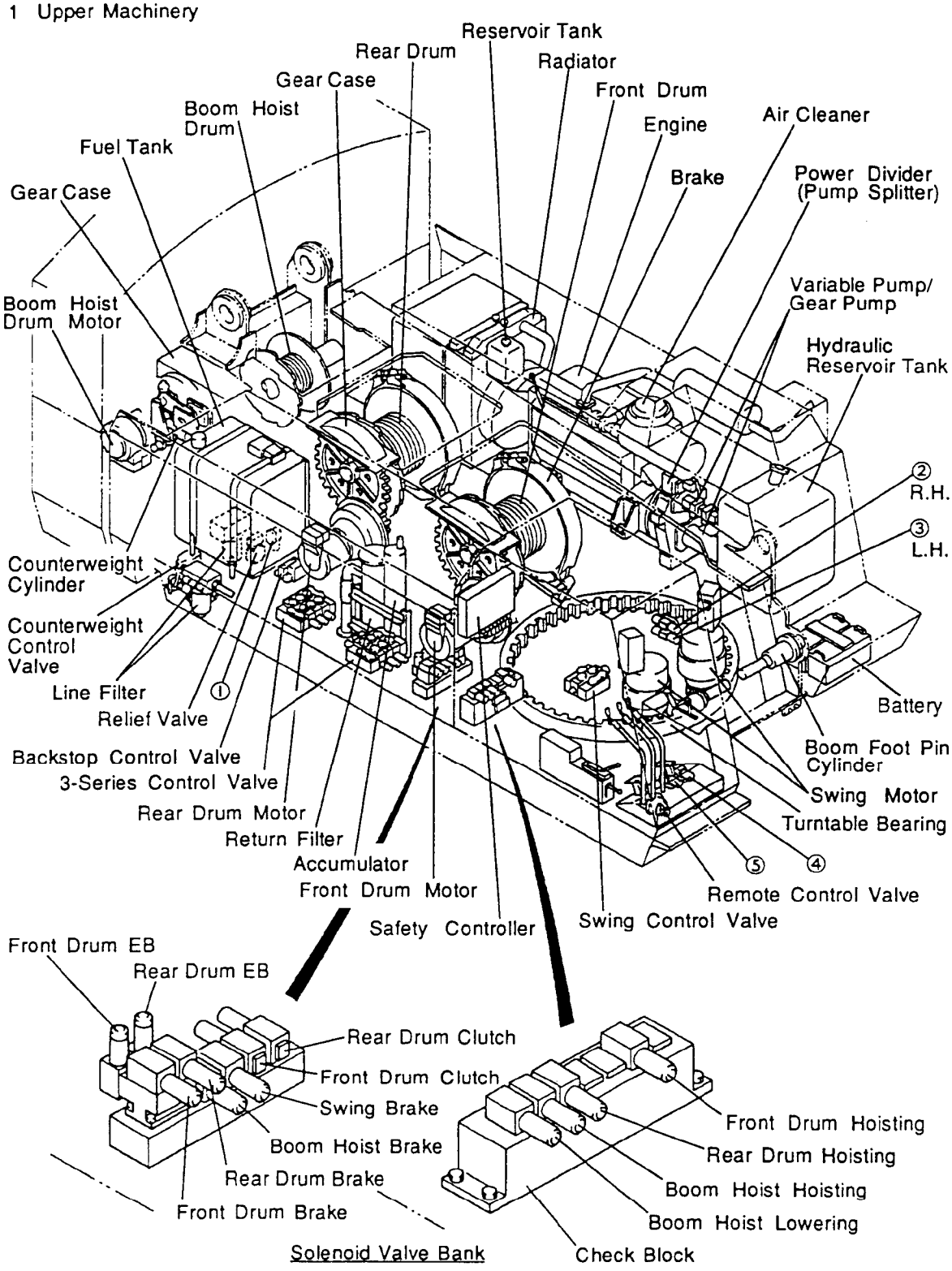
1 Upper Machinery

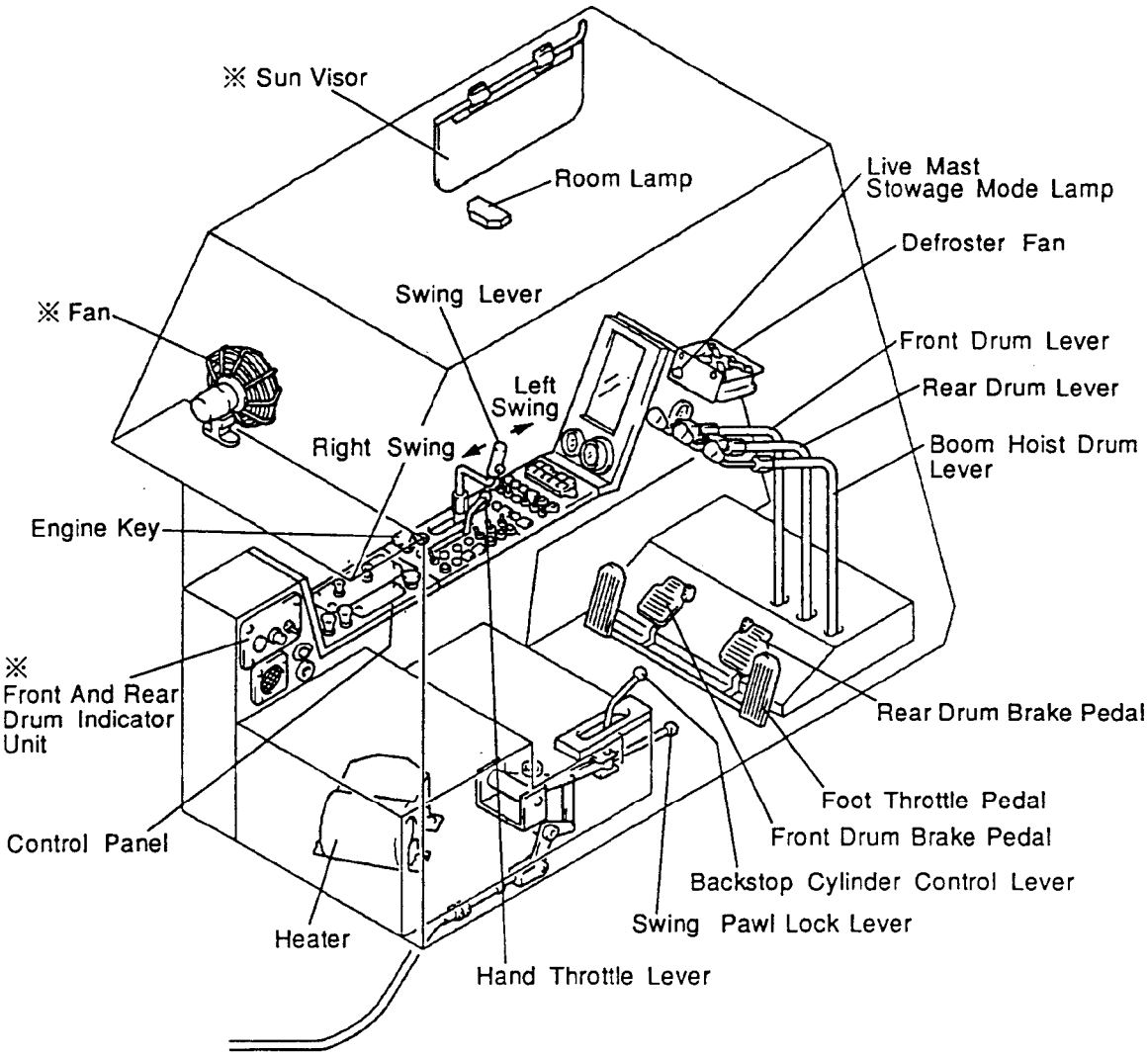


CE0-9S

①:SOL30 For Backstop
②:SOL22,23 For Boom Foot
③:SOL24,25 For Boom Foot
④:SOL20 For Rear Drum Lowering Stop
