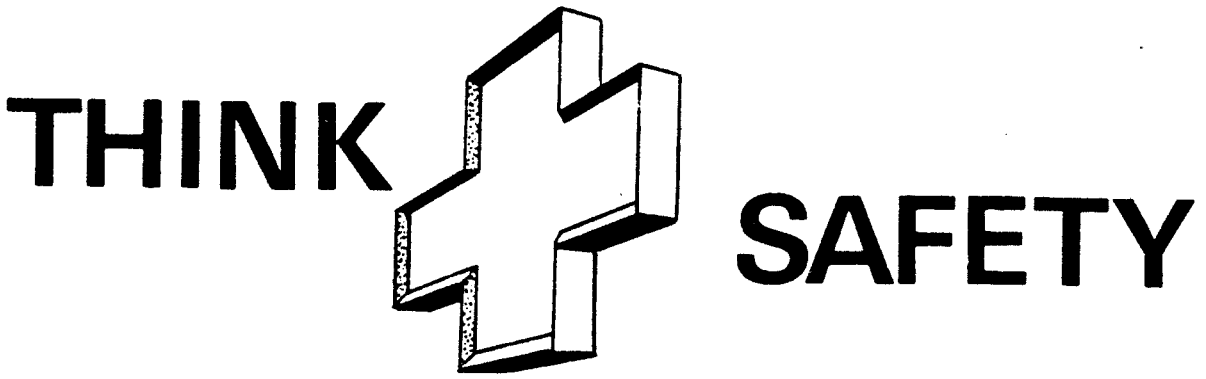
Technical Manual

ALL hold down bolts on rotating frame. Especially swing gear case, motor mounting, machinery pedestal and base bolts. Check also motor generator and air compressor mount and base bolts. Tighten rod bolts on bearing housing.

Examine and readjust the hoist brake, if needed. Look at the condition of brake lining. Remove inpsection plate from swing gear case. Look at condition of gears. Use pry bar to detect any side motion of shaft indicating worn bearings. Examine condition of rotating brakes and their adjustment. Adjust, if needed. Inspect air compressor "V" belt tension, replace if needed. Fill the anti-freezer. Check auto-lube system for loose or broken fittings or injectors.

Check center journal thrust washer and bearing. Secure ALL guards and safety features in place. DISCONNECT POWER SOURCE with machine shut down so electrical crew may adequately clean and inspect motor generators and electrical cabinets. NOTE any discolored electrical parts, it's a sign of overheating. In humid areas, look for fungus and mildew. Dry compressed air at LOW pressure works well for dust removal. Clean corrosion from parts joints and connections. Retighten, where needed, any loose connections and terminals. Use of proper tool here eliminates broken terminals and terminal blocks. Replace missing or damaged tags and labels. Bundle loose wiring. Fasten ALL components and wiring in cabinets. Check the cable armor tight in the fixture. Look closely where wires and cables pass thru openings and grommets. Insulation damage generally occurs here. Replace grommets if needed. Arcing of motors and generators causes discolored commutators. Look at brushes and brush holder condition. Correct brush spring tension where needed. Collector rings need cleaning and checking also. Use a hand grease gun at each injector. Fill ALL grease lines and purge EACH bearing with MPG. Remember to replace ALL plugs, covers and inspection plates.

Passing equipment condition reports along the line is important too. Wear patterns show up at varying degrees in time. Recording and checking these reports at a future date allows comparison and planned shutdowns. Planned repairs, part orders and crews for a scheduled shutdown eliminates idle downtime.



A typical **SUPERFRONT CYCLE OF OPERATION** follows completion of the Operator Inspection and Start-Up Procedures with machine ready for SAFE operation.

Start this Cycle with dipper as close to machine as limits allow.

Move Hoist Command lever (at right) REARWARD and Crowd Command lever (at left) FORWARD, then MATCH THE SPEED of each. (This positions dipper with respect to grade.)

HOLD PITCH by moving Hoist Command lever to LEFT.

Continue Hoist and Crowd speed to send dipper (now in constant pitch) across grade in a long, flat pass into the toe area of the bank.

Once in bank, continue Hoist and Crowd force until the lower Hoist Link pin nears the bank.

At this point, RELEASE PITCH by moving the Hoist Command lever toward RIGHT to Neutral.

Then RETRACT the Crowd by moving Crowd Command lever REARWARD.

CONTINUE HOISTING. Dipper travels UP and THRU the bank. When filled, swing to the dumping location cautiously.

SWING LEFT with Crowd Command lever movement to LEFT.

SWING RIGHT with Crowd Command lever movement to RIGHT.

START SWING SLOWLY. Accelerate and decelerate SLOWLY to avoid unneeded side thrust on the Front End.

To dump, press the Dipper Trip thumb button at end of the Crowd Command lever. Hold button just long enough to release the dipper door.

When dipper is empty, slowly start the return swing while LOWERING and RETRACTING to reposition dipper in front of machine.

Dipper door latches as dipper lowers.

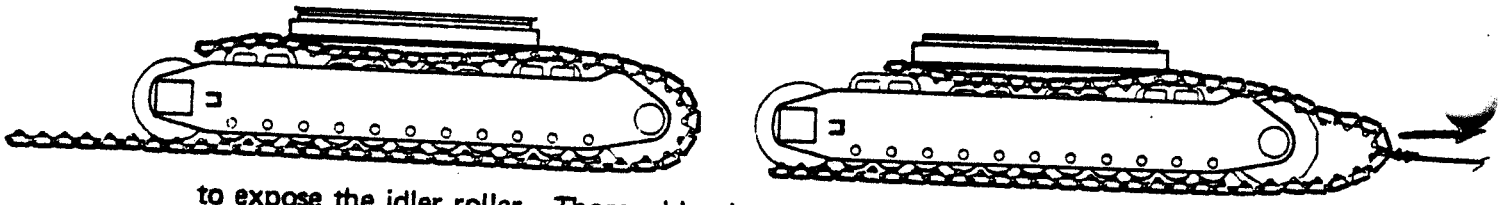
Repeat cycle.

CODE	NAME	DESCRIPTION
continued. . . .		
OGL	Open Gear Lubricants	2. Type H is usually an asphaltic type product requiring heat or a diluent for application. Diluents used in solvent cut-back products must have a fast evaporation rate and be non-flammable. They must not show separation in storage or service and should be suitable for use in automatic dispensing systems at low ambient temperatures. USES—Open gears.
EO	Engine Crankcase	Diesel engine crankcase oils may be one of two (2) viscosity grades, SAE 20-20W or 30. 1. Oil suitable for use in Cummins Engines of at least MIL-L-2104A, Sup. 1 level and suitable for API service classification DM. 2. A qualified series 3 oil for use in Caterpillar Engines.
MO	Motor Oil	A rust and oxidation motor oil suitable for use in DeVilbiss and/or Ingersoll Rand piston type reciprocal air compressor crankcase lubrication.
HL	Hand Lubrication	Use oil (MO) above or a general machine oil (S-SAE 30, W-SAE 20W).
GL	Enclosed Gear Case	Use the same weight oil throughout the year if possible. Use as viscous a product as possible for maximum gear life. Loading shovels and smaller machines of crawler type: 1. Use GL-140 in lower frame propel gear cases and other gear cases outside machinery house. 2. For gear cases inside machinery house in older machines where oil is pumped, use GL-90 in winter and GL-140 in summer.

SECTION 4

MECHANICAL ADJUSTMENTS

INDEX



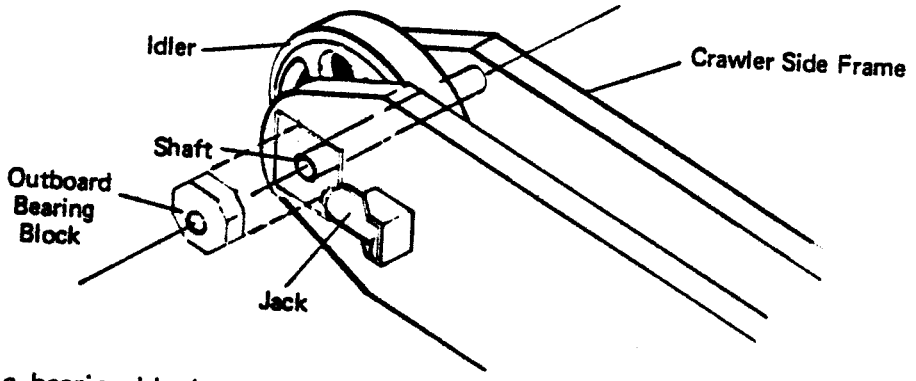
to expose the idler roller. Thoroughly clean the adjusting parts and saturate with penetrating oil. Support the idler roller weight and drive out shaft until roller drops out. It is not necessary to drive shaft all the way out.

