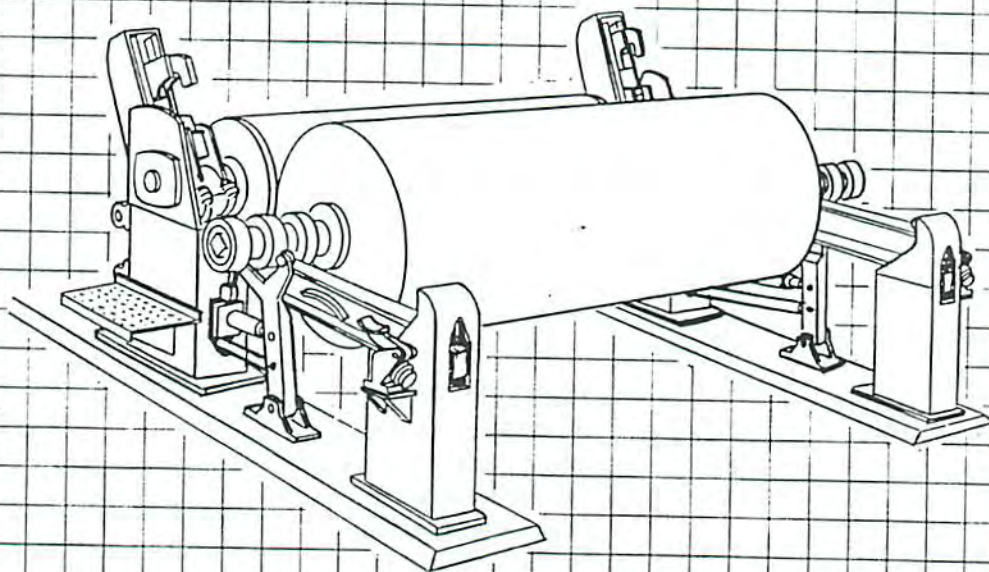


REEL  
MAINTENANCE  
INSTRUCTIONS



**N60-96MT-0009  
Reel Maintenance  
Training Instructions  
Copyright July 1989  
Beloit Corporation  
Paper Machine Division  
A Harnischfeger Industries Company  
1 St. Lawrence Ave.  
Beloit, Wisconsin 53511-6270  
Telephone 608 365-3311**

# Reel Maintenance

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# REEL MAINTENANCE INSTRUCTIONS

## 1 INTRODUCTION

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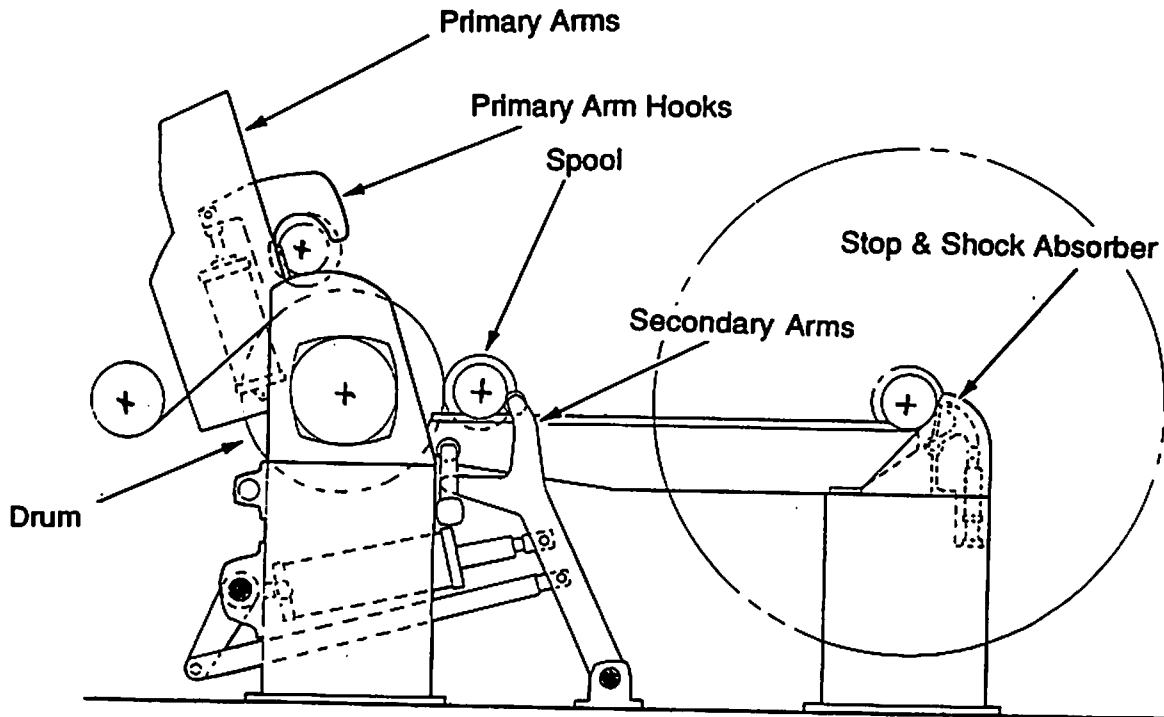


Figure 1-1. Reel

The primary function of the reel is to wind paper continuously as it comes off the machine. It is designed to build quality paper logs for good rewinder operation.

