-style-type: none"> 4. PTO drive belts 5. PTO driven pulley 6. Pulley retaining bolt |
|---|--|

2. Loosen the cap screws on the shaft and pulley adjuster (3) and release the belt tension and remove the belts (4) from the upper pulley (5).

3. Remove the bolts and nuts (2) securing the bearing flanges (1) to the adjuster (3).

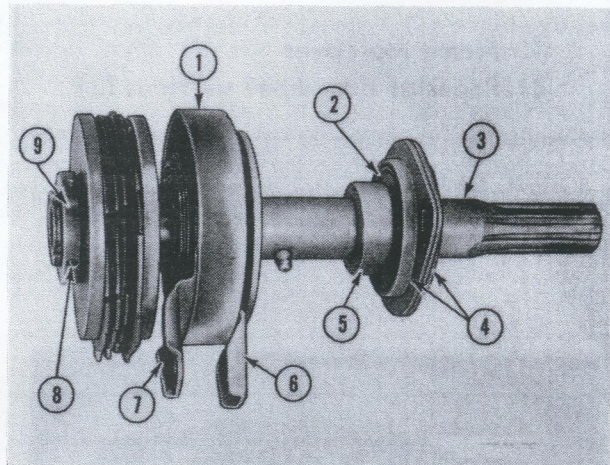
4. Remove the pulley retaining ring or bolt.

5. Pull the drive shaft out of the pulley and remove the pulley.

6. Remove the shaft from the tractor.

Disassembly

IPTO Clutch Assembly



- | | |
|----------------------|--------------------------|
| 1. Cam cover | 6. Stationary cam |
| 2. Rear ball bearing | 7. Actuating cam |
| 3. PTO shaft | 8. Set screw |
| 4. Bearing flanges | 9. Lock nut or snap ring |
| 5. Locking collar | |

1. Loosen the bearing locking collar (5) and remove the PTO shaft rear ball bearing (2), locking collar (5) and bearing flanges (4).

2. Remove the set screw (8) in the lock nut (9) or snap ring and shims from the shaft. Be sure to keep the shims for use in reassembly.

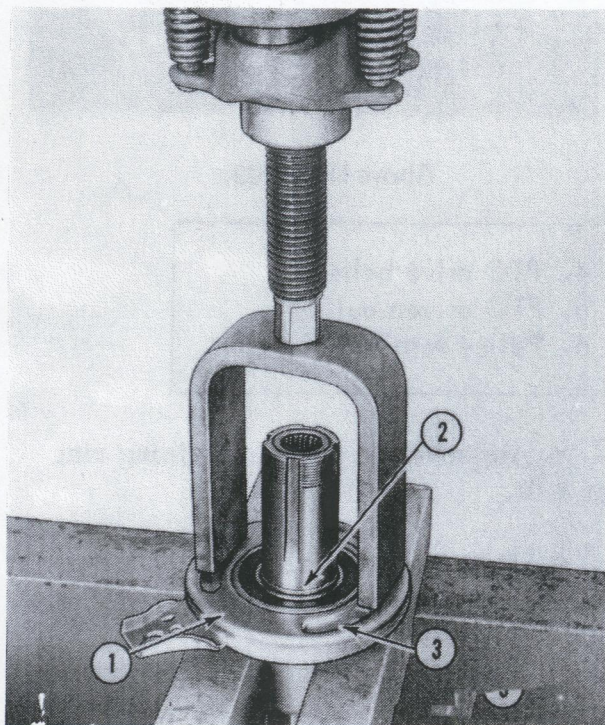
3. Remove the clutch assembly components from the PTO shaft (3) being sure to note their position for reassembly.

4. Remove the cam cover (1), and then remove the actuating cam (7) and balls.

5. Compress the load spring and remove the snap ring retainer (2).

6. Carefully release the load spring pressure and remove the stationary cam and the load spring from the shaft.

7. Press the cam bearings out of the cams if they are to be replaced.



- | |
|-----------------------|
| 1. Stationary cam |
| 2. Snap ring retainer |
| 3. Ball slots |

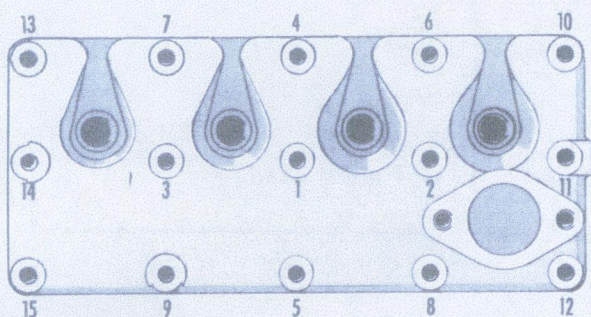
5. Use a straight edge and inspect for warped head, particularly in any area which shows "blow-by."

6. Inspect water jacket in head for an accumulation of rust or lime deposit which would affect circulation of cooling water

and cause hot spots. Clean if necessary.

