SERVICE MANUAL

for

CATERPILLAR®

NO. 29 CABLE CONTROL

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CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS, U.S.A.

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Specifications

Drive Shaft

End clearance	.002 - .010 in.

Cable Drum Bearings

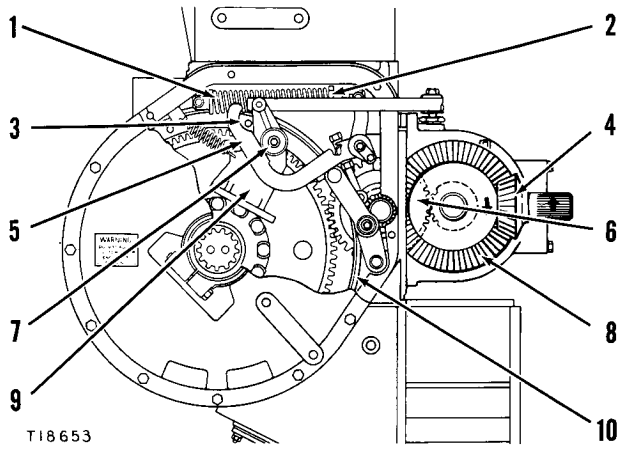
Bearing preload:	
Shims to be removed after end clearance taken up	.007 - .010 in.
Or, torque to rotate at drum diameter	28 - 30 lbs.

Bevel Gear

Bevel gear and pinion backlash, minimum	.010 in.
Bevel gear bearing preload:	
Shims to be removed after end clearance taken up	.003 in.
Or, torque to rotate at gear diameter	5 lbs.

Operation

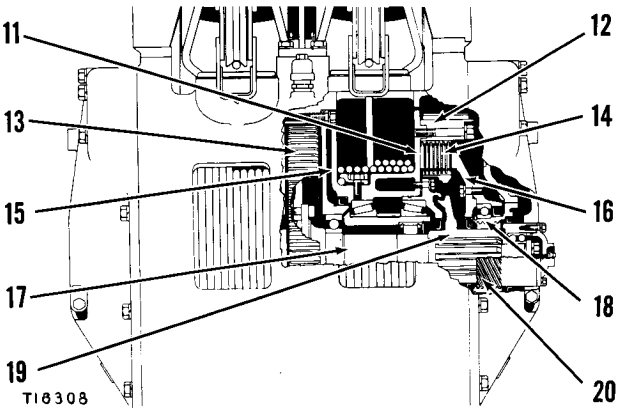
The two line drawing cutaway illustrations of the cable control show the operating mechanism. The roller **(7)** on the clutch lever **(9)** is in contact with the curved brake lever **(5)**, which is linked to the brake band **(10)** and the brake spring **(1)**. This mechanism synchronizes the application of the brake and the clutch release.



NO. 29 CABLE CONTROL (CUTAWAY) RIGHT SIDE VIEW
1–Brake spring. 2–Brake spring adjusting nut. 3–Lock-out notch. 4–Bevel Pinion. 5–Brake lever. 6–Idler gear. 7–Roller. 8–Bevel gear. 9–Clutch lever. 10–Brake band.

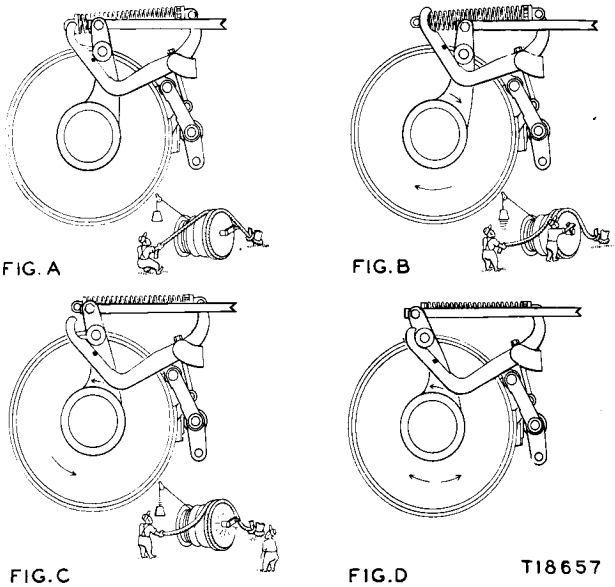
The clutch lever **(9)**, actuated by the operator through the control levers, is bolted to a multiple thread nut **(18)**. Rotating the lever clockwise causes this nut to advance inward on its mating screw **(20)**, forcing the pressure plate **(16)** against the clutch discs **(11)** and **(14)**, thereby engaging the clutch.

When the clutch engagement nut **(18)** is rotated counterclockwise, it actuates the brake lever **(5)** by means of the clutch lever **(9)** and roller **(7)**. This releases the brake band **(10)** from its tight contact with the brake drum **(12)** and allows the cable drum **(15)** to free-spool. In the extreme of this position, the roller **(7)** enters the notch **(3)** in the brake lever **(5)**, which holds the brake in the lock-out position, allowing the cable drum to turn freely in either direction for such an operation as changing the cable.



NO. 29 CABLE CONTROL (CUTAWAY) REAR VIEW
11–Metallic-faced disc. 12–Brake drum. 13–Drum gear. 14 – Plain disc. 15 – Cable drum. 16 – Pressure plate. 17–Clutch shaft. 18–Clutch engagement nut. 19–Clutch inner drum. 20–Clutch engagement screw.

The clutch metallic-faced or driven discs **(11)** are splined to the brake drum **(12)**, which is fastened to the cable drum **(15)**. The plain or driving discs **(14)** are splined to the clutch inner drum **(19)**, which is splined to the main drive shaft **(17)**, and rotates with it by the power transmitted through gears **(4)**, **(8)**, **(6)**, and **(13)** when the engine is running. Engagement of the clutch forces the driving discs into contact with the driven discs tightly, which causes the cable drum to turn.

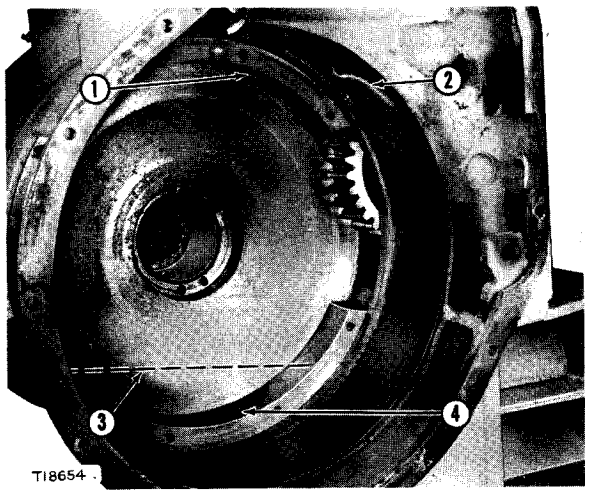


ACTION OF CABLE CONTROLS

The accompanying drawings depict the four functions of the clutch and brake. In Fig. A, the mechanism is in neutral, clutch released, brake energized (wrapped), load held stationary. Fig. B shows the clutch engaged, brake released, load being raised. Fig. C illustrates the clutch released and the brake being released to lower the load. In Fig. D, the brake is locked-out for free-spooling.

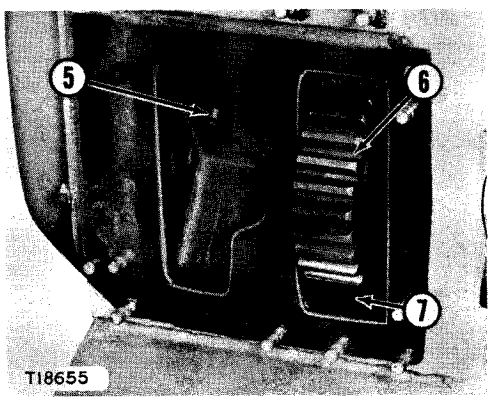
Lubrication

The power train is splash-lubricated by action of the main shaft drive gear. The oil level **(3)** is maintained in the drum gear compartment through the hole **(4)** connecting the gear compartment with the sump below.



CABLE DRUM COMPARTMENT LUBRICATION
1–Elongated opening. 2–Tube. 3–Oil level. 4–Hole.