⑤:SOL21 For Front Drum Lowering Stop

SOL:Solenoid Valve
EB:Emergency Brake

2 Components In Operator's Cab

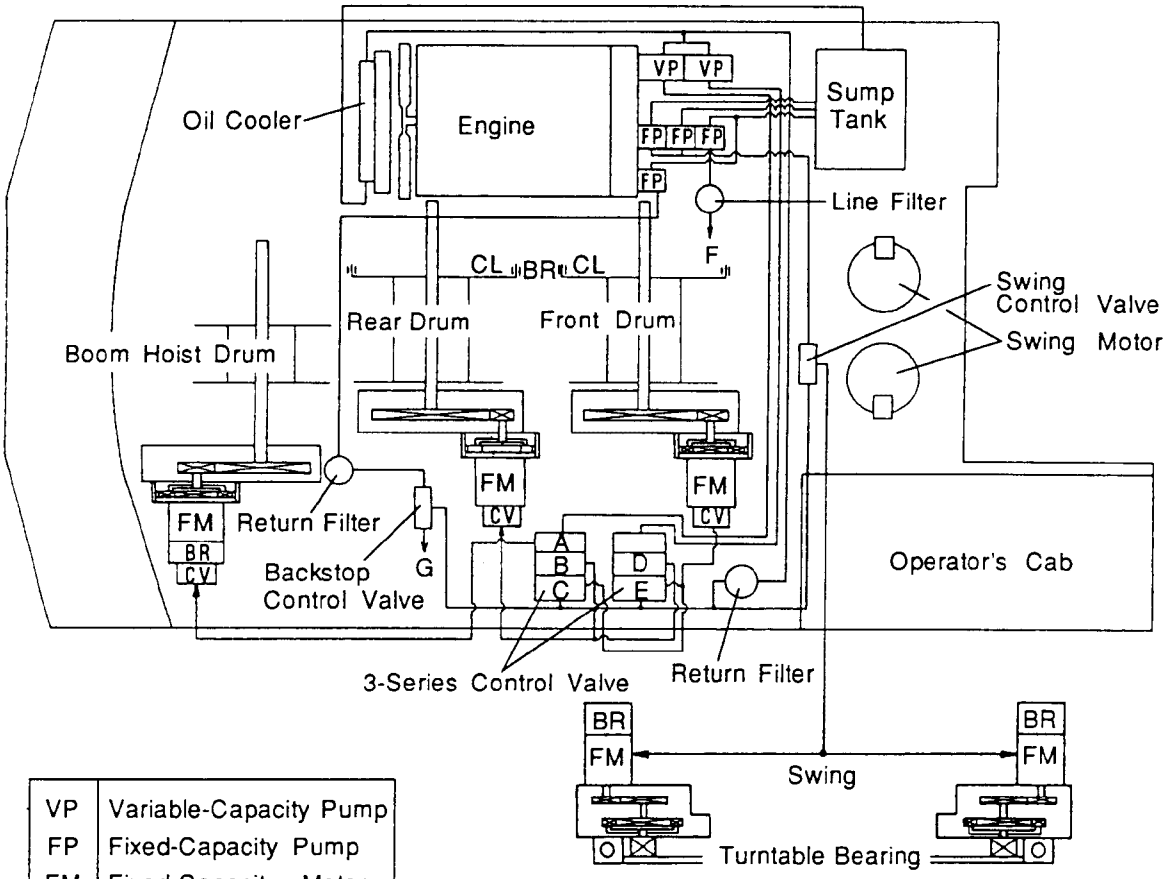


CE0-4S

Note: Mark "※" indicates optional.