To install roller, use the reverse procedure and use caution on alignment.

TO REPLACE IDLER BUSHING(S), release belt tension. Thoroughly clean the adjusting parts and saturate with penetrating oil.

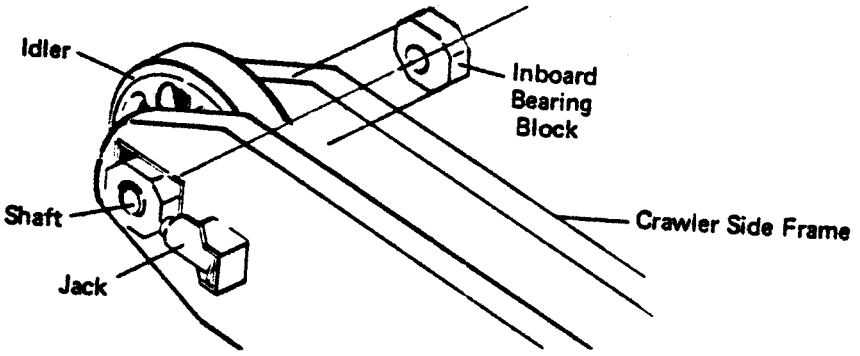
Support the idler roller with blocks to relieve weight on the shaft.

NOTE: It is not necessary to pull shaft.



Remove the bearing block and replace bushing. Check the exposed idler shaft for rough surface, burrs, etc. Replace all worn or damaged parts.

NOTE: This procedure applies to both sides of each crawler frame.



Remove the wedging blocks used to support the idler roller and reverse procedure to adjust and secure the tread belt.

DIG MODE (SET DIG LOCKS):

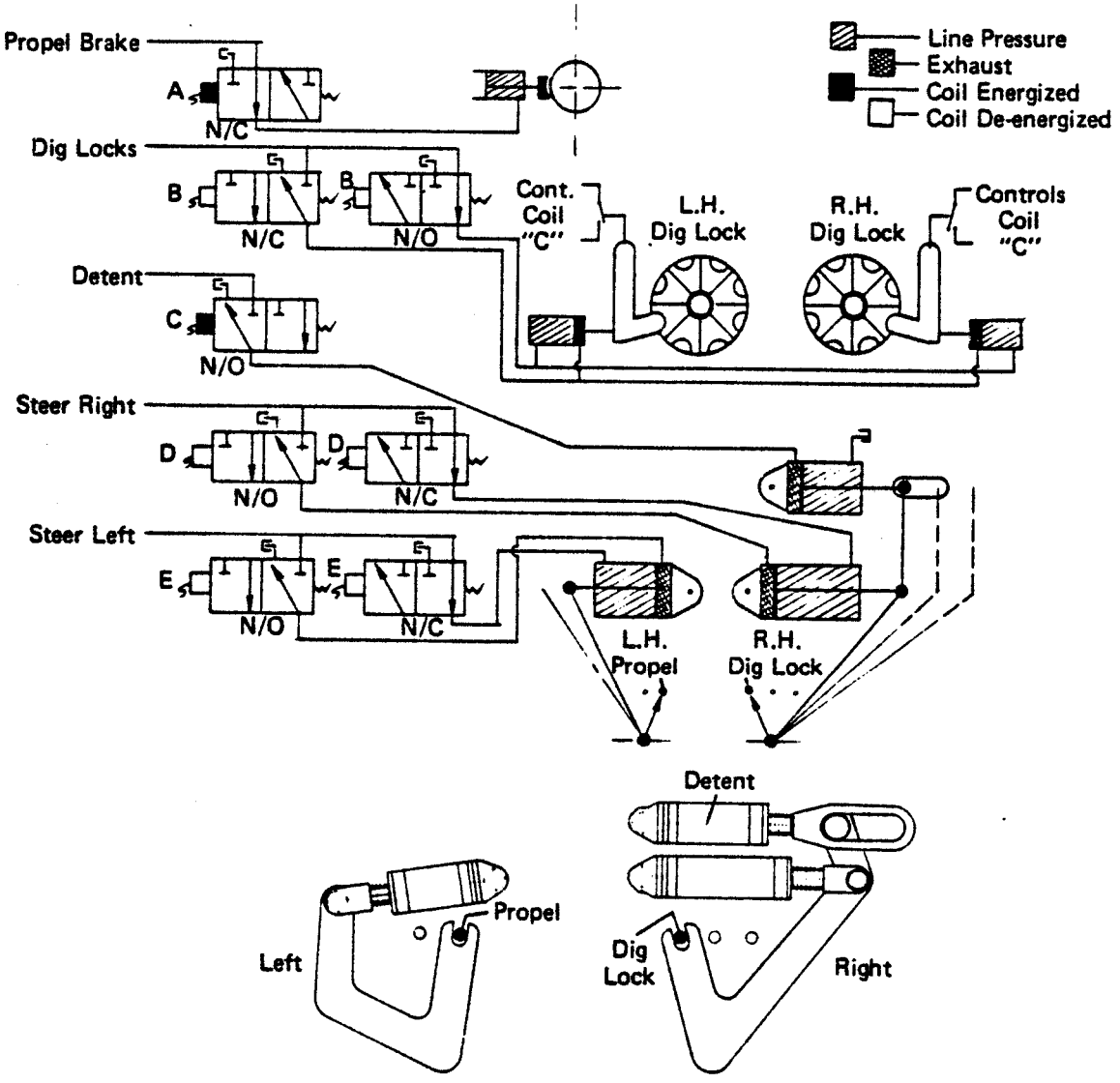
– Propel brake released

– Dig locks attempt to set

– L.H. steering cylinder retracts to propel position

– When either dig lock engages, logic sequence causes detent cylinder to retract

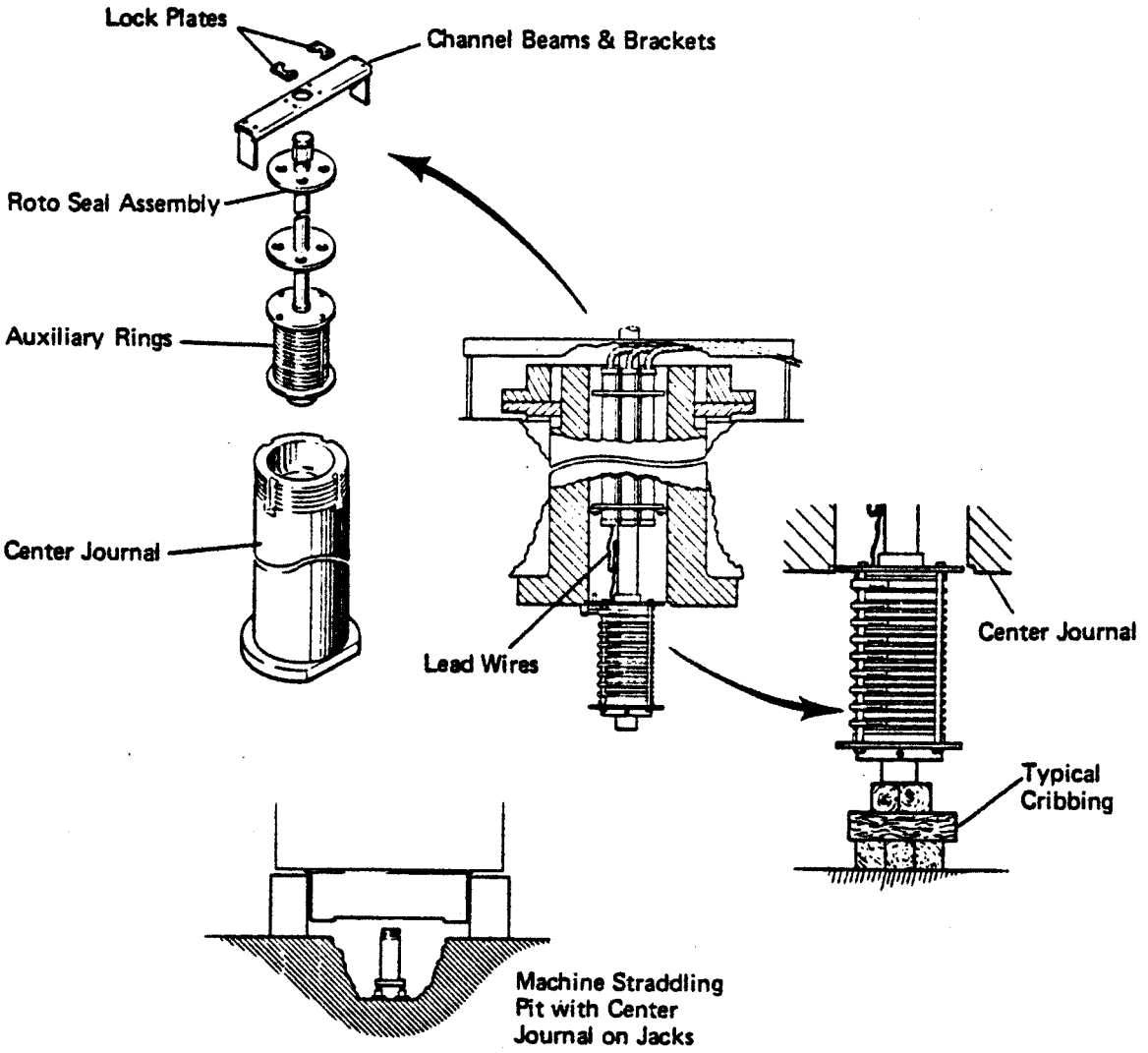
– R.H. steering cylinder then retracts to dig lock position