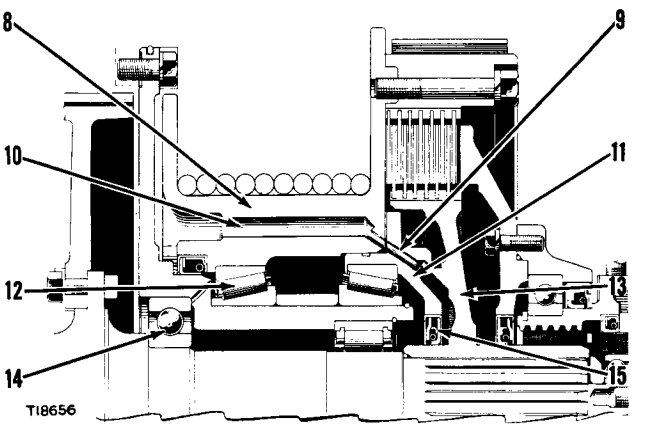
The main shaft drive gear carries oil upward and throws it into the elongated opening **(1)** at the top of the compartment. Oil then flows through the tube **(2)** and **(5)** to the bevel gear compartment, lubricating the gears and bearings.



BEVEL GEAR COMPARTMENT LUBRICATION
5–Tube. 6–Idler gear. 7–Opening to drum gear compartment

Oil returns from the bevel gear compartment to the drum gear compartment through the opening **(7)** beneath the idler gear **(6)**.

The shaft bearings **(14)** and the cable drum bearings **(12)** are splash-lubricated by oil thrown from the main shaft drive gear. If any oil from the shaft bearings **(14)** or cable drum bearings **(12)** should leak past the seal **(15)** into the clutch compartment, the oil slinger portion of the clutch inner drum **(13)** and the cable drum bearing retainer **(11)** act together to throw this oil through the drilled holes **(9)** in the cable drum bearing retainer into holes **(10)** in the cable drum **(8)** which permit the oil to escape.



CABLE DRUM AND SHAFT BEARING LUBRICATION
8–Cable drum. 9–Drilled hole in bearing retainer. 10–Hole in cable drum. 11–Bearing retainer. 12–Cable drum bearings. 13–Clutch inner drum. 14–Shaft bearings. 15–Seal.

Clutch and Brake Mechanism

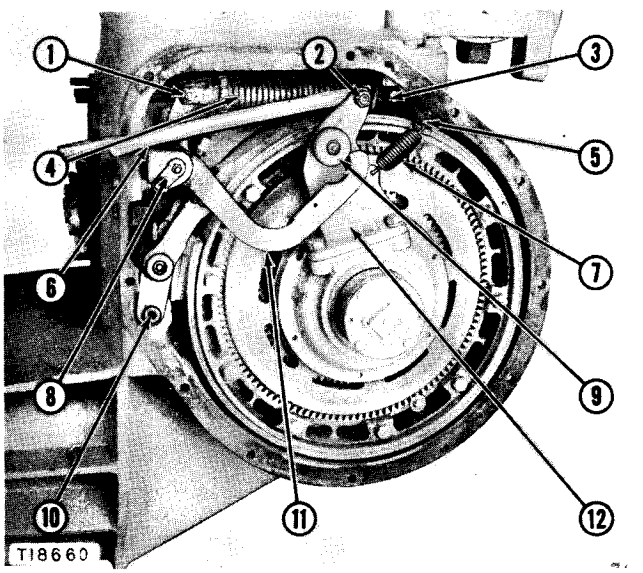
BRAKE LINING REPLACEMENT

Disassembly

1. Remove the clutch and brake cover as described in the topic, CLUTCH DISC REPLACEMENT.
2. Install a nail or pin **(3)** through the hole in the spring assembly in order to hold the spring **(4)** compressed.

NOTE

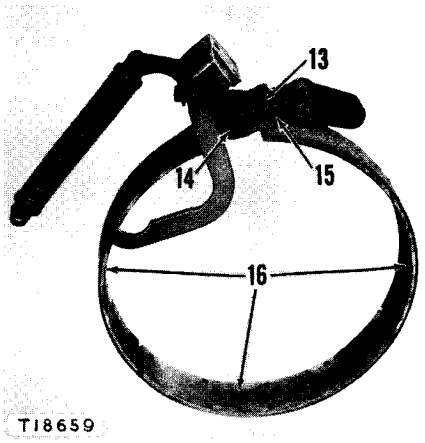
In order to do this, place the clutch lever **(12)** in the lockout position with the brake roller **(9)** in the notch of the brake lever **(11)**. If necessary,



BRAKE BAND REMOVAL
1–Pin. 2–Nut. 3–Nail or pin. 4–Spring. 5–Return spring anchor bracket. 6–Control rod. 7–Return spring. 8–Anchor bracket. 9–Brake roller. 10–Pin. 11–Brake lever. 12–Clutch lever.

pry the brake lever **(11)** back to compress the spring **(4)** until the pin **(3)** goes through the hole in the yoke and the rod.

3. Remove the nut **(2)**, take out the control rod **(6)**, and remove the clutch lever **(12)**.
4. Remove the return spring **(7)** and return spring anchor bracket **(5)**.
5. Remove the pin **(1)** holding the spring yoke assembly to the control case.
6. Remove the pin **(10)** which is held in place by a boss in the cover.
7. Remove the capscrews which hold the anchor bracket **(8)** in place.
8. Remove the brake assembly as a unit.



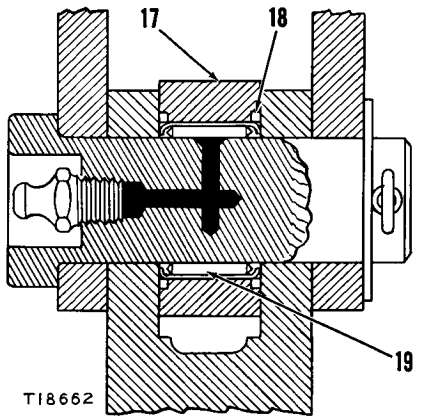
BRAKE BAND ASSEMBLY REMOVED
13–Pin. 14–Pin. 15–Link. 16–Linings.

9. Remove the pins **(13)** and **(14)** to free the brake band assembly from the linkage.
10. Remove the linings **(16)** by punching out the rivets.

NOTE

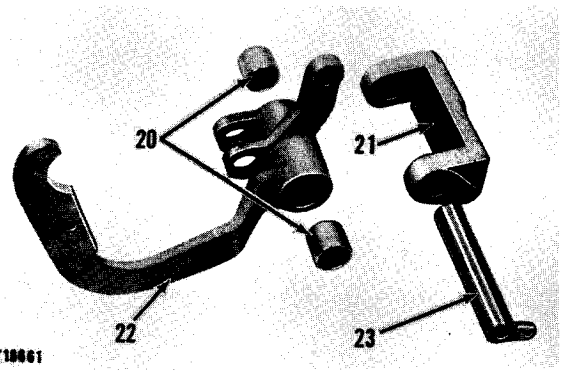
The brake band link roller **(17)** is mounted on needle bearings **(19)**, which are protected by rubber seals **(18)** on each side of the roller **(17)**. These seals prevent dirt from coming in contact with the needle bearings and causing undue wear.

11. Remove the brake band link roller **(17)** by taking out the cotter pin and removing the link pin.
12. Inspect the seals **(18)** and bearings **(19)** and replace if damaged or worn.



BRAKE ROLLER LINK
17–Brake band link roller. 18–Rubber seal. 19–Needle bearings.

13. If the brake lever **(22)** becomes worn or damaged, it can be removed from the bracket **(21)** by taking out the capscrew holding the shaft **(23)** in place.
14. Press out the needle bearings **(20)** and replace them if worn or damaged.



BRAKE LEVER ASSEMBLY
20–Needle bearings. 21–Bracket. 22–Brake lever. 23–Shaft.

Assembly

Brake linings are the molded type.

Carefully install the linings to avoid distortion of the brake band.

Assemble the brake assembly in the reverse order of disassembly, making sure to install the link **(15)** with the cut out portion facing downward.

Install the cover and adjust the brake and clutch as described in that topic.

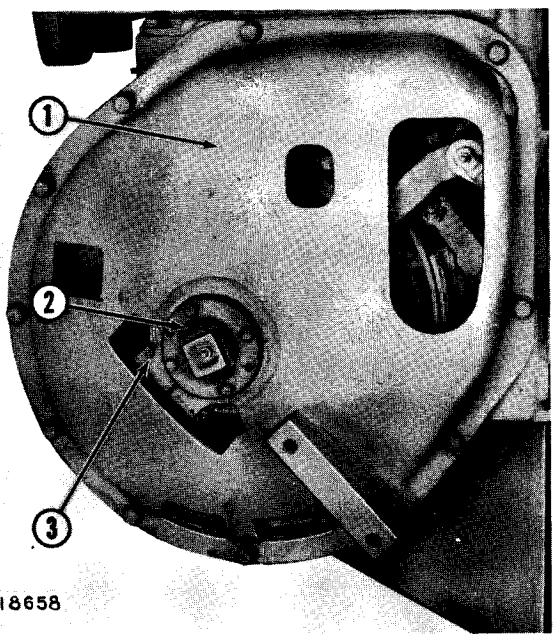
CLUTCH DISC REPLACEMENT

There are thirteen clutch discs in each clutch, seven with metallic facings and six plain. The plain discs, or drive discs, mesh with the inner drum and

the metallic-faced discs, or the driven discs, mesh with the outer drum.

