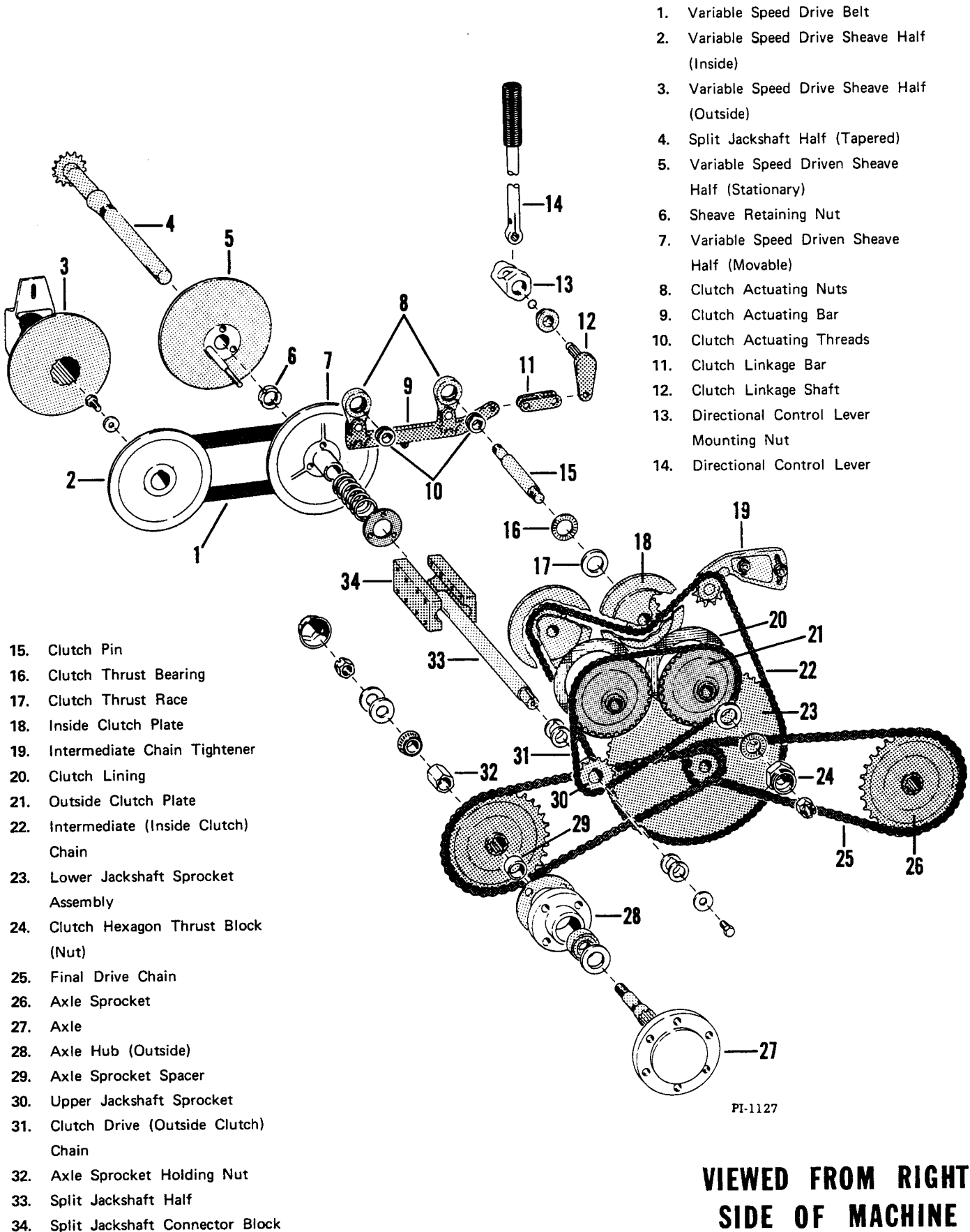


DRIVE SYSTEM SERVICE

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**DRIVE
SYSTEM**

PICTORIAL SCHEMATIC (Drive System)



1. Variable Speed Drive Belt
2. Variable Speed Drive Sheave Half (Inside)
3. Variable Speed Drive Sheave Half (Outside)
4. Split Jackshaft Half (Tapered)
5. Variable Speed Driven Sheave Half (Stationary)
6. Sheave Retaining Nut
7. Variable Speed Driven Sheave Half (Movable)
8. Clutch Actuating Nuts
9. Clutch Actuating Bar
10. Clutch Actuating Threads
11. Clutch Linkage Bar
12. Clutch Linkage Shaft
13. Directional Control Lever Mounting Nut
14. Directional Control Lever

15. Clutch Pin
16. Clutch Thrust Bearing
17. Clutch Thrust Race
18. Inside Clutch Plate
19. Intermediate Chain Tightener
20. Clutch Lining
21. Outside Clutch Plate
22. Intermediate (Inside Clutch) Chain
23. Lower Jackshaft Sprocket Assembly
24. Clutch Hexagon Thrust Block (Nut)
25. Final Drive Chain
26. Axle Sprocket
27. Axle
28. Axle Hub (Outside)
29. Axle Sprocket Spacer
30. Upper Jackshaft Sprocket
31. Clutch Drive (Outside Clutch) Chain
32. Axle Sprocket Holding Nut
33. Split Jackshaft Half
34. Split Jackshaft Connector Block

PI-1127

**VIEWED FROM RIGHT
SIDE OF MACHINE**

DRIVE SYSTEM SERVICE

ROUTINE CLUTCH ADJUSTMENT

The Bobcat has two separate drive trains (one on each side of the machine), each equipped with two clutches. These clutches are engaged and disengaged by the directional control levers. When lever travel (from neutral) exceeds four inches in either direction, the clutches need adjustment. This may occur shortly (about 50 hours) after a new machine is put into service. After the clutch facings are "seated", lever travel should be checked every 100 hours and the clutches adjusted only if lever travel is excessive.

On either side of the machine, the clutch toward the front is the reverse travel clutch and the clutch toward the rear is the forward travel clutch. Adjust according to the following procedure:

1. Shut off the engine before attempting to adjust the clutches.
2. With the large clutch cap wrench, remove the protective caps from the four clutch pins.
3. Remove the cotter pins which hold the castle nuts in place.
4. With the directional control lever in neutral position, tighten the front castle nut 1/2 slot. Move the lever back to check the adjustment. Repeat this until no more adjustment is needed. When the handle (hand grip) of the lever can be moved 3 to 4 inches (maximum) back from neutral to fully engaged position, adjustment of the reverse travel clutch is correct for that side. You may need to use the small end of the clutch wrench to make the adjustment (Figure 14).
5. Tighten the rear castle nut in the same manner, moving the lever forward to check travel (maximum) from neutral, adjustment of the forward travel clutch is correct for that side.
6. Repeat these adjustments on the other side of the machine. When you have finished, the levers on both sides should be in line when they are both moved forward or back to fully engaged position.
7. After completing this adjustment, secure each castle nut with a cotter pin and tighten the protective caps over the clutch pins with a clutch cap wrench.
8. If the quad ring seal sticks to the side panel when a clutch cap is removed, carefully pull the quad ring from the panel and place it in its groove in the cap. Spread a little oil around the quad ring seal before replacing the cap. If oil leakage is noted around the clutch caps, the quad ring seals must be replaced.

WARNING

Do not overtighten the clutches. Overtightening will cause the clutches to be partially engaged when the control lever is in neutral. This causes hard starting and clutch wear.

After all four clutch pins have been adjusted and the protective caps have been installed, sit in the operator's seat and start the engine. With the directional control levers in neutral, the machine should stand still. If the machine creeps, rocks, or jumps back and forth, the clutches are set too tight and must be readjusted.

NOTE: If nothing happens when a directional control lever is moved one way, but the clutch engages when the lever is moved the opposite way, (1) there has been a clutch failure, (2) the needle thrust bearings may be defective, (3) the clutch actuating thread may be stripped.

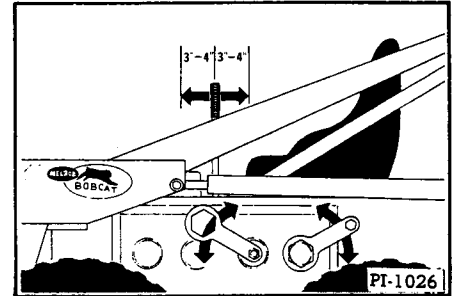


Fig. 14 Routine Clutch Adjustment

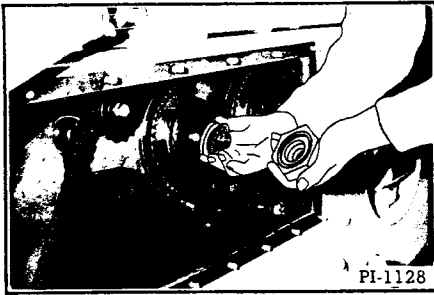


Fig. 15 Remove Thrust Bearings and Races

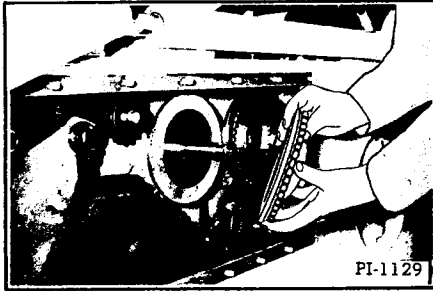


Fig. 16 Removing Outside Clutch Plate

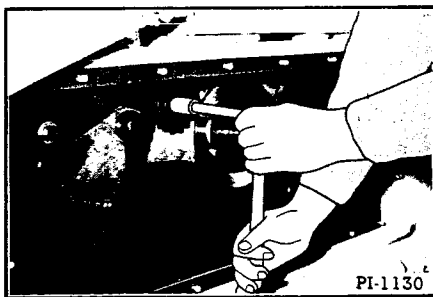


Fig. 17 Removing Sprocket From Idler

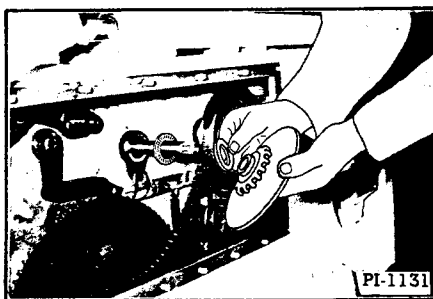


Fig. 18 Removing Inside Clutch Plates



Fig. 19 Removing Hyd. Lines To Clutch Pins

CLUTCH REMOVAL AND REPAIR [2.5 hr.]

The directional control clutches are located inside the gearcases and are actuated by a large square thread screw mechanism on each clutch. One clutch on each side of the machine is controlled by a right hand thread nut, the other by a left hand thread nut. Moving the directional control lever turns both of the clutch actuating nuts in the same direction at the same time. Because one is a right hand thread and the other is a left hand, they will cause one clutch to engage while the other clutch moves away from engagement. One of these clutches controls forward movement of the wheels on that side of the machine; the other clutch controls the reverse movement of the wheels.

Directional control clutch failure is usually caused by a thrust bearing failure or failure of the clutch actuating nuts.

The clutch failure may be one of several types:

1. The clutch actuating nuts may come out of adjustment if the clutch pins they are mounted on turn in the gearcase inner sidewall.
2. The actuating threads and nuts may wear and become sticky. In some cases a wear pattern in the actuating nut will cause the clutches to stick in engaged position.
3. The actuating nut may wear enough so that it rubs on the inside gearcase sidewall.

Clutch lining life is quite long and lining replacement is usually not necessary. The clutch thrust bearings and the hardened clutch thrust races that the bearings run between usually fail prior to clutch lining failure. The hardened clutch thrust races are ground on both sides and may be turned over to secure a new wear surface. The clutch thrust bearings should normally be replaced when the clutches are removed for actuating nut service.

Follow this procedure to remove the clutch and actuating assembly:

1. Remove the protective clutch caps and the gearcase cover.
2. Loosen the clutch drive (outside clutch) chain idler sprocket and remove the clutch drive chain.
3. Remove the cotter pins from the castle nuts and remove the castle nuts.
4. Remove the large hexagon clutch thrust blocks (nuts).
5. Remove the thrust bearings and races. Notice that each clutch thrust bearing is mounted between two hardened clutch thrust races (Figure 15).
6. Remove the outside clutch plate and lining (Figure 16).
7. Remove the sprocket from the intermediate idler (Figure 17). This is necessary to gain enough slack in the intermediate (inside clutch) chain so that the chain can be released from the inside clutch sprockets.
8. Remove the inside clutch plates, hardened races and thrust bearings (Figure 18).
9. Disconnect the clutch actuating linkage and centering spring.
10. Remove the seat and engine cover.
11. Remove the hydraulic lines to the clutch pins (Figure 19).
12. Remove the clutch pin holding nuts.
13. Remove the clutch pins and actuating bar (Figure 20).

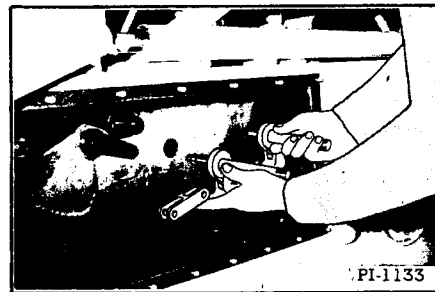


Fig. 20 Removing Clutch Pins & Bar

To reinstall the clutch pins, proceed as follows:

1. Assemble the clutch actuating nuts onto the actuating bar:
 - A. Face the actuating bar as you would if it were in the machine.
 - B. Place the right hand threaded actuating nut into the right clevis and the left hand actuating nut into the left clevis.
 - C. Install the socket head shoulder screws, being sure that a small spring washer is placed into the clevis behind each actuating nut. Watch the washer to be sure it doesn't slip off the shoulder of the socket head screw when the screw is being tightened. This would cause it to be flattened against the back of the actuating bar clevis.
 - D. Turn the clutch pins into the actuating nuts.
2. Install the assembly into the machine.
 - A. Grasp the right clutch pin in your right hand and the left clutch pin in your left hand.
 - B. Place the assembly in the clutch pin mounting holes.

NOTE: Install a new lead seal over the clutch pin threads each time.

- C. Turn the clutch pin holding nuts (large 7/8" nuts) onto the clutch pins and draw the clutch pins up until they are just snug in the frame.

NOTE: The nuts must be tight enough so the pins will not turn under hand pressure.

- D. Connect the actuating bar to the lever linkage bar.

3. To insure positive clutch engagement the clutch pins are adjusted at this point.

- A. Move the directional control lever forward so the hand grip is approximately 4" ahead of its neutral position (Figure 22).

- B. Turn the rear clutch pin so there is full thread contact between the actuating threads (Figures 22 and 23).



NOTE: The sharp edges are purposely broken from the actuating threads to keep them from breaking in use and jamming the threads.