DIG LOCK

Support roto seal then remove split retainers and channel beam. Lower assembly until lead wires are exposed.

Disconnect leads to brushes. Disconnect cables from junction box. Disconnect ALL air and lube lines from roto seal.



STAGED CENTER JOURNAL REMOVAL

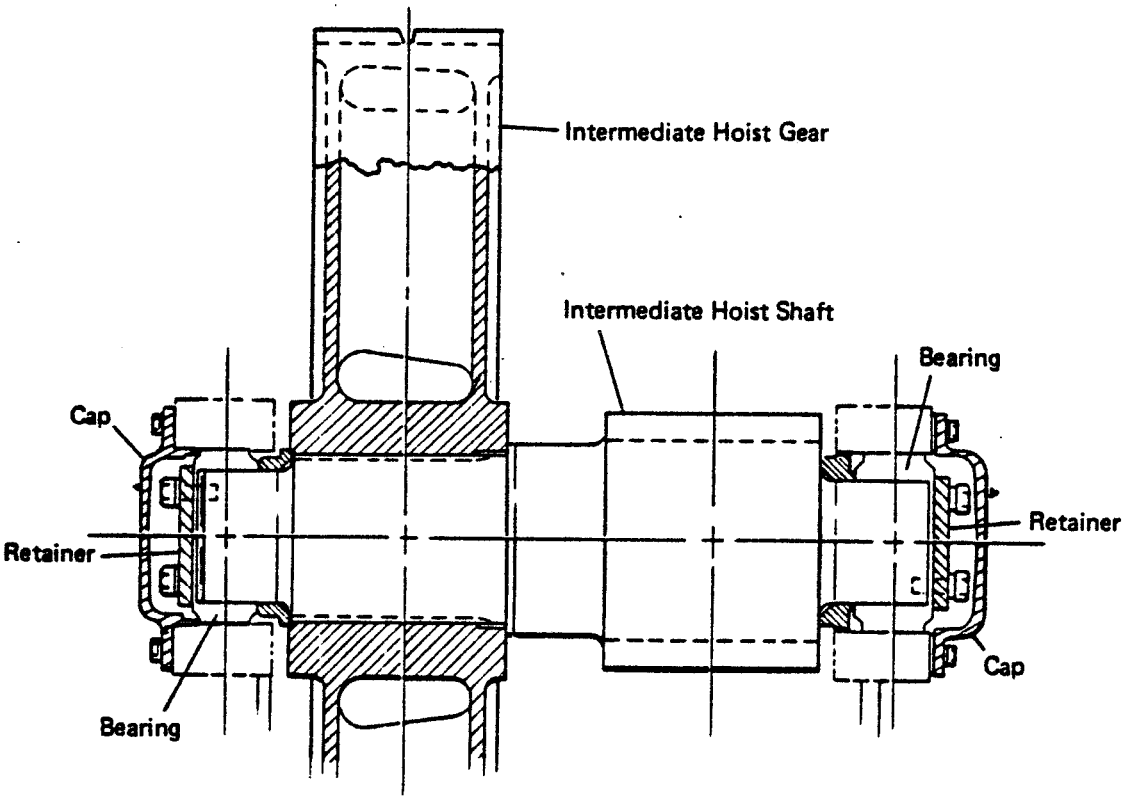
Remove roto seal, with auxiliary collector rings, out the top of the journal.

Use cribbing and hydraulic jacks to support center journal to permit removal of pin flange capscrews. Remove capscrews from lock plate. Remove center journal nut and lock plate. Finally, lower journal into pit with jacks.

Reverse this procedure to install new journal.

The **INTERMEDIATE SHAFT** consists of a double helical gear and attaches to the shaft by involute splines. Two, double row roller bearings support this shaft and integral spur pinion. The left hand bearing clamps tight in the housing by a retainer plate and gasket. Assemble the right hand bearing first. The right hand bearing, mounted in the outboard bearing housing, floats.

Bolt retainers in place and wire lock the capscrews.



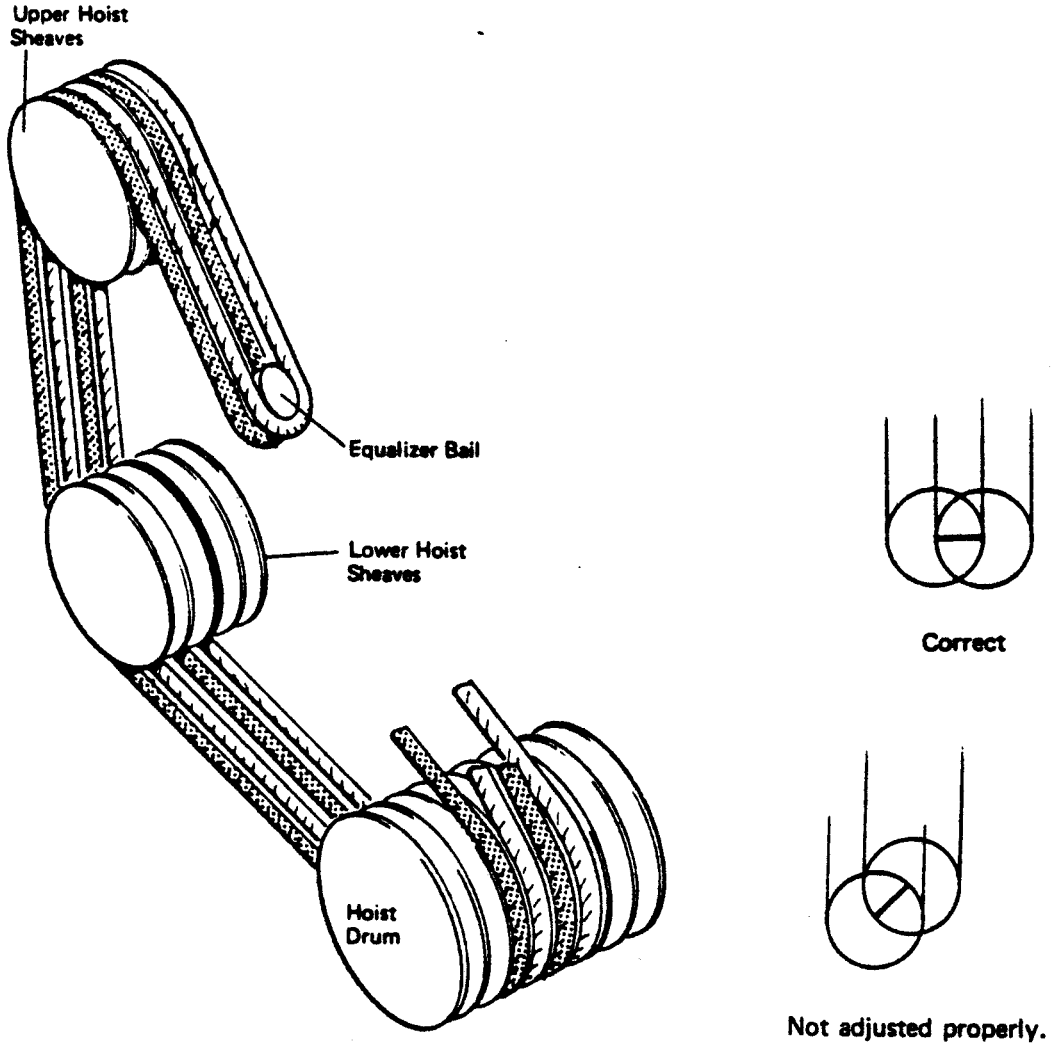
INTERMEDIATE HOIST SHAFT ASSEMBLY

Pry off loops of worn rope from sheaves, insert new hoist ropes on the proper sheaves and leave a loop suspended at bottom of equalizer bail.