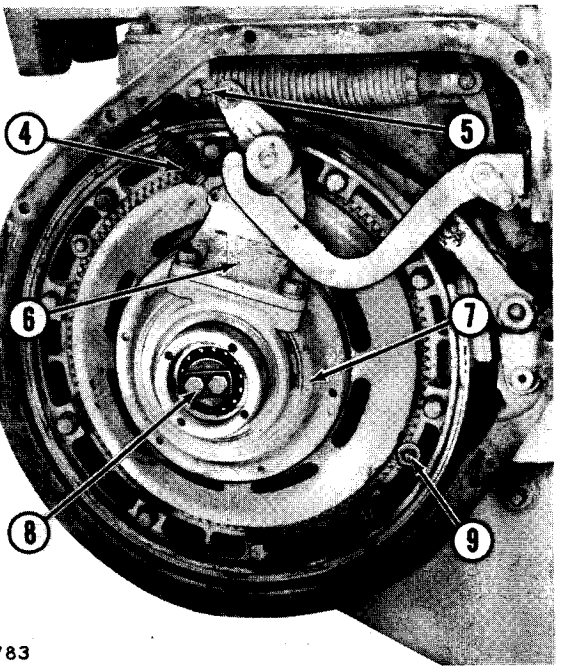
Disassembly

1. Remove the capscrews holding the clutch and brake cover **(1)** to the control case.
2. Loosen the clamp bolt **(3)** and spread the clamp with a small chisel.
3. Remove the cover.



CLUTCH AND BRAKE COVER REMOVAL
1–Cover. 2–Outer bearing retainer. 3–Clamp bolt.

4. Remove the four capscrews and use two of them to pull the outer bearing retainer **(2)**.
5. Compress the brake spring and hold with a nail or pin **(5)**, and remove the control rod, as described in the topic, BRAKE LINING REPLACEMENT.
6. Remove the clutch lever **(6)** from the engaging nut and disconnect the return spring **(4)**.
7. Release the brake spring by forcing the brake lever back and removing the nail or pin **(5)**.
8. Remove the capscrews and retainer **(8)**.
9. Pull the engagement mechanism **(7)** from the shaft to gain access to the clutch discs.
10. Remove the clutch inner drum **(3)** for convenience in removing the clutch discs.
11. Remove the two capscrews and retaining washers **(9)** holding the discs in place.

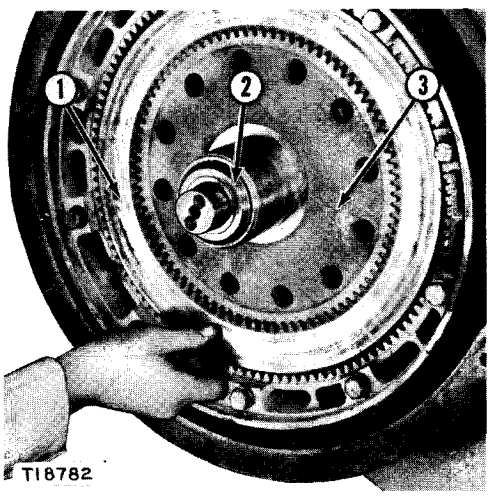


CLUTCH DISC REMOVAL
4–Return spring. 5–Nail or pin. 6–Clutch lever. 7–Clutch engagement mechanism. 8–Retainer. 9–Capscrew for holding clutch discs.

12. Remove the discs **(1)**.

Assembly

1. Push the clutch inner drum **(3)** on the shaft as far as it will go.



INSTALLING CLUTCH DISCS
1–Clutch discs. 2–Spacer. 3–Clutch inner drum.

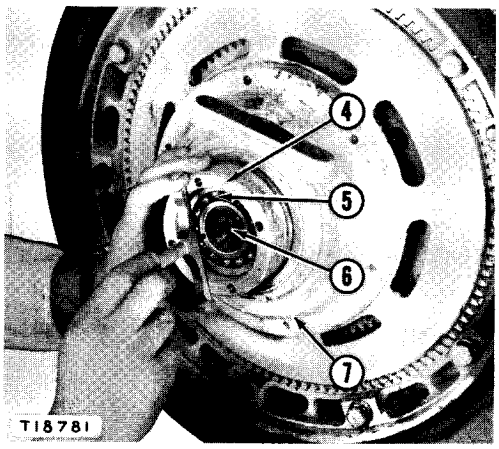
2. Install the discs **(1)**, beginning with a metallic-faced disc against the cable drum and alternating with a plain disc, until seven metallic-faced discs and six plain discs are in place.
3. Install the spacer **(2)** on the shaft with the chamfer and ridge outward.

4. Install the two capscrews and washers that hold the clutch discs in place.

5. Install the clutch engagement mechanism **(7)**.

NOTE

The bearing inner race **(5)** should extend slightly beyond the end of the shaft **(6)** when assembled to insure tightness of the retaining washer and capscrews. If this overlap is too great, the retaining washer can be distorted when the capscrews are tightened. This distortion can cause the capscrews to break. Excess space is taken up by adding shims.



INSTALLING CLUTCH ENGAGEMENT MECHANISM
4–Clutch engagement screw. 5–Bearing inner race. 6–Shaft. 7–Clutch engagement mechanism.

6. Install the retaining washer on the clutch shaft **(6)** without shims and draw tight.

7. Remove the retaining washer.

8. Measure with a depth micrometer, as shown, the distance from the end of the clutch engagement screw **(4)** to the end of the bearing inner race **(5)**.

9. Measure the distance from the end of the engagement screw to the end of the shaft **(6)** and obtain the difference between the two measurements.

10. Install the retaining washer and capscrews on the shaft, with sufficient shims to give from .002" to .010" clearance between the retaining washer and the end of the shaft **(6)**.

11. Compress the brake spring, then connect the clutch lever and control rod in the reverse order of disassembly.

12. Remove the nail or pin holding the spring in compression.

13. Install the clutch and brake drum cover.

14. Install the outer bearing retainer.

15. Adjust the brake and clutch as described in that topic.

CLUTCH ENGAGEMENT MECHANISM

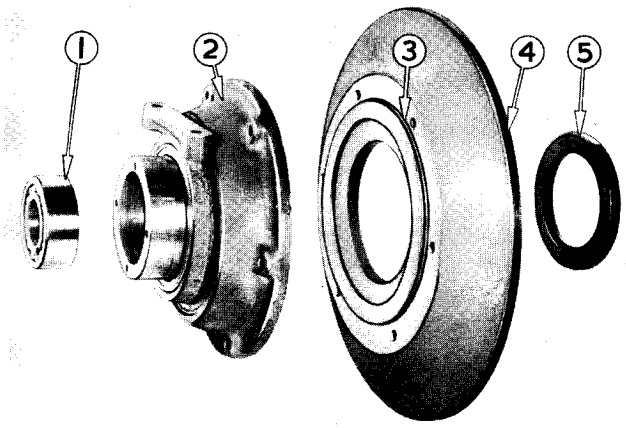
Disassembly and Assembly

The clutch engagement mechanism can be disassembled more readily after it is taken off the cable control.

1. Remove the six capscrews holding the pressure plate **(4)** to the clutch nut and screw assembly **(2)**.

2. The rubber oil seal **(3)** and the rawhide seal **(5)** should be removed if damaged or worn.

3. The bearing **(1)** can easily be removed without a puller.



CLUTCH ENGAGEMENT MECHANISM
1–Bearing. 2–Clutch nut and screw assembly. 3–Rubber ring seal. 4–Pressure plate. 5–Oil seal.

4. Remove the lock ring **(11)**.

5. Press the clutch screw **(12)** and clutch nut **(7)** out of the bearing **(10)**.

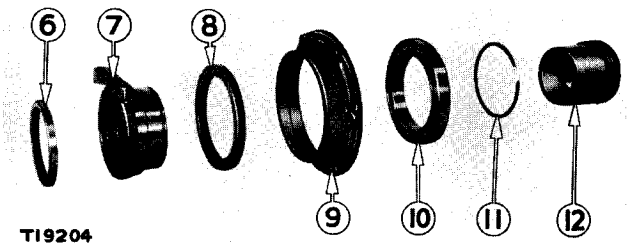
6. Press the bearing **(10)** out of the retainer **(9)**.

