

J.I. CASE

CONDENSED SPECIFICATIONS

	Models		
	224	444	446
Engine Make	Kohler	Kohler	Onan
Model	K321A	K321A	BF (2 cyl.)
Bore and Stroke—Inches	3½ x 3¼	3½ x 3¼	3-1/8 x 2-5/8
Piston Displacement—Cubic Inches	31.27	31.27	40.3
Horsepower	14	14	16
Slow Idle Speed—RPM	1000	1000	1000
High Idle Speed (No Load)—RPM ..	3600	3600	3600
Full Load Speed—RPM	3500	3500	3500
Crankcase Oil			
Capacity Pints	4	4	4
Weight—			
Above 32 Deg. F.	SAE 30	SAE 30	SAE 30
0 Deg. F. to 32 Deg. F.	SAE 10W	SAE 10W	SAE 10W
Below 0 Deg. F.	SAE 5W-20	SAE 5W-20	SAE 5W-20
Transmission Oil			
Capacity—Pints	10	10	10
Weight—			
Above 32 Deg. F.	SAE 20W-40	SAE 20W-40	SAE 20W-40
Below 32 Deg. F.	SAE 5W-20	SAE 5W-20	SAE 5W-20
Differential Oil			
Capacity—Pints	6	6	6
Weight	SAE EP80	SAE EP80	SAE EP80

FRONT AXLE AND STEERING SYSTEM

AXLE MAIN MEMBER

All Models

The axle main member (4—Fig. C1) is mounted to the main frame and pivots on pin (6). To remove the front axle assembly, disconnect the drag link from right steering knuckle. Using a suitable jack under main frame, raise front of tractor until weight is removed from front wheels. Unbolt and remove pivot pin (6), then raise front of tractor to clear axle main member. Roll front axle assembly forward from tractor.

TIE ROD

All Models

The tie rod used on all models is adjustable and front wheel toe-in is adjusted as follows: Loosen locknuts (11—Fig. C1) and rotate tie rod (7) until front wheel toe-in is $1/8$ to $3/8$ -inch measured as shown in Fig. C2. Retighten the locknuts.

STEERING KNUCKLES

All Models

To remove the steering knuckles (5 and 9—Fig. C1), block up under axle main member and remove front wheels. Disconnect drag link from right steering knuckle and remove tie rod. Drive out roll pins (3) and lower steering knuckles from axle main member.

STEERING GEAR

All Models

R&R AND OVERHAUL. Refer to Fig. C3 or C4 and remove steering wheel retaining nut and steering wheel (1). On late 444 and all 224 and 446 tractors, remove key (17—Fig. C4) and tube (16). On all models, raise front of tractor using a suitable jack or hoist and disconnect drag link from quadrant gear (11—Fig. C3 or C4). Remove

capscrew (15), lock washer (14), washer (13), quadrant gear (11) and shims (10 and 12). Shims (10 and 12) should be kept in the order they are removed to aid in reassembly. On early model 444, unseat retaining ring (5—Fig. C3) from its groove, then on all models withdraw steering shaft and pinion (3—Fig. C3 or C4) from steering support (7) and from underside of tractor. Remove nylon bushing (2) from steering column. Unbolt and remove steering support (7). Remove locknut (6), then unscrew stub shaft (9) from support.

Clean and inspect all parts and renew any showing excessive wear or other damage. To reassemble, reverse disassembly procedure. On early model 444, steering shaft (3—Fig. C3) end play is controlled by washers (5 and 8) and retaining ring (4). On late model 444 and all 224 and 446 tractors, tighten steering wheel retaining nut to remove excessive end play of steering shaft (3). Shims (10—Fig. C3 or C4) are used to adjust gear backlash between quadrant gear (11) and steering shaft pinion. Adjust gear backlash by repositioning shims (10) from upper to lower side of quadrant gear (11) to decrease backlash or from lower to upper side of quadrant gear to increase backlash. Backlash should be minimal

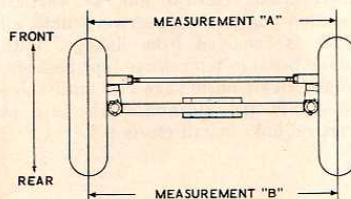
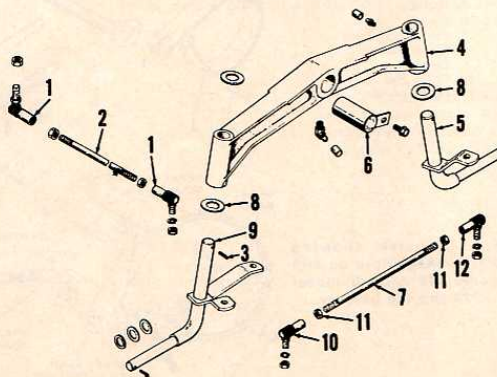


Fig. C2—Toe-in measurement "A" should be $1/8$ to $3/8$ -inch less than measurement "B" with both measurements taken at hub height.

Fig. C1—Exploded view of typical front axle assembly.

1. Drag link ends
2. Drag link
3. Roll pin
4. Axle main member
5. Steering knuckle L.H.
6. Pivot pin
7. Tie rod
8. Thrust washers
9. Steering knuckle R.H.
10. Tie rod end (L.H. thread)
11. Locknuts
12. Tie rod end (R.H. thread)



without causing binding of gears. Gears should be lubricated with good quality multi-purpose grease after every 50 hours of operation.