Fig. 21 Actuating Thread

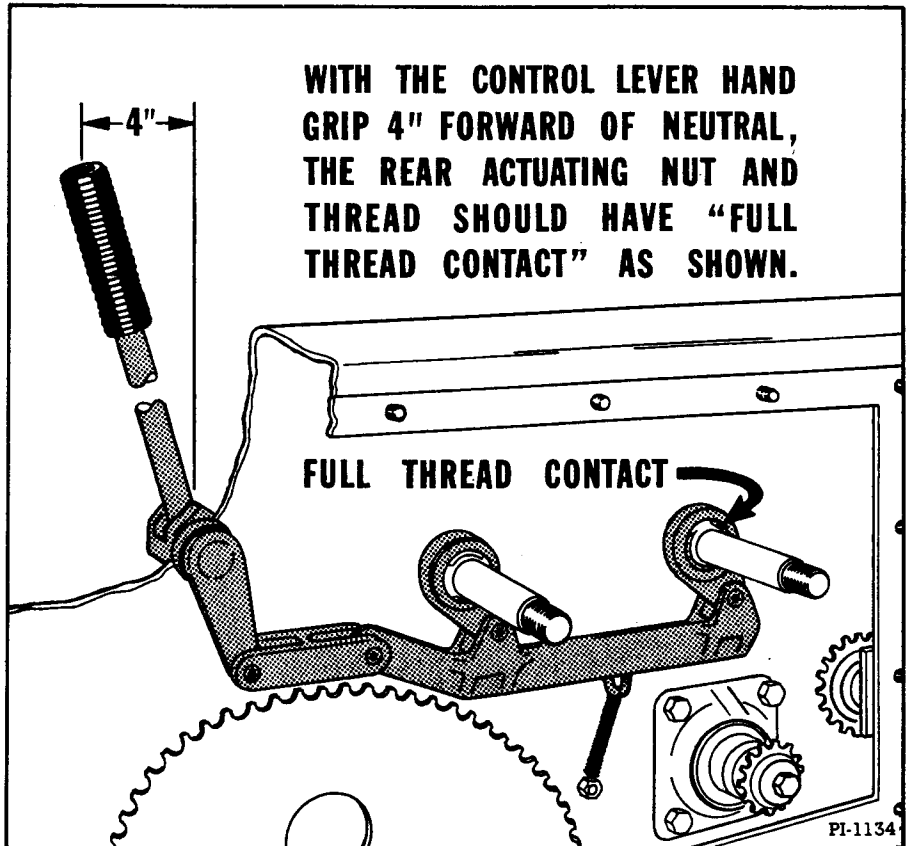


Fig. 22 Full Thread Contact at Rear Pin

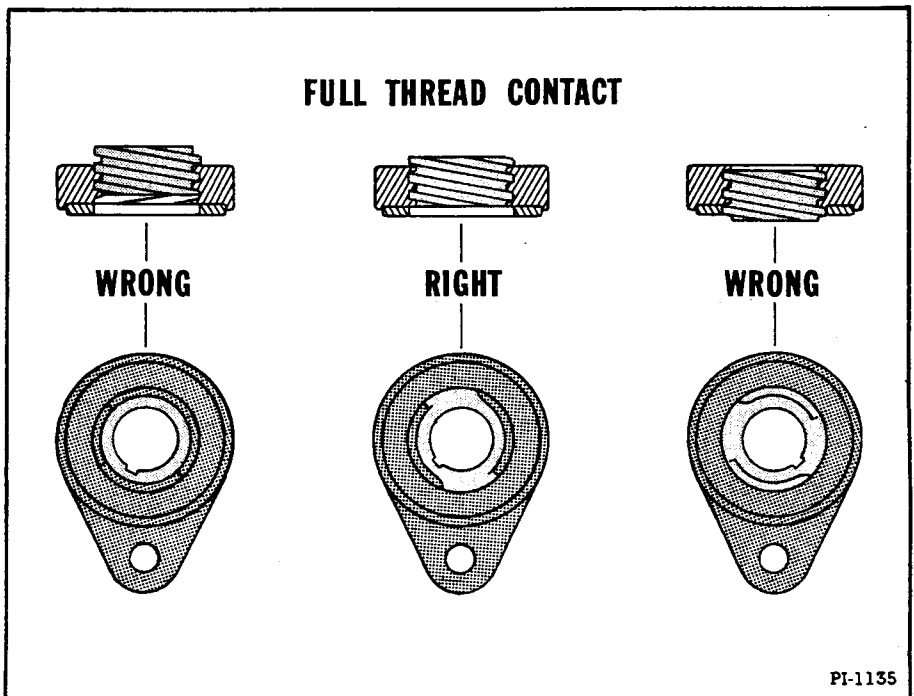


Fig. 23 Full Thread Contact

NOTE: To turn the clutch pin, turn the castle nut onto the outside of the clutch pin so the slots in the nut are toward the machine. Put a pin through the slots in the nut and the hole in the pin. Turn the pin with a wrench.

- C. When the rear clutch pin has the right adjustment, tighten the clutch pin holding nut. Use a wrench on the castle nut to hold the clutch pin while you are tightening the holding nut. This prevents turning the clutch pin.
- D. Mount the inside clutch plates.

WARNING

The clutch thrust bearing may fall from the end of the clutch hub when an inside clutch is being installed. Put a small amount of grease on the thrust bearing to hold it on the hub, or hold it with your fingers as you replace the clutch plate. Use new thrust bearings.

- E. Align the front clutch plate to the rear clutch plate with both clutches in neutral position. Lay a straightedge along the faces of the clutch plates and turn the front clutch pin until the clutch plates are in line (Figure 24). Tighten the holding nut, holding the clutch pin so it doesn't turn.
4. Mount the intermediate (inside clutch) chain and replace the idler sprocket. Tighten the chain.

NOTE: The intermediate chain goes over the idler sprocket, under the sprocket on the front clutch and over the sprocket on the rear clutch.

5. Install the clutch linings onto the inside clutch plates. Make sure the linings fit easily over the shoulders on the inside clutch plates. If a lining does not slide easily over the shoulder, file or sandpaper the inside diameter of the lining until it fits loosely on the shoulder.

WARNING

If the lining is forced onto the shoulder of the clutch plate it may crack the center member of the lining and cause a lining failure after only a few hours service. It must turn freely on the clutch plate.

6. Mount the outside clutch plates.
7. Install the hardened thrust races and clutch thrust bearings on the outside clutch plates. The hardened race is mounted on the shoulder of the clutch plate, followed by the thrust bearing.

NOTE: Turn the thrust race mounted in the large hexagon thrust block (nut) and the thrust race on the clutch plate to the sides that have not been in contact with the thrust bearing. If both sides have been worn, replace the thrust races. Install new thrust bearings.

8. Loosen the self aligning portion of the large hexagon thrust block (nut) with the handle of a screwdriver (Figure 25). If it cannot be loosened by this method, place it into a vise or press and loosen it, being careful not to damage the wearing surface of the hardened race.
9. Install the large hexagon thrust blocks (nuts).
10. Install the castle nuts and cotter pins.
11. With a straightedge, check the alignment of the upper jackshaft sprocket with the outside clutch sprockets (Figure 26).

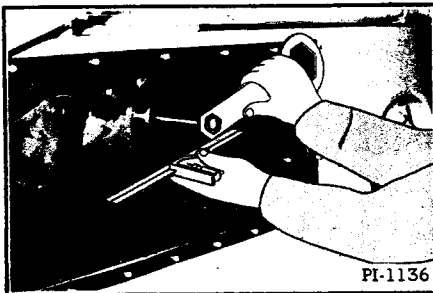
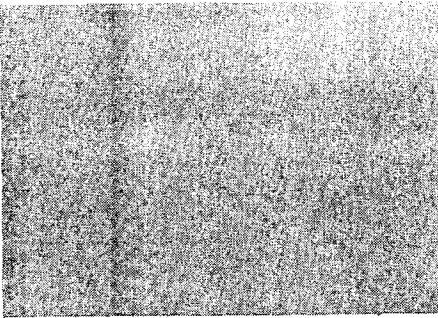


Fig. 24 Aligning Clutch Plates

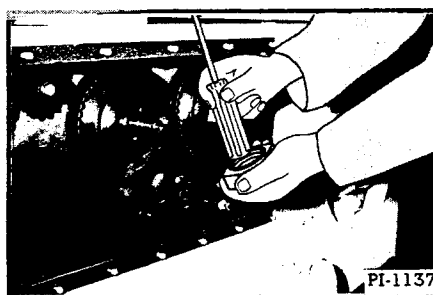
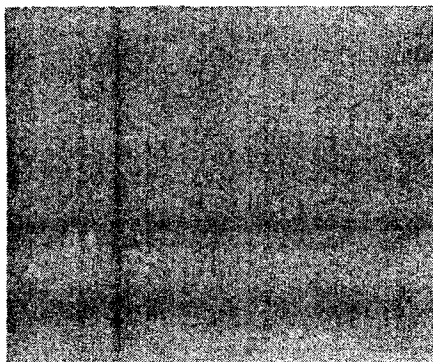


Fig. 25 Loosening Hardened Race

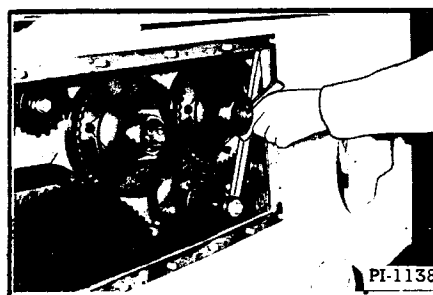


Fig. 26 Checking Sprocket Alignment

12. Reinstall the clutch drive (outside clutch) chain, tightening it hand tight (Figure 27). It should be tight enough so that it can be deflected 1/4" under 10 lbs. spring scale tension (Figure 28).
13. Install the gearcase cover.
14. Check the lever travel and adjust the clutches if necessary (See Routine Clutch Adjustment).
15. Replace the protective clutch caps.
16. Replace the hydraulic lines to the clutch pins.

In most cases you will not be removing the forward and reverse clutches at the same time. To remove one of the clutches and its actuating nut, proceed as follows:

1. Remove the protective clutch caps and the gearcase cover.
2. Loosen the clutch drive (outside clutch) chain idler sprocket and remove the clutch drive chain.
3. Remove the cotter pin from the castle nut and remove the castle nut.
4. Remove the hexagon clutch thrust block (nut).
5. Remove the thrust bearing and the hardened thrust race. Notice that the clutch thrust bearing is mounted between two hardened clutch thrust races (Figure 15).
6. Remove the outside clutch plate and lining (Figure 16).
7. Loosen the intermediate chain idler. Remove the sprocket from the intermediate idler (Figure 17). This is necessary to gain enough slack in the intermediate (Inside clutch) chain so that the chain can be released from the inside clutch sprockets.
8. Remove the inside clutch plate, hardened thrust race and thrust bearing (Figure 18).
9. Remove the socket head shoulder screw that fastens the clutch actuating bar to the actuating nut. Be careful to save the small spring washer which is located in the actuating bar clevis (behind the actuating nut).
10. Remove the hydraulic tubeline (Figure 19) and clutch pin holding nut on the inside of the loader frame.
11. Remove the clutch pin from the frame.

The clutch actuating nut is mated to the clutch actuating thread, which is fastened to the clutch pin with a woodruff key. To change the clutch actuating nut and thread, tap the assembly off the clutch pin and replace with a new thread and nut.

To reinstall a clutch, follow this procedure:

1. Install the clutch pin, with an actuating thread and nut on it, into the clutch pin mounting hole. Use a new lead washer each time. Turn the clutch holding nut onto the clutch pin and draw the clutch pin up until it is just snug in the frame.
2. Fasten the actuating nut to the actuating bar. Be sure to insert the small spring washer into the clevis behind the actuating nut. Be sure the washer doesn't slip off the shoulder of the socket head shoulder screw when you're tightening the screw. This would cause it to be flattened against the back of the actuating bar clevis. Check for straightness of the actuating bar. Straighten if necessary.
3. Remove these parts from the other clutch assembly:
 - A. Cotter pin and castle nut.
 - B. Hexagon thrust block (nut), thrust bearing and race (Figure 15).
 - C. Outside clutch plate (Figure 16) and clutch lining.
 - D. Inside clutch plate, thrust race and bearing (Figure 18).

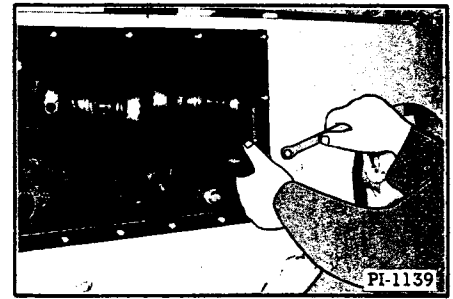


Fig. 27 Tightening Clutch Drive Chain

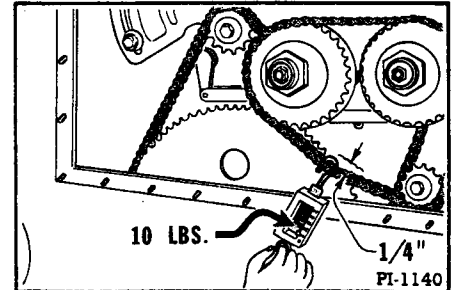
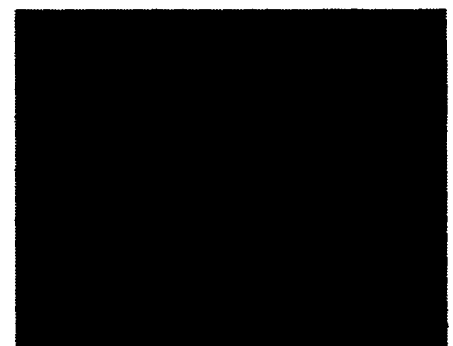
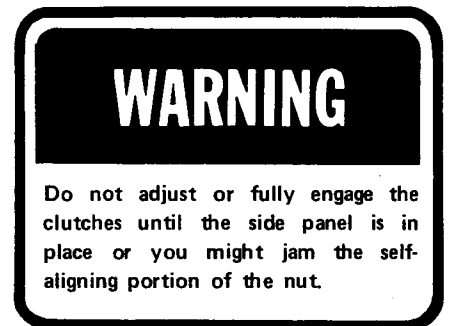
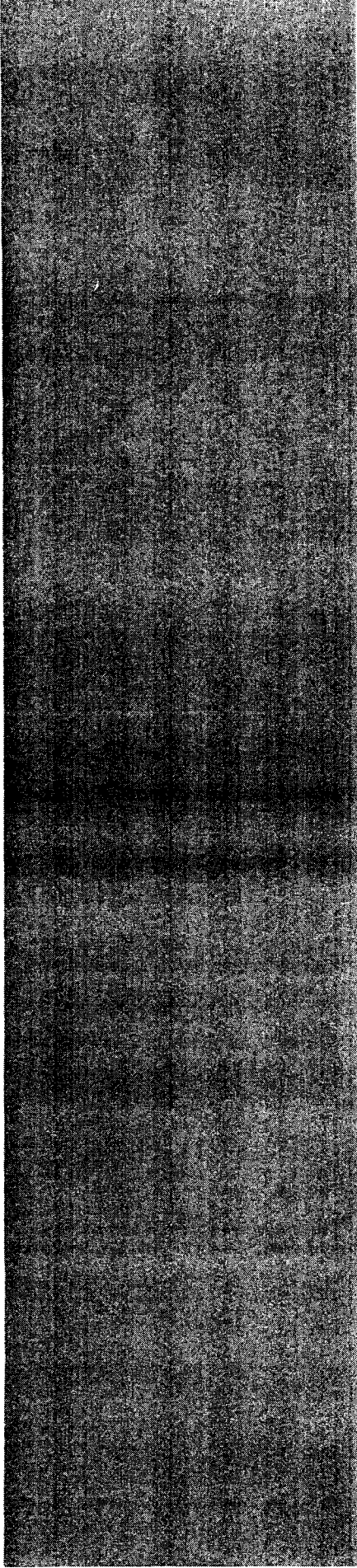


Fig. 28 Checking Tension of Clutch Chain



NOTE: Proper sprocket alignment and chain tension are necessary for satisfactory chain life.