7. Unscrew the clutch screw **(12)** from the clutch nut **(7)**.

8. Press the seal **(6)** from the clutch nut and the seal **(8)** from the retainer **(9)**.

NOTE

Inspect all parts for excessive wear and replace them if necessary. To insure against oil leaks it is good practice to install new oil seals when assembling the cable control.



CLUTCH NUT AND SCREW ASSEMBLY
6–Oil seal. 7–Clutch engaging nut. 8–Oil seal. 9–Retainer. 10–Bearing. 11–Lock ring. 12–Clutch engaging screw.

9. Press the oil seal **(6)** in the clutch nut **(7)** with the wiping edge to the outside.
10. Install the oil seal **(8)** with the wiping edge to the outside.
11. Place the clutch engaging nut **(7)** in the retainer **(9)** positioning it in the seal with care.
12. Install the bearing **(10)** on the clutch nut.
13. After making sure the bearing is bottomed in the retainer, install the lock ring **(11)**.
14. Install the oil seal **(5)** in the pressure plate **(4)**, with the wiping edge to the outside.
15. Replace the oil seal **(3)** and install the bearing **(1)** in the clutch screw **(12)**.
16. Fasten the pressure plate **(4)** to the engagement assembly with the six capscrews.

The assembly is then placed on the shaft and the brake mechanism installed in reverse order of removal. Adjust the brake and the clutch.

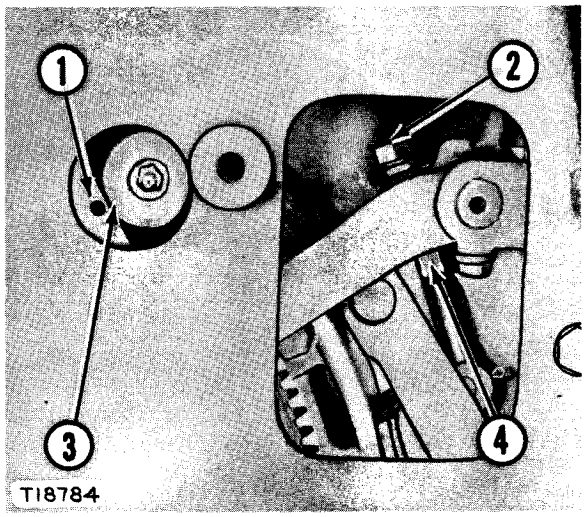
CAUTION

Protect the clutch screw and clutch nut threads in removal and assembly. Damage to these threads will prevent proper assembly and operation of the cable control.

CLUTCH AND BRAKE ADJUSTMENTS

The clutch and brake are operated by the control rod which is connected to the clutch engagement lever. A roller on the clutch lever contacts a ramp on the brake lever which actuates the brake.

Wear in the brake mechanism causes the roller on the clutch lever to move from its original position on the brake lever ramp and, in turn, changes free movement in the clutch mechanism. Therefore, it is necessary to make the brake adjustment before making the clutch adjustment.



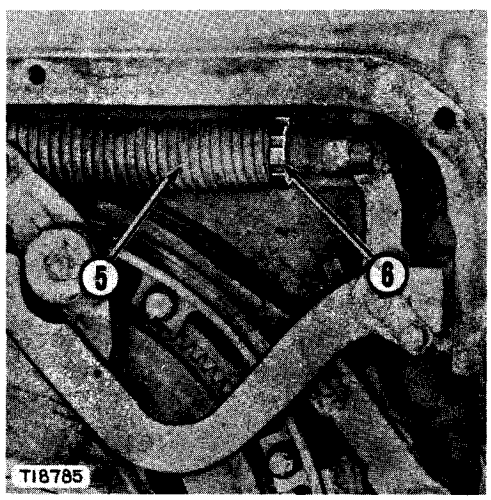
BRAKE ADJUSTMENT
1–Hole. 2–Adjusting nut. 3–Roller. 4–Lock nut.

Brake Adjustment

The brake should be adjusted by aligning the center of the roller **(3)** on the clutch lever with the holes **(1)** on the brake lever.

Loosen the lock nut **(4)** and tighten the adjusting nut **(2)** to move the brake lever back. This allows the clutch return spring to pull the center of the roller to the mark, as shown. Tighten the lock nut.

Adjustment is made to the left side in the same manner although some of the parts are located in slightly different positions.



BRAKE SPRING ADJUSTMENT
5–Spring. 6–Adjusting nut.

If a cable control is to be used with a scraper, it may be necessary to increase the brake spring tension or decrease the spring tension for operating a bulldozer.

The spring **(5)** should be adjusted just tight enough to hold the load without the brake slipping.

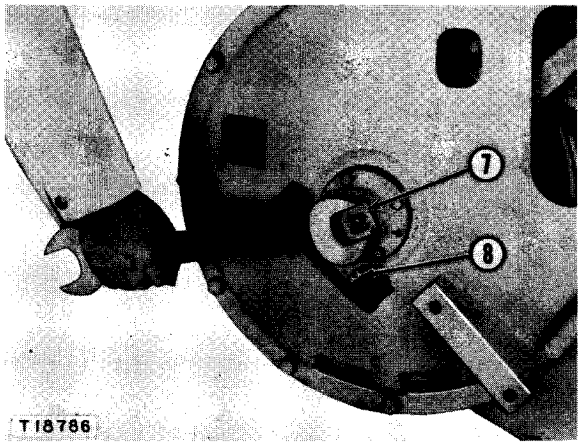
Turn the brake spring adjusting nut **(6)** with a punch or pinch bar. Turning the nut toward the spring will compress the spring and increase the spring tension.

Clutch Adjustment

WARNING

Do not adjust the clutch with the engine running.

Loosen the clamp bolt **(8)**.



CLUTCH ADJUSTMENT
7–Adjusting screw. 8–Clamp bolt.

Turn the adjusting screw **(7)** to tighten the clutch until there is a free movement between the "neutral" and "clutch engaged" positions of the control lever of 5½" — more, if desired, but never less than 5½".

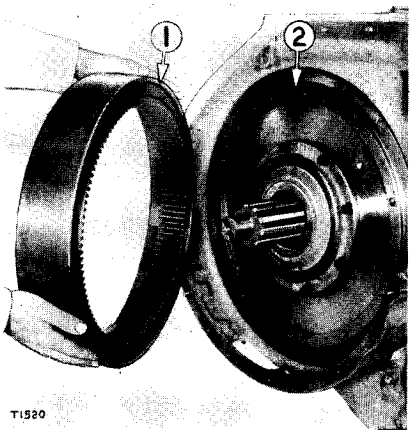
Tighten the clamp bolt securely after making the adjustment.

Cable Drum

The cable drums are mounted on tapered roller bearings which are supported by a hub.

REMOVAL

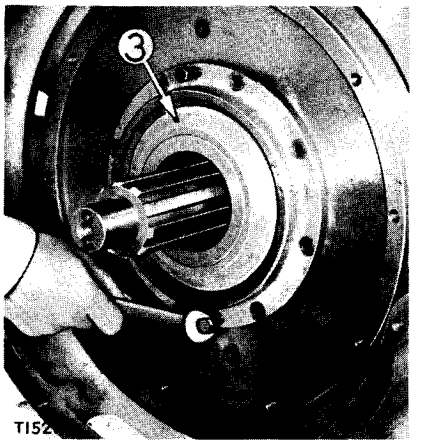
1. After the clutch and brake band assemblies have been removed, the brake drum **(1)** is removed from the cable drum **(2)** by taking out the capscrews.



REMOVING CLUTCH AND BRAKE DRUM
1–Outer clutch drum. 2–Cable drum.

2. Take out the capscrews holding the bearing retainer **(3)** to the cable drum. The bearing cage is provided with two ⅜" - 16 (NC) puller holes in which two of the capscrews can be used as forcing screws.

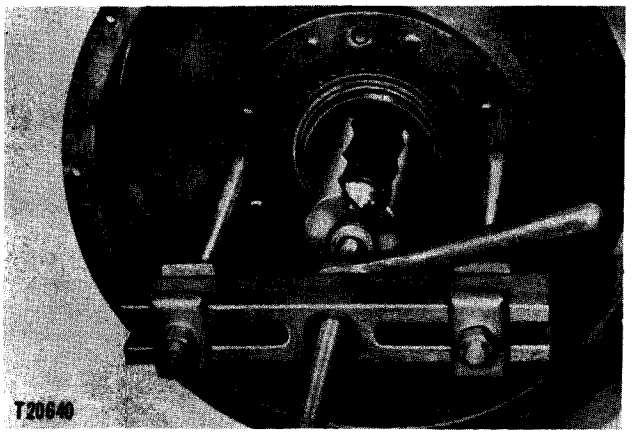
3. Remove the lock ring located directly in front of the bearing.