Note: For more details of operating levers, pedals and switches on the panel, refer to the operator's manual.

Power from the engine is separated by the power divider (pump splitter) to drive hydraulic pumps. The rotating energy of engine power is also converted into fluid energy (the flow of high pressure hydraulic oil) which is directed by the contorol valves, through pipelines, to various actuators.



VP	Variable-Capacity Pump
FP	Fixed-Capacity Pump
FM	Fixed-Capacity Motor
BV	Brake Valve
CV	Counterbalancing Valve
CL	Clutch
BR	Brake

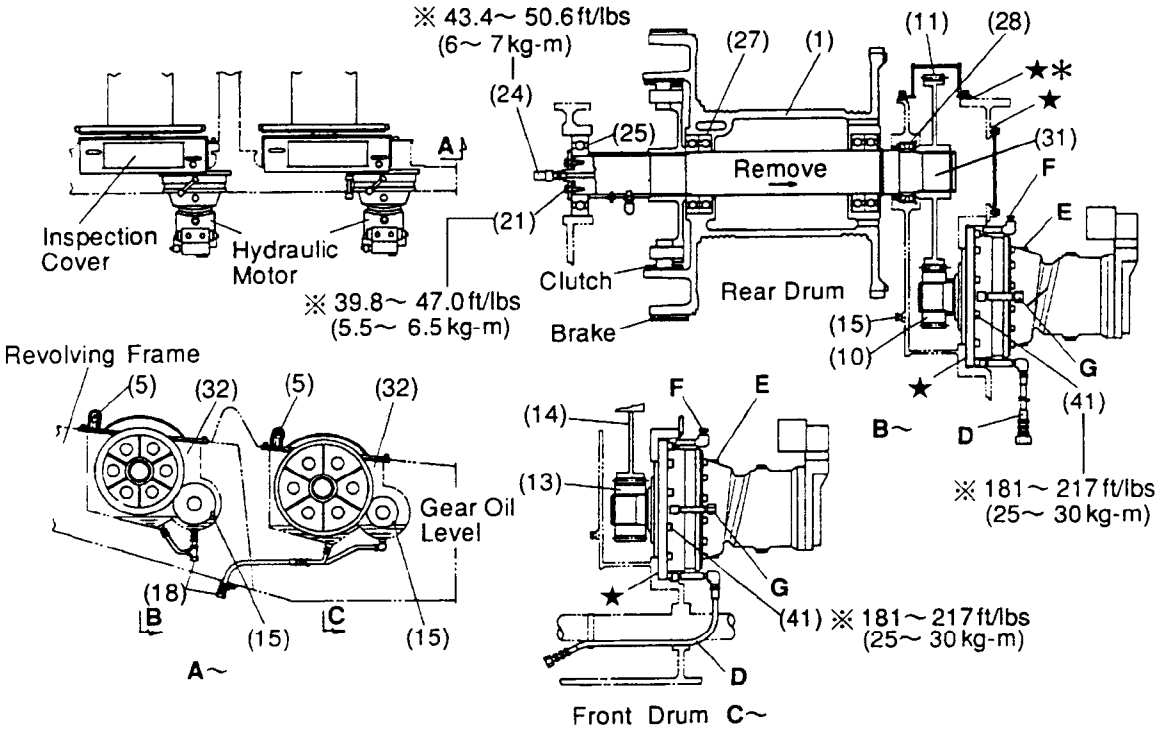
A:Boom Hoist
B:Rear Drum 1-Speed
C:Front Drum 2-Speed
D:Rear Drum 2-Speed
E:Front Drum 1-Speed
F:To Control Device And Counterweight Removal Device
G:To Backstop Cylinder

CE1-94S

The hydraulic motor drives the drum via reduction gears. Separate motors and reduction gears are used for each drum.

1 Structure

The drum shaft mainly consists of a reduction gear case (32), drum shaft (31), hydraulic motor, clutch and brake. The reduction gear (11) and drum shaft (31) are supported by the reduction gear case (32) and revolving frame through bearings (25),(27) and (28). The clutch assembly is splined to the drum shaft. The drum is designed to rotate freely on the drum shaft with bearings (27). Spur gear (11),(14) lubrication oil is stored in the gear case (32), being an oil bath type.



Mark※:Tightening Torque
Mark★:Surface Of Coating Liquid Packing "Three Bond, No.50(Gray)".
Mark✻:Sealing

D:Drain Hose For Motor Lubrication Oil
E:Hang Hole (M16) For Motor
F:Filler Port For Motor Lubrication Oil
G:Level For Motor Lubrication Oil

CED0235Z-E CE1-109S

(1) Drum	(13) Pinion	(21) Bolt	(28) Bearing
(5) Oil Cap (Filler Port)	(14) Spur Gear	(24) Rotating Joint	(31) Drum Shaft
(10) Pinion	(15) Level Plug	(25) Bearing	(32) Reduction Gear Case
(11) Spur Gear	(18) Drain Cap	(27) Bearing	(41) Bolt

Automatic brake and free fall operation

This unit possesses two modes of operation. One is an automatic brake function and the other is a free fall function. The automatic brake function constantly activates the clutch and thus the drum shaft and drum are connected. When the control lever is moved either hoist or lower, the brake is disengaged to rotate the drum. In the case of operation under free fall function, the automatic brake is disengaged at all time, and the control lever moved either to hoist or lower will activate the clutch to connect the drum shaft and drum. Thus the drum is rotated. When the control lever is placed in neutral, the drum becomes free with the clutch disengaged. Therefore, the braking operation by the brake pedal is required. For more details, refer to operator's manual.