Loosely install cover plate, then remove guy line supporting the bail links and cribbing, that supported the sheave block during this procedure.

Carefully raise hoist to tighten new ropes on the equalizing sheaves and crankshaft.

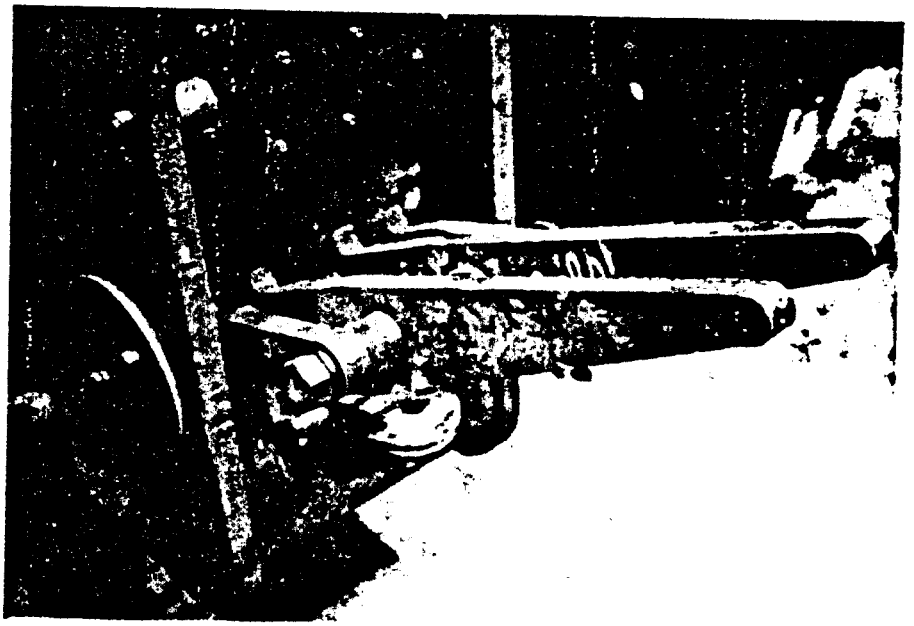
Adjust rope length at drum by adding/removing shim(s) behind ferrule. Being assured the equalizer is in a horizontal position, tighten nuts and bolts to secure the top plate.



HOIST ROPE REEVING

Tighten the nylon clamps, then insert and tighten the lateral retaining bar to complete the hoist rope replacement procedure.

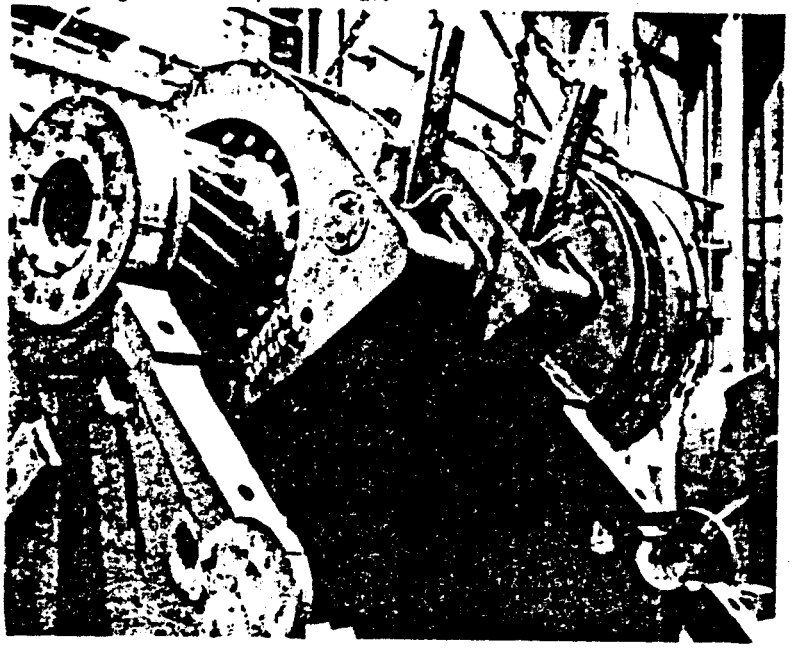
Air actuator

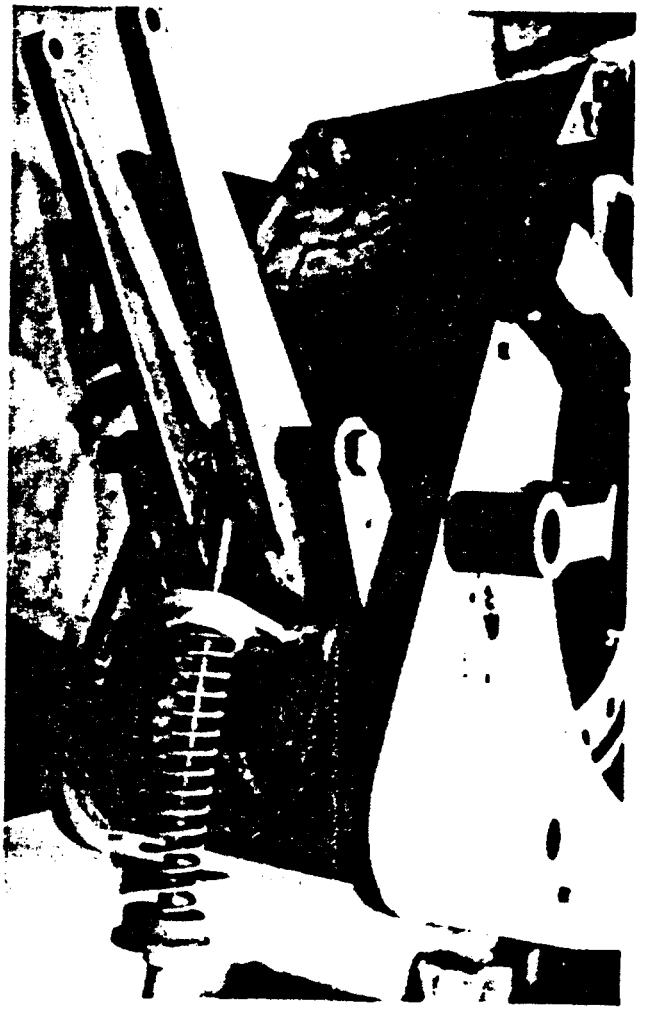


Secondary levers before & after spring installation

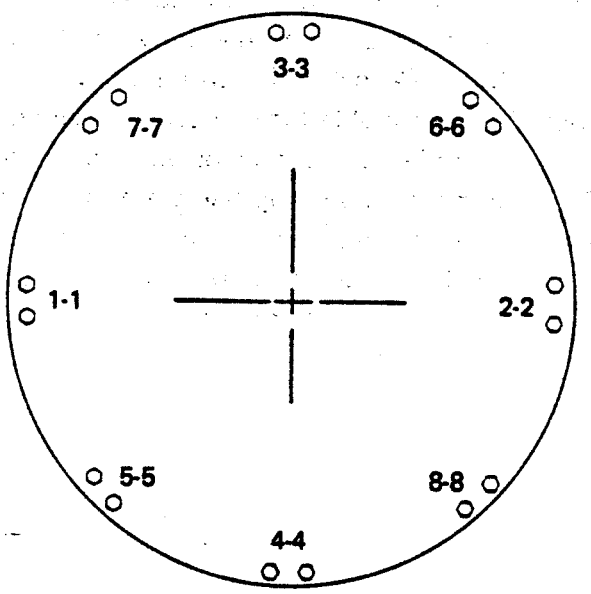
MAIN and SECONDARY ACTUATORS

Nesting the crowd pinion shaft





BOLTING PROCEDURE FOR CROWD DRUM SHAFT:



Keep drum shaft free to turn with ropes slack and brake released.