- 
- E. Loosen the hydraulic tubeline at the clutch pin holding nut end. Loosen the clutch pin holding nut slightly (this nut is located inside the loader frame).
4. To insure positive clutch engagement the clutch pins are adjusted at this point:
- A. Move the directional control lever forward so the hand grip is approximately 4" ahead of its neutral position (Figure 22).
 - B. Turn the rear clutch pin so there is full thread contact between the actuating nut and actuating thread (Figures 22 and 23).

NOTE: To turn the clutch pin, turn the castle nut onto the outside of the clutch pin so the slots in the nut are toward the machine. Put a pin through the slots in the nut and the hole in the pin. Turn the pin with a wrench.

- C. When the rear clutch pin has the right adjustment, tighten the clutch pin holding nut. Use a wrench on the castle nut to hold the clutch pin while you are tightening it.
- D. Mount the inside clutch plates.

WARNING

The clutch thrust bearing may fall from the end of the clutch shoulder when an inside clutch is being installed. Put a small amount of grease on the thrust bearing to hold it on the shoulder, or hold it with your fingers as you replace the clutch plate. Use a new thrust bearing. Turn the hardened thrust races so an unworn side comes in contact with the new thrust bearing.

- E. Align the front clutch plate to the rear clutch plate with both clutches in neutral position. Lay a straightedge along the faces of the clutch plates and turn the front clutch pin until the clutch plates are in line (Figure 24). Tighten the clutch pin holding nut, holding the castle nut with a wrench to keep the clutch pin from turning.
5. Mount the intermediate (inside clutch) chain and replace the idler sprocket. Tighten the chain.

NOTE: The intermediate chain goes over the idler sprocket, under the sprocket on the front clutch and over the sprocket on the rear clutch.

6. Install the clutch linings onto the inside clutch plates. Make sure the linings fit easily over the shoulders on the inside clutch plates. If a lining does not slide easily over the shoulder, file or sandpaper the inside diameter of the lining until it fits properly.

WARNING

If the lining is forced onto the shoulder of the clutch plate it may crack the center member of the lining and cause a lining failure after only a few hours service. It must turn freely on the clutch plate.

7. Mount the outside clutch plates.
8. Install the hardened thrust races and clutch thrust bearings on the outside clutch plates. The hardened race is mounted on the shoulder of the clutch plate, followed by the thrust bearing.

NOTE: Turn the thrust race mounted in the large hexagon thrust (nut) and the thrust race on the clutch plate to the sides that have not been in contact with the thrust bearing. If both sides have been worn, replace the thrust races. Install new thrust bearings.

9. Loosen the self aligning portion of the large hexagon thrust block (nut) with the handle of a screwdriver (Figure 25). If it cannot be loosened by this method, place it into a vise or press and loosen it, (being careful not to damage the wearing surface of the hardened race) or replace it with a new assembly.
10. Install the large hexagon thrust blocks (nuts).
11. Install the castle nuts and cotter pins.
12. With the directional control lever in neutral, check the alignment of the upper jackshaft sprocket with the rear outside clutch sprockets (Figure 26).

NOTE: On the left side of the machine (with tapered jackshaft) align the belt, then shim the upper jackshaft sprocket for alignment. Refer to page 12.

13. Reinstall the clutch drive (outside clutch) chain, tightening it hand tight (Figure 27). It should be tight enough so that it can be deflected 1/4" under 10 lbs. spring scale tension (Figure 28).

Be sure the intermediate chain has been tightened (Figure 29). It should require 15 lbs. spring scale tension to deflect it 1/4" (Figure 30).

14. Install the gearcase cover. Check the condition of the gasket.
15. Check the lever travel and adjust the clutches if necessary (See Routine Clutch Adjustment).
16. Replace the protective clutch caps. Check the condition of the quad ring seals.
17. Replace the hydraulic lines to the clutch pins.

REPLACING CLUTCH NEEDLE BEARINGS

When replacing clutch needle bearings, press one bearing in from each side of the clutch plate. The bearings should be pressed in so they are flush with the outside of the hub (Figure 31).

NOTE: If the chains are too tight, both bearings will work inward toward the center of the hub.

VARIABLE SPEED DRIVE

The variable speed drive mechanism on every Bobcat is factory adjusted, but it may, in time, require further adjustment. Several conditions can cause loss of power through the variable speed drive belt. They are listed below with their remedies:

1. If the belt is bottoming and slipping in the drive (engine) sheave, the operator should nudge the variable speed lever slightly toward higher speed. This will bring the sides of the sheave in to where they can grip the belt.

NOTE: Most belt bottoming and slipping can be avoided. Whenever the operator places the variable speed in low speed position, he should nudge the lever forward to move the belt slightly outward from the hub.

2. If the belt slips and is not bottoming, tighten it by turning the three nuts on the spring loaded jackshaft sheave. Tighten these nuts evenly, one turn at a time. After tightening each nut one turn, start the machine and check for slippage.
3. If the belt continues to slip, it may be worn too narrow to be gripped by the drive sheave, in which case it should be replaced with a new belt. The spring loaded jackshaft sheave must be readjusted after replacing the belt. A new belt is 1-13/16" wide at the top. When a new belt is installed adjust the three nuts on the spring loaded jackshaft sheave so 1/4 inch of thread shows past the three nuts.

WARNING

Do not overtighten the spring-loaded jackshaft sheave because this will cause the belt to wear excessively.

NOTE: Correct sprocket alignment is necessary for satisfactory chain life.

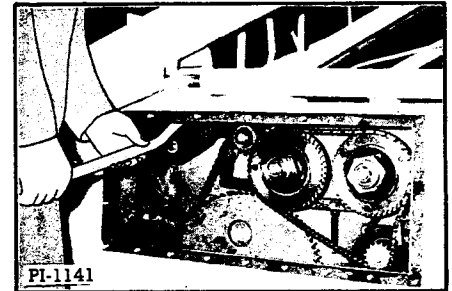


Fig. 29 Tightening Intermediate Chain

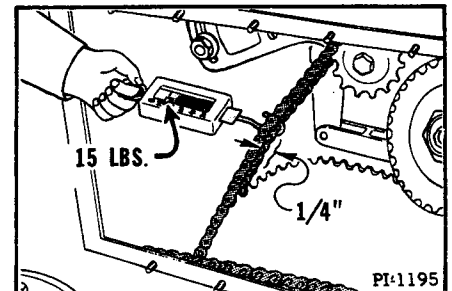


Fig. 30 Checking Tension of Chain

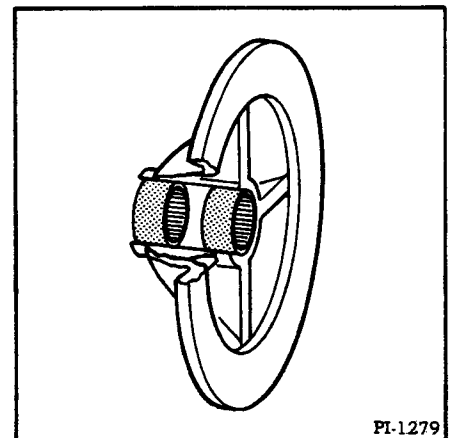
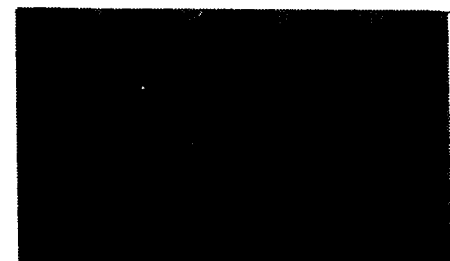


Fig. 31 Replacing Clutch Needle Bearings



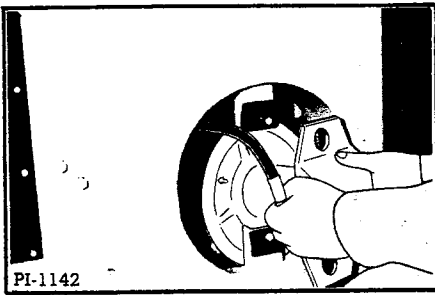


Fig. 32 Removing Engine Sheave Half

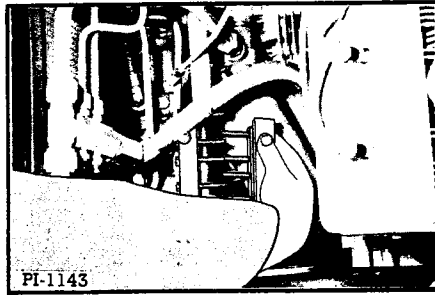


Fig. 33 Removing Jackshaft Connector

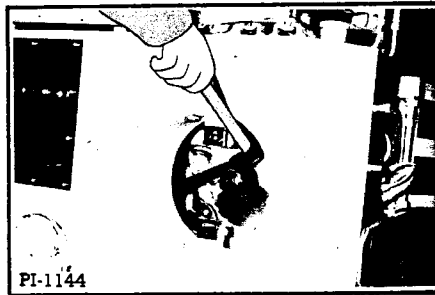


Fig. 34 Pulling Belt into Driven Sheave

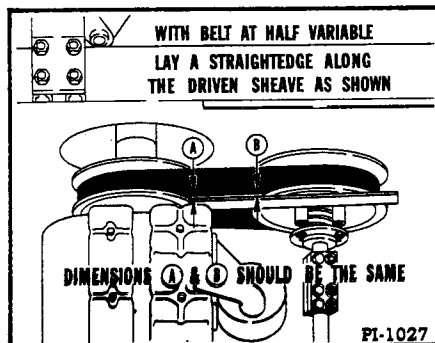
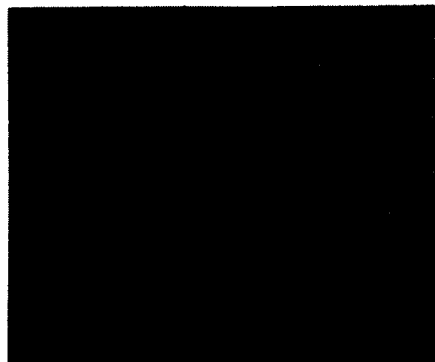


Fig. 35 Checking Belt Alignment



DRIVE BELT REPLACEMENT (Split Jackshaft) [1.5 hr.]

On machines with a split jackshaft use the following procedure:

1. Remove the outside portion of the engine variable width sheave and hydraulic cylinder assembly, located at the left rear of the machine, on the engine output shaft (Figure 32). Clean the cylinder and hose before disconnecting the fitting. Plug the cylinder port and hose to keep out dirt.

NOTE: Observe whether there are any spacers between the variable speed cylinder mounting bracket and the frame brackets. These spacers must be replaced as they were (M-600 and M-500 gasoline and LP gas).

On machines with a swivel coupling, remove the swivel, then remove the large holding nut to separate the sheave halves (M-600 and M-500 diesel, M-600 and M-500 electric, M-444 gasoline and LP gas).

2. Remove the split jackshaft connector (Figure 33). The connector must be replaced in the same position as it was before removal. Matched ends are punch marked. Keep the marked ends of the block toward the sheave.
3. Pass the worn belt between the shaft ends and replace it with a new belt.
4. Reinstall the split jackshaft connector, exactly as it was before. Four screw heads should be up and four down. Retorque the eight connector screws to 18-20 ft. lbs. torque. The screws must be tightened down evenly.
5. Pull the belt with a pry bar to force it into the driven sheave (Figure 34). This will make it possible to replace the outside (engine) sheave half. Do not use a flat bar, as it will damage the belt.

NOTE: The spring loaded variable width sheave will have to be readjusted after a new belt is installed because a new belt is wider than an old, worn belt.

6. Reinstall the outside drive sheave half and reconnect the hydraulic hose. Align the balance marks on the sheave halves when reinstalling.
7. Check the belt alignment of the drive and driven sheaves (Figure 35).

DRIVE BELT REPLACEMENT (One Piece Jackshaft) [5 hr.]

On machines with a one piece jackshaft, use the following procedure:

1. Remove the outside portion of the engine variable width sheave and hydraulic cylinder assembly, located at the left rear of the machine, on the engine output shaft (Figure 32). Clean the cylinder and hose before disconnecting the fitting. Plug the cylinder port and hose to keep out dirt.

NOTE: Observe whether there are any spacers between the variable speed cylinder mounting bracket and the frame brackets. These spacers must be replaced as they were (M-500 gasoline and LP gas).

On machines with a swivel coupling, remove the swivel, then remove the large holding nut to separate the sheave halves (M-500 diesel, M-600 and M-500 electric, M-444 gasoline and LP gas).

2. Remove the protective clutch caps from both sides of the machine.
3. Remove both gearcase covers.
4. Loosen the clutch drive (outside clutch) chain tighteners and remove the clutch drive chains.
5. Remove the sprocket retaining screws and the sprockets from both ends of the jackshaft.

NOTE: You may need to use a puller to remove the sprocket from the end of the shaft. Remove the sprocket retaining screw from the jackshaft and remove the retaining washers. Turn the screw back into the end of the shaft. (Figure 36).

6. Loosen the set screws in the hub of the stationary half of the driven sheave.
7. Drive the driven sheave assembly toward the right far enough so the square key can be removed from the jackshaft.
8. Remove the square key and move the sheave assembly back toward the left.
9. Remove the bearing locking collar from each end of the jackshaft. Loosen the set screw in the bearing locking collar (Figure 37) and rotate the collar opposite the shaft rotation until it is loose on the bearing (Figure 38). Rotating it about 3/4" will unlock it. Rotating it too far will relock it (backward).
10. Thoroughly clean that portion of the right end of the jackshaft which will be driven through the right bearing.
11. Drive the jackshaft to the right (through the sheave) far enough to pass the belt between the jackshaft and the machine sidewall.
12. Remove the worn belt and replace it with a new one.
13. To reassemble, align the jackshaft sprocket with the outside clutch sprockets on the right side of the machine. When they are aligned, lock the bearing locking collar onto the bearing hub by rotating it in the direction of shaft rotation (Figure 39). Tighten the locking collar set screw (Figure 37).
14. Mount the sprocket on the left end of the jackshaft and align it to the outer clutch sprockets. Use shim washers if necessary. Lock the locking collar by turning it in the direction of shaft rotation. Tighten the locking collar set screw (Figure 37).

NOTE: The spring loaded driven sheave will have to be readjusted after a new belt is installed because a new belt is wider than an old, worn belt.