2 Inspection

Place	Inspection Item
Hydraulic motor Reduction gear case (46) Rotating joint (24)	} Check for oil leakage.
All moving portions	Listen for any unusual noises and smell with load.
Pinion (10)(13), Gear (11)(14), Drum (1)	} Check for excessive wear, cracks and damage of teeth.
Reduction gear case (46)	Check lubricant oil level. With the level plug removed, the oil should be to the level of the plug hole. If below that level, add oil.
Mounting portions	Check for looseness and missing parts. If loosened or missing, replace and/or retighten with specified torque as required.

Note: After inspecting the above, disassemble or repair, as necessary.

3 Oil Inspection Of Reduction Gear Case

1) Remove the level plug (15) and check the oil level. If the level is at the lower part of the level plug (15) hole, the oil is in proper quantity. If the oil level is too low, supply gear oil from the oil filler port.

Note: When oil overflows from the level plug (15) hole, the oil stands at the standard level.

Note: For proper oils, refer to the operator's manual.

4 Oil Replacement Of Reduction Gear Case

Change oil yearly or 1000 hours of operations, which ever comes first.

1) Park the machine on level ground.
2) Engage the swing lock and shutdown the engine.
3) Wipe off the dirt from the drain cap (18), oil cap (32) (filler port) and level plug (15) to prevent foreign material from entering.
4) Place a clean oil container under the drain cap (18).
5) Remove the drain cap (18), oil cap (32) and level plug (15) to drain the oil.
   Lubricant capacity:
   For the front case; 4gal.(15 lit.)
   For the rear case; 2.1gal.(8 lit.)

Note: Check for foreign materials in the drained oil. If foreign materials are found, check the case internal.

6) Install the drain cap (18).
7) Fill the gear case with lubricant through the oil cap (5) (filler port) to the lower part of the level plug (15) hole.

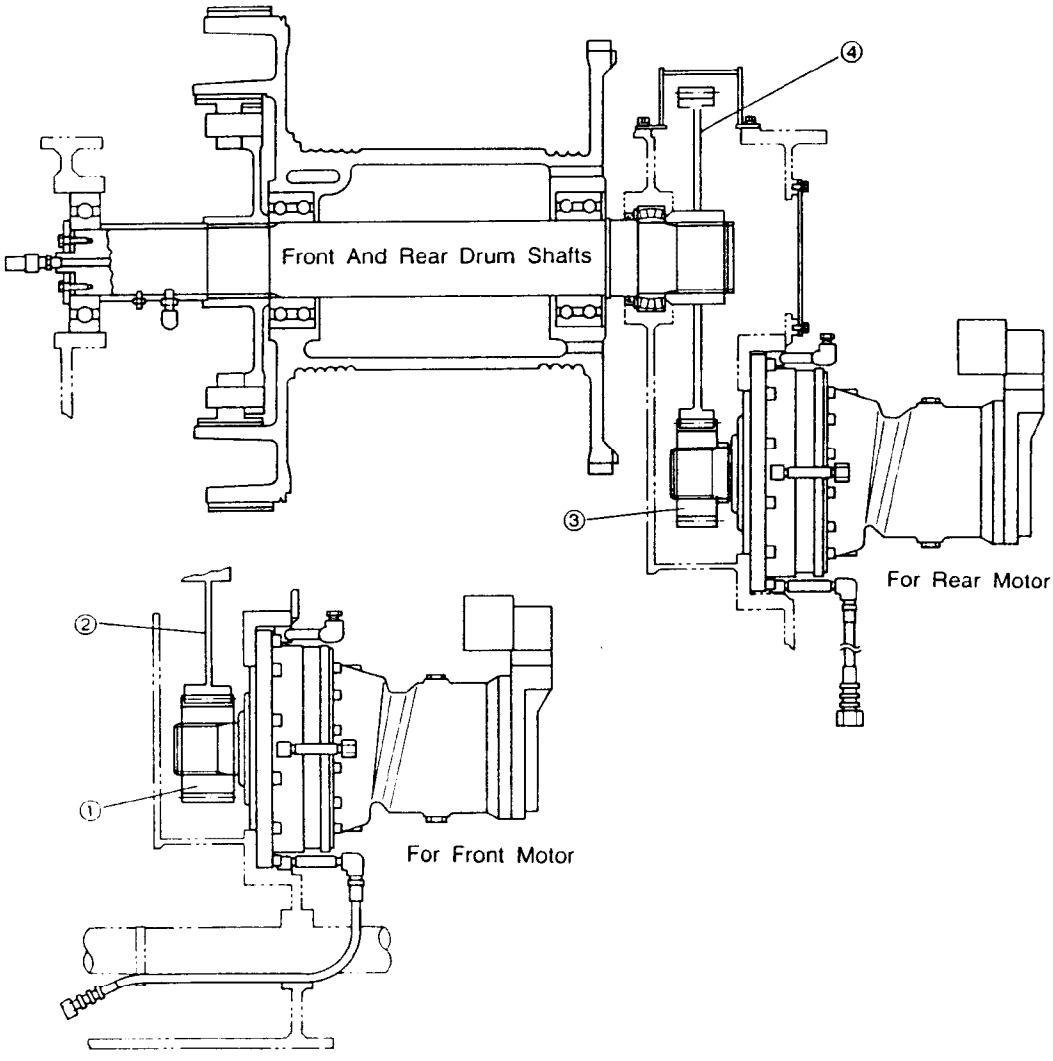
Note: For proper lubricants, refer to the operator's manual.