7. Thoroughly clean the gasket surface to insure proper sealing of the new gasket.

8. Be sure to use a new gasket.



Installation

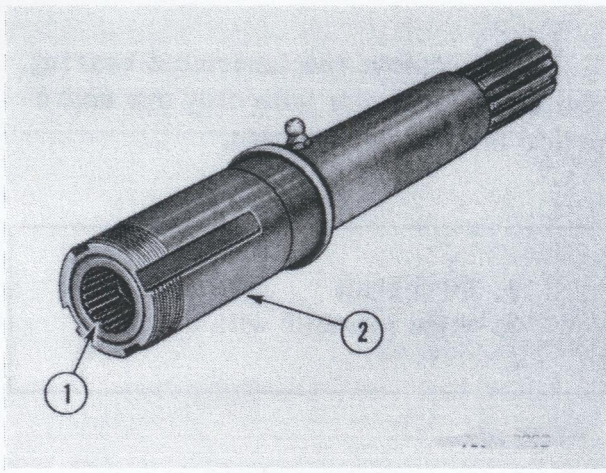
1. Using a new gasket, install the cylinder head on the engine.

2. Install the cylinder head cap screws. Using the sequence shown, tighten evenly in steps to 45 ft. lbs. torque. Be sure to install all brackets and mounting clips under the cap screw heads before tightening.

3. Install the spark plugs and tighten to 30 ft. lbs. torque.

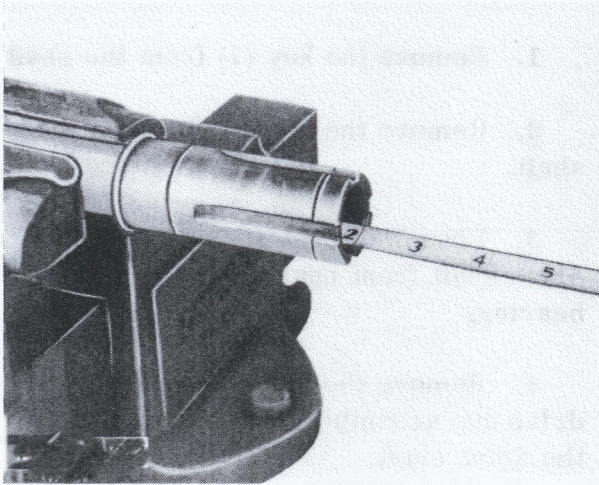
4. Install the water outlet elbow, air cleaner, muffler, fuel tank and hood.

5. Refill the radiator with coolant.

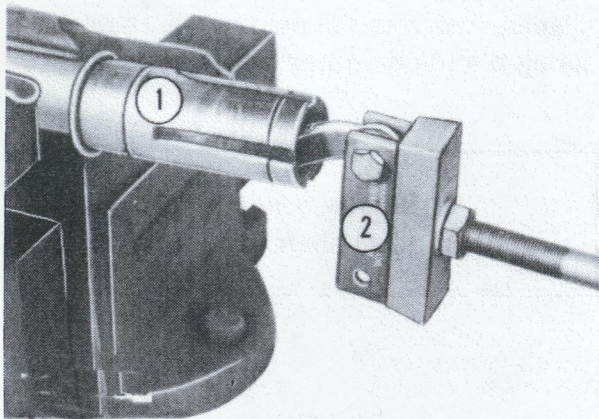


8. If needle bearings are to be replaced, remove the outermost bearing using a slide hammer with two legs.

- 1. Needle bearings (2)
- 2. PTO shaft



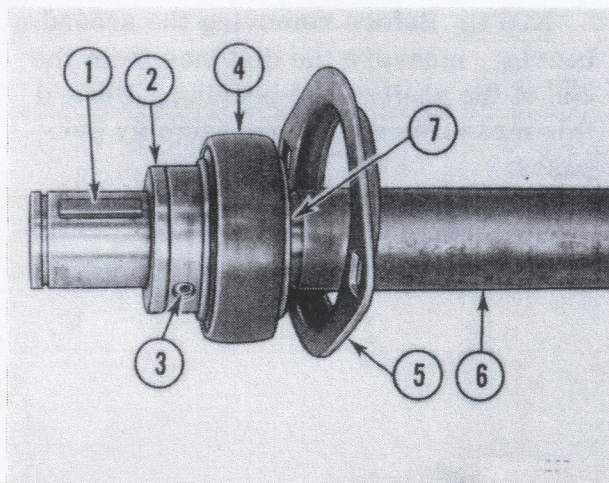
NOTE: Before removing the second bearing, measure the distance from the end of the shaft to the bearing. Record this measurement for reassembly purposes.



9. To remove the innermost bearing, use a slide hammer with only one appropriate length leg as shown.

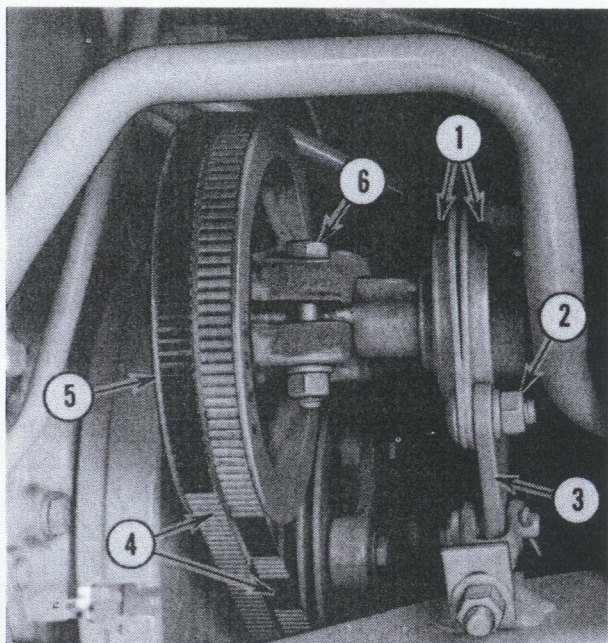
1. PTO shaft
2. Slide hammer with one leg

IPTO Drive Shaft



1. Remove the key (1) from the shaft.
2. Remove the spacer (2) from the shaft.
3. Loosen the set screws (3) in the drive shaft front bearing and remove the bearing.
4. Remove the set screws from the drive cup assembly and remove it from the drive shaft.