15. Reinsert the key and set screws in the driven sheave hub. Check the alignment of the drive and driven sheaves (Figure 35). Move the driven sheave on the jackshaft to align. Tighten the set screws.

DRIVEN SHEAVE REMOVAL (Split Jackshaft) [3 hr.]

To remove a driven (spring loaded) sheave, proceed as follows:

1. Remove the outside portion of the engine variable width sheave and hydraulic cylinder assembly, located at the left rear of the machine, on the engine output shaft (Figure 32). Clean the cylinder and hose before disconnecting the fitting. Plug the cylinder port and hose to keep out dirt.

NOTE: Observe whether there are any spacers between the variable speed cylinder mounting bracket and the frame brackets. These spacers must be replaced as they were (M-500 Kohler & M-600 Wisconsin).

On machines with a swivel coupling, remove the swivel, then remove the large holding nut to separate the sheave halves.

2. Remove the protective clutch caps from the left gearcase cover.
3. Remove the gearcase cover.
4. Loosen the clutch drive (outside clutch) chain tightener and remove the clutch drive chain.
5. Remove the sprocket retaining screw and the sprocket from the end of the jackshaft.

NOTE: You may need to use a puller to remove the sprocket from the end of the shaft. Remove the sprocket retaining screw from the jackshaft and remove the retaining washers. Turn the screw back into the end of the jackshaft (Figure 36).

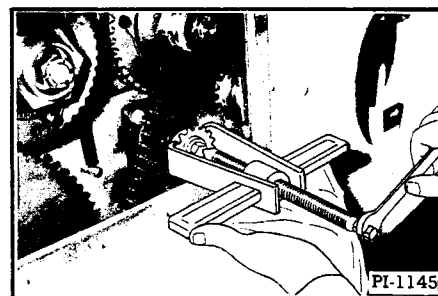


Fig. 36 Pulling Upper Jackshaft Sprocket

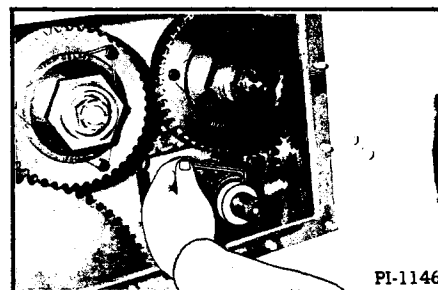


Fig. 37 Loosening Set Screw

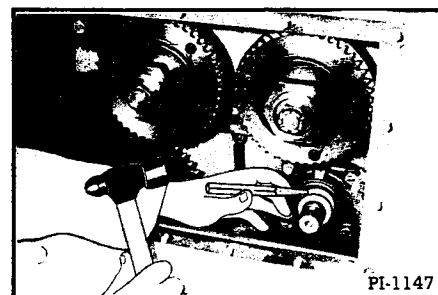


Fig. 38 Removing Bearing Locking Collar

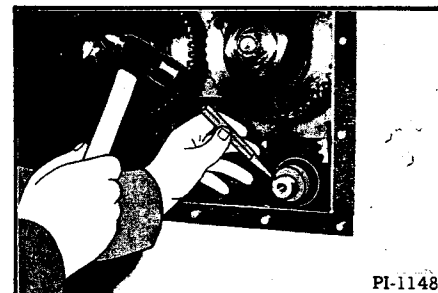


Fig. 39 Reinstalling Bearing Locking Collar

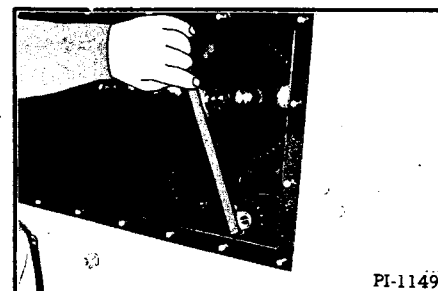


Fig. 40 Checking Sprocket Alignment

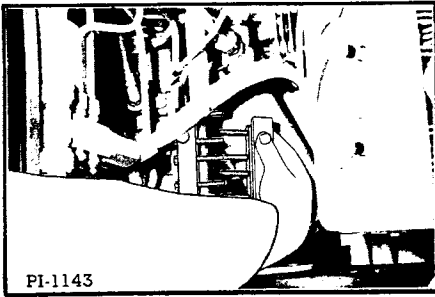


Fig. 41 Removing Split Jackshaft

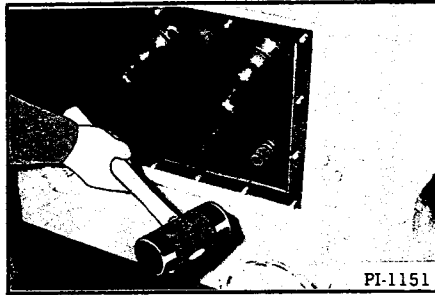


Fig. 42 Driving Jackshaft Half

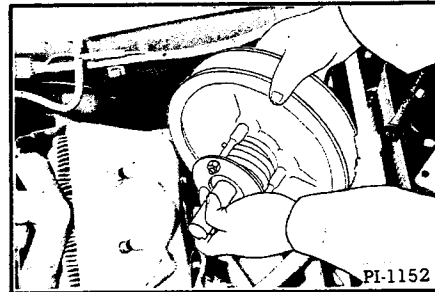


Fig. 43 Inserting Driven Sheave Assembly



Fig. 44 Pulling Belt Into Driven Sheave

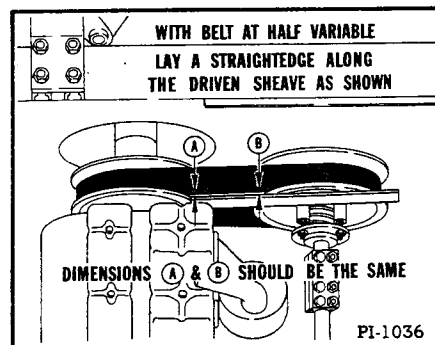


Fig. 45 Checking Belt Alignment

6. Remove the bearing locking collar from the jackshaft. Loosen the set screw in the bearing locking collar (Figure 37) and rotate the collar opposite the shaft rotation until it is loose on the bearing (Figure 38). Rotating it 3/4" will unlock it. Rotating it too far will relock it (backward).
7. Remove the split jackshaft connector (Figure 41). The connector must be replaced in the same position as it was before removal.
8. Drive the jackshaft half toward the center of the machine with a rubber or plastic mallet (Figure 42).
9. Pull the assembly into the opening in front of the engine and remove it by pulling it straight up on all machines except the M-500 gasoline and LP gas (Figure 43). On these models (M-500 gasoline and LP gas) take the assembly out through the bottom of the machine.

These parts must be removed from the machine to make removal of the jackshaft and sheave assembly possible.

- A. On M-600 gasoline and LP gas machines, remove the following:
 - a. The hydraulic tubeline from the clutch lubrication manifold to the left rear clutch pin.
 - b. Disconnect and remove the battery.
 - c. Remove the hydraulic lines from the variable speed control valve to the check (lock) valve. If the machine is not equipped with a check valve, remove the hydraulic line from the variable speed control valve to the variable speed cylinder hose.
- B. On M-600 and M-500 diesel machines, remove the following:
 - a. The hydraulic tubeline from the clutch lubrication manifold to the left rear clutch pin.
 - b. Remove the hydraulic lines from the variable speed control valve to the check (lock) valve. If the machine is not equipped with a check valve, remove the hydraulic line from the variable speed control valve to the variable speed cylinder hose.

To reinstall a driven (spring loaded) sheave, proceed as follows: (Split Jackshaft)

1. Insert the assembly (spring loaded sheave and jackshaft half) into the machine (Figure 43).
2. Install a variable speed belt over the jackshaft.
3. Reinstall the split jackshaft connector, matched ends together (Figure 41). Four screw heads should be up and four down. Tighten the screws down evenly.
4. Pull the belt into the driven sheave with a pry bar (Figure 44). This will make it possible to replace the outside (engine) sheave half. Do not use a flat bar, as this will damage the belt.
5. Reinstall the outside drive sheave half and reconnect the hydraulic hose. Align the balance marks on the sheave halves when reinstalling.
6. Mount the sprocket on the end of the jackshaft. Align the sprocket with the outside clutch sprockets (Figure 40).
7. Lock the bearing locking collar on the bearing hub by turning it in the direction of shaft rotation (Figure 39).
8. Tighten the locking collar set screw (Figure 37).
9. Reinstall the clutch drive chain. Tighten the chain hand tight (Figure 46). You should be able to deflect the chain 1/4" using 10 lbs. of spring scale tension (Figure 47).
10. Reinstall the gearcase cover and protective clutch caps.

11. Reinstall the split jackshaft connector and tighten the screws down evenly to 18-20 ft. lbs.
12. Check the belt alignment of the drive and driven sheaves (Figure 45). If the belt is not properly aligned, do this:
 - A. Start the engine and move the variable speed belt to half variable position. Stop the engine.
 - B. Loosen the set screws on the hub of the stationary half of the sheave. Move the sheave sideways on the jackshaft until proper alignment is achieved.

DRIVEN SHEAVE DISASSEMBLY [.5 hr.]

To disassemble the driven sheave assembly after it has been removed from the machine, follow this procedure: (tapered split jackshaft)

1. Remove the grease fitting.
2. Remove the three spring retaining nuts.
3. Remove the spring.
4. Remove the movable half of the sheave from the shaft.
5. Remove the sheave retaining nut. A special wrench is available for this.
6. Remove the sheave half by tapping the end of the shaft on a block of wood (Figure 48).

To reassemble the sheave onto the tapered split jackshaft:

1. Tap the shaft into the tapered bore on the fixed half of the sheave (Figure 49). Be sure the key is being included in the assembly.
2. Mount the retaining nut. Tighten the nut to 130 ft. lbs. torque. Use a spanner wrench or a punch and hammer.
3. Check the movable half of the sheave to determine the condition of the grease seals. Replace the seals if they have been allowing grease to pass. Replace the bushings if they are worn and allowing the movable half of the sheave to vibrate or wobble on the shaft.
4. Mount the movable half of the sheave on the shaft.
5. Mount the spring.
6. Loosen the nut on one of the guide bolts and slide the bolt through far enough so a spring retaining nut can be started (Figure 50).
7. Retighten the nut on the guide bolt to its former position.
8. Start the other spring retaining nuts and tighten them until they are flush with the ends of the guide bolts.
9. Insert the grease fitting (Figure 51).

To disassemble the driven sheave assembly after it has been removed from the machine, follow this procedure: (all except tapered jackshaft units)

1. Remove the grease fitting.
2. Remove the three spring retaining nuts.
3. Remove the spring.
4. Separate the sheave halves.

To reassemble:

1. Check the movable half of the sheave to determine the condition of the grease seals. Replace the seals if they have been allowing grease to pass. Replace the bushings if

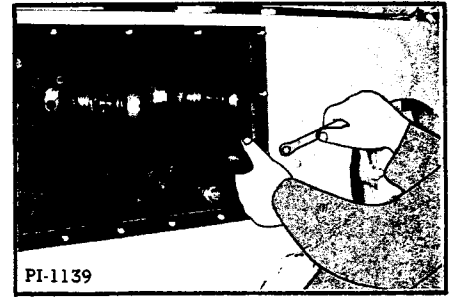


Fig. 46 Tightening Clutch Drive Chain

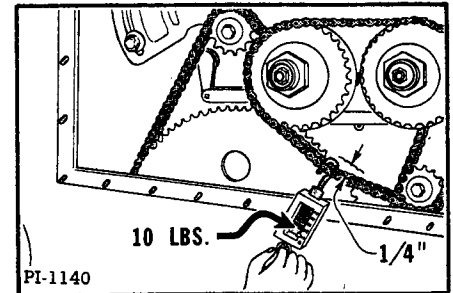


Fig. 47 Checking Clutch Drive Chain

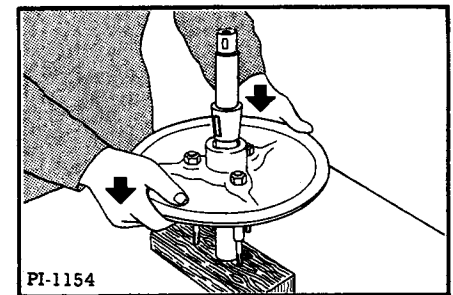


Fig. 48 Removing Sheave Half From Shaft

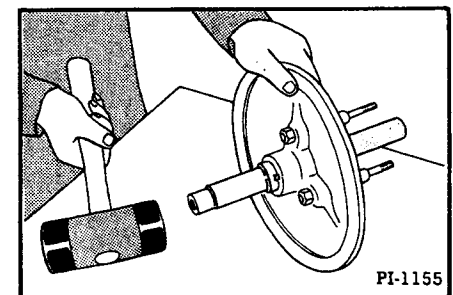


Fig. 49 Driving Shaft Into Sheave

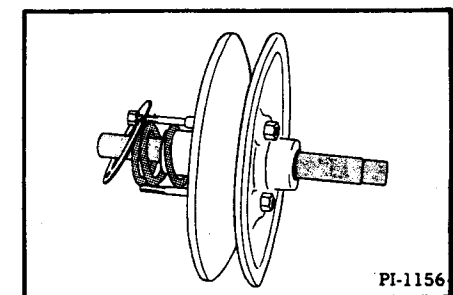


Fig. 50 Mounting Spring Retaining Plate

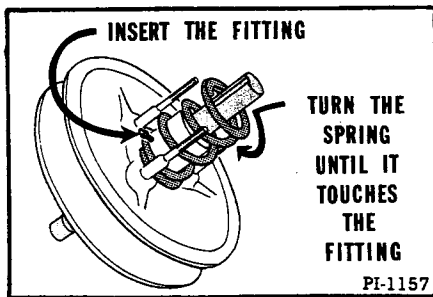


Fig. 51 Insert The Grease Fitting

MODEL	PART NO.	A
M-500G M-600D M-500D	6503352	3-7/8"
M-600G M-600E	6503348	4-1/4"
M-500E	6503379	4"

Fig. 52 Split Tapered Jackshaft

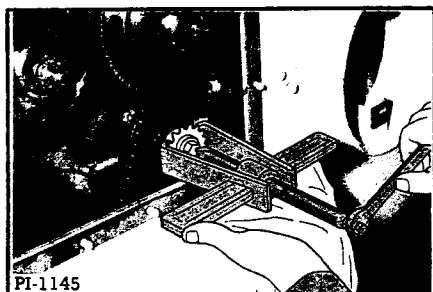


Fig. 53 Remove Upper Jackshaft Sprocket

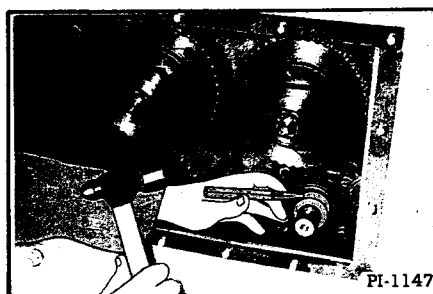


Fig. 54 Removing Bearing Locking Collar

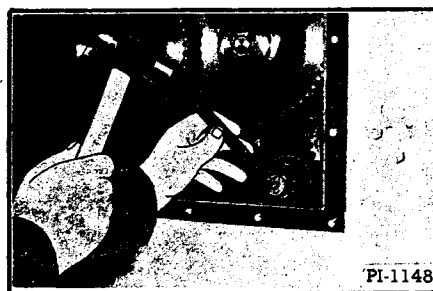


Fig. 55 Reinstalling Bearing Locking Collar

they are worn and allowing the movable half of the sheave to vibrate or wobble on the shaft.