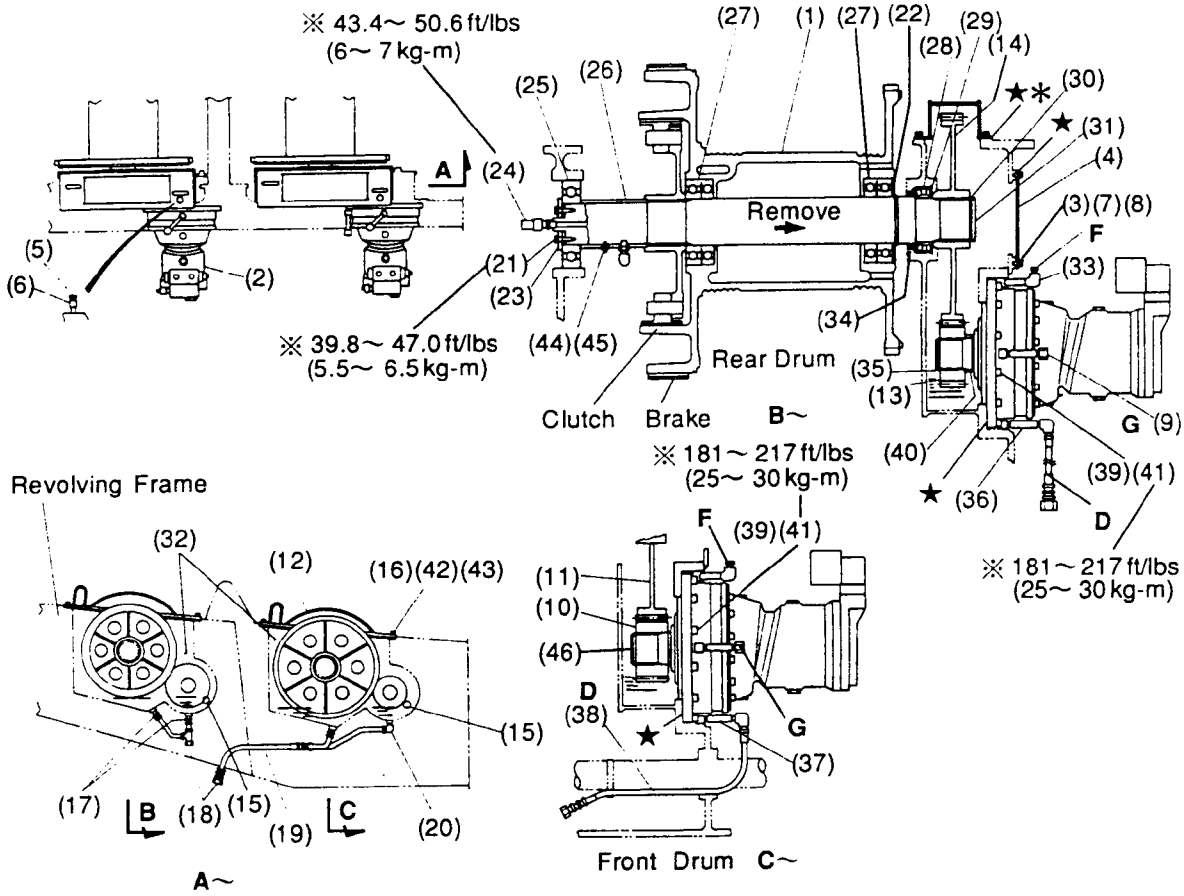
8) Install the level plug (15) and the oil cap (5).

Unit: inches (mm)

Item	Part Name	Number Of Teeth	※	Back-Lash	Treatment
1	Pinion	3	3.088" (78.43)	.083" (2.1)	Replacement
2	Spur Gear	8	9.113" (231.48)		
3	Pinion	4	4.273" (108.53)	.094" (2.4)	Replacement
4	Spur Gear	7	22.346" (568.60)		

※ Allowable Displacement Over A Given Number Of Teeth.





Mark※:Tightening Torque
Mark★:Surface Of Coating Liquid Packing "Three Bond, No.50(Gray)".
Mark✱:Sealing

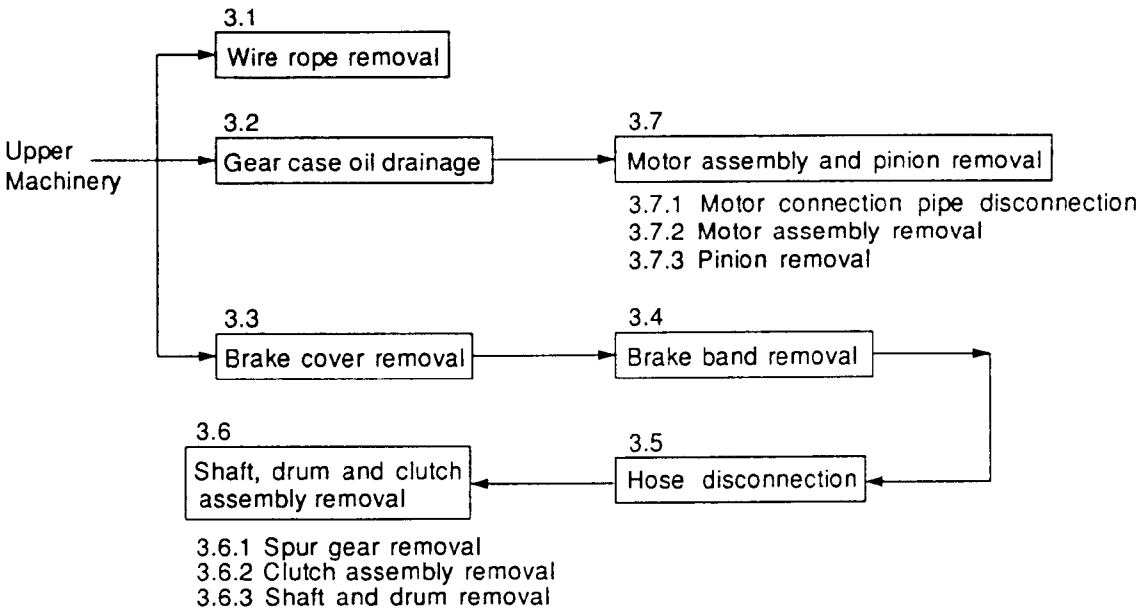
D:Drain Hose For Motor Lubrication Oil
E:Hang Hole (M16)For Motor
F:Filler Port For Motor Lubrication Oil
G:Level For Motor Lubrication Oil