Position drum with finish bolts at top center.

Loosen all other bolts, one or two turns.

Tighten all nuts by hand.

Keep lock washers loose and slotted head tight against flange.

Use air wrench; tighten the two topmost, center bolts ONLY.

Rotate drum 180°; tighten two topmost, center nuts.

Rotate drum 90°; tighten two topmost, center nuts.

Rotate gear 180°; tighten two topmost, center nuts.

Rotate gear 45°; tighten two topmost, center nuts.

Rotate gear 180°; tighten two topmost, center nuts.

Rotate gear 90°; tighten two topmost, center nuts.

Rotate gear 180°; tighten two topmost nuts.

Tighten ALL remaining nuts.

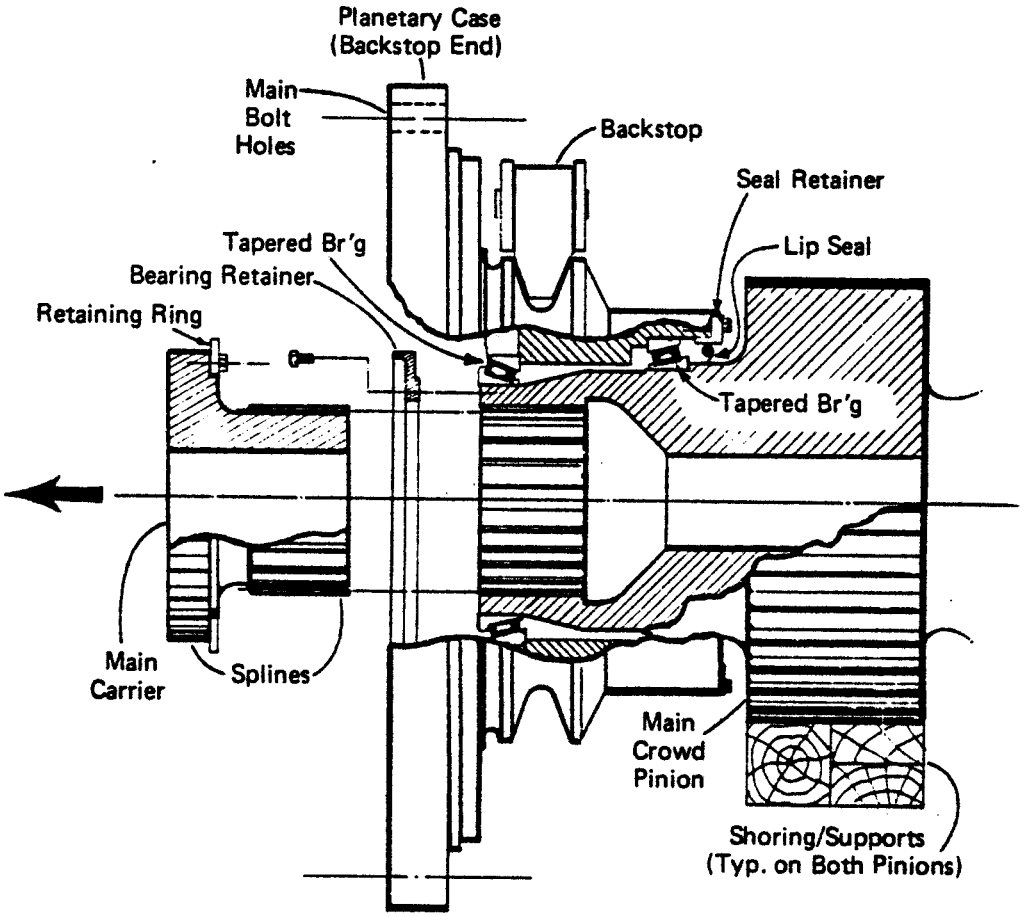
RETIGHTEN ALL nuts, advancing one nut each time.

Rotate drum so each nut is at top of drum in turn.

Operate machine 30 minutes under load and RETIGHTEN.

NOTE: Due to dead weight, it is possible that ALL bolts seem tight (nuts do not turn anymore) and still a gap at bottom of gear exists as gear rotates. The changing position under load causes the bolts to loosen with additional bending stress. RETIGHTENING IS IMPORTANT.

REMOVE MAIN PLANETARY CASE nuts and carefully pull off gear case containing 1st and 2nd reductions. Use caution and AVOID BINDING during this procedure. With suitable lifting device, extract the main carrier unit and its attached retainer ring.

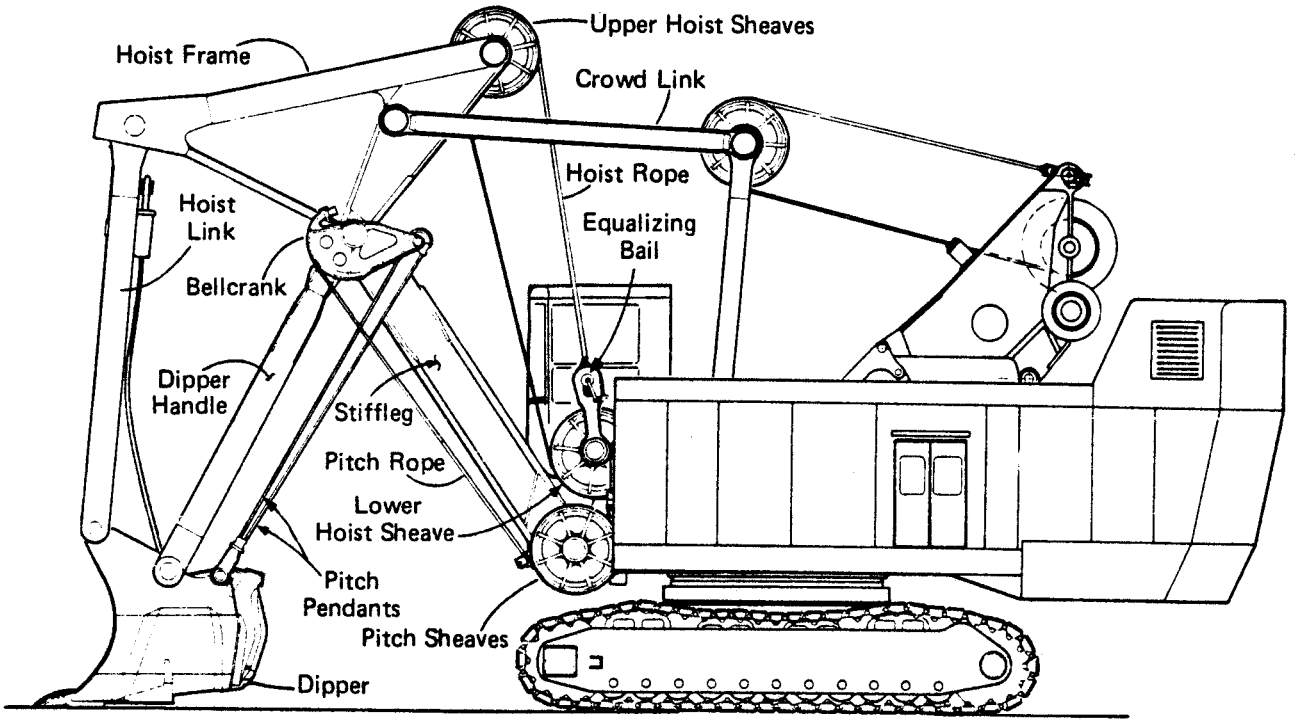


MAIN CARRIER REMOVAL

Place a 1-1/3 inch clevis thru the topmost main bolt hole on backstop end of case and attach a wire rope sling to a lifting device. Extract bolts and lift off lip seal retainer. Remove bolts and lift off inner bearing retainer. Pull inner race and bearings located on gear case end of pinion shaft.