1. Key
2. Spacer
3. Set screw
4. Front ball bearing
5. Bearing flange
6. PTO drive shaft
7. Snap ring (not shown)

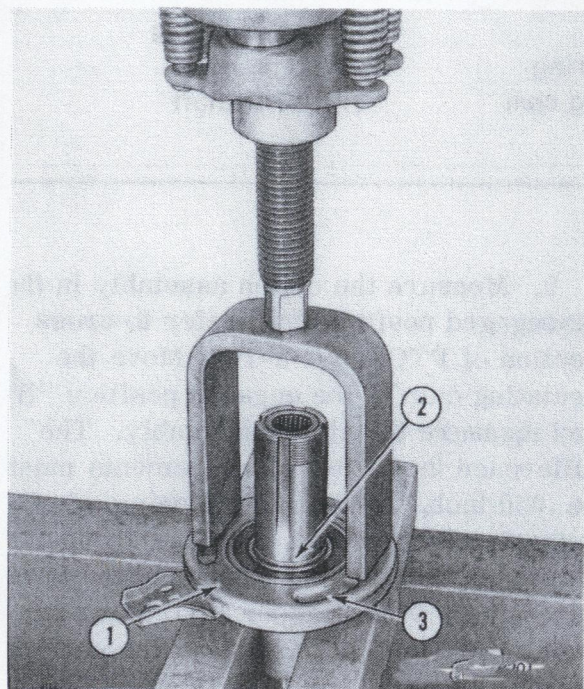


6. Install the second bearing flange (1) on the shaft. Place the PTO driven pulley (5) in position and move the drive shaft into it. Install the retaining snap ring or bolt.

7. Install the cap screws and nuts (2) securing the bearing flanges (1) to the adjuster (3). Tighten nuts (2) only finger tight at this time.

8. Install the belts (4) on the pulley and tighten only enough to remove the slack. Do not tighten to operating tightness at this time.

1. Bearing flanges
2. Nuts
3. Shaft and pulley adjuster
4. PTO drive belts
5. PTO driven pulley
6. Pulley retaining bolt



1. Stationary cam
2. Snap ring retainer
3. Ball slots

IPTO Clutch Assembly

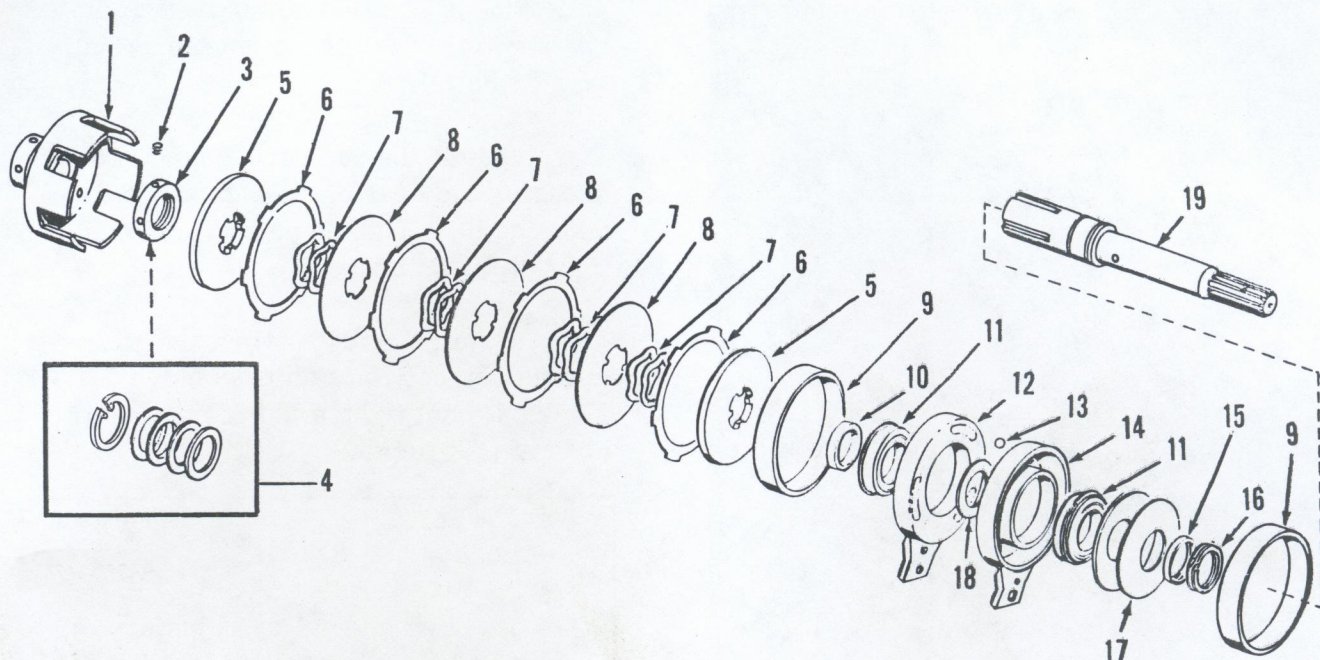
1. If the needle bearings inside the PTO shaft have been removed, new bearings must be installed.