CED0235Z-E

CE1-77S

(1) Drum	(13) Pinion	(25) Bearing	(37) Nipple
(2) Motor	(14) Spur Gear	(26) Spacer	(38) Hose
(3) Bolt	(15) Level Plug	(27) Bearing	(39) Washer
(4) Cover Plate	(16) Bolt	(28) Bearing	(40) Spacer
(5) Oil Cap (Filler Port)	(17) Connector	(29) Snap Ring	(41) Bolt
(6) Coupling	(18) Drain Cap	(30) Snap Ring	(42) Washer
(7) Washer	(19) Hose	(31) Shaft	(43) Washer
(8) Washer	(20) Elbow	(32) Gear Case	(44) Setscrew
(9) Level Cap	(21) Bolt	(33) Elbow	(45) Nut
(10) Pinion	(22) Seal Collar	(34) Oil Seal	(46) Snap Ring
(11) Spur Gear	(23) End Plate	(35) Snap Ring	
(12) Gear Cover	(24) Rotating Joint	(36) Nipple	

1 Disassembly Procedure



2 Preparation

1) Stop the machine on flat and stable ground, and lower the attachment to the ground.
2) Engage the swing lock, and park the machine. Stop the engine.

⚠ WARNING

All Trapped Hydraulic Pressure Must Be Exhausted From The System Before Removing Any Line Or Component. A Sudden Release Of Hot Oil Could Cause Burns Or Other Serious Injury.

3) Operate the control lever back and forth several times to release any hydraulic pressure trapped in the lines.

3 Disassembly

3.1 Wire rope removal

⚠ WARNING

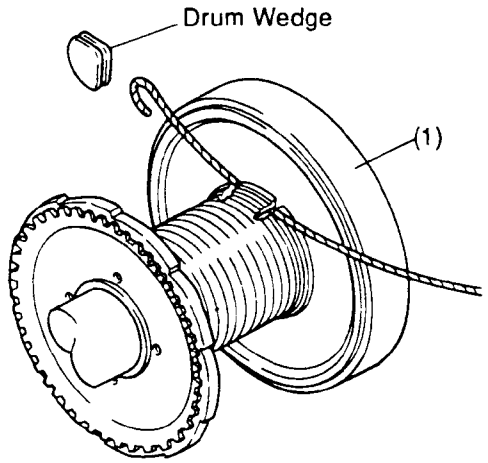
Avoid Injury To Yourself.
Replace Or Rearrange Rope Carefully To Avoid An Accident. Rope Wrapped Around Sheaves May Become Twisted.
When Released, The Rope Can Spin As The Dead End Pins Or Sockets Are Removed.

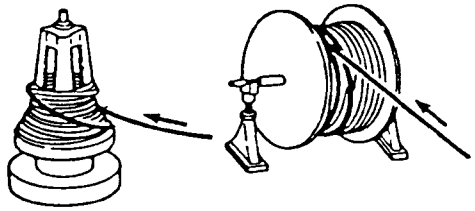
1) Remove the hook ball or block from the wire rope.
2) Release the hoist brake pedal, pull out the wire rope from the drum (1) and wind the rope with a winder.

⚠ CAUTION

Properly Release The Hoist Drum Brake During Removal Of Wire Rope Or Rope May Become Kinked Or Twisted, Resulting In Excessive Deformation, Shortening Wire Rope Life.

3) Remove the drum wedge and remove the wire rope from the drum (1).

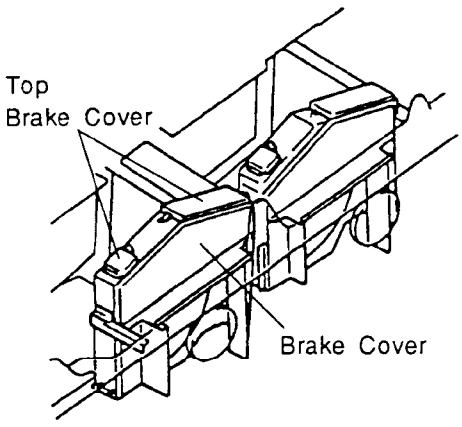




Proper Wire Rope Releasing AM81

3.2 Gear case oil drainage
Drain the oil from the gear case.
(Refer to ES1-10-00○○ in this manual.)

3.3 Brake cover removal
1) Open the top brake cover.
2) Remove the hanging bolts and adjusting bolts for the brake band.
3) Remove the all bolts which are conncted to the brake cover.
4) Remove the brake cover.



CE1-163S

3.4 Brake band removal
(Refer to ES3-5-60○○ in this manual.)

3.5 Hose separation

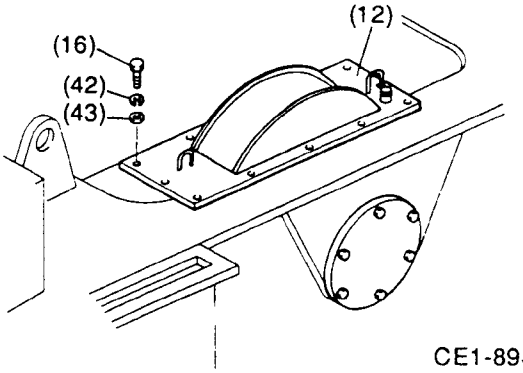
1) Disconnect the hose from the rotating joint (24).