2. Mount the movable half of the sheave over the guide bolts.
3. Mount the spring.
4. Loosen the nut on one of the guide bolts and slide the bolt through far enough so a spring retaining nut can be started (Figure 50).
5. Retighten the nut on the guide bolt to its former position.
6. Start the other spring retaining nuts and tighten them until they are flush with the ends of the guide bolts.
7. Insert the grease fitting (Figure 51). The grease fitting must be slotted relief type to prevent overgreasing and seal damage.

NOTE: Not all tapered jackshaft halves are the same. See Figure 52 for dimensional differences and models used on.

DRIVEN SHEAVE ALIGNMENT (Belt Alignment)

1. Check to be sure the fixed half of the sheave is tight on the jackshaft, and has not moved sideways on the shaft, causing belt misalignment. This can be checked by laying a straightedge along the driven sheave with the belt at half variable position. The belt should be parallel to the straightedge along its entire length (Figure 45).
2. Check the condition of the movable half of the sheave to see that it slides freely on the shaft. It may have to be cleaned and relubricated, and new grease seals installed.
3. Check the condition of the three sliding studs (guide bolts) and related oilite bearings to be sure excessive wear has not caused wobbly motion (or vibration) of the two sheave halves and belt breakage.

If the variable speed belt is not properly aligned it will be necessary to move the driven sheave sideways until it is. On machines with tapered split jackshaft, do this:

1. Remove the left gearcase cover.
2. Loosen the split jackshaft connector.
3. Remove the clutch drive (outside clutch) chain.
4. Remove the sprocket retaining screw and the sprocket from the end of the jackshaft.

NOTE: You may need to use a puller to remove the sprocket from the end of the shaft. Remove the sprocket retaining screw from the jackshaft and remove the retaining washers. Turn the screw back into the end of the jackshaft (Figure 53).

5. Remove the bearing locking collar set screw (Figure 37) and the bearing locking collar (Figure 54) from the jackshaft. Loosen the bearing locking collar by turning it opposite the direction of shaft rotation.
6. Slide the jackshaft half to the desired position and tighten the 8 connector screws. Tighten the screws evenly to 18-20 ft. lbs. torque.
7. Recheck the alignment (Figure 45).
8. Reinstall and tighten the bearing locking collar on the bearing hub. To tighten it, turn it in the direction of rotation (Figure 55).
9. Mount the jackshaft sprocket. Use spacer washers to align the sprocket with the outside clutch sprockets. Check the alignment (Figure 40). Install the sprocket retaining washer and screw.
10. Reinstall the clutch drive chain. Tighten the chain hand tight (Figure 46). You should be able to deflect the chain 1/4" using 10 lbs. of spring scale tension (Figure 47).
11. Reinstall the gearcase cover and the protective clutch caps.

On machines without a tapered split jackshaft it is not necessary to remove the gearcase cover and jackshaft sprocket when aligning the belt. Proceed as follows:

1. Loosen the two set screws which hold the driven sheave to the shaft. They are located on the hub of the stationary half of the sheave (between the sheave assembly and the machine sidewall).
2. Slide or drive the sheave in the direction needed to give proper belt alignment.
3. Recheck the alignment (Figure 56).
4. Tighten the two set screws securely.

UPPER JACKSHAFT BEARING REPLACEMENT [1.5 hr.]

Remove and replace an upper jackshaft bearing as follows:

1. Remove the protective clutch caps and the gearcase cover.
2. Remove the clutch drive (outside clutch) chain.
3. Remove the sprocket retaining screw and the sprocket from the end of the jackshaft.
NOTE: You may need to use a puller to remove the sprocket from the end of the shaft. Remove the sprocket retaining screw from the jackshaft and remove the retaining washers. Turn the screw back into the end of the jackshaft (Figure 53).
4. Remove the bearing locking collar set screws (Figure 37) and the bearing locking collar (Figure 54) from the jackshaft. Loosen the bearing locking collar by turning it opposite the direction of shaft rotation.
5. Remove the four nuts which hold the bearing housing to the gearcase sidewall and pull the bearing and housing from the shaft.
6. Insert a length of shaft material (same diameter as the jackshaft) into the bearing and pull on the shaft until the bearing becomes free of the housing (Figure 57).

To reinstall:

1. Place a new bearing vertically into the housing. You should be able to turn it freely in the housing (Figure 58). If you can't, replace the housing with a new one.
2. With a length of shaft material inserted into the bearing, rotate it into the housing (Figure 57). It should not take over 200 in. lbs. force to rotate the bearing into the housing.
NOTE: The offset hub of the bearing must be toward the flanged side of the housing (not at the flat mounting side).
3. When mounting the housing to the gearcase inner sidewall, use new sealing washers behind the nuts to prevent oil leakage.

ENGINE VARIABLE DRIVE SHEAVE REMOVAL [1 hr.]

Use the following procedure to pull an engine variable drive sheave (M-600D, M-500D & M-600G):

1. Remove the holding screw and machined holding washer (Figure 59).
2. Remove the washer from the holding screw and replace the screw in the end of the crankshaft. Turn it in until the head of the screw bottoms against the crankshaft.
3. Insert 1/4" cap screws into the tapped holes in the fixed sheave hub.
4. Mount a puller on the sheave half (Figure 60) behind the cap screws.

WARNING

Do not substitute a common flat washer for the machined holding washer when reassembling the variable drive sheave to the engine shaft.

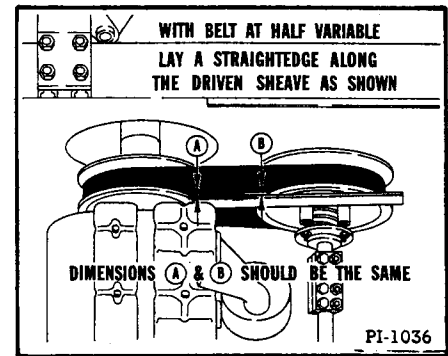


Fig. 56 Checking Belt Alignment

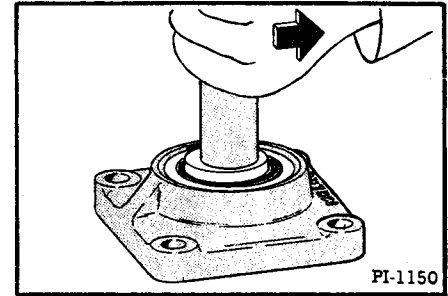


Fig. 57 Removing Bearing from Housing

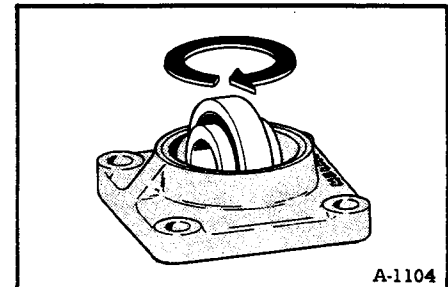


Fig. 58 Checking Housing Tolerance

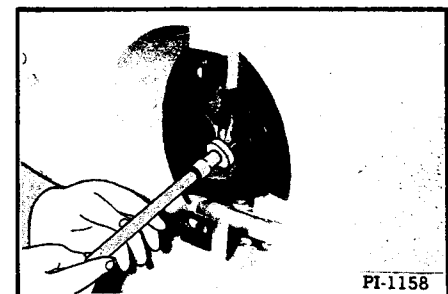


Fig. 59 Removing Holding Screw & Washer

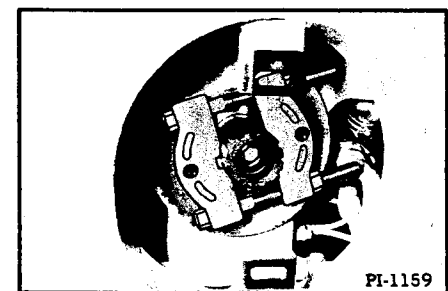


Fig. 60 Mount Puller on Sheave Half

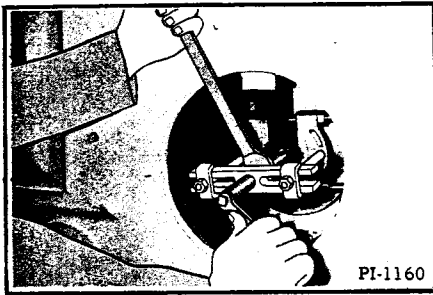


Fig. 61 Pulling Sheave Half from Shaft

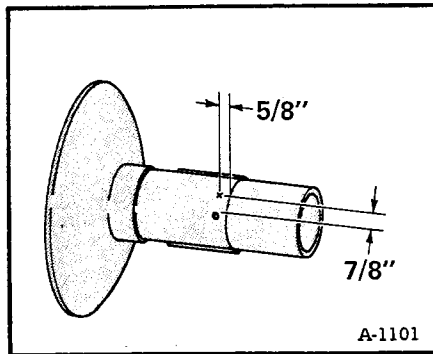


Fig. 62 Location of Alignment Hole

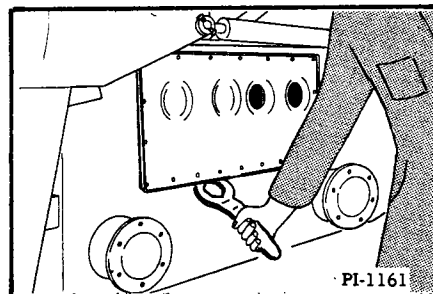


Fig. 63 Removing Gearcase Cover

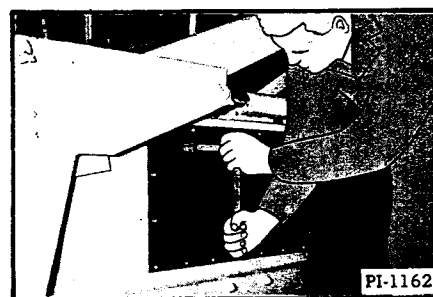


Fig. 64 Loosen the Intermediate Chain

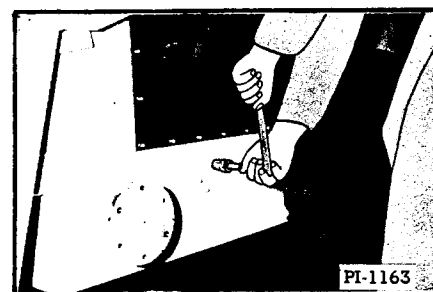


Fig. 65 Loosen the Final Drive Chains

5. Pull the sheave half from the engine shaft (Figure 61).

Use the following procedure to pull an engine variable drive sheave (M-500G, M-444, M-600E & M-500E).

1. Loosen the two set screws in the stationary sheave half.
2. Install a bearing puller (Figure 60), tightening the puller firmly behind the keys.
3. Pull the sheave half from the engine shaft (Figure 61).

DRIVE SHEAVE MODIFICATION (M-444, M-600D, M-500D, M-600E & M-500E) [2 hr.]

Replacing the roll pins in these sheave half assemblies with set screws will prevent possible sheave damage due to roll pins working out of place. To modify, follow these steps:

1. Press the cylinder barrel into the sheave half as far as it will go. Use a long bolt with large washers on each end to hold it in place.
2. Locate and drill a 19/64" hole (Figure 62).
3. Insert a 5/16" x 1/2" long roll pin into the hole. This will assure alignment when drilling future holes.
4. Using the pilot holes in the sheave half, drill three 15/16" holes through the cylinder barrel.
5. Tap the holes 3/8" NC, but only to within 1/16" of cylinder barrel inner surface.

NOTE: It is important that the set screws bottom out in the threads of the cylinder barrel. Use **Loc-Tite®** on the screws to keep them securely in place.

6. When assembling the sheave halves be sure to align the arrow on the movable half to the chisel mark on the fixed half.

AXLE REMOVAL [Remove and Replace 2.5 hr. (front) 3.5 hr. (rear)]

To remove an axle from the Bobcat loader: (front axle)

1. Drain the oil from the gearcase.
2. Raise the side of the machine that the axle will be removed from.

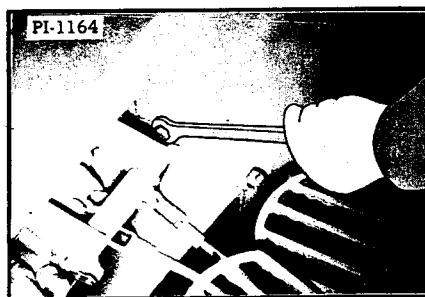


Fig. 66 Loosen the Final Drive Chains

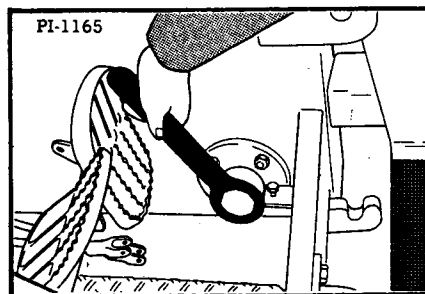


Fig. 67 Removing Oil Cap end of Axle

3. Disconnect the linkage from the foot pedals.
4. Remove the floor panels.
5. Remove the wheel from the axle that is to be removed.
6. Remove the gearcase cover (Figure 63).
7. Loosen the intermediate (inside clutch) chain (Figure 64).
8. Loosen the final drive chains (Figures 65 and 66).
9. Remove the oil cap at the end of the axle (Figure 67).

10. Remove the cotter pin from the castle nut and remove the castle nut which holds the axle in place (Figure 68). Remove the spacers and holding washers.
11. Loosen the sprocket holding nut with the special open end wrench. Turn two hexagon head screws into the end of the axle and turn the axle with a bar. The wrench is used only to hold the nut. You do not have room inside the gearcase to turn the wrench (Figure 69).
12. Remove the four outside axle hub mounting nuts (Figure 70).
13. Drive the axle with a plastic or rubber mallet (Figure 71) or use a slide puller at the outside of the machine. Remove the axle from the machine (Figure 72).
14. Remove the sprocket holding nut and flat locking washer from the gearcase (Figure 73).
15. Remove the axle sprocket from the gearcase. Check whether the spacer sleeve has been removed from the machine with the axle or fallen into the gearcase.

AXLE BEARING AND SEAL REPLACEMENT

To change an axle bearing or seal, do this:

1. Remove the hub from the axle shaft by tapping the end of the axle on a block of wood (Figure 74).
2. Remove the axle bearing from the axle shaft with a bearing puller (Figure 75).
3. Install a new bearing and seal into the axle hub (Figure 76). The outer seal should be flush with the outer edge of the hub. Both seal lips must face inward.
4. Use a hollow tube slightly larger than the axle shaft to drive the hub and bearing assembly onto the shaft (Figure 77) or use a hydraulic press with an adapter tube.
5. Place spacer sleeve onto axle.