2. Press new cam bearings into the cams if they were removed. Be sure the snap ring around the bearing bottoms against the cam body.

3. Install the load spring and stationary cam on the shaft.

4. Compress the load spring and install the snap ring retainer (2).

5. Be sure to grease the cam ball slots and balls. Install the balls in the stationary cam ball slots (3) and then install the actuating cam on the shaft.



- | | | |
|--|-------------------|--------------------|
| 1. Drive cup | 7. Wave spring | 14. Stationary cam |
| 2. Set screw | 8. Separator disc | 15. Retainer |
| 3. Lock nut | 9. Cam cover | 16. Snap ring |
| 4. Shims and snap ring
(later models) | 10. Spacer | 17. Load spring |
| 5. Pressure plate | 11. Cam bearing | 18. Snap ring |
| 6. Friction disc | 12. Actuating cam | 19. PTO shaft |
| | 13. Ball | |

6. Install the cam cover (9) around the cams. Use rubber cement to hold the cover in place.

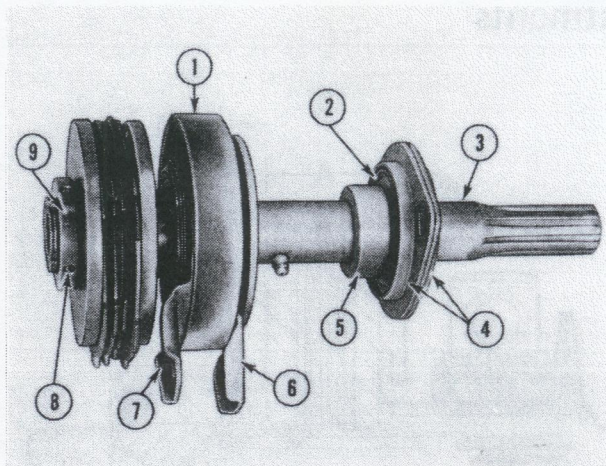
7. Install the spacer (10) on the shaft and then install the pressure plate (5), friction discs (6), wave springs (7), and separator discs (8) as shown.

8. Install the shims and snap ring (4) or the lock nut (3). Do not tighten the set screw at this time.

IMPORTANT: The following adjustment must be made before installing the PTO clutch assembly on the tractor.

9. Measure the clutch assembly in the disengaged position "A" (refer to cross section of PTO, page 8-10). Move the actuating cam to the engaged position "B" and measure the clutch assembly. The difference in the two measurements must be .050 inch. Adjust by tightening or loosening the lock nut or by installing shims between the snap ring and the pressure plate. When proper adjustment has been made, install and tighten the set screw.

NOTE: Use caution when tightening the locking set screw. **OVER TIGHTENING** will result in distortion of the needle bearings.

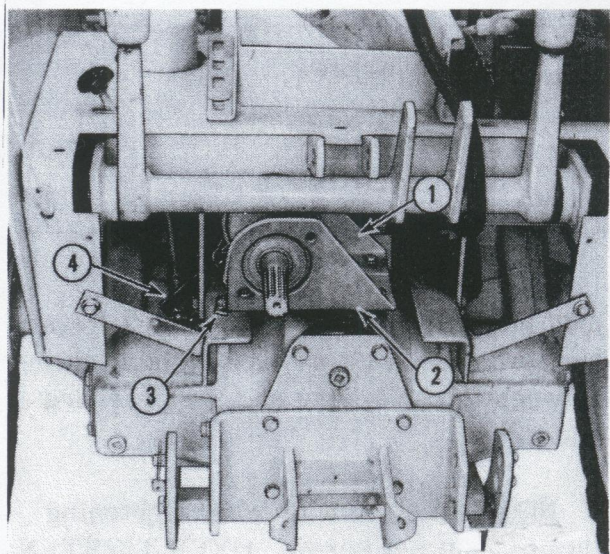


10. Install the bearing flanges (4), locking collar (5) and shaft ball bearing (2). Do not tighten the locking collar at this time.

- | | |
|--------------------|--------------------------|
| 1. Cam cover | 6. Stationary cam |
| 2. Ball bearing | 7. Actuating cam |
| 3. PTO shaft | 8. Set screw |
| 4. Bearing flanges | 9. Lock nut or snap ring |
| 5. Locking collar | |

11. Install the clutch unit in the drive cup. Be sure the clutch cleat pin mates with the stationary cam.

NOTE: If the clutch cleat pin fits tightly in the bottom of the slot in the stationary cam, shims must be installed under the clutch cleat bracket. Failure to do this will result in misalignment of the PTO shafts.