Note: Close the port of the disconnected hose with cap or plug to prevent foreign materials from entering from the outside.

3.6 Shaft, drum and clutch assembly removal

3.6.1 Spur gear removal

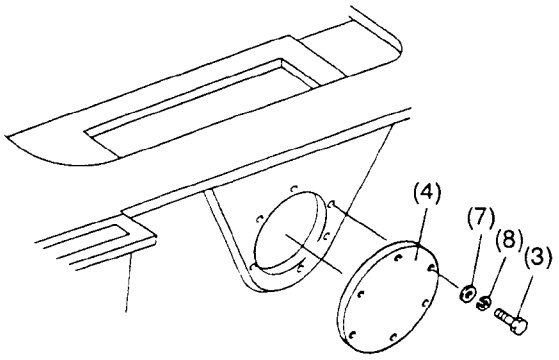
1) Loosen the bolts (16) and washers (42) and (43), and remove the gear cover (12).



CE1-89S

2) Loosen the bolts (3) and washers (8) and (7), and remove the cover plate (4).
3) Remove the rotating joint (24), bolt (21) and end plate (23).
4) Remove the snap ring (30).
5) Remove the adapter hose and nipple of the clutch.
6) Remove the setscrew (44) and nut (45).
7) Support the spur gear (11) and drum (1) respectively with nylon belts, and slide the shaft assembly leftward.

Note: In case of the rear drum shaft, also remove the spur gear (14).

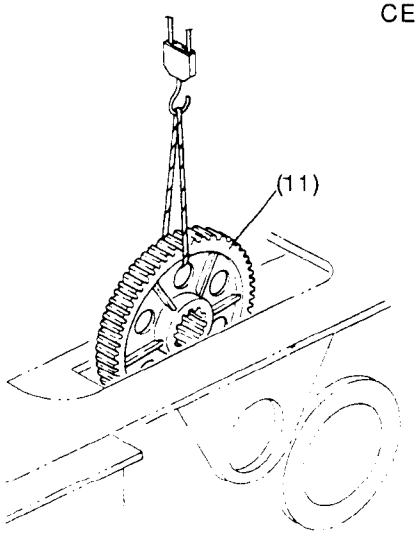


CE1-90S

⚠ CAUTION

Slowly Slide The Shaft With Care Not To Damage The Spline.

8) Remove the bearing (25) and spacer (26).
9) Suspend the spur gear (11) with nylon belt for removal.
Weight(11): 190lbs (86.2kg)
Weight(14): 135lbs (61.4kg)



CE1-91S

3.6.2 Clutch assembly removal

1) Remove the clutch assembly from the drum (1).
Weight: 194lbs (87.9kg)
(For disassembly, refer to ES1-17-60○○ in this manual.)

3.6.3 Shaft and drum removal

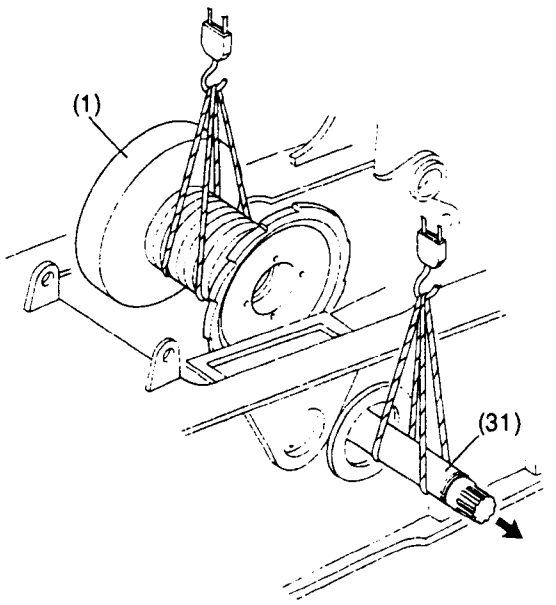
1) Slide the shaft assembly rightward, and remove the snap ring (29), bearing (28) and oil seal (34).

⚠ CAUTION

Slowly Slide The Shaft With Care Not To Damage The Spline.

2) Support the shaft (31) with nylon belt, slide the shaft farther rightward. Remove the shaft (31) and seal collar (22) from the drum (1).
Weight (1): 1280.9lbs (581kg)
Weight (31): 524.7lbs (238kg)

3) Remove the bearing (27) from the drum (1).



CE1-92S

3.7 Motor assembly and pinion removal

3.7.1 Motor connection pipe disconnection

1) Remove all pipes which are connected to the motor.

2) To prevent oil from flowing out and foreign materials from entering through the pipe holes and open ports of the motor, attach the blind plugs, blind flanges, caps and others.

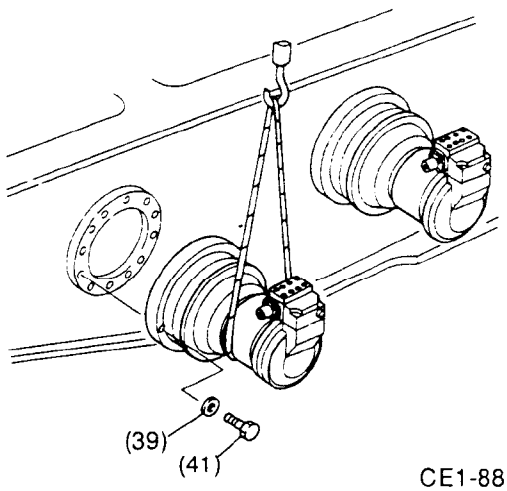
Note: Fix the disconnected pipes in such a position as reassembly and assembly are not disturbed. Scribe marks on the pipes, hoses and joints for easier reassembly.