REINSTALLING AXLE

To reinstall the axle, proceed as follows:

1. Reinstall the axle sprocket in the gearcase.

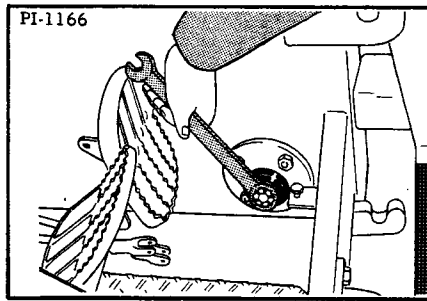


Fig. 68 Removing the Castle Nut

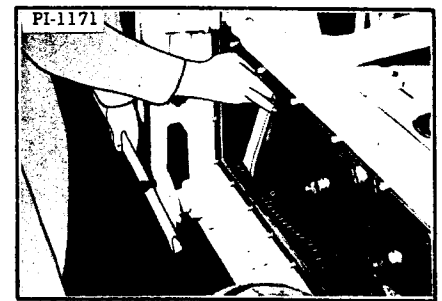


Fig. 69 Loosen Axle Sprocket Nut

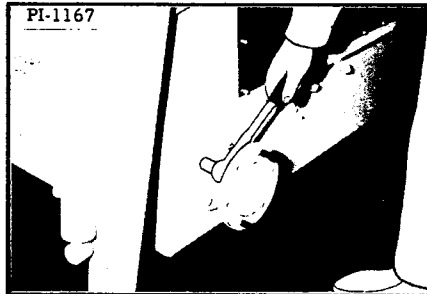


Fig. 70 Removing the Outside Hub

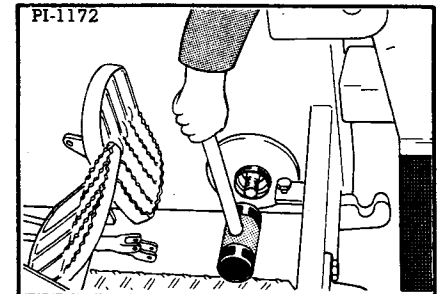


Fig. 71 Driving Axle with Mallet

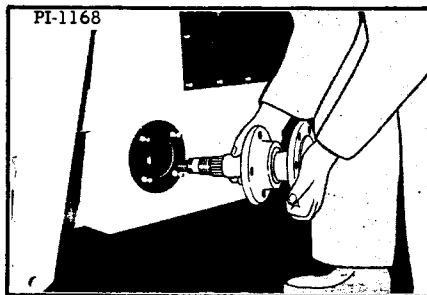


Fig. 72 Removing Axle from Machine

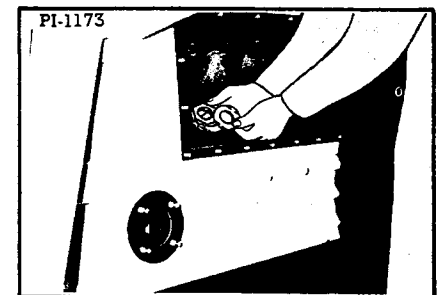


Fig. 73 Remove Nut & Washer

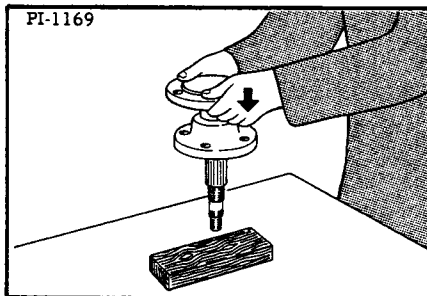


Fig. 74 Removing Hub from Axle

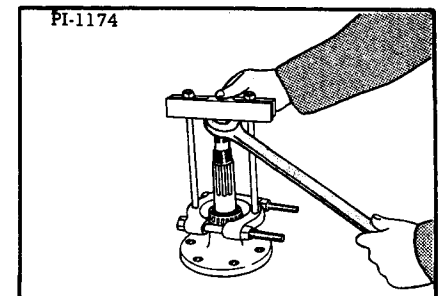


Fig. 75 Removing Bearing from Axle

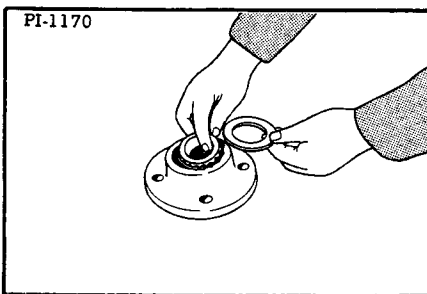


Fig. 76 Installing New Bearing & Seal

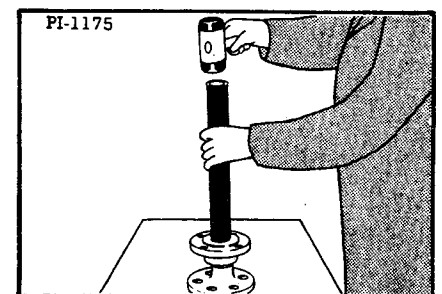


Fig. 77 Driving Hub & Bearing onto Shaft

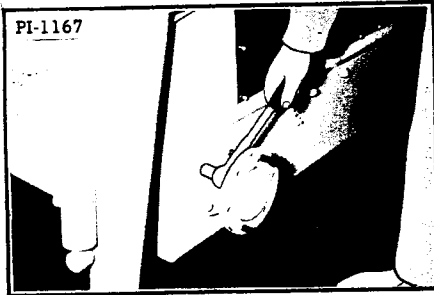


Fig. 78 Bolting Hub to Frame

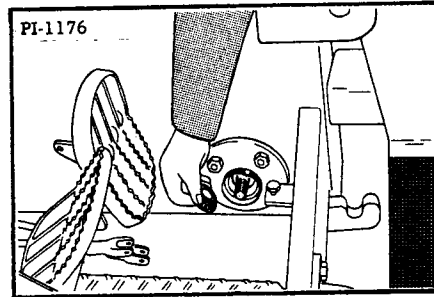


Fig. 79 Mounting the Inside Bearing

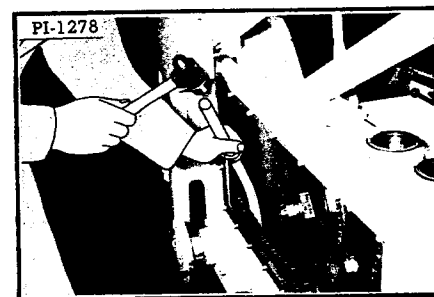


Fig. 80 Locking the Locking Washer

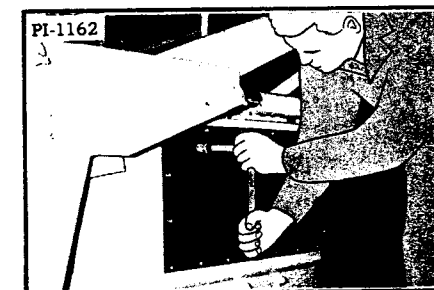
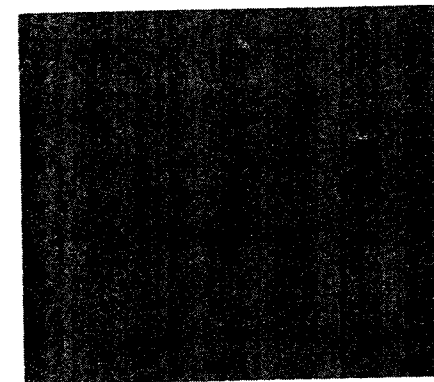


Fig. 81 Loosening the Intermediate Chain

2. Reinstall the axle in the machine.
3. Mount the flat locking washer and the holding nut on the axle. The threaded portion of the rear axle sprocket holding nut must be away from the sprocket.

NOTE: In most cases a new locking washer will be required. The inside diameters of the front axle and rear axle locking washers are different.

4. Bolt the outside hub to the loader frame (Figure 78).
5. Start the sprocket holding nut.
6. Mount the inside bearing (Figure 79) spacers and washer.
7. Turn the castle nut onto the end of the axle and tighten it until the bearings have a moderate preload (Figure 68).
8. Reinstall the cotter pin and dust cap on the inside end of the axle. Tighten the cap (Figure 67). Check the condition of the "o" ring seal.
9. Tighten the sprocket holding nut on the inside of the gearcase by using the special open end wrench. The wrench is used only to hold the nut. You do not have room inside the gearcase to turn the wrench. Thread two hexagon head screws into the end of the axle and turn the axle with a bar.
10. Lock the sprocket holding nut into position by bending the locking washer over one of the flats of the nut and over a flat spot on the sprocket hub. Use a bar to start bending the washer then use a hammer (Figure 80).
11. Tighten all chains in the drive (See Drive Chain Adjustment).
12. Replace the gearcase cover and protective clutch caps.
13. Replace the floor panels and reconnect the control pedal linkages.

AXLE SPROCKET REPLACEMENT [2.5 hr. (front) 3.5 hr. (rear)]

The rear axle shaft has short splines. It requires a short spacer sleeve and a long sprocket anchoring nut. The front axle has longer splines. It requires a long spacer sleeve and a short sprocket anchoring nut.

The final drive sprockets on the front and rear axles are identical.

Early machine models use a 42 tooth sprocket. Current machines use 41 tooth sprockets to eliminate the offset or half links in the final drive chains. A 42 tooth sprocket requires a 77 pitch chain and a 41 tooth sprocket requires a 76 pitch chain.

The 41 and 42 tooth sprockets have different part numbers. Whenever replacing these sprockets in the field be sure to count the number of teeth on the sprocket and replace it with the proper part.

Using one 41 tooth and one 42 tooth sprocket on a side of the machine will cause chain and sprocket breakage.

LOWER JACKSHAFT REMOVAL [Remove and Replace 3.5 hr.]

To remove the lower jackshaft assembly from the Bobcat:

1. Raise the side of the machine you will be working on and remove the wheels from that side.
2. Remove the protective clutch caps and the gearcase cover.
3. Drain the oil from the gearcase.
4. Remove the linkage from the hydraulic control pedals and remove the floor panels.
5. Loosen and remove all the drive chains:
 - A. Loosen the clutch drive (outside clutch) chain and remove it from the machine.
 - B. Loosen the intermediate (inside clutch) chain (Figure 81). Disconnect the chain and remove it from the machine. Use a chain disassembly tool to remove the connector link.

- C. Loosen the final drive chains. Loosen the outside holding bolts (Figure 65) and the inside holding bolts (Figure 66). Remove the outside holding bolts from the mounting holes (Figure 82). This will make it possible to raise the final drive chains enough to disconnect them. Use a chain disassembly tool to remove the connector links (Figure 83).

NOTE: Use a number 60 chain disassembly tool.

6. Remove the reverse drive clutch (nearest the front of the machine). This makes removal of the lower jackshaft possible.
7. Remove the inside holding bolts (jackshaft mounting bolts).

NOTE: Turn the lower jackshaft sprocket so the large hole in the sprocket is directly over the mounting bolt. Remove the bolt through the hole in the sprocket. Repeat this to remove the second bolt.

8. Insert the over-center tank spreader to spread the gearcase panels enough so the assembly can be removed (Figure 84).
9. Grasp the assembly and remove it from the machine by pulling forward and up (Figure 84).

LOWER JACKSHAFT REPAIR

To install new bearings in the cluster sprocket (final drive chain sprocket) proceed as follows:

1. Remove the outside mounting plate by tapping with a hammer.
2. Remove the large sprocket from the cluster sprocket.
3. Press new needle bearings into the cluster sprocket.

NOTE: Press the bearings in so the imprinted numbers are toward the outside of the sprocket (Figure 85). Do not push both bearings in from one side of the cluster sprocket. If you try to press on the rounded edge of the bearing, you will flatten the end and damage the bearing.

Bearings should be indented 1/16" inside the hub.

4. Fasten the large sprocket to the cluster sprocket. Use Loc-Tite[®] (Figure 86) and torque the connector screws to 55 ft. lbs. (Figure 87). Safety wire the connector screws (Figures 88 and 89).