REMOVING DRUM BEARING RETAINER
3–Bearing retainer.

4. Pull the cable drum from the hub, using the 2H6021 Adapter, 2H6024 Spacer, 2H6026 Ring and the 8B7548 Push Puller as shown.

5. Fasten the 2H6026 Ring to the drum, using the drum bearing retainer capscrews. The ring provides tapped holes for the puller legs. The 7F9540 Hydraulic Puller can also be used. When using the hydraulic puller, limit the pull to 20 **tons** (40 tons on the gauge). If with this force the cable drum does not relieve from its bear-

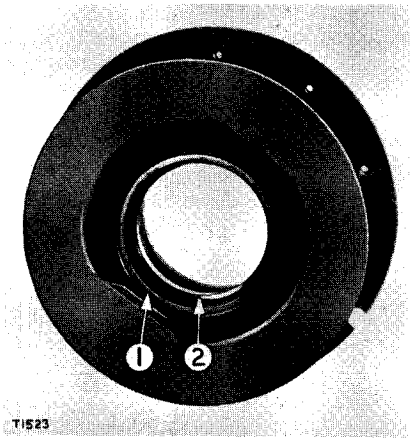


PULLING CABLE DRUM

ings, jar the inside of the drum with a hammer blow. The cable drum bearings and spacer are removed when the cable drum is pulled. Remove the seals from the cable drum and the retainer, and replace if necessary.

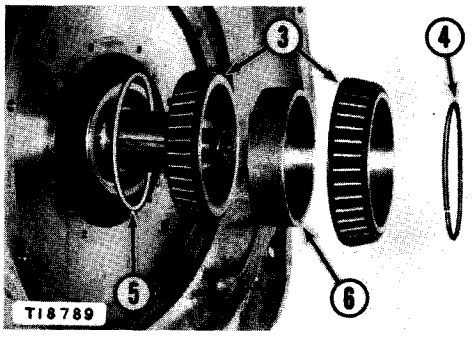
ASSEMBLY

1. Install the seal **(1)** with the lip turned toward the cable drum bearing and bearing race **(2)**.



CABLE DRUM
1–Oil seal. 2–Bearing race.

2. Place the cable drum over the hub and install the small spacer **(6)**, two bearings **(3)** and spacer **(5)** between them. The bearings can be installed more easily if they are heated first in oil and then installed on the hub.



INSTALLING CABLE DRUM
3–Bearings. 4–Lock ring. 5–Spacer. 6–Spacer.

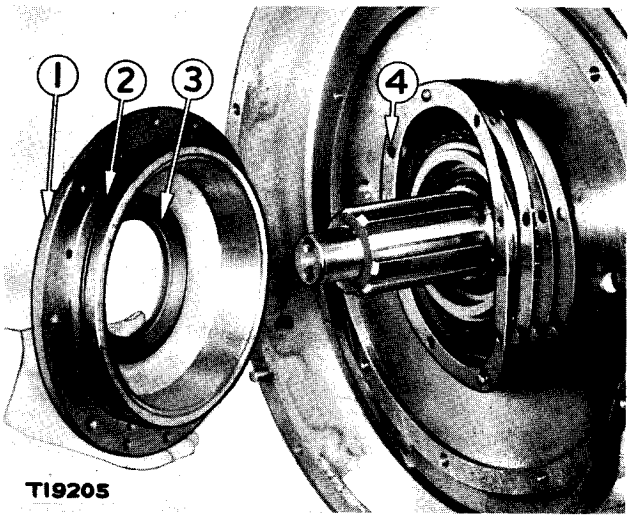
3. Make sure the bearings are bottomed in the cable drum and then install the lock ring **(4)**.

DRUM BEARING ADJUSTMENT

1. Replace the oil seals **(2)** and **(3)** on the bearing retainer, with the lip of seal **(3)** turned toward the cable drum bearing.
2. Install the retainer **(1)** on the cable drum.

NOTE

There are eight oil relief holes in the retainer and four in the cable drum. The four holes in the drum will line up with four holes in the retainer to permit any oil which may leak through the oil seal to pass into a cored hole in the cable drum and out on the inside flange of the cable drum.



INSTALLING DRUM BEARING RETAINER
1–Retainer. 2–Rubber ring seal. 3–Oil seal. 4–Shims.

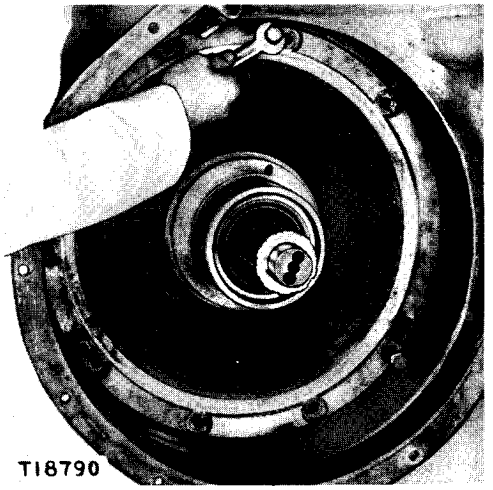
3. Install the bearing retainer **(1)** without shims and tighten it down evenly, just enough to remove the end play of the cable drum.
4. Check the existing clearance between the retainer and the cable drum with shims **(4)** that are used in assembly.
5. When the correct number of shims have been selected, subtract shims, .008" to .010", to obtain a preload (pounds pull required to turn the cable drum) of 28 to 30 pounds at drum diameter.
6. Remove the bearing retainer, install the shims, place the bearing retainer on the cable drum and tighten.

Drive Gear and Main Drive Shaft

The main drive shaft is mounted on two roller bearings which are mounted on the inside of the hub.

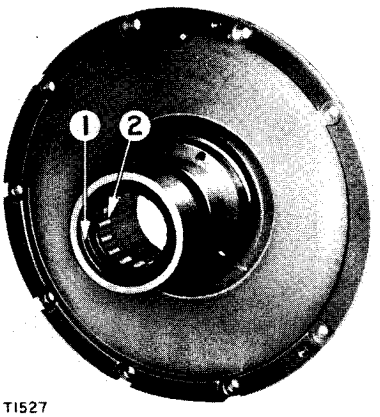
REMOVAL AND DISASSEMBLY

1. Take out the capscrews holding the hub to the case.
2. Pull the hub, using three ½" - 13 (NC) forcing screws.



REMOVING DRUM BEARING SUPPORT HUB

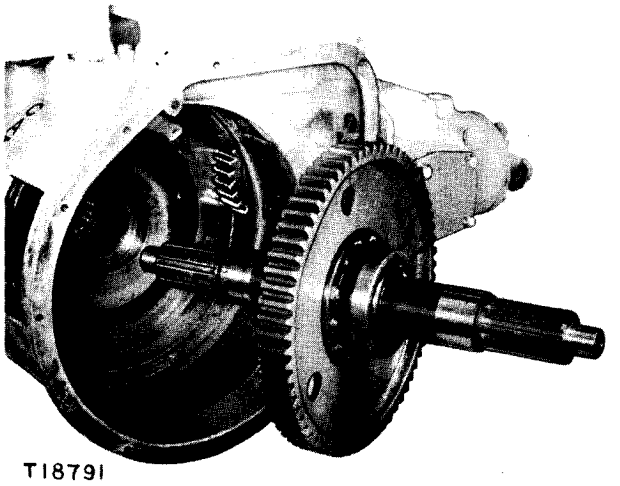
3. Remove the lock ring **(1)** from the hub and press out the bearing **(2)**.



DRUM BEARING SUPPORT HUB
1–Lock ring. 2–Bearing.

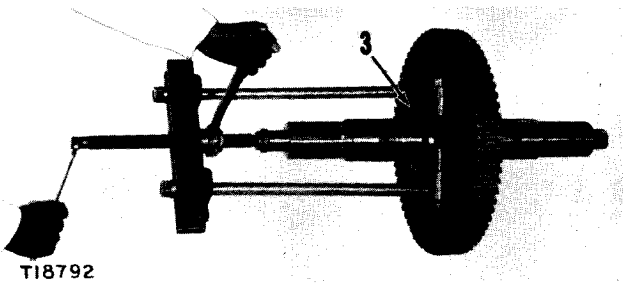
NOTE

To remove the main drive shaft it is necessary to remove the cover, bearing retainer, and the flat retainer, held to the shaft by two capscrews, from the opposite side from which the shaft is to be removed. The shaft can then be removed by driving the shaft with a soft hammer until it can be lifted out of the case.