ENGINE

REMOVE AND REINSTALL

All Models

To remove the engine, tilt hood and grille forward and disconnect battery

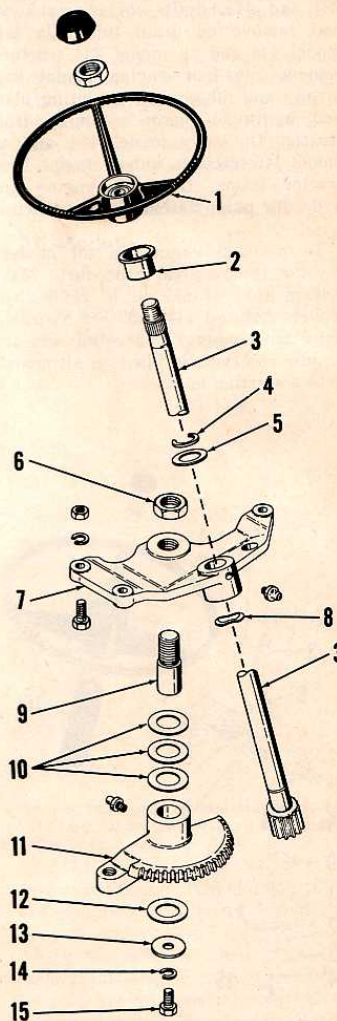


Fig. C3—Exploded view of steering gear assembly used on early model 444 tractors.

- | | |
|----------------------------|-------------------|
| 1. Steering wheel | 8. Wave washer |
| 2. Nylon bushing | 9. Stub shaft |
| 3. Steering shaft & pinion | 10. Shims |
| 4. Retaining ring | 11. Quadrant gear |
| 5. Washer | 12. Shim |
| 6. Locknut | 13. Washer |
| 7. Steering support | 14. Lock washer |
| | 15. Capscrew |

cables. On models 224 and 444, disconnect wires from starter-generator and on model 446, disconnect cable from starter motor and unplug charging circuit wires. On all models, disconnect headlight wire and ignition coil wire. Disconnect choke and throttle control cables and the fuel line at fuel pump. Disconnect hydraulic line at lower right side of oil cooler and drain hydraulic oil. Disconnect pump suction line at reservoir, then unbolt and remove reservoir and oil cooler assembly. Disconnect pump pressure line and the pto clutch control rod. On models 224 and 444, drain engine crankcase and remove oil drain tube. On late model 444 and all model 224 tractors, remove the four engine mount cap-screws and lift engine, mounting plate and hydraulic pump assembly from tractor. On early model 444 and all model 446 tractors, unbolt engine from tractor frame, then lift engine and hydraulic pump assembly from tractor.

To reinstall engine on all models, reverse the removal procedure. Make certain that crankcase is refilled on models 224 and 444 and that hydraulic lines are properly connected and hydraulic reservoir is filled on all models before starting engine.

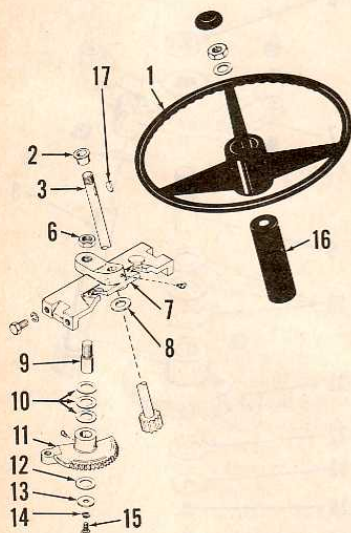


Fig. C4—Exploded view of steering gear assembly used on late model 444 and all model 224 and 446 tractors.

- | | |
|----------------------------|-------------------|
| 1. Steering wheel | 10. Shims |
| 2. Nylon bushing | 11. Quadrant gear |
| 3. Steering shaft & pinion | 12. Shim |
| 4. Locknut | 13. Washer |
| 5. Steering support | 14. Lock washer |
| 6. Washer | 15. Cap screw |
| 7. Stub shaft | 16. Tube |
| | 17. Key |

OVERHAUL

All Models

Engine make and model are listed at the beginning of this section. To overhaul the engine components and accessories, refer to the Kohler and Onan sections of this manual.

BRAKE

ADJUSTMENT

Early Model 444

To adjust the brake on early model 444 tractors, refer to Fig. C5 and remove clevis pin (8). Adjust clevis (9) on brake rod (10) until there is sufficient braking action when pedal is depressed. Do not over-adjust brake. When pedal is depressed, there must be enough brake pedal travel for neutral return spring attached to brake pedal to return speed control lever to neutral.

Models 224-446-Late 444

To adjust the brake, refer to Fig. C6 and proceed as follows: Adjust brake linkage mounting nuts to obtain a clearance of 0.010-0.015 between the washers and brake arms. Disconnect brake rod clevis from vertical link. Place range transmission in neutral position. Tighten brake band adjusting nut until tractor cannot be moved manually, then back nut off 1½ turns. Hold brake vertical link in vertical position and push it rearward until all slack is removed from linkage. With brake pedal in full release (up) position, adjust clevis on linkage rod until holes in clevis are aligned with hole in vertical link. Install clevis pin.

Fig. C5—Exploded view of brake assembly used on early model 444 tractors.

1. Brake band
2. Pin
3. Shaft
4. Arm
5. Roll pin
6. Spring
7. Park brake latch
8. Clevis pin
9. Clevis
10. Brake rod
11. Brake pedal

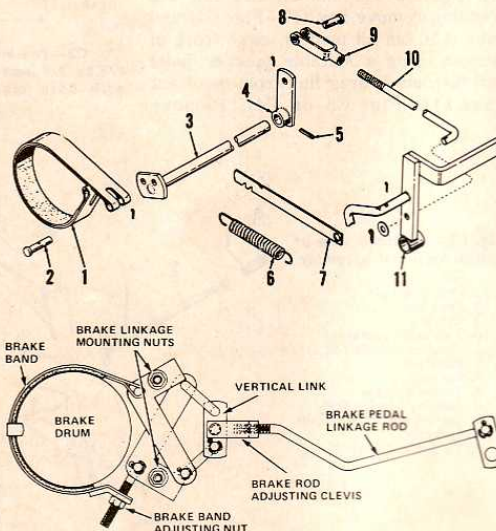


Fig. C6—View showing brake linkage used on late model 444 and all model 224 and 446 tractors.

