STEERING CLUTCHES AND BRAKES

Removal

Start by:

(a) drain the oil from the bevel gear case and transmission case [9.5 liters (2.5 U.S. gal), approx.]

(b) remove the tracks (on both sides)

It is not necessary to remove the tracks unless they engage the sprockets. (Refer to Removal, TRACKS.)

Removal sequence

1. Disconnect the following electric wires:
   (1) Wire between battery switch and battery
   (2) Clamp for wire between battery and starter

2. Remove the following parts:
   (1) Floor plate
   (2) Operator's seat and seat plate
   (3) Rear cover

3. Remove the following parts:
   1. Steering control rods (2 pcs)
   2. Brake control rods (2 pcs)
   3. Springs (4 pcs)
   4. Steering clutch oil pipes (4 pcs)
   5. Levers (2 pcs)
   6. Bracket
   7. Steering valve
   8. Cover
DISASSEMBLY AND REASSEMBLY

9. Cover
10. Shaft
11. Spring
12. Steering brake mounting bolts (4 pcs)
13. Bracket

4. Raise the rear end of the machine by positioning a jack under the steering clutch case so that the sprockets can be freely rotated, and block the final drive cases, using wood blocks, as shown.

5. Hold the clutch pedal in depressed position, and place the transmission control lever in forward 1st position.

6. Unscrew bolts 14 and 15 securing the steering clutch & brake assembly. To do this, turn the splined portion of transmission input shaft $S$ to rotate that assembly to remove the bolts one by one.
7. Remove the following parts:
   14  Mounting bolts
   15  Mounting bolts
   A  Steering clutch & brake assembly

   16  Washer
   17  Hose
   B  Steering clutch cylinder assembly

Installation
To install, follow the reverse of removal sequence.
Suggestions for steering clutch & brake assembly and cylinder assembly removal
These assemblies can be removed from the steering clutch case by removing bracket 13, with the operator’s seat tilted forward. It is not necessary to remove the seat plate.
Inspection after installation
(1) Make sure that the oil pipes are connected properly.
(2) Fill the steering clutch with recommended oil.
Disassembly

A Steering clutch & brake assembly

Disassembly sequence

(9) Remove A1 thru A9 as an assembly.
A1 Pin
(10) Remove A2 thru A5 as an assembly.
A2 Lever
A3 Spring pin
A4 Pin
A5 Roller

A6 Anchor
A7 Clevis
A8 Adjusting nut
A9 Brake band assembly
A10 Outer drum
A11 bolt
A12 Plate
A13 Plate
A14 Spring
A15 Spacer
A16 Pressure plate
A17 Disc plate
A18 Friction plate
A19 Inner drum

Number of friction plates A18

<table>
<thead>
<tr>
<th>Machine model</th>
<th>No. of friction plates A18</th>
</tr>
</thead>
<tbody>
<tr>
<td>40PS (standard/swamp models)</td>
<td>6, each side</td>
</tr>
<tr>
<td>50PS (super/ultra-super swamp models)</td>
<td>7, each side</td>
</tr>
</tbody>
</table>
B  Steering clutch cylinder assembly

Disassembly sequence

B1  Flange  B3  Bearing  B5  Backup ring
B2  Shifter  B4  Piston  B6  Cylinder

C  Bevel gear assembly

Disassembly sequence

C1  Locking plate  (Remove C4, C5 and outer race of C7 as an assembly.)  C7  Roller bearing
C2  Nut  C4  Bearing cage  C8  Bevel gear
C3  Set screw (to be loosened)  C5  Oil seal  C9  Drive shaft
C6  Collar
DISASSEMBLY AND REASSEMBLY

Inspection

1. Thickness of disc plates and friction plates

Measure the thickness of the disc plates and friction plates. If the thickness is less than the service limit, do the steps 2 and 3 below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Assembly standard</th>
<th>Service limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness of disc plates (6 pcs) and friction plates (6 pcs) (40PS model)</td>
<td>69 (2.72)</td>
<td>66 (2.60)</td>
</tr>
<tr>
<td>Thickness of disc plates (6 pcs) and friction plates (7 pcs) (50PS model)</td>
<td>69.3 (2.728)</td>
<td>66 (2.60)</td>
</tr>
</tbody>
</table>

2. Friction plates

Measure the thickness of each friction plate and its backlash with the outer drum splines. Replace the plate if any of these measurements exceeds the service limit.

<table>
<thead>
<tr>
<th>Item</th>
<th>Assembly standard</th>
<th>Service limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness 50PS model</td>
<td>8.7 (0.343)</td>
<td>6.0 (0.236)</td>
</tr>
<tr>
<td>Thickness 40PS model</td>
<td>7.5 (0.295)</td>
<td></td>
</tr>
<tr>
<td>Backlash with outer drum splines</td>
<td>0.16 to 0.52 (0.0063 to 0.0205)</td>
<td>0.80 (0.0315)</td>
</tr>
</tbody>
</table>

3. Disc plates

Measure the thickness of each disc plate and its backlash with the inner drum splines. Replace the disc plate if any of these measurements exceeds the service limit.