DRIVE GEAR AND MAIN DRIVE SHAFT REMOVED

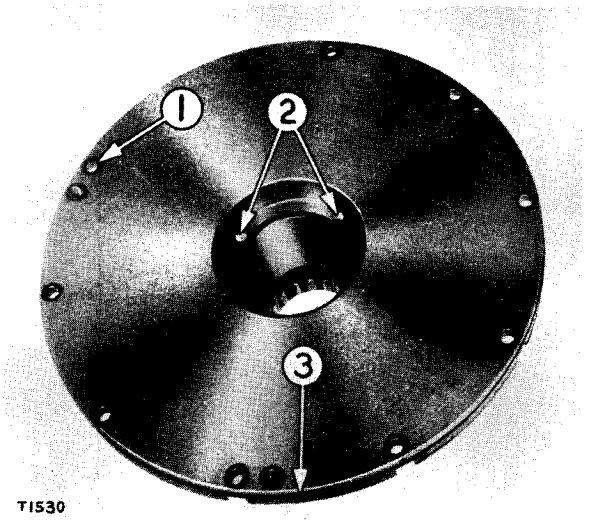
4. Remove the bearing **(3)**, using 8B7548 Push Puller, 8B7549 Legs and 8B7551 Attachment.
5. Remove the gear from the shaft by taking out the 12 bolts.



REMOVING SHAFT BEARINGS
3–Bearing.

ASSEMBLY AND INSTALLATION

1. Install the gear and shaft in the reverse order of removal.
2. There are rubber gaskets **(1)** at each capscrew hole to prevent oil leakage. Glue the rubber gaskets in place, centering them with the holes as close as possible. Any type of quick drying cement or shellac can be used.
3. Press a cork in each of the three puller holes from the inside of the flange so the large end of the cork is on the inside face of the flange. This will keep the corks from coming out and causing an oil leak.
4. Replace the large rubber oil seal **(3)** located on the large diameter of the flange.



INSTALLING RUBBER GASKET ON HUB
1–Rubber gasket. 2–Oil holes. 3–Rubber ring seal.

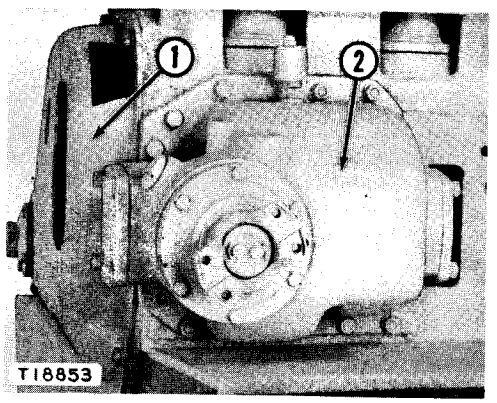
5. Check the oil holes **(2)** to see that they are not clogged. These oil holes provide oil passage to the drum bearings from the gear case.

Gears

The gear train transmits power from the rear power take-off shaft extension to the main drive shaft. The gear train consists of the bevel pinion, bevel gear, spur pinion, idler gear and main drive shaft gear.

BEVEL GEAR CASE REMOVAL AND INSTALLATION

1. Drain the lubricant.
2. Remove the right hand clutch and brake cover **(1)**, as mentioned under the topic, CLUTCH DISC REPLACEMENT; compress the brake spring and install the nail to hold the spring compressed.



REMOVING BEVEL GEAR CASE
1–Right hand clutch and brake cover.
2–Bevel gear case.

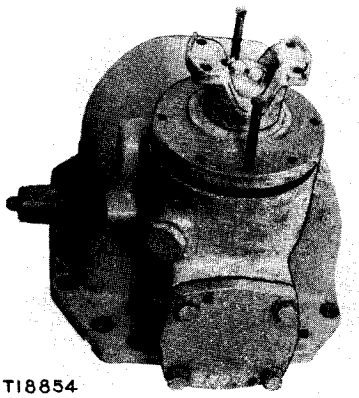
3. Remove all of the nuts and capscrews holding the bevel gear case **(2)** to the cable control. Remove the bevel gear case.

NOTE

When installing the bevel gear case, be sure to replace the seal between the case and the cable control housing.

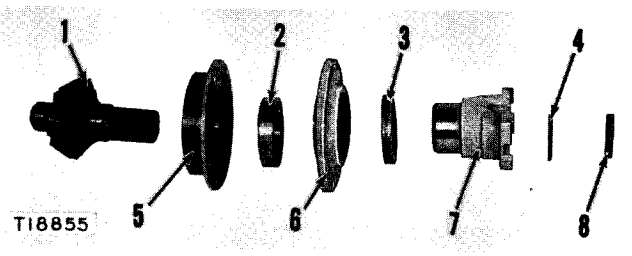
BEVEL PINION REMOVAL AND DISASSEMBLY

1. Remove the capscrews and pull the bevel pinion out of the bevel gear case, using the forcing screws as shown.



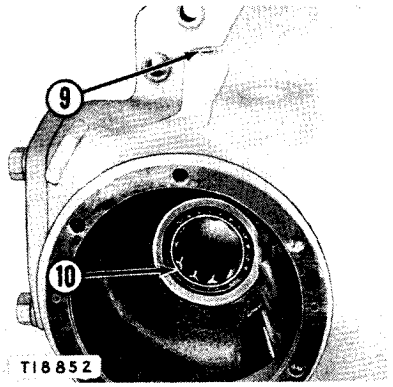
REMOVING BEVEL PINION

2. Remove the two capscrews and the retainer plate **(8)** and gasket **(4)**.
3. The universal flange **(7)** can then be removed from the pinion shaft.
4. Remove the bearing retainer **(6)**.



BEVEL PINION DISASSEMBLY
1–Pinion. 2–Bearing. 3–Seal. 4–Gasket. 5–Bearing cage. 6–Bearing retainer. 7–Flange. 8–Retainer plate.

5. Pull the bearing cage **(5)** and bearing **(2)** from the pinion shaft, using the 8B7551 Bearing Pulling Attachment and the 8B7548 Push Puller.
6. The bearing **(2)** can be pressed from the cage using an arbor press.

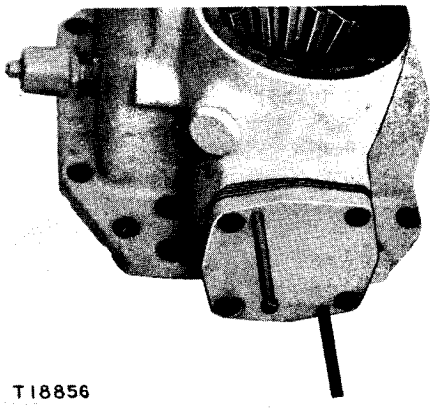


BEVEL PINION INNER BEARING
9–Opening to dowel. 10–Bearing.

7. The pinion inner bearing **(10)** can be driven out of the case, after removing the dowel at **(9)** and after the bevel gear shaft has been removed.

BEVEL GEAR AND SHAFT REMOVAL AND DISASSEMBLY

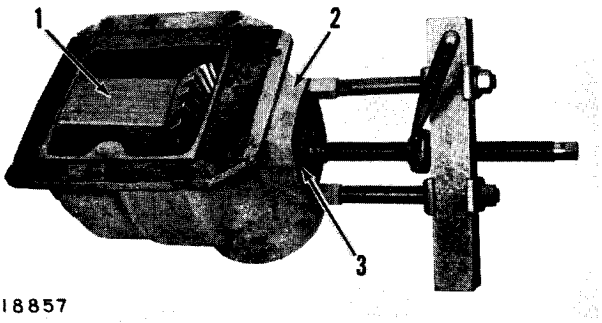
1. Remove the two bevel gear shaft bearing retainers by taking out the four capscrews and pulling them with two forcing screws as shown.



PULLING BEVEL GEAR BEARING CAGE

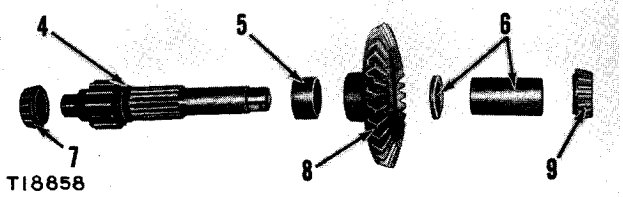
To remove the bevel gear shaft from the case, it must be disassembled as follows:

2. Position the case, as shown, and attach the 8B7557 Adapters, 8B7550 Legs, 8B7562 Wrench and the 8B7548 Push Puller to the right hand bearing retainer boss **(2)**.
3. Place blocks **(1)** at the top and bottom between the bevel gear and case. Push the shaft through the bearing **(3)**, using a suitable step plate between the screw and the shaft.
4. The shaft **(4)** can be removed through the left bearing bore, and the gear **(8)** and spacers **(5)** and **(6)** lifted out of the case.



REMOVING BEVEL GEAR FROM SHAFT
1–Blocks. 2–Right hand bearing retainer boss. 3–Bearing.