HYDRAULIC DRIVE

OPERATION

All Models

The three main components of the hydraulic drive are the hydraulic pump, control valve and hydraulic motor. The hydraulic pump draws oil from the reservoir located at front of tractor behind the oil cooler. Oil is pumped to the drive control valve and when the control valve is in neutral, the oil passes through the valve and to the oil cooler. After flowing through the oil cooler, the oil is returned to the reservoir. If the control valve is in forward or reverse position, the oil is directed to the hydraulic motor. This causes the motor shaft to rotate which in turn drives the range transmission input gear. Oil returning from the motor, flows through the valve, through the oil cooler and to the reservoir. When control lever is returned to neutral position, oil flow between valve and motor stops and this stops rotation of motor shaft. The dynamic braking action occurs and tractor is halted.

OIL FLOW AND PRESSURE CHECK

All Models

To check the oil flow and system pressure, install a Hydra Sleuth, Flo-Rater or equivalent tester as shown in Fig. C7. Remove hydraulic lines from control valve to hydraulic motor and plug valve ports. Close the shut-off valve in line and fully open load valve on tester. Start and operate engine at 3600 rpm until hydraulic oil temperature is approximately 120°F. Check

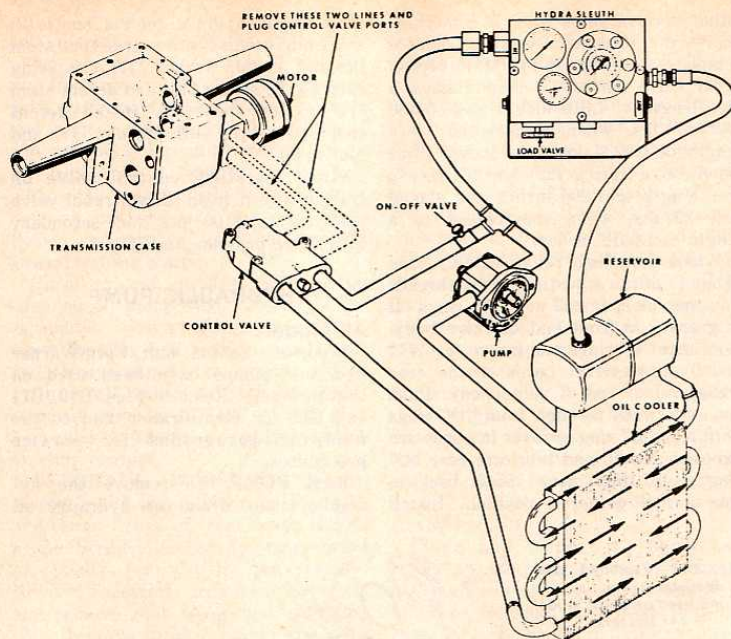


Fig. C7—View showing "Hydra Sleuth" tester installed to check flow and pressure of hydraulic drive system.

and record the gpm flow at 0 psi. Slowly close tester load valve until pressure gage reading is 1000 psi. This flow reading must not be more than 25% less than the previously recorded 0 psi flow reading. If pump output flow drops more than 25%, pump is worn and must be overhauled or renewed.

If pump output flow drop is less than 25%, record the gpm flow at 1000 psi and continue tests. Fully open the shut-off valve in line and the load valve on tester. With engine still operating at 3600 rpm, move control lever in full forward or reverse position. Slowly close load valve on tester until pressure gage reading is 1000 psi and note the gpm reading. This reading must not exceed $\frac{1}{2}$ gpm less than the

previously recorded pump gpm flow at 1000 psi. If control valve internal leakage is more than $\frac{1}{2}$ gpm, check and adjust drive relief valve pressure.

To check drive relief valve pressure, close the load valve on tester and note the pressure gage reading. The relief valve should open between 2050-2150 psi. To increase pressure relief setting, turn adjusting plug (1—Fig. C8 or 8—Fig. C9) inward as required. Re-check control valve for internal leakage. If control valve leakage still exceeds $\frac{1}{2}$ gpm, valve body and spool are excessively worn or valve body is cracked and assembly must be renewed.

Remove test equipment and install original lines. If pump and control valve check out good and adequate tractor performance cannot be obtained, remove hydraulic motor and overhaul or renew the motor.

CONTROL VALVE

All Models

Early model 444 tractors were equipped with a single spool Dukes drive control valve (Fig. C8). Late model 444, model 224 equipped with

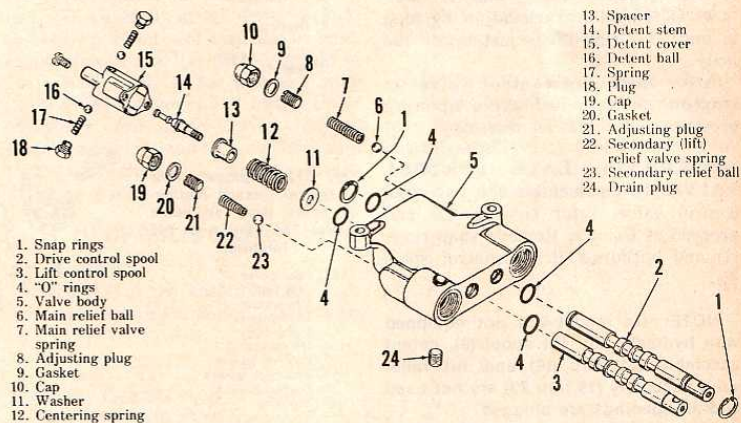


Fig. C9—Exploded view of late Dukes two-spool control valve used on late model 444 and all model 224 and 446 tractors. Spool (3) and items (11 thru 23) are not used on model 224 not equipped with hydraulic lift.