NOTES:

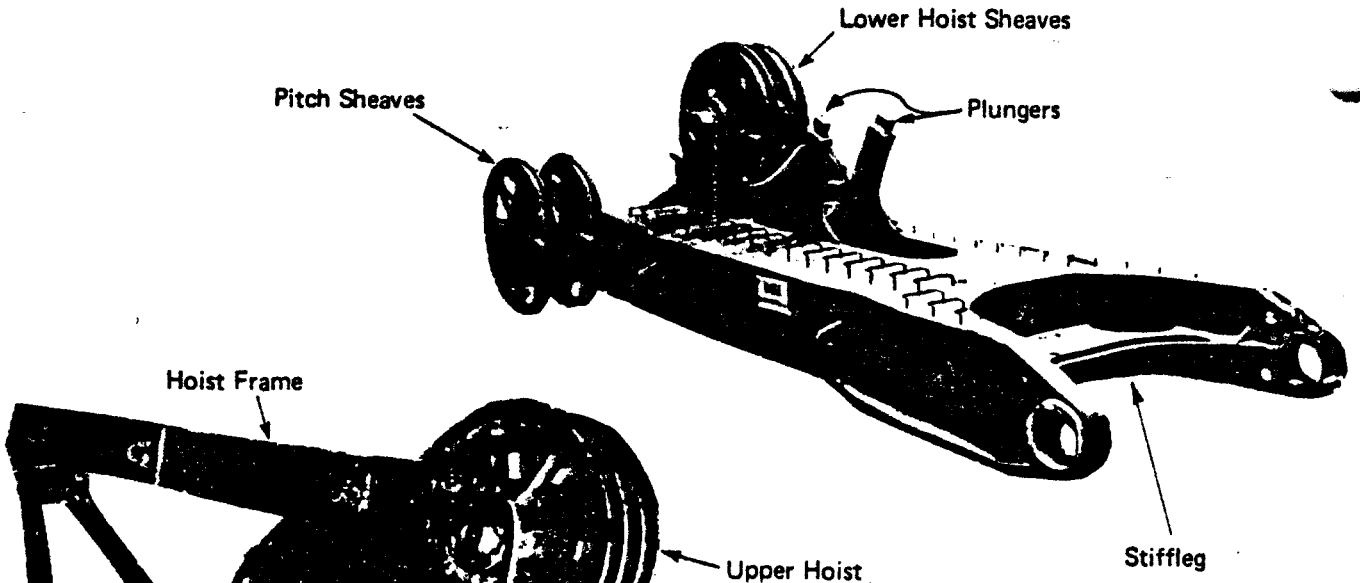
SUPERFRONT'S FRONT END COMPONENTS start with the dipper supported by the hoist link and the dipper handle. These last two members connect to the triangular hoist frame. All of these members turn about/around the head shaft in a levering action with support from the stiffleg. The stiffleg pivots on its foot pins.

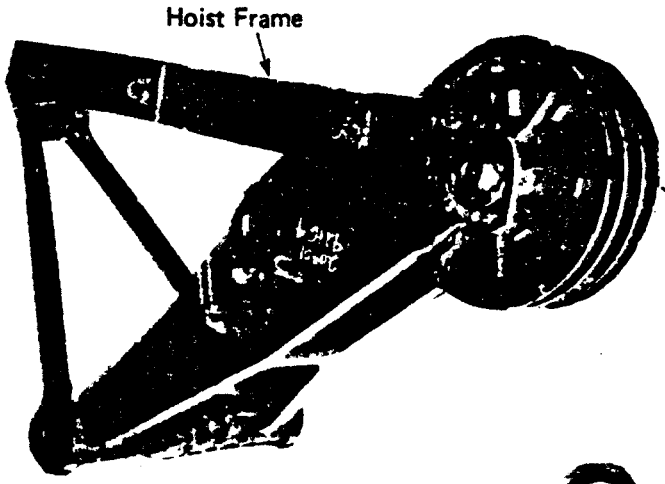


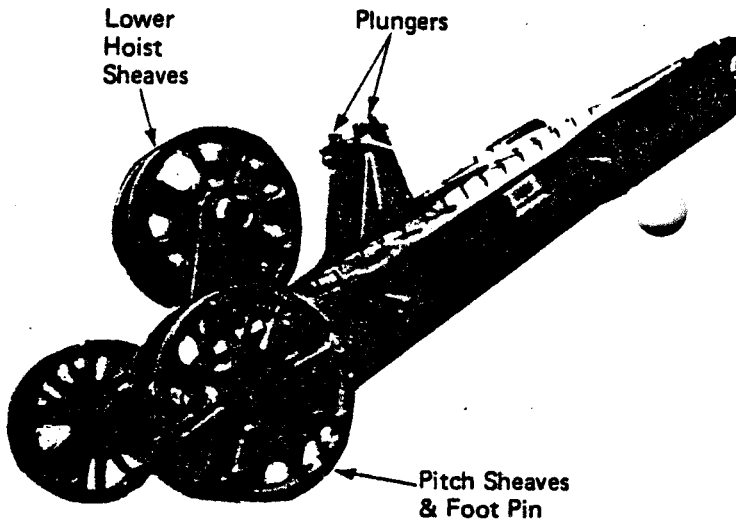
The crowd links support the front end at the top and connect the hoist frame to the mast.

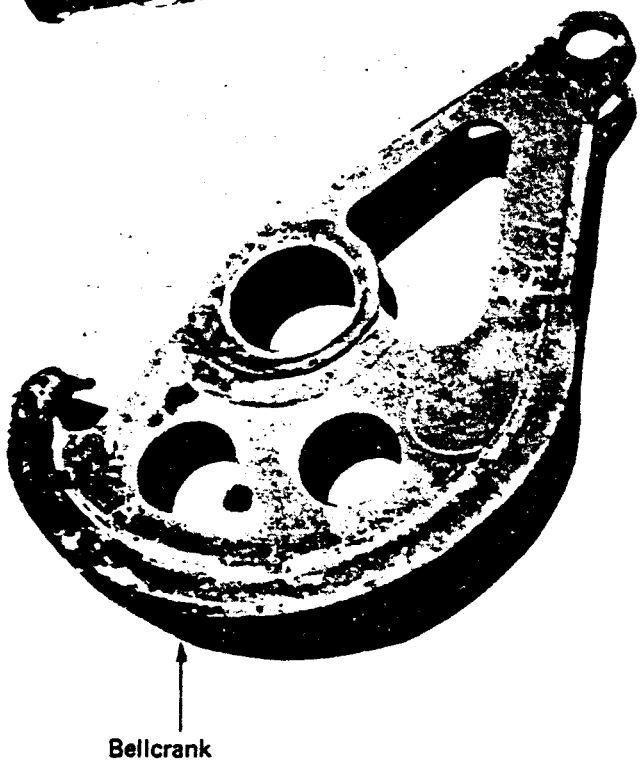
Attached to the variable pitch dipper, the pitch stop rope and pitch pendants along with the bellcrank, pitch sheaves, pitch ropes and pitch rams ALL control pitch so the dipper teeth are orientated in its travel direction.

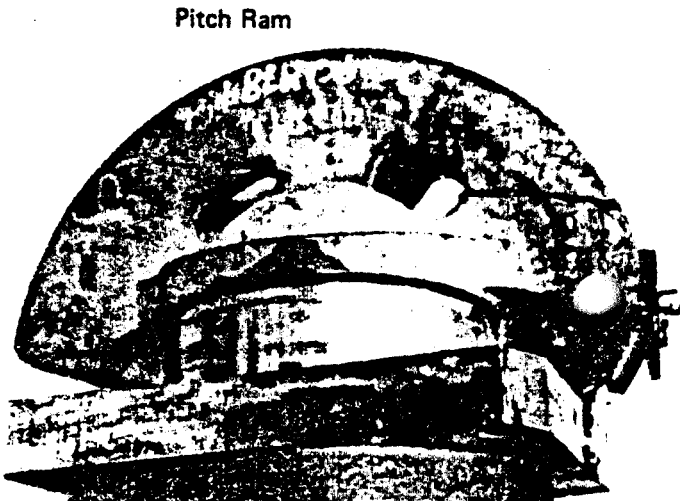
Two parts of wire rope attach to the hoist drum, travel around the upper and lower hoist sheaves and back to the drum. Hoisting shortens the distance between upper and lower hoist sheaves utilizing the block and tackle principle. This action moves the hoist frame about the head shaft, like a lever with the dipper and upper hoist sheaves at either end, while the head shaft acts as the fulcrum.