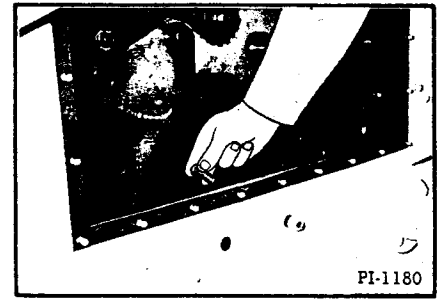


Fig. 82 Removing the Outside Bolts

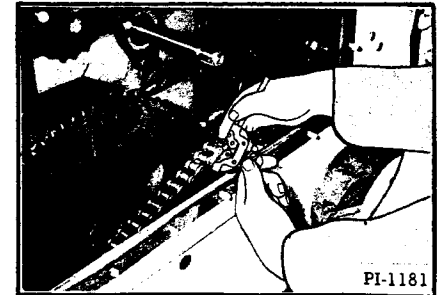


Fig. 83 Disassembling Final Drive Chains

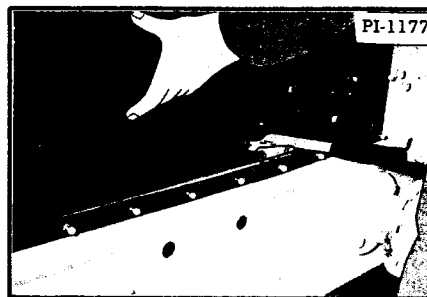


Fig. 84 Removing Lower Jackshaft

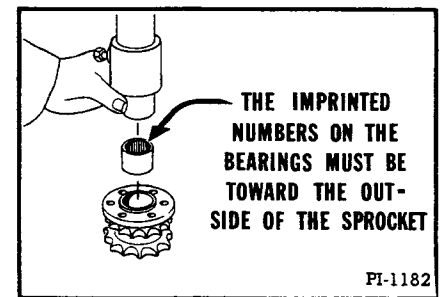


Fig. 85 Pressing Bearing into Sprocket

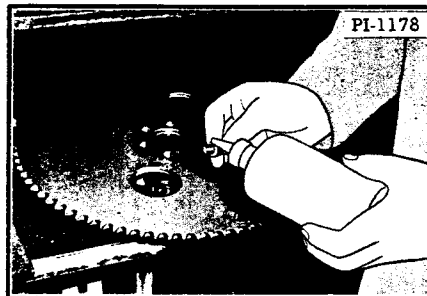


Fig. 86 Insert the Connector Screws

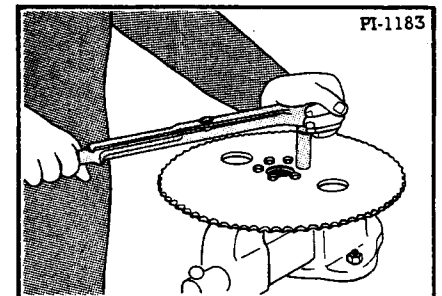


Fig. 87 Torque the Connector Screws

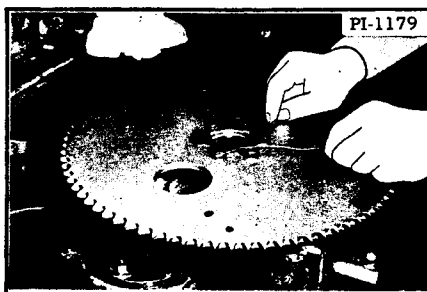


Fig. 88 Safety Wire the Screws

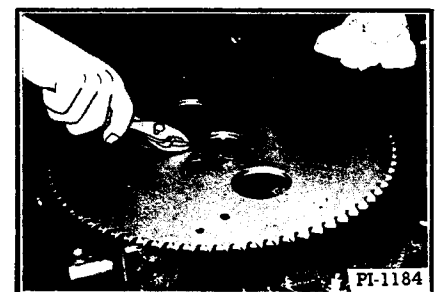


Fig. 89 Safety Wire the Screws

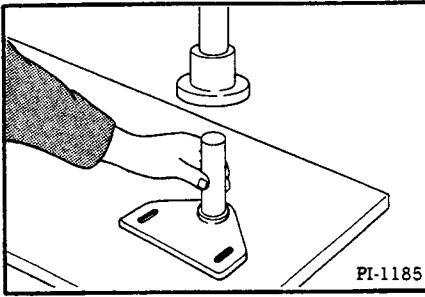


Fig. 90 Pressing in New Mounting Pin

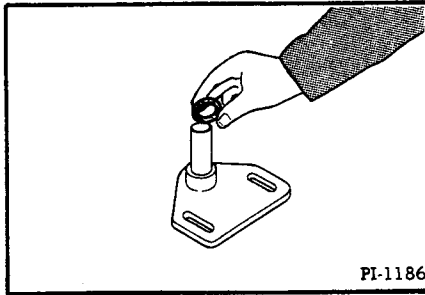


Fig. 91 Installing Inside Thrust Washer

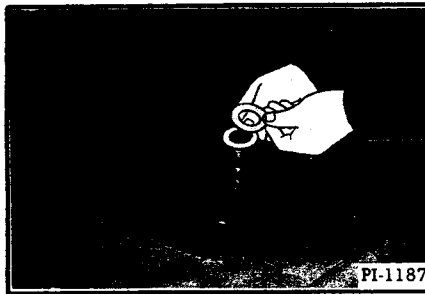


Fig. 92 Installing Outside Thrust Washers

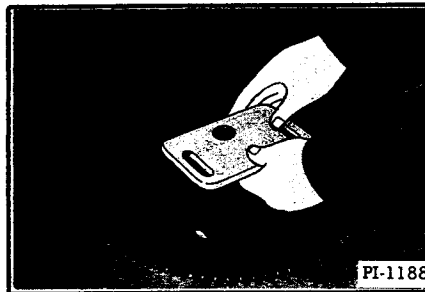


Fig. 93 Installing Outside Mounting Plate

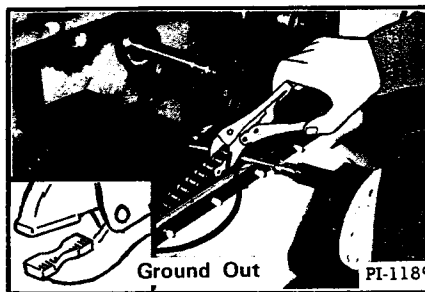


Fig. 94 Reconnecting Final Drive Chains

5. If a new mounting pin is required, press the old mounting pin from the inside mounting plate and press a new mounting pin into place (Figure 90).
6. Install the inside thrust washer (Figure 91).
7. Mount the sprocket assembly onto the mounting pin with the large sprocket toward the inside mounting bracket.
8. Install the outside thrust washers (Figure 92).
9. Install the outside mounting plate (Figure 93).

LOWER JACKSHAFT REINSTALLATION

To reinstall a lower jackshaft assembly, follow this procedure:

1. Carefully install the assembly into the gearcase (Figure 84). Use an overcenter tank spreader to spread the sidewalls of the tank and make installation of the lower jackshaft possible.
2. Turn the lower jackshaft sprocket so the large hole in the sprocket is over one of the mounting holes in the gearcase inner sidewall.

Insert the inside holding bolts (jackshaft mounting bolts) into their mounting holes through the large hole in the jackshaft sprocket.

NOTE: On early machines with coarse threaded bolts, replace with the new heat treated fine threaded bolts and lock nuts (Clark part number 6504934).

3. Reconnect the final drive chains. Use a gripping plier to press on the connector links (Figure 94). It will be impossible to force the connector link onto the pins with a single plier gripping action. Press, then release the plier and tighten the plier grip for another gripping action. Repeat this until the link has been forced all the way into position.

NOTE: Use only a press-on type connector link. There is not enough room between the chains in the cluster sprocket area for a cotter pin or spring clip type connector link.

WARNING

Do not re-use a press-on connector link.

4. Install the outside holding bolts (jackshaft mounting bolts) (Figure 82).

NOTE: Use heat treated fine threaded bolts and lock nuts.

5. Install the front clutch assembly.
6. Install the intermediate chain (Figure 95). Use a length of bent wire to pull the chain around the lower jackshaft sprocket.

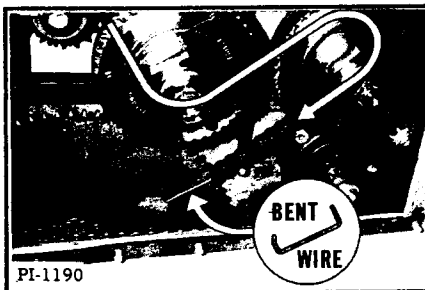


Fig. 95 Installing Intermediate Chain

NOTE: The intermediate (inside clutch) chain goes over the tightener, under the sprocket on the front clutch, over the sprocket on the rear clutch and around the large sprocket on the lower jackshaft.

7. Reconnect the intermediate chain with a gripping plier (Figure 96).
8. Install the clutch drive (outside clutch) chain.
9. Tighten all the chains in the drive (See Drive Chain Adjustment).
10. Replace the gearcase cover and protective clutch caps.
11. Replace the floor panels and reconnect the control pedal linkages.

DRIVE CHAIN ADJUSTMENT

On new machines or on machines which have had chain or sprocket replacement we recommend that chain tension be checked every ten hours for the first 50 hours. Chain tension should be checked every 50 hours thereafter, or more often if necessary.

To check chain adjustment, do this:

1. Place a block under the rear of the Bobcat and raise the machine with the boom. All four wheels must rise from the ground.
2. Shut off the engine.
3. Lock the directional control levers in forward position.
4. Try to turn the wheels in both directions by hand. There should be no free play. The chains should be taut.

If you notice any free movement, adjust the drive chains:

WARNING

This operation requires that you remove the gearcase covers, which means that the lubrication and hydraulic oil reservoir, and the drive mechanism, will be open to the air. DO THIS JOB IN A CLEAN AREA, away from dirt and blowing dust.

Do not run the machine with the side panel open.

1. Remove the protective clutch caps and the gearcase cover.
2. Tighten the final drive chains, taking these steps:
 - A. Loosen the two outside lower jackshaft mounting bolts (Figure 97).
 - B. Remove the linkage from the hydraulic control pedals and remove the floor panels.
 - C. Loosen the two inside lower jackshaft mounting bolts, opposite the two outside nuts (Figure 98).
 - D. Insert a pry bar in the hole provided in the large jackshaft sprocket and pry up until the final drive chains are taut. It may be necessary to tap the face of the sprocket with a soft hammer while prying to assure proper alignment. The jackshaft sprocket may shift 1/4" forward or backward in order to maintain the proper tension on both chains at the same time.

Use a bar to hold the rear edge of the large sprocket away from the gearcase inner sidewall while prying. This will keep the sprocket from interfering with the front final drive chain after the lower jackshaft mounting bolts are retightened (Figure 99).
 - E. When the chains have the proper tension, tighten the inside front holding nut (Figure 100). It is important that this nut be tightened first. Next, tighten the outside nuts (Figure 97). Tighten the inside rear nut. Tap the face of the large jackshaft sprocket to align. On early machines with coarse threaded bolts, replace with the new heat treated fine threaded bolts and lock nuts and tighten to 110 ft. lbs torque.

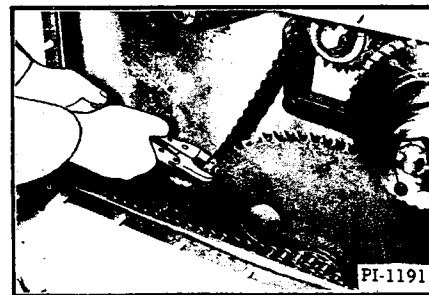


Fig. 96 Reconnect Intermediate Chain

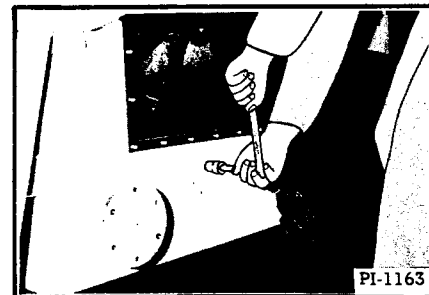


Fig. 97 Loosening Outside Mounting Bolts

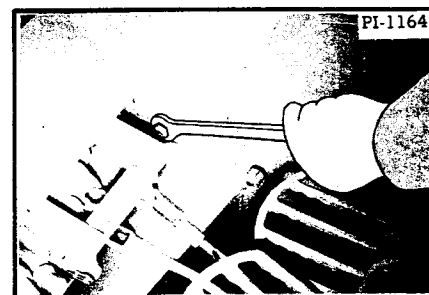


Fig. 98 Loosening Inside Mounting Bolts



Fig. 99 Tightening Final Drive Chains



Fig. 100 Tightening Inside Front Nut

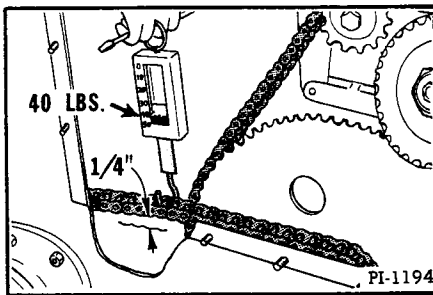


Fig. 101 Check Final Drive Chain Tension

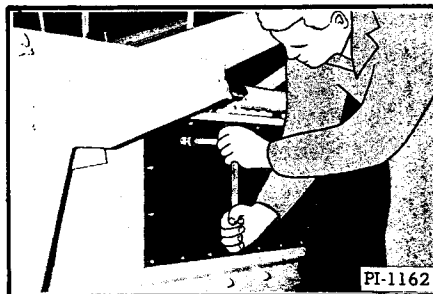


Fig. 102 Loosening Intermediate Chain

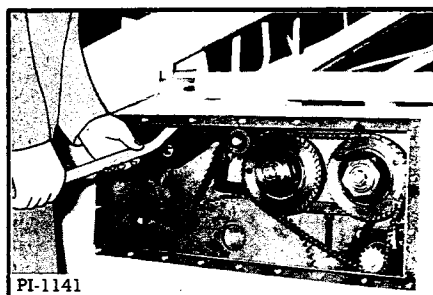


Fig. 103 Tightening Intermediate Chain

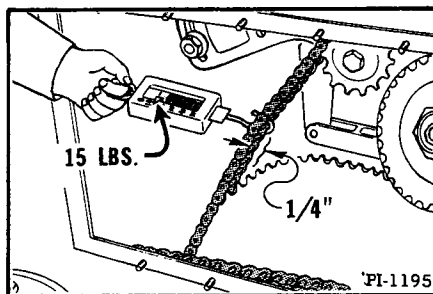


Fig. 104 Check Intermediate Chain Tension

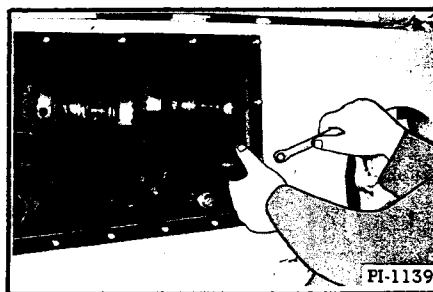


Fig. 105 Tightening Clutch Drive Chain

- F. Check the final drive chain tension. You should have about 1/4" deflection on the chains using 40 lbs. of spring scale tension (Figure 101). If necessary, loosen or tighten the chain to get the desired 1/4" chain deflection.
 - G. With the directional control lever in neutral position, turn one of the wheels a little at a time, and check the chain tension by pulling up on the chain by hand. If a final drive chain does not have the same tension throughout a full revolution, it indicates an out-of-round sprocket on either the lower jackshaft or the axle. Replace any out-of-round sprockets with new ones, and recheck.
3. Tighten the intermediate (inside clutch) chain, taking these steps:
 - A. Loosen the two nuts on the top front idler-sprocket chain tightener located inside the gearcase (Figure 102).
 - B. Insert a pry bar above the idler bracket and pry up on the bar until the chain is taut (Figure 103). Be careful to avoid damage to the upper lip of the gearcase opening.
 - C. Tighten the two nuts on the idler bracket securely. Tighten the small nut (1/2") to 85 ft. lbs. torque and the large nut 9/16") to 110 ft. lbs. torque while holding the idler bracket to maintain proper chain tension.
 - D. Check the intermediate (inside clutch) chain tension. You should have about 1/4" deflection on the chain using 15 lbs. of spring scale tension (Figure 104). If necessary, loosen or tighten the chain to get the desired 1/4" chain deflection.
 - E. With the directional control lever in neutral position, turn one of the wheels a little at a time, and check the chain tension by pulling on the chain by hand. If the intermediate chain does not have the same tension throughout a full revolution, it indicates an out-of-round sprocket on the lower jackshaft on either of the inside clutch plates. Replace any out-of-round sprockets with new ones and recheck.
 4. Tighten the clutch drive (outside clutch) chains, taking these steps:
 - A. Loosen the two nuts on the outside of the gearcase panel.
 - B. Pull the idler sprocket forward until the chain has proper tension. DO NOT OVERTIGHTEN. Overtightening will cause excessive chain noise.
 - C. Tighten the two nuts to 30 ft. lbs. torque while holding the idler sprocket forward (Figure 105).

WARNING

After securing the idler sprocket, make sure the sprocket on the tightener is not interfering with the sprockets on the clutch or jackshaft. If the tightener must be set forward this far to tighten the chain, remove one link from the chain.