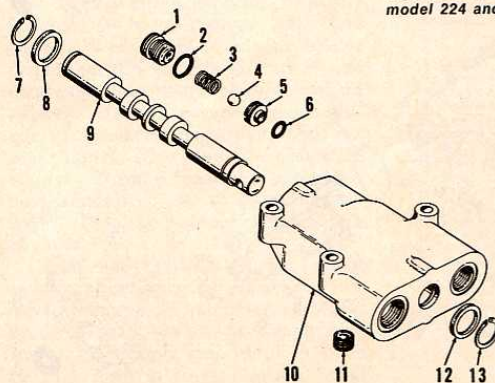


Fig. C8—Exploded view of early Dukes single spool control valve used on early model 444 tractors.

hydraulic lift and all model 446 tractors are equipped with the two-spool Dukes control valve (Fig. C9). Spool (3), detent assembly (11 thru 18) and secondary (lift) relief valve assembly (19 thru 23) are not used on model 224 not equipped with hydraulic lift. Bore for lift spool is plugged.

R&R CONTROL VALVE. To remove the control valve, first drain hydraulic reservoir. Disconnect control lever linkage and hydraulic lines. Plug or cap openings to prevent dirt from entering system. Unbolt and remove the control valve assembly. To reinstall the control

valve, reverse the removal procedure.

OVERHAUL EARLY CONTROL VALVE. To disassemble the single spool control valve, refer to Fig. C8 and remove snap rings (7 and 13) from ends of spool (9), then withdraw spool from valve body (10). Remove quad rings at both ends of spool bore in body. Unscrew relief spring adjusting plug (1) and remove spring (3) and ball (4). Unscrew ball seat (5) and remove "O" ring (6).

Inspect components and renew any showing excessive wear or other damage. If valve spool or bore in valve body is scratched or scored, renew complete valve assembly. Relief valve spring free length should be 0.750 inch. To reinstall spool (9), quad rings and snap rings, install quad ring (12) in front of spool bore and lubricate ring with light oil. Insert spool (9) from back end of valve body. Pull spool through body until rear end of spool just clears rear quad ring groove in spool bore. Lubricate and install rear quad ring (8). Install snap ring (13) on spool and carefully push spool rearward through quad ring (8). Install rear snap ring (7). Install relief valve seat (5) with new "O" ring (6), relief ball (4), spring (3) and adjusting plug (1) with new "O" ring (2). Turn adjusting plug in until "O" ring (2) is just inside the body.

After installing control valve on tractor, check relief valve opening pressure and adjust as necessary.

OVERHAUL LATE CONTROL VALVE. To disassemble the two-spool control valve, refer to Fig. C9 and proceed as follows: Remove snap rings (1) and withdraw drive control spool (2).

NOTE: On model 224 not equipped with hydraulic lift, lift spool (3), detent assembly (11 thru 18) and lift relief valve assembly (19 thru 23) are not used and all openings are plugged.

On valves with two spools, remove plugs (18), springs (17) and detent balls (16), then unbolt and remove detent cover (15). Withdraw lift spool assembly from valve body (5). Detent stem (14), spacer (13), centering spring (12) and washer (11) can now be removed. Unscrew cap (10) and remove gasket (9), adjusting plug (8), spring (7) and main relief ball (6). Place body (5) on a bench so that drain plug (24) is pointing upward. Remove cap (19), gasket (20), adjusting plug (21), spring (22) and secondary (lift) relief ball (23). Remove "O" rings (4) from valve body.

Clean and inspect all parts and renew any showing excessive wear or other damage. If either spool (2 or 3) or

either bore in valve body is scratched, scored or excessively worn, renew complete valve assembly. Main (drive) relief valve spring (7) should have a free length of 1.310 inches and should test 57 lbs. when compressed to a length of 0.1235 inch. Secondary (lift) relief valve spring (22) should have a free length of 1.200 inches and should test 20 lbs. when compressed to a length of 1.0312 inches.

When installing relief valves, turn about $\frac{1}{2}$ of the adjusting screw threads into the valve. Install new "O" rings (4) in grooves in front end of valve body. Lubricate "O" rings and insert spools (2 and 3) into correct bores at the rear (relief valve) end of valve body. Push spools forward through front "O" rings until rear "O" ring grooves in bores are exposed. Install and lubricate rear "O" ring seals, then move spools back to the normal centered position. Install

snap rings on drive control spool (2) and using green Loctite on detent stem threads, install washer (11), centering spring (12), spacer (13) and detent stem (14) on lift spool (3). Install detent cover (15), balls (16), springs (17) and plugs (18).

After installing control valve on tractor, adjust main (drive) relief valve pressure to 2100 psi and secondary (lift) valve pressure to 575 psi.

HYDRAULIC PUMP

All Models

Wooster, Cessna and Borg-Warner hydraulic pumps have been used on these tractors. Refer to Figs. C10, C11 and C12 for identification and to the following paragraphs for service procedures.

R&R PUMP. To remove the hydraulic pump, drain the hydraulic oil

Fig. C10—Exploded view of Wooster hydraulic drive pump used on some model 444 tractors.

1. Rear cover
2. Seal ring
3. Pump body
4. Bearing
5. Driven gear
6. Drive gear
7. Bearing
8. Pressure seal
9. Rubber spacer
10. Seal ring
11. Front cover
12. Oil seal

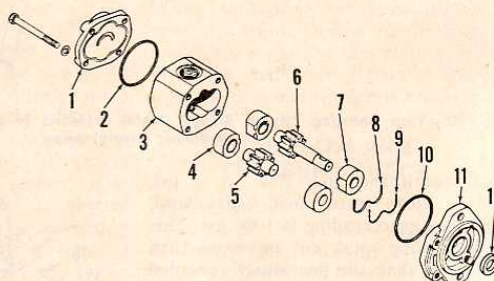


Fig. C11—Exploded view of typical Cessna hydraulic pump used on some model 224, 444 and 446 tractors.