Lower Hoist Sheaves
Pitch Sheaves
Plungers
Stiffleg


Hoist Frame
Upper Hoist Sheaves

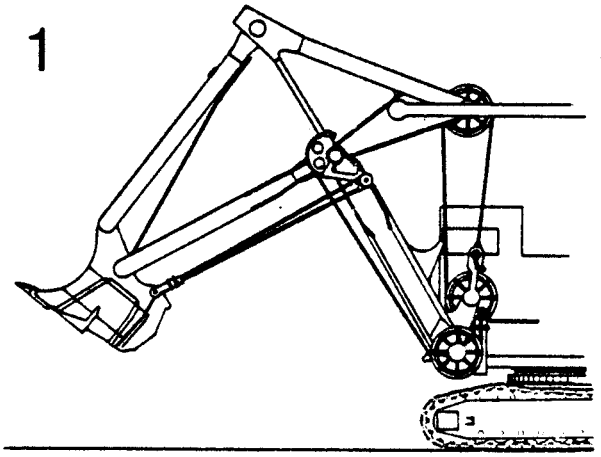

Lower Hoist Sheaves
Plungers
Pitch Sheaves & Foot Pin


Bellcrank


Pitch Ram

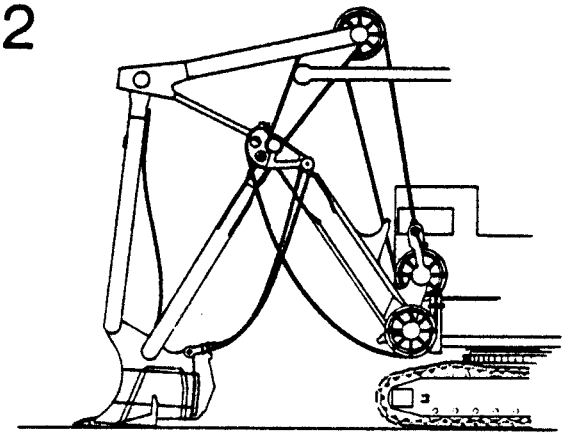
PITCH ROPE REPLACEMENT

1

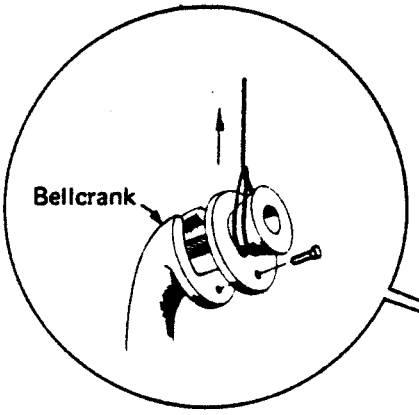


Hoist dipper to compress pitch cylinders. Shut valve between pitch reservoir and cylinders.

2

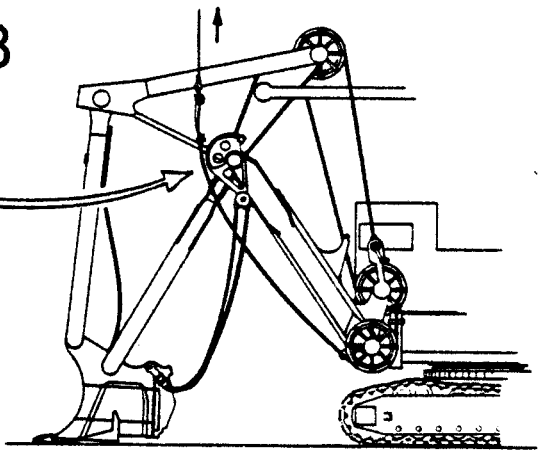


Lower dipper with hoist link in near vertical attitude. Pitch ropes and pitch pendants become slack; bellcrank will turn freely. Fashion sling and stand clear for pitch rope disconnection.



Close up of bellcrank and pitch rope with lifting device attached.

3



With sling attached, remove pitch rope and lower via truck crane.

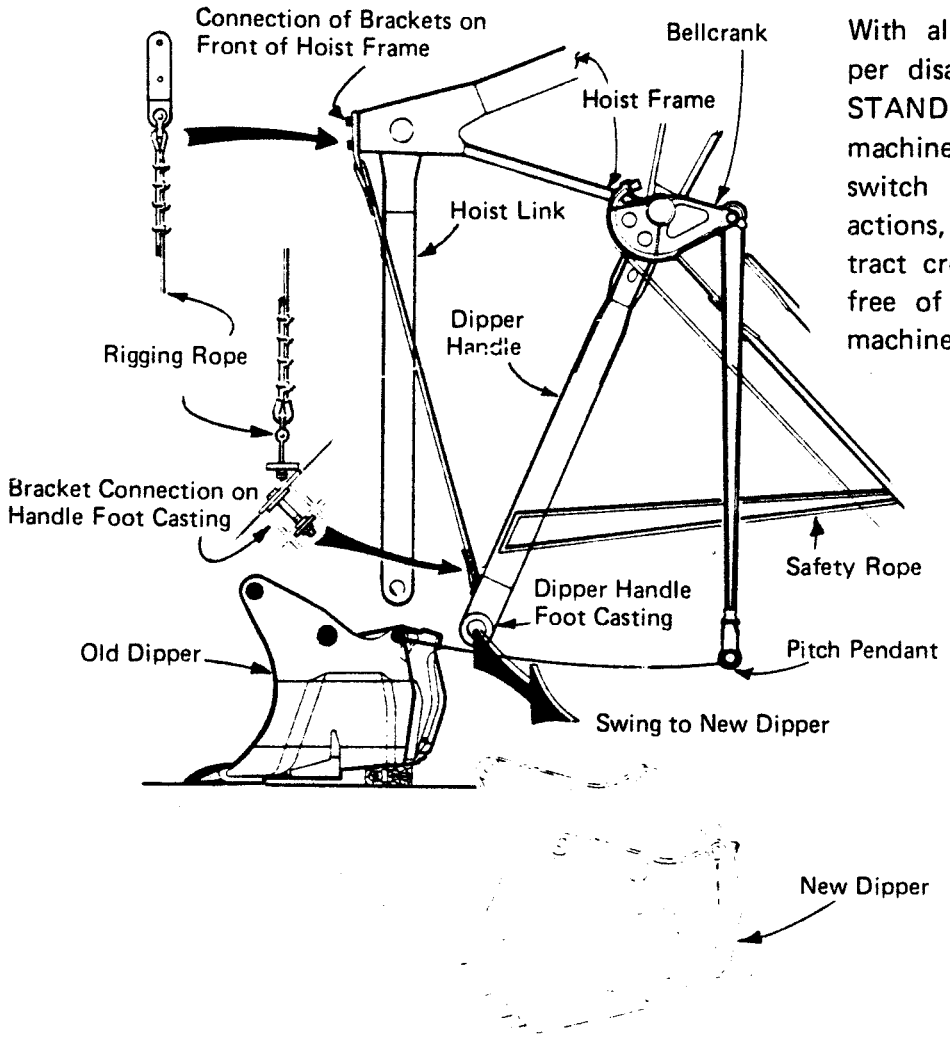
NOTE: Reverse procedure during replacement.