5. The left bearing **(7)** can be pulled off the shaft, using the 8B7548 Push Puller and 8B7551 Attachment.



BEVEL GEAR SHAFT DISASSEMBLED
4–Shaft. 5–Spacer. 6–Spacers. 7–Bearing. 8–Bevel gear. 9–Bearing.

BEVEL GEAR ASSEMBLY AND INSTALLATION

The bevel gear can be assembled into the case in the reverse order of disassembly.

CAUTION

Make sure the right hand bearing is pressed on the shaft tight enough to snug up the gear and spacers.

BEVEL PINION ASSEMBLY

1. Reassemble the bevel pinion in the reverse order of disassembly, making sure the bearing is properly seated on the shaft.
2. Reinstall and dowel the pinion inner bearing, if it has been removed.

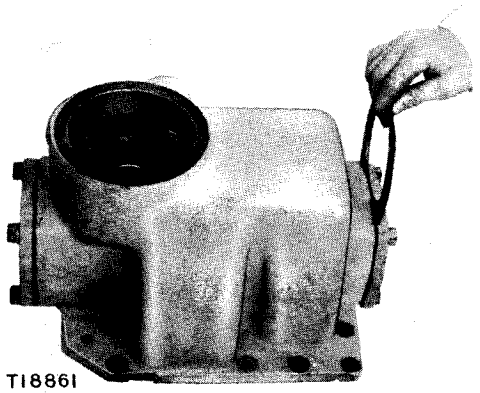
BEVEL GEAR AND PINION ADJUSTMENTS

The bevel gear and pinion must be correctly adjusted to obtain proper tooth contact and clearance

between the teeth (backlash). Maximum life of these parts will be obtained only if these adjustments are carefully made.

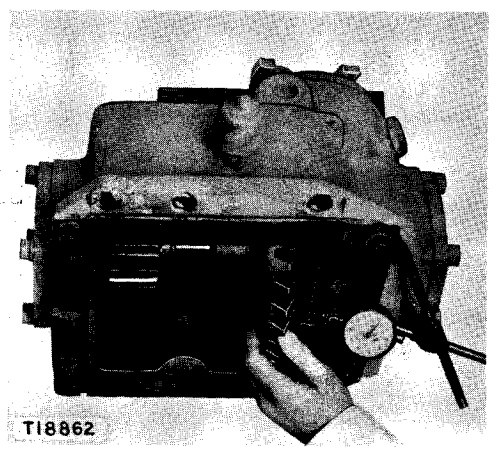
Bevel Gear Bearing Adjustments

1. Install the bearing cage at one end of the bevel gear shaft with the original shims in place and tighten the capscrews which hold the cage in place.



ADJUSTING BEVEL GEAR SHAFT BEARINGS

2. Install the other bearing cage without shims and tighten the capscrews just enough to remove the end play from the shaft.
3. Tighten these capscrews evenly so the clearance between the bearing cage and the case is equal at all points around the cage.
4. Determine the clearance between the bearing cage flange and the case by using a thickness gauge or the shims which are to be used.
5. Remove the bearing cage and enough shims, approximately .003", to obtain a 5 pound preload at bevel gear diameter.
6. Install the shims and retainer; tighten the capscrews securely.



ADJUSTING BACKLASH

Pinion Backlash Adjustment

1. Install the bevel pinion in the case with sufficient shims between the cage and the case to line up the heels of the bevel gear and pinion teeth.
2. Mount a dial indicator so the anvil rests on one of the bevel gear teeth.
3. Block the pinion shaft to prevent it from turning and rock the bevel gear back and forth. The backlash will be equal to the difference in readings on the dial indicator. The correct backlash at the tightest point should not be less than .010".
4. The backlash between the bevel gear and the pinion teeth is adjusted by moving shims from the bearing cage at one end of the shaft to the bearing cage at the other end, after the bearings are preloaded.

NOTE

While adjusting the backlash, the oil seals can be left off the bevel gear shaft bearing cages to prevent damage to the seals, as it may be necessary to remove the bearing cages several times in making the adjustment.

CAUTION

When removing shims from one of the bevel gear shaft bearing cages to change the backlash, be sure to place these same shims on the other bearing cage. The total number of shims used with the two cages must remain the same or the bearing preload, which has been set, will be changed.

Tooth Contact Adjustment

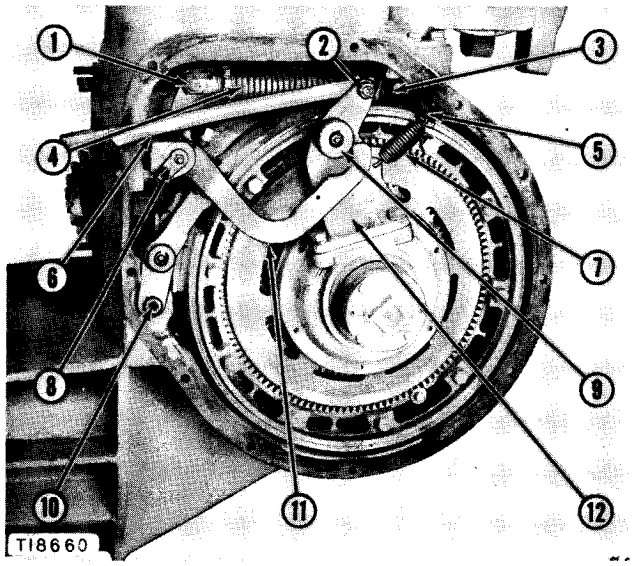
After the backlash is properly adjusted, the tooth contact pattern should be checked. Coat the bevel gear teeth sparingly with Prussian blue or red lead. Press forward on the pinion and rotate the bevel gear backward and forward until a contact pattern is noted on the bevel pinion. The tooth contact pattern should be heaviest toward the toe end and extend a little over half the length of the tooth on both faces.

If the pinion is too far away from the centerline of the bevel gear shaft, causing the teeth to bear on the toe ends, move the pinion toward the bevel gear by removing shims between the pinion bearing cage and the case If the pinion is too close to the centerline of the bevel gear shaft, causing the teeth to bear on the heel end, add shims between the pinion pilot housing and the case.

Always remember that the backlash will also affect the tooth contact pattern. Therefore, be sure the backlash is properly adjusted before checking the adjustment of the pinion. If the pinion is changed to correct the tooth contact, the amount of backlash between the pinion and bevel gear will be affected. Adjust the backlash, as previously given, and then recheck the tooth contact.

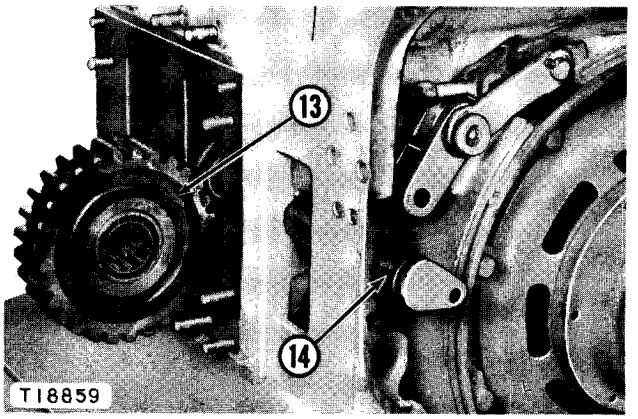
IDLER GEAR REMOVAL AND INSTALLATION

1. Remove the bevel gear case as described in that topic.
2. Remove the left clutch and brake cover.
3. Remove control rod **(6)**.
4. Compress the brake spring **(4)** and install the nail **(3)** to hold the spring compressed.



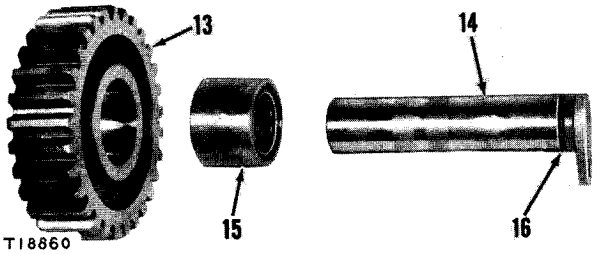
PREPARING TO REMOVE IDLER GEAR
1–Pin. 2–Nut. 3–Nail or pin. 4–Spring. 5–Return spring anchor bracket. 6–Control rod. 7–Return spring. 8–Anchor bracket. 9–Brake roller. 10–Pin. 11–Brake lever. 12–Clutch lever.

5. Remove the brake adjusting nut.
6. Remove the pin which holds the spring **(4)** to the case.
7. Remove the bracket **(8)** and the spring **(4)** from the cable control.
8. Remove the pin **(10)**.
9. Rotate the brake band clockwise, as illustrated, to clear the idler shaft.
10. Remove the idler shaft retaining capscrew.
11. Remove the shaft **(14)** and idler gear **(13)**.