1. Rear cover
2. Seal ring
3. Drive gear
4. Driven gear
5. Pump body
6. Diaphragm
7. Back-up gasket
8. Protector gasket
9. Diaphragm seal
10. Seal ring
11. Front cover
12. Oil seal

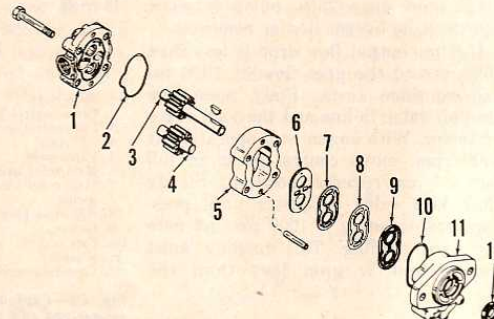
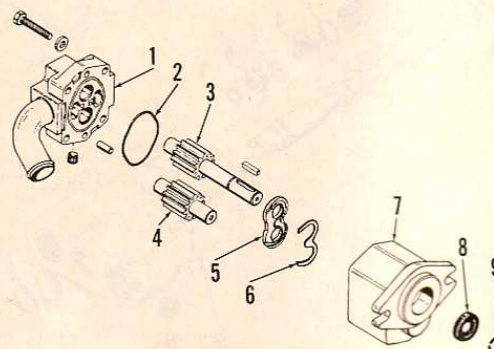


Fig. C12—Exploded view of typical Borg-Warner hydraulic pump used on some model 224, 444 and 446 tractors.

1. Rear cover assembly
2. Seal ring
3. Drive gear
4. Driven gear
5. Wear plate
6. Pressure seal
7. Pump body
8. Oil seal
9. Snap ring



TRACTORS

J.I. Case

and disconnect hydraulic lines from pump. Cap or plug openings to prevent dirt from entering system. On tractors prior to serial number 9646800, unbolt and remove side panels. Then, unbolt and remove pump and support assembly from side of tractor. On tractors with serial number 9646800 and later, remove battery and battery tray. Unbolt and remove pump and support assembly from above.

On all models, mark position of the coupling on pump shaft for aid in reassembly. Loosen set screw and remove coupling half from pump. Unbolt and remove pump from support.

Reinstall pump by reversing the removal procedure. Make certain that hydraulic reservoir is refilled before starting engine.

OVERHAUL (WOOSTER). To disassemble the pump, refer to Fig. C10 and clamp flange of front cover (11) in a vise. Scribe a line across pump covers and body for aid in reassembly. Remove capscrews from rear cover (1) and remove rear cover and seal ring (2). Remove pump body (3) with bearings (4 and 7), driven gear (5) and drive gear (6). Withdraw bearings and gears from pump body. Remove brass pressure seal (8), rubber spacer (9), seal ring (10) and oil seal (12) from front cover.

Clean and inspect all parts and renew any that are excessively worn or otherwise damaged. When reassembling, renew all seals and lubricate all internal parts with new oil. Install drive gear shaft carefully to prevent damage to lip of oil seal (12). Tighten the four pump capscrews evenly to a torque of 28-32 ft.-lbs.

OVERHAUL (CESSNA). To disassemble the pump, refer to Fig. C11 and scribe a line across covers (1 and 11) and body (5) for aid in reassembly. Remove capscrews from rear cover (1) and separate rear cover and seal ring (2) from pump body. Withdraw driven gear (4) and drive gear (3). Separate body (5) from front cover (11). Note position of small pressure vent hole in diaphragm (6), gaskets (7 and 8) and diaphragm seal (9) and place a mark on adjacent area on cover. Remove diaphragm, gaskets, diaphragm seal and seal ring (10) from cover. Inspect shaft oil seal (12) and if removal is necessary, heat front cover (11) to approximately 250°F. Then, pull oil seal straight out of cover.

Clean and inspect all parts and renew any showing excessive wear or other damage. When reassembling, renew all seals, gaskets and diaphragm. Install diaphragm seal (9) with open "V" side first in cover (11) and small pressure vent hole adjacent to the

previously affixed mark on the cover. Install gaskets (7 and 8) and diaphragm (6) aligning the pressure vent holes with hole in diaphragm seal. Bronze side of diaphragm must face gears. Lubricate internal parts with new oil. Make certain the scribe marks on covers (1 and 11) and pump body (5) are aligned. Install and tighten cover capscrews to a torque of 24-26 ft.-lbs.

OVERHAUL (BORG-WARNER). To disassemble the pump, refer to Fig. C12 and scribe a line across cover (1) and pump body (7) for aid in reassembly. Remove capscrews from rear cover and separate cover from pump body. Remove seal ring (2) and snap ring (9), then withdraw driven gear (4) and driving gear (3). Remove wear plate (5) and pressure seal (6). To remove oil seal (8), heat pump body to approximately 250°F., then pull oil seal straight out of cover.

Clean and inspect all parts and renew any showing excessive wear or other damage. When reassembling, lubricate internal parts with new oil. Press new oil seal (8) in cover until seal is 0.188 inch below flush with end of bore. Install pressure seal (6) in wear plate (5). Install wear plate assembly in body (7). Carefully install drive gear (3) so that lip of oil seal is not damaged. Install driven gear (4) with long end of shaft in the body. Place new seal ring (2) in groove in cover (1), install cover assembly and align scribe marks. Install capscrews and tighten them to a torque of 24-26 ft.-lbs. Place snap ring (9) in its groove on shaft.

HYDRAULIC MOTOR

All Models

REMOVE AND REINSTALL. To remove the hydraulic motor, place range

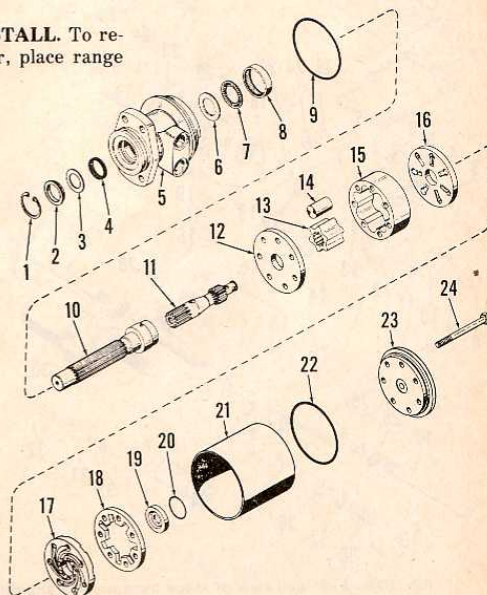
transmission shift lever in neutral position. Block up under tractor frame and place a rolling floor jack under range transmission and differential housing. Unbolt and remove fenders, seat and seat support. Disconnect hydraulic lines from hydraulic drive motor and plug or cap all openings. Remove capscrews securing range transmission and differential assembly to tractor frame and roll the assembly rearward from tractor. Drain lubricant from transmission and differential housing, then unbolt and remove top cover. Remove left rear wheel. Unbolt hydraulic drive motor, hold the range transmission sliding gear and withdraw the drive motor. Let sliding gear rest in bottom of transmission housing.