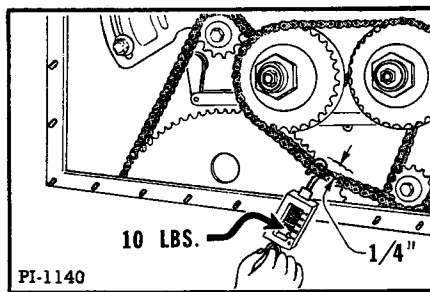
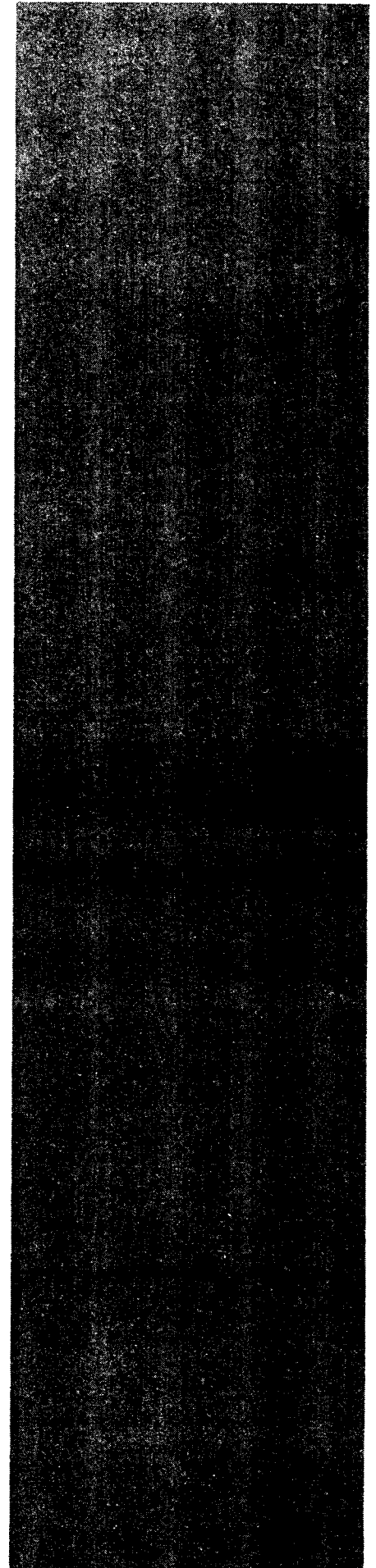


Fig. 106 Checking Clutch Chain Tension

- D. Check the clutch drive (outside clutch) chain tension. You should have about 1/4" deflection on the chain using 10 lbs. of spring scale tension (Figure 106). If necessary, loosen or tighten the chain to get the desired 1/4" chain deflection.
5. After all chains are secure, turn the

wheels on each side of the machine through a full revolution to check for interference of any of the chains with the gearcase sidewall, other chains, or other sprockets. If necessary, readjust.

6. Replace the gearcase covers.
7. Replace the protective clutch caps.
8. Replace the floor panels and the hydraulic control pedal linkages.
9. Start the machine and let it run for several minutes while moving the directional control levers back and forth. Shut off the machine and check for oil leaks around the gearcase cover and protective clutch caps.
10. With the chains properly adjusted and no apparent leaks, remove the blocks from under the Bobcat and lower it back to ground level.



TROUBLESHOOTING THE DRIVE SYSTEM

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION	PAGE
Sudden increase in directional control lever travel in one direction.	A clutch thrust bearing has failed.	Replace with a new thrust bearing. Always turn around or replace the thrust races when a thrust bearing is replaced.	
	The threads are stripped from the actuating nut.	Replace the actuating nut; also the actuating thread on the clutch pin if necessary. Adjust the clutch pin for proper thread contact between the new actuating nut and thread	
	The splines on the directional control lever and linkage shaft are badly worn, causing the lever to jump the splines.	Replace the directional control lever and lever linkage shaft. Be sure to install a screw in the new lever.	
Directional control lever side play.	The screw is missing from the directional control lever.	Replace the screw after checking the condition of the splines.	
	The splines are worn in the lever or on the linkage shaft.	Replace the parts showing excessive wear.	
	The mounting nut is worn.	Replace the nut.	
The directional control linkage inside the tanks is interfering with the chains, indicated by a growling noise.	The directional control lever linkage shaft is not tight in the directional control lever.	Tighten the screw in the directional control lever. Replace the splined mating parts if the splines show excessive wear.	
	The small spring washers are not in place on the actuating bar.	Remove the shoulder screw (socket head) holding the actuating nut into the actuating bar and insert washer behind the actuating nut flange. Be sure the washer does not slip off the shoulder of the screw and flatten against the back of the clevis when assembling the unit.	13
	The actuating bar is warped so that it interferes with the chains or inside gearcase wall.	Examine the actuating bar (outside the machine). A small amount of warpage may not cause problems. However, if warpage is excessive straighten or replace the actuating bar.	
	The actuating nut is bottoming against the tank wall.	Adjust the clutches.	
	The linkage bar is too thick. It interferes with the chains or inside wall of the gearcase.	Grind the excess material from the linkage bar or replace the bar.	
The clutches will not engage properly.	Actuating thread bottoming against tank.	Readjust clutches.	
	The bearings are not properly located in the clutch plate hubs.	The clutch plate bearings (two bearings in each hub) should be pressed into the hub only far enough so one bearing is flush with each end of the hub.	17
	The large hex nut hangs up on the gearcase cover.	Reposition the nut.	

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION	PAGE
The directional control clutches will not remain engaged. The levers will return to neutral when released.	The actuating threads and nuts are worn.	Replace the actuating threads and nuts if you want the directional control levers to remain engaged when placed in an engaged position (forward or reverse.)	12
	The actuating nuts are excessively hardened.	Replace the actuating nuts.	12
The clutches will not disengage properly (Excessive force may be necessary to disengage them).	Full thread contact has not been maintained between the actuating threads and actuating nuts. The threads and nuts are worn unevenly, causing sticking or jamming.	Replace the unevenly worn actuating threads or actuating nuts.	13
		Keep the clutches properly adjusted.	13
Clutch Slippage	The clutch pins are not adjusted properly. One actuating nut is bottoming against the tank wall before the other engages the clutch fully.	Adjust the rear clutch pin to obtain full thread contact when the steering lever is 4" forward of center. Align the front inside clutch plate with the rear inside clutch plate with lever in neutral position.	13
	Using too much counterweight.	Reduce the counterweight to make turning easier.	
	Using wrong oil.	Replace with correct oil.	
Premature clutch thrust bearing failure.	The hardened races on the clutch plates may be rough or pitted, causing seizing of the bearing.	Replace the bearing and turn or replace the hardened races. If one thrust bearing on a clutch fails, replace them both.	13
	The operator may be using too much lever pressure.	Use only enough lever pressure to engage and maintain drive.	
		Check the hardened races for pitting and roughness.	
	Improper counterweighting.	Use proper counterweighting.	
The hardened race in the self-aligning nut may not be free to align the bearings.	Tap the face of the self-aligning nut each time it is removed to be sure the hardened race is free in the nut. (It may be necessary to use a press or vise to loosen the race.)	14	
Premature clutch lining failure or excessive wear.	Nicks on one or both of the clutch faces.	Replace the clutch face and lining.	14
	Improper clutch adjustment — The clutches are adjusted too tightly.	Replace the clutch lining and adjust the clutches for 3 to 4 inches of lever travel from neutral.	11
	One or more of the clutch lubrication tubelines is plugged.	Remove the tubelines and check for obstructions.	

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION	PAGE	
Clutch lining breaks and falls out of the clutch.	The clutch lining has been forced onto the shoulder of the inside clutch plate, cracking the lining.	Whenever you replace a clutch lining, be sure that it fits loosely on the shoulder of the inside clutch plate. Do not force it onto the shoulder.	14	
Excessive clutch drive chain wear.	The upper jackshaft sprocket is not in line with the outer clutch sprockets.	Align, with a straightedge, the upper jackshaft sprocket with the outer clutch sprockets. Use shim washers behind or in front of the sprocket as required.	14	
	The chain is adjusted too tightly.	Tighten only hand tight.	15	
Oil leakage past the upper jackshaft bearings.	The bearing is backward in the bearing housing. The shaft may have turned inside the bearing, scoring the shaft.	Remove the jackshaft and check the shaft for scoring. Insert the bearing in the housing so that the machined offset on the bearing hub is toward the inside of the tank. Lock the locking collar over the offset.	23	
	The seal in the bearing is leaking.	Replace the bearing.	23	
	The gasket is allowing leakage past the bearing housing.	Tighten the housing mounting bolts.		
		Replace the gasket		
	The bearing fits the housing too tightly because of a too large housing dimensional tolerance.	Replace the housing with one which has a larger bore.	23	
The grease fitting on the variable speed driven (spring loaded) sheave is breaking off repeatedly.	The spring is striking the fitting when it compresses, breaking it off.	Turn the spring so a coil sets up next to the new fitting on the sheave side of the fitting.	22	
Drive Belt Slipping	The belt is bottoming on the hub of the drive sheave.	Instruct the operator to nudge the lever forward slightly to move the belt slightly outward from the hub whenever he places the variable speed into low speed position.	17	
	The spring loaded jackshaft sheave is not adjusted properly.	Tighten the three adjusting nuts evenly, one turn at a time. Restart the machine and check for slippage.	17	
	There is grease on the faces of the drive or driven sheave halves.	Clean the grease from the faces of the sheaves and relubricate. Do not over-grease.		
	The belt is worn too narrow to grip the sheaves.	Replace the belt.	17	

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION	PAGE
Drive Belt Breakage	The driven (spring loaded) sheave has moved sideways, causing belt misalignment.	Move the driven sheave so correct alignment of the belt is obtained. The belt should run parallel to the outer edge of the sheave.	17
	The spring loaded sheave is adjusted too tightly.	Back the nuts off the studs until the belt will slip when you start the engine. Stop the engine and tighten the nuts one turn at a time until the belt no longer slips.	17
	The movable half of the driven sheave is not sliding freely on the jackshaft.	The movable half of the sheave should be cleaned and re-lubricated. New grease seals may have to be installed.	17
	The movable half of the driven sheave is not sliding freely on the shaft due to the grease fitting not taking grease.	The movable half of the sheave should be cleaned. A new grease fitting should be installed and the sheave lubricated. Do not overgrease.	17
	The three sliding studs and the oilite bearings on the driven sheave are worn, causing vibration.	Replace any excessively worn parts, including the sheave halves if necessary.	17
	The engine has come loose in its mountings, causing it to shift position. This causes sheave misalignment.	Relocate the engine, reworking the mounting holes if they have been enlarged through vibration. The variable speed drive and hydraulic pump must be realigned to the engine.	
	The bore of the fixed half of the driven sheave is worn, allowing the sheave to wobble.	Replace the sheave and jackshaft.	
	Too high raising pressure.	Decrease to specifications.	
Chains are tight but there is free play in the wheels	The sprocket anchoring nuts are loose.	Tighten and lock the nuts.	
	Worn axle splines or cluster sprockets.	Replace.	
Axle Sprocket Breakage	Using sprockets with the wrong number of teeth.	When replacing sprockets, be sure they have the right number of teeth for the chain being used.	26
	Chain breakage, caused by using the wrong type chain.	When replacing drive chains, use only chain rated the same as the original (special) chain.	26
	Chain breakage, caused by using the wrong type chain connector.	Use only the same type chain connectors as were removed. Do not reuse press type chain connectors.	27
	Chain breakage, caused by chain interference.	Be sure you have sufficient chain clearance whenever you tighten the drive chains.	30
(Cont'd)			

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION	PAGE
Axle Sprocket Breakage (Cont'd)	Chain breakage, caused by out-of-round sprocket.	Be sure to check all sprockets for out-of-roundness whenever you tighten the chains.	30
	There is no spacer on the axle to hold the sprocket in place.	Be sure these spacers are reinstalled during axle replacement.	26
Excessive Axle Breakage (usually occurs on back wheels.)	Loading the bucket with the front wheels off the ground.	Load only with all four wheels on the ground to prevent excess load on the rear wheels and axles.	
	Hitting obstructions with the wheels.	Slow down for obstructions.	
	Chain breakage, caused by using the wrong type chain.	When replacing drive chains, use only chain rated the same as the original (special) chain.	26
	Chain breakage, caused by using the wrong type chain connector.	Use only the same type chain connectors as were removed. Do not re-use press type chain connectors.	27
	Chain breakage, caused by interference between chains.	Be sure you have sufficient chain clearance whenever you tighten the drive chains.	
	Improper counterweighting.	Use proper counterweighting.	
	Using solid type tires.	Reduce speed when using solid tires.	
Final drive chain breakage.	Operating with loose chains.	Adjust the final drive chains to 1/4" deflection using 40 lbs. of spring scale force.	30
	Operating with out-of-round sprockets.	Be sure to check all sprockets for out-of-roundness whenever you tighten the chains.	30
	Worn chains and sprockets.	Replace.	
	Using an axle sprocket with the wrong number of teeth on one axle.	Be sure all axle sprockets have the same number of teeth.	26
	Operating with tires of different diameter on a side of the machine.	Use the same air pressure in all tires.	7
		Rotate tires.	7
	Operating with solid type tires.	Replace with pneumatic tires.	
		Check chain condition daily; adjust when loose.	
	Foreign objects in tanks.	Remove.	
Excessive drive chain wear or breakage. (Cont'd)	Loading the bucket with the front wheels off the ground.	Load only with all four wheels on the ground to prevent excess load on the rear final drive chain.	
	Chains are too loose.	Tighten to proper tension.	30
	Chains are too tight	Loosen to proper tension.	30
	Using wrong type chain.	Use only recommended chain.	

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION	PAGE
Excessive drive chain wear (Cont'd)	Interference between chains.	Check for interference whenever tightening the drive chains.	30
	Using too much counterweight.	Reduce counterweight.	7
Chain interference	The lower jackshaft sprocket is misaligned, causing the intermediate chain to interfere with the final drive chain.	Whenever the final drive chains are being tightened, the rear of the large sprocket should be held away from the gearcase sidewall with a bar. After tightening the chains, the drive should be turned through a full revolution to check for chain interference.	30
	The directional control linkage is interfering with the intermediate chain.	Check for interference and correct as necessary.	
	Axle sprocket holding nuts are loose.	Tighten and lock them.	25
Loud growling noise in the drive system. (Machine is standing still with the engine running) (Machine is in motion)	The clutch drive chain is too tight.	Loosen, and retighten only hand tight.	30
	Chains are misaligned and interfering with other chains or sprockets.	Retighten all the drive chains, then turn the drive through a full revolution to check for interference.	30
	The upper jackshaft bearings have failed.	Replace the bearings, locking the new bearings to the shaft with the offset locking collars.	23
	The intermediate chain is too tight.	Loosen, then tighten to proper tension.	30
	The intermediate chain is too loose, causing the inside clutch sprocket (reverse drive clutch) to slip on the chain.	Tighten to proper tension.	30
	The lower jackshaft sprocket is loose, causing growling in one direction of travel.	Retighten all the drive chains, then rotate the drive through a full revolution to check for interference.	30
The gearcase cover is difficult to install.	The self-aligning (large hex) nuts are not turned with a flat on top.	Turn the seal-aligning nuts to obtain a flat on top. The holding bar on the gearcase cover must rest on these flats.	
	The clutch drive chain is too tight, drawing the clutch pins together.	Loosen the chain and retighten only hand tight.	30
	The intermediate chain is too tight.	Loosen and retighten to proper tension.	30
Oil leakage past the clutch pin caps.	The cap is loose.	Tighten.	
	The quad ring seals are not properly seated in their grooves in the caps.	Replace the quad ring seals and place them carefully in their grooves in the caps. Spread a little oil around the quad ring seals before replacing the caps.	
	The quad ring seals are cracked or broken.		