3.7.2 Motor assembly removal

⚠ WARNING

Since The Component Parts Related To This Procedure Are Heavy, Handle Them Carefully Or Accidents May Result. Use Supporter Base, Jack, Hoist And Others To Handle Them Efficiently. Check That The Hoist Capacity Is Sufficient.

1) Route nylon belt on the motor assembly for support, loosen the bolts (41) and washers (39), and remove the motor assembly.
Weight: 684lbs (310.2kg), front side
Weight: 716lbs (324.8kg), rear side
(For reassembly, refer to ES5-9-60○○ in this manual.)



CE1-88S

3.7.3 Pinion removal

• Front drum side

1) Remove the snap ring (46) and pinion (10) from the motor assembly.

• Rear drum side

2) Remove the snap ring (35), pinion (13) and spacer (40) from the motor assembly.

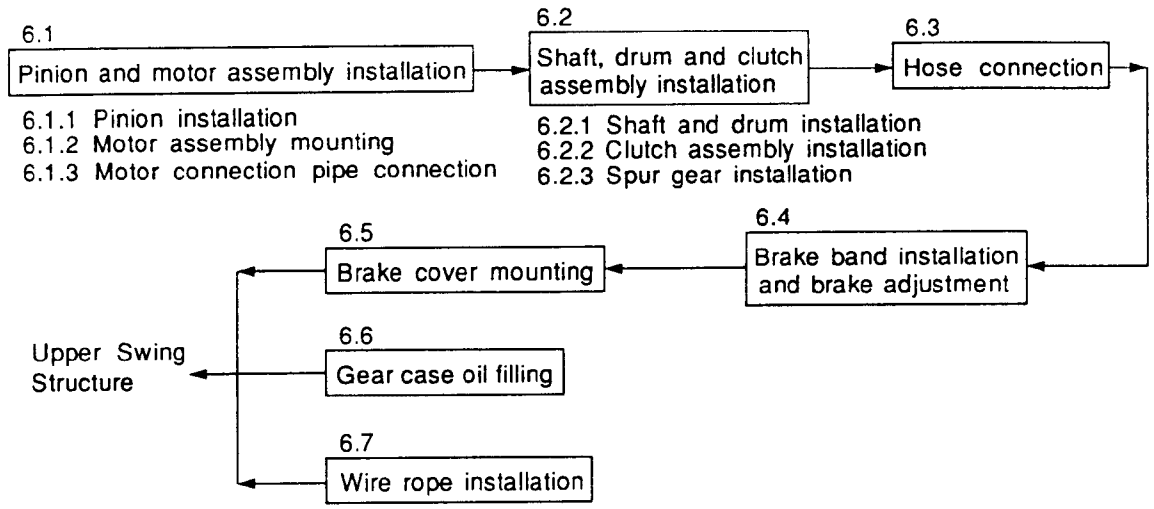
4 Inspection And Parts Replacement

⚠ WARNING

Use Solvent Only In A Well Ventilated Area, Away From Open Flame.
Wear Safety Glasses And Protective Clothing. Metal Chips Blown By Compressed Air Can Cause Injury.

1) Wash all disassembled parts with solvent, and completely dry with compressed air.
2) Check all parts for excessive wear. In case of slight score or similar, recondition the area with fine file or oil stone.
   Replace parts which cannot be repaired.
3) Visually check the shaft and spur gear for cracks, deformation, and other irregularity.
4) Replace the bearing if excessively damaged.
5) Replace the oil seal with a new one.

5 Reassembly Procedure



6 Reassembly

6.1 Pinion and motor assembly installation

6.1.1 Pinion installation

• Front drum side

1) Install the pinion (10) and snap ring (46) to the motor assembly.

• Rear drum side

2) Install the spacer (40), pinion (13) and snap ring (35) to the motor assembly.

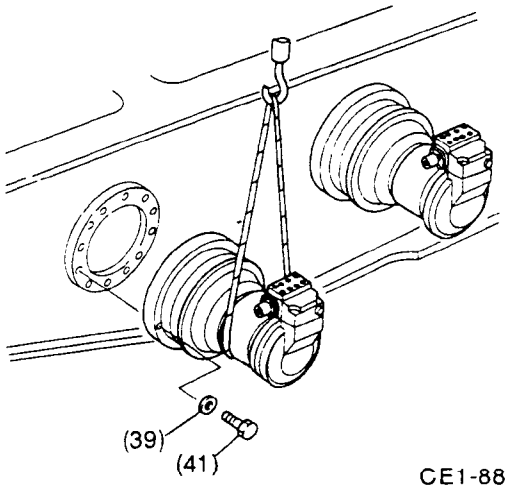
6.1.2 Motor assembly mounting

⚠ WARNING

Since The Component Parts Related To This Procedure Are Heavy, Handle Them Carefully Or Accidents May Result. Use Supporter Base, Jack, Hoist And Others To Handle Them Efficiently. Check That The Hoist Capacity Is Sufficient.

(For reassembly, refer to ES5-9-60○○ in this manual.)

1) Suspend the motor assembly with the nylon belt, coat liquid packing on the mounting surface, and fasten the motor assembly with bolts (41) and washers (39).
Adhesive: Three bond No.50 (Gray)
Tightening torque : 181 to 217 ft/lbs
(25 to 30 kg-m)



CE1-88S

6.1.3 Motor connection pipe connecting

1) Connect the pipes to the motor.

Note : When assembling, refer to the mark for the mounting position.

Note: Wrap seal tape on the threaded areas of the pipes and joints.