When reinstalling the hydraulic drive motor, use new "O" ring on motor housing. Hold range transmission sliding gear in position (shift fork between gears) and insert motor output shaft through housing and gear. Apply Loctite to capscrew threads and tighten the motor retaining capscrews to a torque of 110-125 ft.-lbs. The balance of installation is the reverse of removal procedure. Fill transmission and differential housing to level plug opening with SAE EP80 gear oil. Capacity is approximately 6 pints.

OVERHAUL. To disassemble the hydraulic drive motor, clamp motor body port boss in a padded jaw vise with output shaft pointing downward. Remove the seven capscrews (24—Fig. C13) and remove end cover (23), seal

Fig. C13—Exploded view of Ross hydraulic drive motor.

1. Snap ring
2. Spacer
3. Shim washer (0.010)
4. Oil seal
5. Body
6. Thrust washer
7. Thrust bearing
8. Needle bearing
9. Seal ring
10. Output shaft
11. Drive link
12. Wear plate
13. Rotor
14. Roller (6)
15. Stator
16. Manifold plate
17. Manifold
18. Commutator ring
19. Commutator
20. Seal ring
21. Sleeve
22. Seal ring
23. End cover
24. Capscrew (7)



ring (22), commutator (19) and commutator ring (18). Remove sleeve (21), manifold (17) and manifold plate (16). Lift drive link (11), wear plate (12), rotor (13), rollers (14) and stator (15) off the body (5). Remove output shaft (10), then remove snap ring (1), spacer (2), shim (3) and oil seal (4). Remove seal ring (9). Do not remove needle bearing (8), thrust bearing (7) or thrust washer (6) from body (5) as these parts are not serviced separately.

Clean and inspect all parts for excessive wear or other damage and renew as necessary. A seal ring and seal kit (items 2, 3, 4, 9, 20 and 22) is available for resealing the motor. To reassemble the motor, clamp body port boss in a padded vise with the seven tapped holes upward. Insert shaft (10) and drive link (11). Install new seal ring (9) in groove on body (5). Place stator (15) on wear plate (12) and install rotor and rollers (13 and 14) with counterbore in rotor facing upward. Place wear plate and rotor assembly over the drive link and on the body.

NOTE: Two capscrews, 3/8" x 4 1/2" - 24, with heads removed, can be used to align bolt holes in body (5) with holes in wear plate (12), stator (15), manifold plate (16), manifold (17), commutator plate (18) and end cover (23).

Install manifold plate (16) with the slots toward the rotor. Install manifold (17) with swirl grooves toward the rotor and the diamond shaped holes

upward. Place commutator ring (18) and commutator (19) on the manifold with the bronze ring groove facing upward. Place bronze seal ring (20) into the groove with the rubber side downward. Lubricate seal ring (9) and install sleeve (21) over the assembled components. Install new seal ring (22) on end cover (23), lubricate seal ring and install end cover. Remove line up bolts and install the seven capscrews (24). Tighten the capscrews evenly to a torque of 50 ft.-lbs.

Remove motor from vise and place it on bench with output shaft pointing upward. Lubricate and install new oil seal (4), shim (3), spacer (2) and snap ring (1). Lubricate motor by pouring new SAE 20W oil in one port and rotating output shaft until oil is expelled from other port.

RANGE TRANSMISSION AND DIFFERENTIAL

A two-speed range transmission is used on all models. The range transmission and differential are contained in one case. The transmission shift lever has three positions; High, Neutral and Low. When transmission is in neutral, tractor can be moved manually.

REMOVE AND REINSTALL

All Models

To remove the range transmission and differential assembly, place shift lever in neutral position. Block up under tractor frame and place a rolling floor jack under transmission and differential housing. Unbolt and remove fenders, seat and seat support. Disconnect and remove brake band. Disconnect hydraulic lines from hydraulic drive motor and plug or cap all openings to prevent entrance of dirt or other foreign material. Remove capscrews securing transmission and differential assembly to tractor frame and roll the assembly rearward from tractor.

Reinstall by reversing removal procedure. Transmission and differential oil should be renewed each 500 hours of operation or once each year. Use SAE EP80 gear oil. Capacity is approximately 6 pints.

OVERHAUL

All Models

To disassemble the range transmission and differential assembly, drain lubricant, then remove top cover and rear wheels. Place a large drive punch against inside end of brake shaft (38—Fig. C14) and hit drift sharply with a hammer. This will dislodge retaining ring (5) from its groove in brake shaft. Remove retaining ring and brake idler gear (4) as brake shaft is withdrawn. Unbolt hydraulic drive motor (30), hold sliding gear (14) and remove drive motor and sliding gear. Unseat retaining rings (15), withdraw shift rod (31) and remove shift fork (16). Remove "C" rings (18) from inner end of axle shafts (27 and 40), withdraw axle shafts and lift out the differential assembly with spacer (9) and thrust washers (10 and 24). Remove locknuts (11) and bolts (26), then remove low speed ring gear (12) and high speed ring gear (23). Separate differential case halves (13 and 22) and remove drive pin (21) with roll pin (7), thrust washers (19), pinion gears (20) and axle gears (17). Remove oil seals (28, 33 and 37). Remove plug (34) and needle bearing (35). If necessary, remove brake shaft bushings (6 and 36) and axle shaft flanged bushings (8, 25 and 29). New bushings must be reamed after installation.