12. Connect the clutch control arm (4) to the actuating cam.

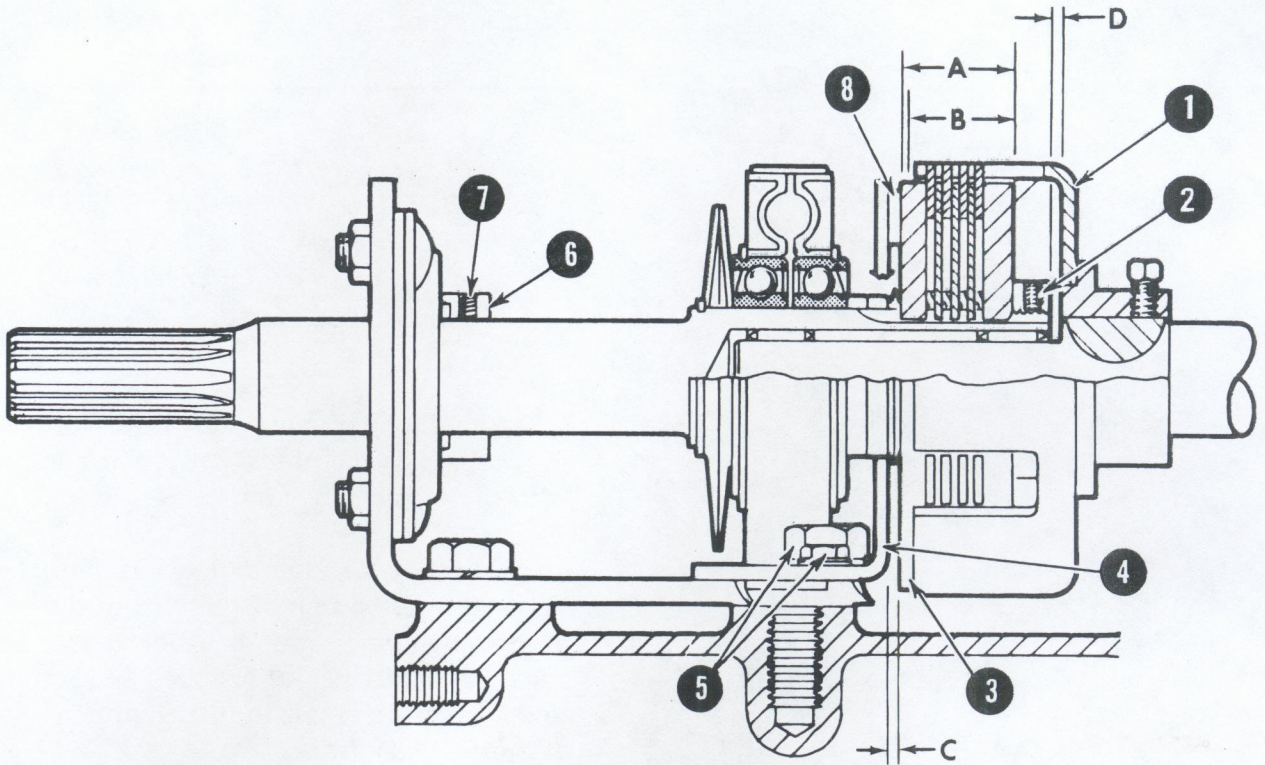
13. Install the shaft bearing mounting bracket support (2) and the brake support (1) on the transmission case.

14. Tighten the front bearing flange nuts securely.

15. Install and securely tighten the rear bearing flange bolts and nuts.

- | |
|-----------------------------------|
| 1. Brake support |
| 2. Shaft bearing mounting bracket |
| 3. Clutch cleat bracket |
| 4. Clutch control arm |

IPTO Adjustments



- | | |
|--------------------------|-----------------------|
| 1. Drive cup | 5. Cap screws |
| 2. Lock nut or snap ring | 6. Locking collar |
| 3. Pressure plate | 7. Set screw |
| 4. PTO brake support | 8. Brake friction pad |

(Refer to cross section of PTO)

NOTE: Measurements "A" and "B" are taken with the PTO assembly removed from the tractor. Refer to page 8-2.

Measure the clutch assembly in the dis-engaged position "A". Move the actuating cam to the engaged position "B" and measure the clutch assembly. The difference in the two measurements must be

.050 inch. Adjust by tightening or loosening the lock nut (2) or by installing shims between the snap ring and the pressure plate.

NOTE: Use caution when tightening the lock nut set screw. **OVER TIGHTENING** will result in distortion of the idler shaft needle bearings.

Install the PTO clutch unit on the tractor.

Measurement "D", shaft to drive cup clearance, must be 1/8 inch. This is obtained by bottoming the PTO assembly against the drive cup (1) and then moving the assembly rearward 1/8 inch. Tighten the rear PTO shaft bearing locking collar (6) and set screw (7) securely.

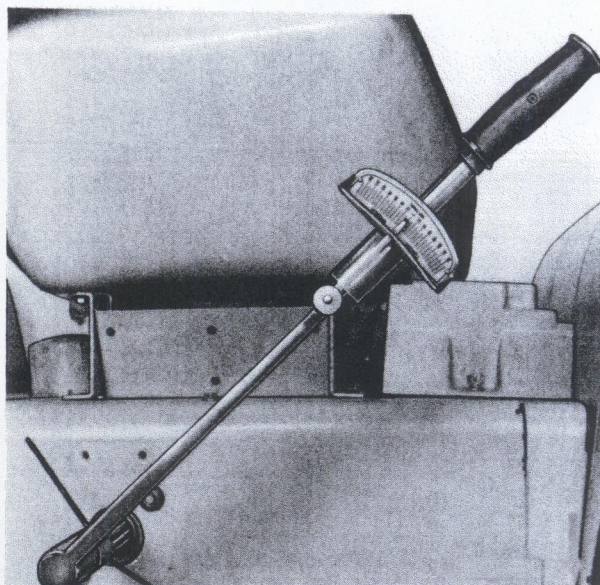
Be sure to get full pin contact between the clutch cleat bracket and the stationary cam to prevent vibration. Position the clutch cleat bracket to get full pin contact.