REMOVAL POSITION

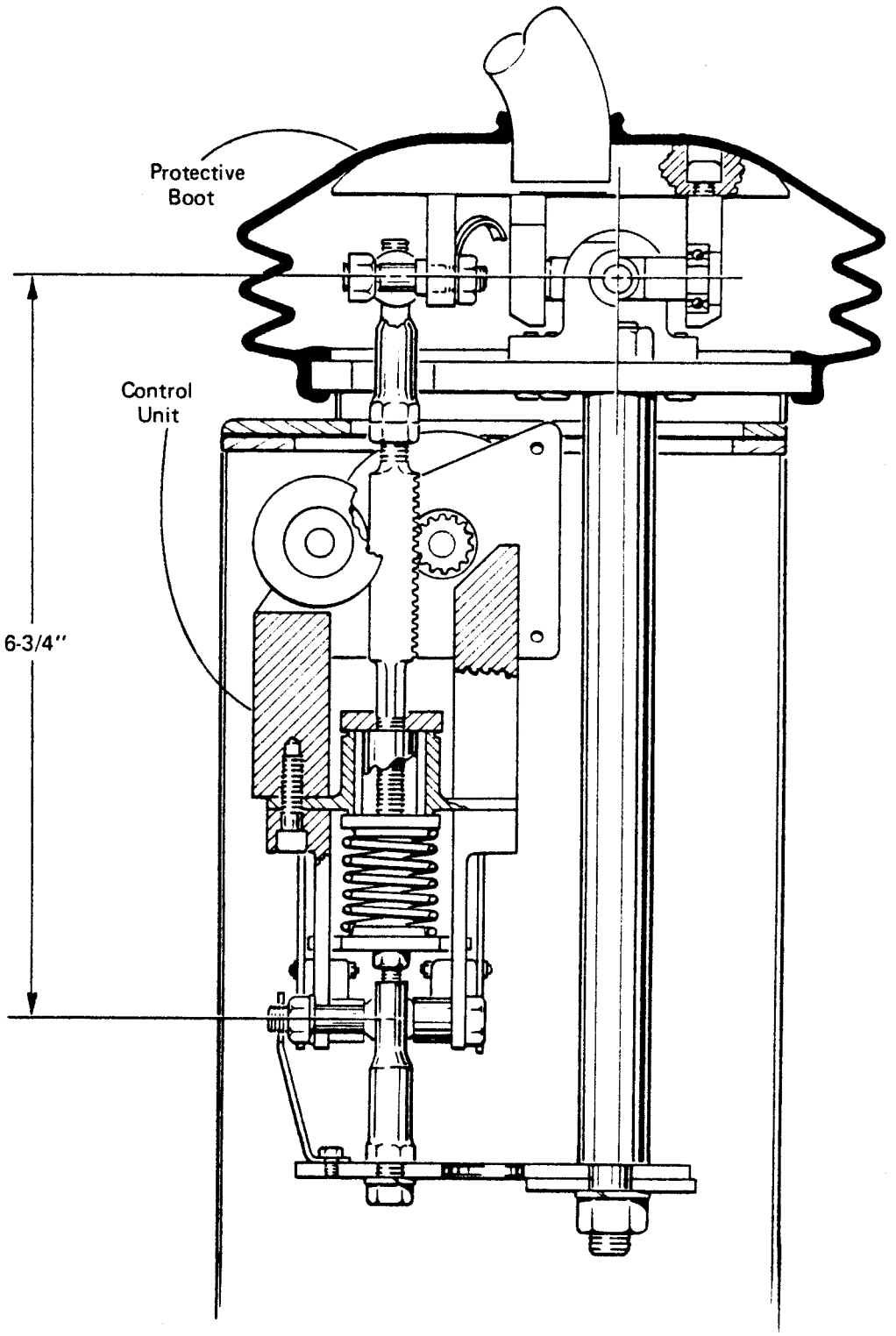
Jack and block under dipper lip or heel until handle and hoist link pins can be freed and removed.

Carefully remove jacks and blocking from under dipper.

With all connections to dipper disassembled and secure, STAND CLEAR and start up machine. Utilize limit kill switch to slow machine reactions, then cautiously retract crowd to lift front end free of dipper. Shut down machine.



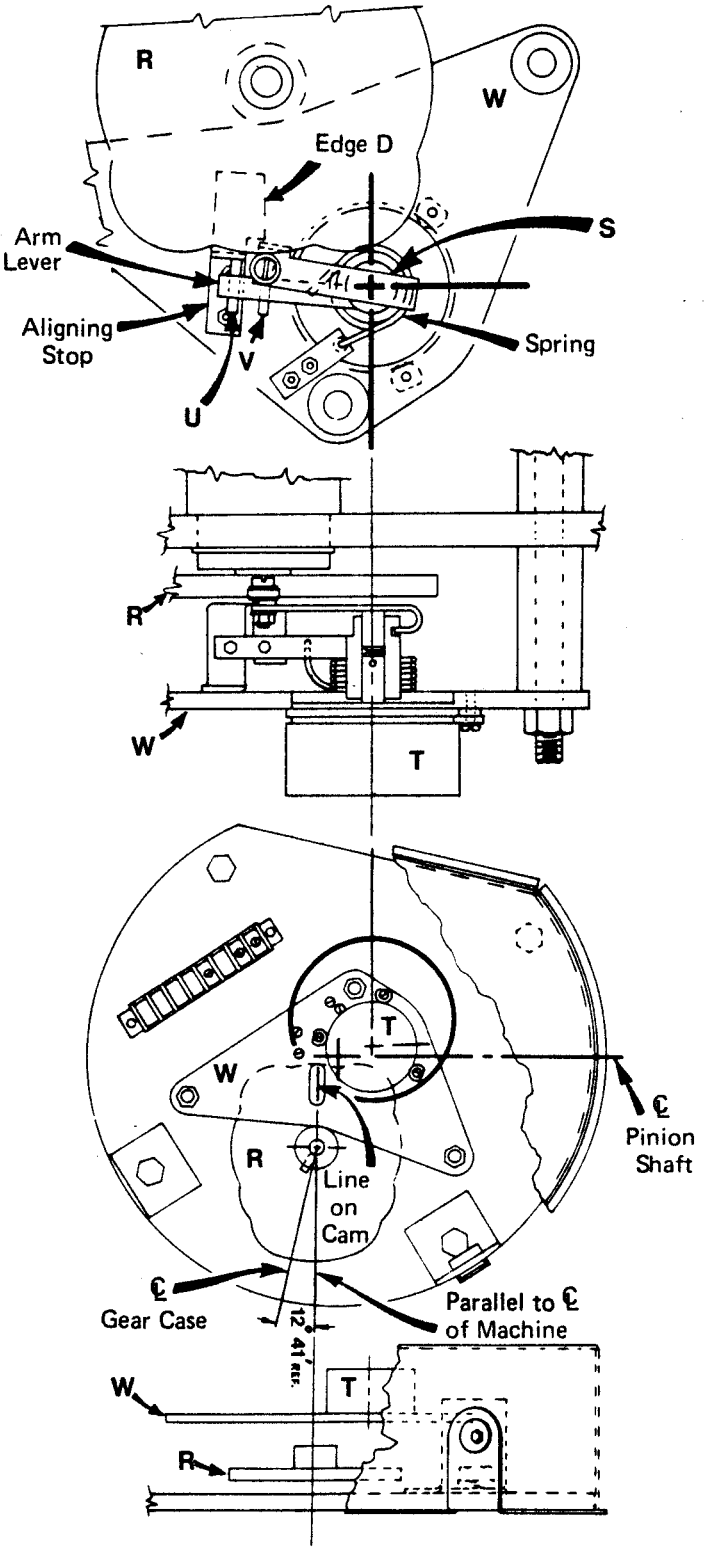
To **ATTACH DIPPER,** reinstall handle and hoist link pins once dipper is properly aligned and blocked. Reassemble pitch stop sockets; reattach pitch pendants; open gate valve on pitch tank to load pitch linkage; attach and reactivate auto lube and air lines; remove safety ropes from stiffleg and blocking from dipper.



HEAD SECTION AND CONTROL UNIT ASSEMBLY

SWING MOTION LIMIT ASSEMBLY

R – Swing Limit Cam
S – Cam Follower
T – Swing Limit Potentiometer
U – Limit Range Adjustment Screw
V – Corner Clearance Adjustment Screw
W – Reference Plate



SWING MOTION LINK LINKAGE provides output showing upper frame position relative to lower frame.

It is located on the RIGHT swing case and is driven by an attachment to the case pinion shaft. A small gear train is used to position cam (R) so that cam maintains a parallel relationship to the shovel lower frame, regardless of upper frame rotation. A cam follower (S) direct drives the potentiometer (T). Adjustment screw (U) is provided to adjust the difference of potentiometer output between when shovel upper frame is aligned over the crawler front corner and when its front is aligned parallel to the lower frame. Adjustment screw (V) will fine adjust potentiometer to set ENTIRE SWING LIMIT SYSTEM GAIN. A reference plate (W) is adjusted to align with cam (R) scribe mark at INITIAL SET UP of cam and lower frame alignment.