Clean and inspect all parts and renew any showing excessive wear or other damage. If brake shaft bushings were removed, press new bushings into position, then ream inner bushing (6) to 1.004-1.005 and outer bushing (36) to 1.192-1.193. If axle shaft bushings were

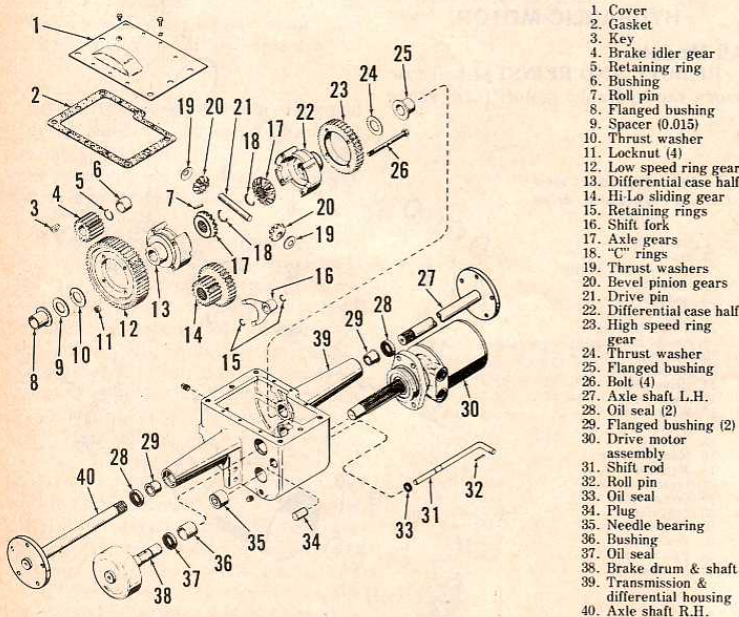


Fig. C14—Exploded view of range transmission and differential assembly.

TRACTORS

removed, install inner bushings (8 and 25) with oil groove downward, then install outer bushings (29). Ream all four axle bushings to 1.876-1.877. Reassemble differential and ring gears. Use new locknuts (11) and tighten them to a torque of 50 ft.-lbs. Use new oil seals (28, 33 and 37), new gasket (2) and new "O" ring on drive motor flange. Use 0.015 thick spacers (9) as required to adjust differential unit side play until side play is between 0.005 minimum and 0.030 maximum. When installing drive motor, apply Loctite to capscrew threads and tighten capscrews to a torque of 110-125 ft.-lbs. Fill transmission and differential housing to level plug opening with SAE EP80 gear oil. Capacity is approximately 6 pints.

PTO CLUTCH

R&R AND OVERHAUL

All Models

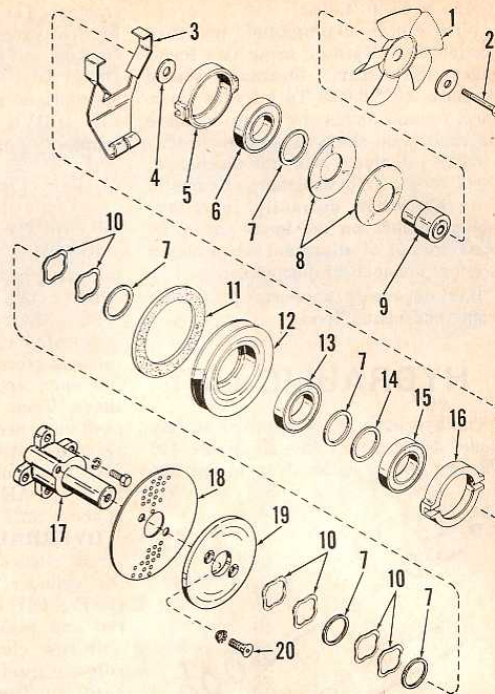
To remove the pto clutch, remove tractor hood and unbolt oil cooler supports from flange. Move oil cooler ahead for access to the clutch. Disconnect pto control rod from cam actuator lever (3—Fig. C15 or C16). Remove left hand thread capscrew (2), fan (1), hub spacer (9), Belleville springs (8), spacer (7), outer cam (5) with bearing (6) and cam actuator (3) as an assembly. On models 224 and 444, washer (4—Fig. C15) will be removed with hub spacer (9). On model 446, remove retaining ring (4—Fig. C16). Then, on all models, remove inner cam (16—Fig. C15 or C16) with bearing (15), spacer and shim pack (7 and 14), pulley (12) with bearing (13) and friction disc (11). Spacers (7) and springs (10) can now be removed.

Clean and inspect all parts and renew any showing excessive wear or other damage. Check friction disc for glaze and wear. If friction surface is glazed or if friction disc thickness measures less than 1/8-inch, renew the friction disc. Sealed bearings (6, 13 and 15) must rotate freely and quietly.

When reassembling, install spacers (7) and springs in same sequence as original assembly. Place friction disc (11) over shoulder of clutch pulley (12), then place both on drive hub. Install original spacer and shim pack (7 and 14). Measure diameter of inner cam (16) at each side of lever notches. One side will measure about 3 inches and the other about 2-7/8 inches. Install cam and bearing assembly with shorter side of cam downward, on drive hub. On model 446, install retaining ring (4—Fig. C16) on drive hub. On all models place washer, fan (1—Fig. C15 or C16), hub spacer (9), Belleville

Fig. C15—Exploded view of typical pto clutch used on models 224 and 444.