NOTE: If the clutch cleat pin fits tightly in the bottom of the slot in the stationary cam, shims must be installed under the clutch cleat bracket. Failure to do this will result in misalignment of the PTO shaft. Tighten the cap screws securely.

Measurement "C", clearance between the pressure plate (3) (engaged position "B") and the brake friction pad (8), must be .040 inch. This is obtained by loosening the cap screws (5) and properly locating the brake plate (4) at the slotted holes.

Check the belt tension. The belts are properly adjusted when 50 foot-pounds of torque is required to turn the output shaft. To check this adjustment, lock the tractor brakes with the pedal lock, shift the transmission into third gear (the creeper drive unit in high if tractor is so equipped) and engage the PTO clutch. Place two

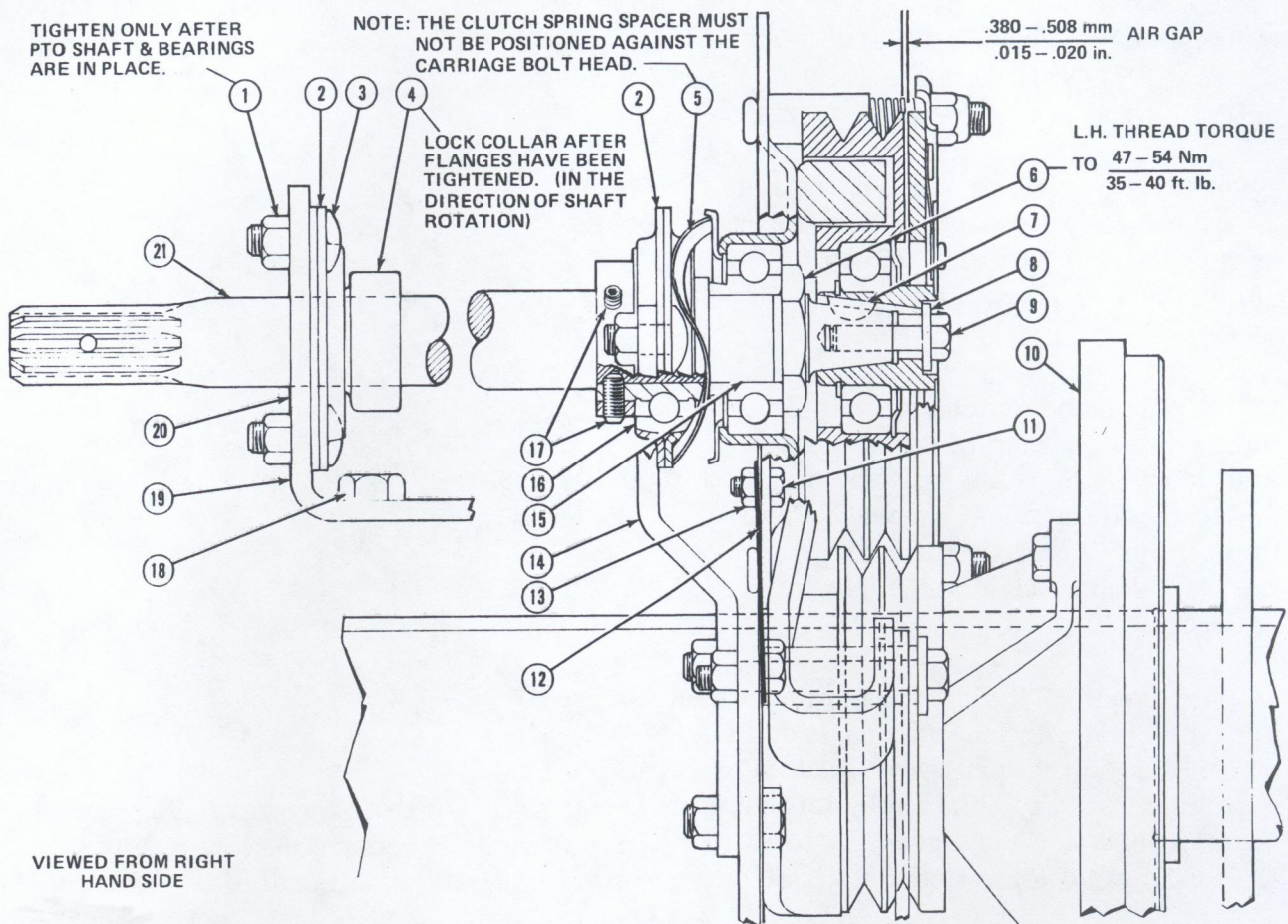
Allen wrenches in any splines of the shaft. Slide a 15/16 inch twelve-point socket over the shaft and the Allen wrenches. Using a torque wrench, apply force until a reading of 50 foot-pounds is obtained.