REMOVING IDLER GEAR AND SHAFT
13–Idler gear. 14–Shaft.

12. Inspect the bearing **(15)** and replace if worn or damaged.
13. When installing the idler gear shaft **(14)**, be sure the seal **(16)** is in place on the shaft.

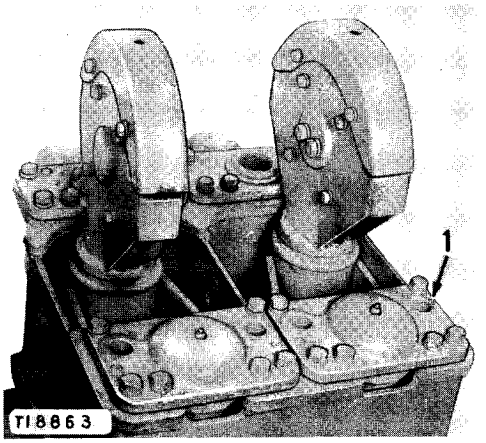


IDLER GEAR AND SHAFT ASSEMBLY
13–Idler gear. 14–Idler gear shaft. 15–Bearing. 16–Seal.

Sheave Group

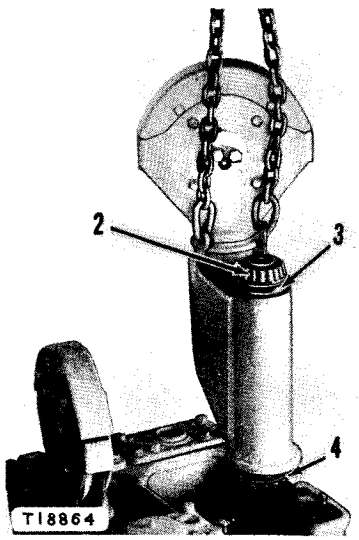
SWIVEL SHEAVE REMOVAL AND DISASSEMBLY

1. Remove the capscrews and take off the bearing retainer **(1)**.



PREPARING TO REMOVE THE SWIVEL SHEAVE
1–Bearing retainer.

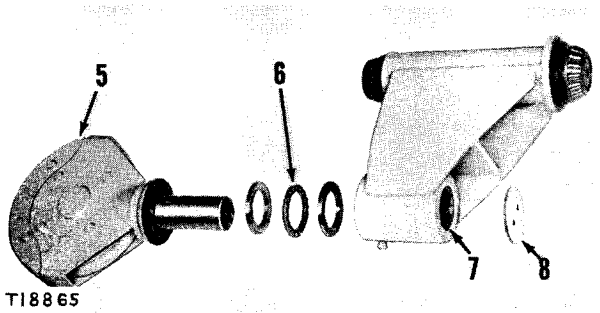
2. Lift the swivel sheave assembly from the cable control.
3. The two tapered roller bearings **(2)** and **(4)**, on which the swivel brackets are mounted, are removed by using an 8B7548 Push Puller and 8B7551 Attachment.
4. The seals **(3)** can be removed from the bracket if damaged or worn.



REMOVING SWIVEL SHEAVE
2–Bearing. 3–Seal. 4–Bearing.

NOTE

These seals **(3)** are to prevent dirt from entering the bearings and causing wear. Therefore, the seals should be installed with the lip turned away from the bearings.



SWIVEL SHEAVE EXPLODED VIEW
5–Shroud. 6–Bearing. 7–Bushing. 8–Retainer.

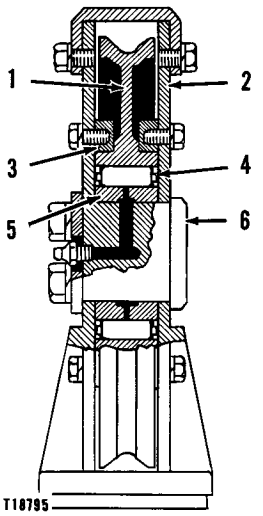
5. Take out the two capscrews holding the retainer **(8)** to the shroud **(5)**.
6. The shrould can then be lifted from the swivel bracket and the bearing **(6)** inspected.
7. The bushing **(7)** can be pressed out of the support, if it needs replacing.

SHEAVE DISASSEMBLY AND ASSEMBLY

NOTE

All the sheaves are mounted to the shrouds in the same manner.

1. Remove the capscrews holding the shaft **(6)** to the retainer washer.

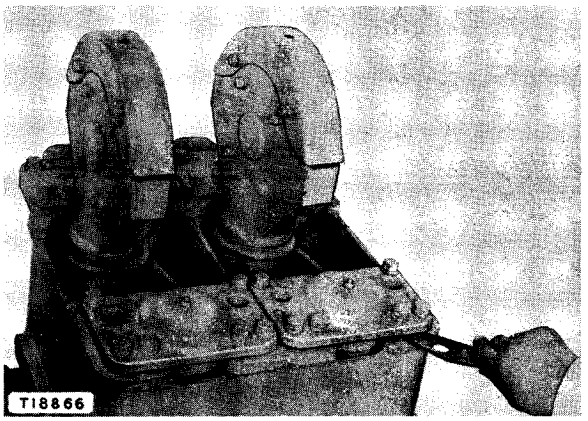


SHEAVE ASSEMBLY
1–Sheave. 2–Shroud. 3–Retainer. 4–Bearing. 5–Bearing race. 6–Shaft.

2. Take out the capscrews on each side of the shroud **(2)** which hold the retainer **(3)** in place.
3. Remove the shaft **(6)** and pull the sheave **(1)**, retainers **(3)**, bearing **(4)**, bearing race **(5)** from the shroud **(2)**.
4. Inspect all the parts and replace them if necessary.
5. Assemble in the reverse order of disassembly.

SWIVEL SHEAVE ASSEMBLY AND INSTALLATION

1. Assemble in the reverse order of removal, making sure the oil seals and bearings have been replaced if damaged or worn.
2. Make the swivel sheave bracket adjustment with the sheave assemblies in the position shown.
3. Install the bearing retainer and tighten it down evenly until endplay is removed.
4. Check the existing clearance between the bearing retainer and the support.

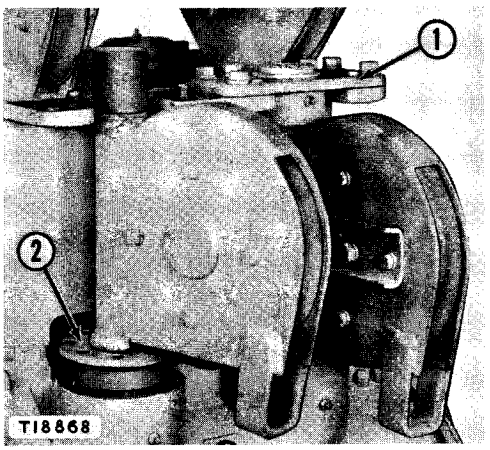


ADJUSTING SWIVEL SHEAVE BRACKET BEARING

5. After the clearance has been determined, remove the bearing cage and insert the number of shims that were necessary to fill the gap between the cage and the support. After adjustment, the swivel sheave should work freely.

FAIR LEAD SHEAVE REMOVAL, DISASSEMBLY, AND INSTALLATION

1. Remove the fair lead shrouds by taking out the capscrews holding the retainer assembly **(1)** and the retainer **(2)**.

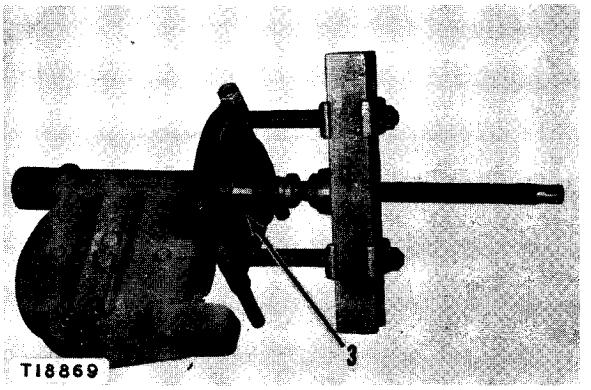


REMOVING FAIRLEAD SHEAVE
1–Retainer assembly. 2–Retainer.

2. The shroud can be lifted out of the cable control as shown.
3. The bearing **(3)** can be pulled from the shroud, using the 8B7548 Push Puller and the 8B7551 Attachment, as shown, after removing the retaining nut.

NOTE

Assemble and install in the reverse order of disassembly and removal.



PULLING FAIRLEAD SHEAVE BEARING
3–Bearing.