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<thead>
<tr>
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<th>Service limit</th>
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<tbody>
<tr>
<td>Thickness</td>
<td>2.8 (0.110)</td>
<td>2.3 (0.091)</td>
</tr>
<tr>
<td>Backlash with inner drum splines</td>
<td>0.14 to 0.30 (0.0055 to 0.0118)</td>
<td>0.60 (0.0235)</td>
</tr>
</tbody>
</table>
Reassembly

Tightening torque: 3.5 ± 0.3 kgf·m
(25 ± 2 lbf·ft) [34 ± 3 N·m]

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(25 ± 2 lbf·ft) [34 ± 3 N·m]
DISASSEMBLY AND REASSEMBLY

Reassembly sequence

C Bevel gear assembly

C5 C8 C2 C7 → Steering clutch case

C6 (Outer race)
(C6 inner race)

A Steering clutch & brake assembly

A13 A15 A14 A19 A17 A16 → Flange (B1)

A7 A5 A4 A3 → A2 A8 A6 A1 → A9

B Steering clutch cylinder assembly

B4 → B3 → B2 → B1 → Drive shaft

B5 → B6.

Suggestions

1. Drive shaft installation

(1) Before installing drive shaft C9, fit the inner race of left-hand roller bearing C7 and collar C6 to the shaft.

(2) After installing shaft C9 and bevel gear C8 in the steering clutch case, fit the inner race of right-hand roller bearing C7 to the shaft.

2. Friction plate and disc plate installation

(1) The 50 PS model has seven friction plates while the 40 PS model has six friction plates.

(2) In the 50 PS model, put the friction plate next to the pressure plate.
3. Tapered roller bearing preload adjustment

   (1) Tighten adjusting nuts C2, right and left, to settle them in place. Lock one of the nuts with its lock plate C1, and tighten or loosen the other nut to adjust the preload. (Tightening the nut increases the preload.)

   (2) Hook a spring balancer to the tooth of bevel gear in mesh with the pinion with a wire, pull the balancer in the tangential direction, and read the balancer indication.

<table>
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<tr>
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| Preload               | 0.72 to 0.88 kgf·m  
                         | (5.2 to 6.4 lbf·ft)  
                         | (7.1 to 8.6 N·m)    |
| Spring balancer reading | 6.55 to 8.00 kgf  
                         | (14.4 to 17.6 lbf) 
                         | (64.2 to 78.5 N)   |

4. Bevel gear and pinion backlash adjustment

   (1) Put a fuse stock into between the bevel gear and pinion at the place indicated as E, roll it and measure the amount of flattening.

   (2) Measure the backlash at a total of four places by turning the bevel gear 90° at a time, and take the smallest measurement for comparison with the assembly standard.

   (3) To adjust the backlash, tighten or loosen the adjusting nuts, right and left.

   Unit: mm (in.)

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</table>
| Backlash | 0.15 to 0.20  
          | (0.0059 to 0.0079) |

**NOTE**

If one nut is loosened, for instance, the other nut must be tightened by the same amount to keep the preload unchanged.
5. Tooth contact adjustment

(1) To move the bevel pinion G toward or away from the bevel gear C8 for tooth contact adjustment, decrease or increase shims F between the bearing cage and transmission case.

(2) To determine the tooth contact pattern, brush red lead sparingly on the bevel gear teeth, and rotate the pinion backward and forward until a contact pattern is noted on both concave and convex faces of the gear teeth.

**NOTE**

To make the tooth contact pattern more visible, lightly press the gear when rotating the pinion.

Correct tooth contact

Contact (indicated by the dark areas on the tooth faces) is heaviest toward the toe end and extends about 30% of the tooth length on both convex and concave faces.

Incorrect tooth contact

* Pinion too far away from bevel gear

(1) Contact extends toward the toe end of concave faces and toward the heel end of convex faces.

(2) To correct this contact, decrease the thickness of shims F, and turn adjusting nuts C2 to move pinion G away from gear C8. Again brush red lead on the gear teeth, and check the contact pattern.
* Pinion too close to bevel gear

(1) Contact extends toward the heel end of concave faces and toward the toe end of convex faces.

(2) To correct this contact, increase the thickness of shims F, and turn adjusting nuts C2 to move gear C8 toward pinion G. Recheck the contact pattern by brushing red lead.

**NOTE**
The foregoing tooth contact adjustments are meaningless unless the bevel gear and pinion backlash has been adjusted properly.
DISASSEMBLY AND REASSEMBLY

STEERING VALVE

Removal and installation

For removal and installation of the steering valve, refer to Removal, STEERING CLUTCHES AND BRAKES.

Disassembly

Disassembly sequence

1 Cover  6 Return spring  11 Plunger valve
2 Oil seal 7 Cover  12 Return spring
3 Piston 8 Oil seal
4 Valve spring 9 Piston
5 Plunger valve 10 Valve spring 13 Valve housing
Reassembly

Reassembly sequence

12→11  10→9  8→7  1→2  3→6  5←4