If 50 foot-pounds torque reading cannot be obtained remove the left side panel and adjust the belts. If after adjustment the torque reading of 50 foot-pounds cannot be obtained, remove the PTO clutch (refer to page 8-2) and check for damage or excessive wear. Readjust the PTO clutch.

Remove the rear bearing flange nuts and install the rear PTO shields. Install and securely tighten the nuts.

Electric IPTO Clutch and Drive Shaft Assembly (184 Tractor)

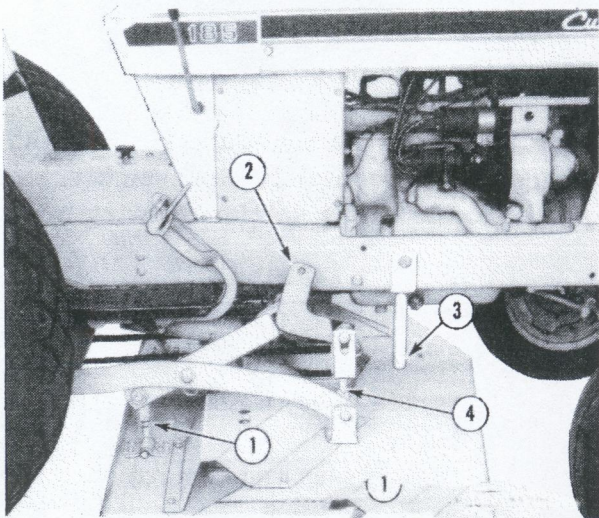


- | | |
|---|--|
| 1. Hex nut | 11. Anchor strap capscrew |
| 2. Bearing flange retainer | 12. Anchor strap |
| 3. Carriage bolt head | 13. Anchor strap hex nut |
| 4. Lock collar | 14. Front bearing bracket assembly |
| 5. Clutch spring spacer | 15. Field bearing assembly |
| 6. Field nut | 16. Front bearing assembly |
| 7. Woodruff key | 17. Bearing collar set screws |
| 8. Hardened washer .34 I.D. x 7/8
O.D. (.177 - .197 thick) | 18. Front bearing bracket mounting bolts |
| 9. Capscrew (5/16 x 1-1/4 inch) | 19. Rear bearing bracket assembly |
| 10. Engine flywheel | 20. Rear bearing assembly |
| | 21. PTO drive shaft |

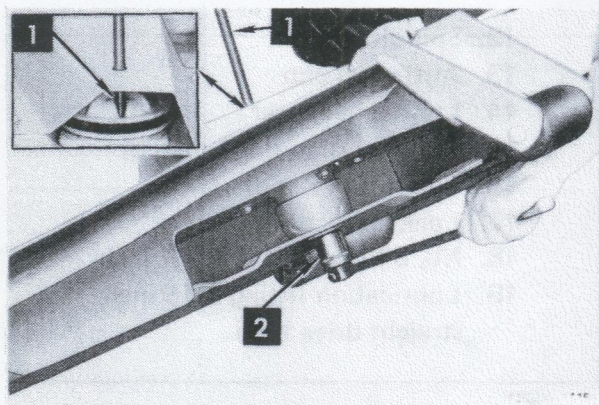
Mower Spindle Assembly



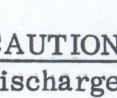
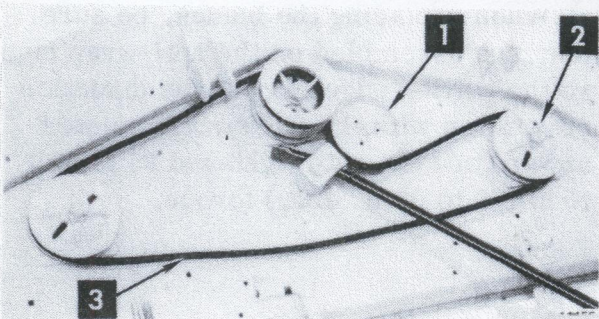
CAUTION! Disengage the tractor power take-off and stop the engine when working on the mower.



1. Rear adjustable link
2. Rockshaft
3. Mower limiter/stop
4. Front adjustable clevis



1. Pin—25.4 mm (1/2 inch) diameter
2. Removing blade nut



CAUTION! Never look into the discharge opening when the blades are in motion.

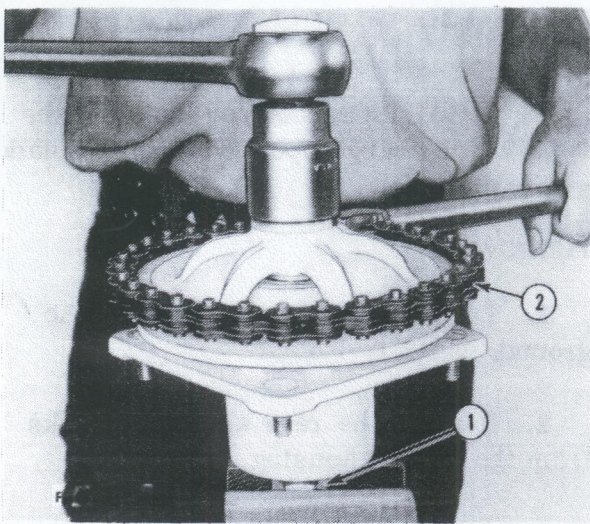
Removal

1. Lower the mower housing to the ground.
2. Remove the rear adjustable links from the mower housing.
3. Pull the pins out of the center frame at the mower housing.
4. Raise the 3 point hitch and slide the mower out from under the tractor.
5. Place the mower on a suitable workbench and remove the blade and blade nut as follows.