1. Fan
2. Capscrew (L.H. thread)
3. Cam actuator lever
4. Washer
5. Outer cam
6. Bearing
7. Spacer (0.050)
8. Belleville springs
9. Hub spacer
10. Springs
11. Friction disc
12. Clutch pulley
13. Bearing
14. Shim (0.010)
15. Bearing
16. Inner cam
17. Drive hub
18. Grass screen
19. Clutch plate
20. Machine screw (2)

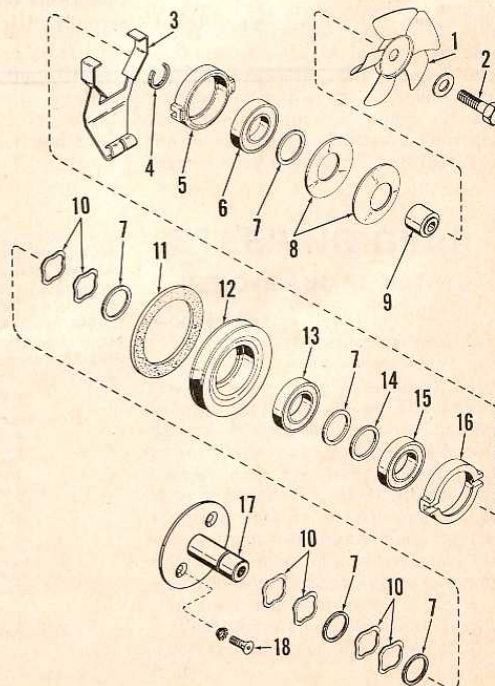


springs (8) and spacer (7) on left hand thread capscrew (2). Position outer cam (5) with bearing (6) on hub spacer (9) so that longer diameter of cam between notches is downward. On models 224

and 444, place washer (4—Fig. C15) on hub spacer. Install cam actuating lever (3—Fig. C15 or C16) in notches of inner cam (16), then install outer cam assembly. Tighten capscrew (2) to a

Fig. C16—Exploded view of typical pto clutch assembly used on model 446 tractors.

1. Fan
2. Capscrew (L.H. thread)
3. Cam actuator lever
4. Retaining ring
5. Outer cam
6. Bearing
7. Spacer (0.050)
8. Belleville springs
9. Hub spacer
10. Springs
11. Friction disc
12. Clutch pulley
13. Bearing
14. Shim (0.010)
15. Bearing
16. Inner cam
17. Drive hub & clutch plate
18. Machine screw (2)



torque of 35-40 ft.-lbs.

With clutch disengaged, measure friction disc clearance using two feeler gages 180° apart. Clearance should measure 0.015-0.025. To increase clearance, remove shims (14) or to decrease clearance, add shims (14) as required.

NOTE: If clutch will not disengage, check for incorrect assembly of cams (5 and 16). When correctly installed, facing notches on the inner and outer cams are out of alignment when clutch is either engaged or disengaged.

Bolt oil cooler supports to tractor frame and install hood.

HYDRAULIC LIFT

The hydraulic lift is standard on late model 444 tractors and all model 446 tractors and is optional on model 224

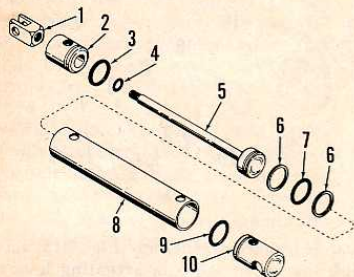


Fig. C17—Exploded view of model F30 hydraulic lift cylinder used on some tractors.

- | | |
|-----------------|-------------------|
| 1. Clevis | 6. Back-up rings |
| 2. Rod guide | 7. "O" ring |
| 3. "O" ring | 8. Tube |
| 4. "O" ring | 9. "O" ring |
| 5. Rod & piston | 10. Cylinder head |

tractors. The hydraulic oil is furnished by the hydrostatic drive pump and the control valve used is the two-spool Dukes valve shown in Fig. C9. Refer to appropriate paragraphs in HYDRAULIC DRIVE section for service procedure on pump and control valve.

LIFT CYLINDER

All Models So Equipped

REMOVE AND REINSTALL. With the lift cylinder in closed position, disconnect the two hoses. Unpin and remove the cylinder assembly.

Reinstall cylinder by reversing the removal procedure. Operate cylinder to full open and closed position several times. Then, with cylinder in closed position, check oil level in hydraulic reservoir. Add oil as necessary. Use SAE 5W-20 oil if temperature is below 32°F. or SAE 20W-40 oil if temperature is above 32°F.

OVERHAUL (F30). Remove the street elbows from cylinder and drain the cylinder. Pull outward on clevis (1—Fig. C17) and remove rod guide and rod and piston assembly (1 thru 6). Unscrew clevis from rod (5), then remove guide (2). Remove cylinder head (10) from tube (8). Remove and discard all "O" rings and back-up rings.

Clean and inspect all parts and renew any showing excessive wear, scoring or other damage. When reassembling, renew all "O" rings and back-up rings and lubricate internal parts with SAE 20W oil. Apply Loctite to threads on rod and tighten clevis securely. Use pipe thread sealer or

teflon tape on threads and install the two street elbows.

OVERHAUL (H30 or J30). Drain the oil from the cylinder and disassemble as follows: Clean all paint and/or rust from inside the base end of cylinder tube (3—Fig. C18). Push piston and rod assembly and end plate (7 or 8) out of the cylinder tube. Remove "O" ring (5) from piston, "O" ring (6) from end plate (7 or 8) and wiper seal (1) and "O" ring (2) from cylinder tube.

Clean and inspect all parts and renew any showing excessive wear, scoring or other damage. When reassembling, renew wiper seal and "O" rings which are available in a seal kit. Lubricate wiper seal and all "O" rings and use caution not to damage "O" rings during reassembly. Install end plate (7 or 8) just far enough to permit installation of cylinder mounting pin.

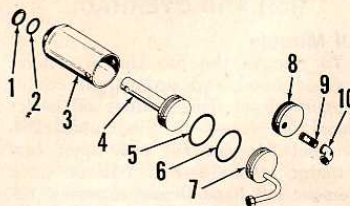


Fig. C18—Exploded view of model H30 or J30 hydraulic lift cylinder used on some tractors. Items 8, 9 and 10 are used on model H30 cylinder.

- | | |
|------------------|--------------------|
| 1. Wiper seal | 6. "O" ring |
| 2. "O" ring | 7. End plate (J30) |
| 3. Cylinder tube | 8. End plate (H30) |
| 4. Rod & piston | 9. Pipe nipple |
| 5. "O" ring | 10. Pipe elbow |