A hole is provided in the pulley hubs and through the belt shields to keep the spindle from rotating when blade nuts are removed. This is accomplished by inserting a 1/2 inch diameter pin through the hole in the shield and pulley hub as shown.

6. Remove the deck drive belt as shown.
7. Remove the 4 hex nuts securing the spindle assembly under the mower housing and pull off the spindle assembly.
8. Place the blade nut back on the spindle shaft and secure the spindle shaft in a soft jawed vise.

1. Spring-loaded idler
2. Outer pulley
3. Deck drive belt



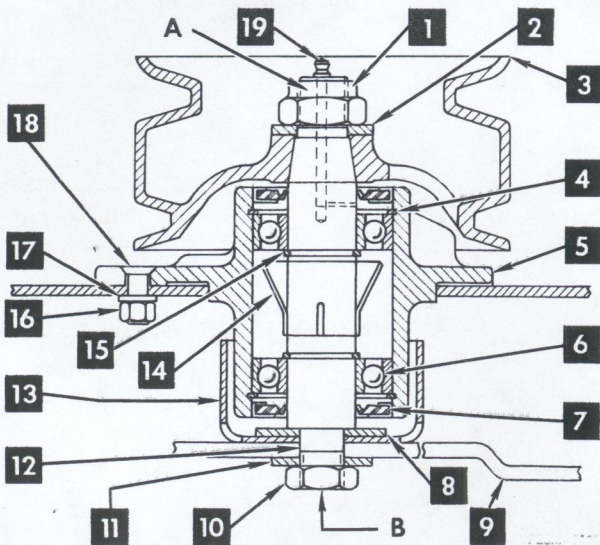
Disassembly

1. Attach a chain wrench around the pulley and remove the 7/8 inch lock nut as illustrated.

NOTE: Do not wrap the chain wrench around the inside pulley groove.

2. Remove the seals and snap rings to accomplish complete disassembly. (Refer to the cross section drawing.)

1. Blade nut
2. Chain wrench



1. 7/8 inch Lock nut
2. Spindle pulley washer
3. Pulley
4. Internal snap ring (2 req'd)
5. Spindle housing
6. Spindle bearing (2 req'd)
7. Grease seal (2 req'd)
8. Support disk
9. Blade
10. Jam nut
11. Flat washer, 12 ga.
12. Spindle shaft
13. Anti-wrap cup
14. Lubricant slinger
15. External snap ring (2 req'd)
16. Hex nut (4 req'd)
17. Lock washer (4 req'd)
18. No. 3 Plow bolt, 3/8 x 1 inch
19. Lubrication fitting 3/16 inch straight drive type

Reassembly

1. Reassemble in the reverse order of the removal procedure.

2. Tighten lock nut "A" from 129 to 156 N·m (95 to 115 ft. lbs.) of torque.

3. Tighten nut "B" holding the mower blade to the spindle from 95 to 122 N·m (70 to 90 ft. lbs.) torque.

When replacing the blades, be sure they are assembled on the anti-wrap cups so the cutting edges are in the direction of rotation with the wind wings pointed upward and the nuts tightened 95 to 122 N·m (70 to 90 ft. lbs.) torque.

IMPORTANT INFORMATION FOR INTERNATIONAL AND FARMALL GASOLINE TRACTOR OWNERS:

Get a FREE GAS CAP for your tractor



A continuous safe working operation of a gasoline-powered tractor, truck or other machine, gasoline engine use, fuel cap pressure is the gas tank. If the gas tank cap is often malfunctions the engine is running to fast, the engine's volume of pressure could force gasoline out of the fuel tank and into a fire. Therefore the use range of the gas cap is not always regulated.

Owner requires a gas cap that will fit on existing tractor, change against the requirements.

**GET A FREE GAS-CAP FOR YOUR
INTERNATIONAL OR FARMALL GASOLINE TRACTOR**

A one-time gas cap, for available in 1965, for special design. Machine of engine gasoline engine, fuel tank or fuel injection line to improve gas use required. The one gas cap, for available before the top of the cap and for "PRESSURE - OPEN BLOWN" released in the top with the cap.

**IF YOUR GAS CAP DOES NOT HAVE TWO MUST HAVE AND DOES NOT SAY:
"PRESSURE - OPEN BLOWN" you can get a new gas cap free.**

TO GET A NEW GAS CAP, COMPLETE THIS FORM AND MAIL IT TO THE ADDRESS SHOWN

FREE GAS CAP OFFER

**TO: Newline International Transportation Corp.
Box 1088
Fort Wayne, Indiana 46801**

Circle the following International or Farmall **GASOLINE** tractors that have a fuel cap not enclosed with "PRESSURE - OPEN BLOWN." (These provide a free gas cap for each tractor listed below.)

(PLEASE NOTE: Must have tractor model.)

..... (Model)	..... (Serial Number)	..... (Model)	..... (Serial Number)
..... (Model)	..... (Serial Number)	..... (Model)	..... (Serial Number)

Your Name (please print)

Address

City State Zip

Your Signature Date

Model