This manual will identify the main parts of the basic reel, briefly cover the routine maintenance associated with the reel and describe some new concepts and ideas..

The parts of the reel on which maintenance will be discussed are:

- Spreader Rolls
- Primary Arms, Cross Shaft and Drive
- Reel Drum
- Drum Doctor
- Secondary Arms and Cross Shaft
- Brake
- Framework
- Spool Starter
- Turn Up
- Threaders (Rope and Air Tube)
- Spools

An overhead crane and strongback are used to load empty spools into the reel. The spool is brought up to machine speed by a spool starter, moved into position and a turn-up is made. The spool is then lowered to the reel rails by primary arms with an electric motor driven rack and gear arrangement. The spool is transferred to secondary loading arms which control the sheet winding tension for the remainder of the log buildup. Full diameter logs of paper roll down the rails by gravity to a spool stop/brake position. From this point they are removed by machine room crane to the finishing area.



## 2 REEL MAINTENANCE

The Beloit Pneumatic Reel requires very little maintenance if operated with reasonable care and adequate lubrication. By following a planned program of maintenance and lubrication, the life of the reel will be extended and the possibility of unscheduled shutdowns will be greatly reduced.

Beloit reels are engineered with component and assembly drawings. Always refer to these drawings before disassembly and reassembly. These drawings provide instructional information and knowledge of what the inside of the equipment looks like. This makes maintenance work go smoother and faster.

Continuous reeling and the transfer process, which exchanges the winding log from one pair of loading arms to another, can be successfully accomplished only on a reel which is properly aligned. The drum, rails and arms must be properly located and coordinated beginning at the baseplates.

### 2.1 Spreader Rolls

The spreader roll is a bowed or crowned roll mounted ahead of the reel drum to spread the sheet. The spreading action removes wrinkles which prevents damage to the paper and promotes good winding. Spreader rolls should be driven either through a drive stickout or with a belt.

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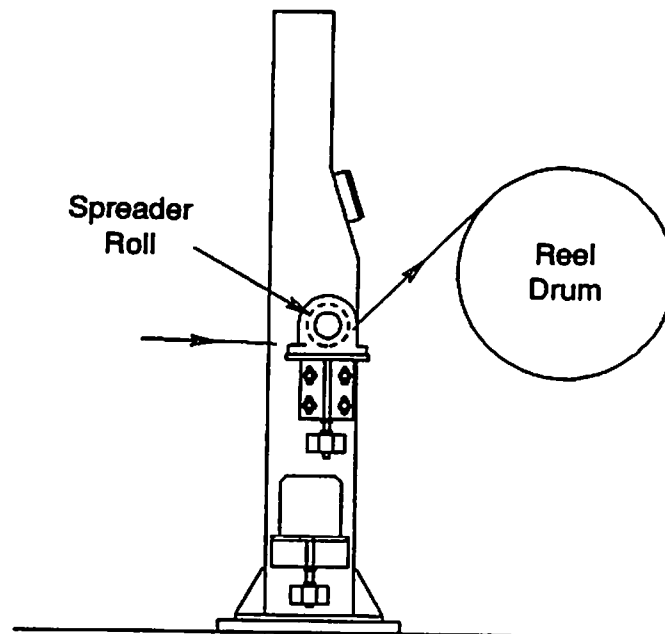


Figure 2-1. Bowed or Crowned Spreader Roll

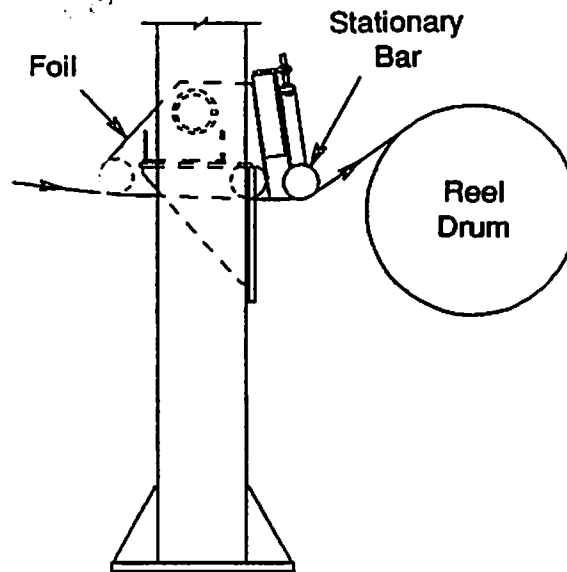


Figure 2-2. Stationary Bar Used with Tissue

For tissue, a bowed stationary bar may be used to eliminate wrinkles and provide economy as compared to a conventional roll.

A plain spreader roll uses a  $3/16$ " crown. This provides sufficient bow for spreading the sheet.

A bowed roll has an arrow on the mounting which indicates the direction of the bow. Set this arrow perpendicular to the bisector of the wrap angle in the direction of the sheet travel (See Figure 2-3). As the bow is moved into the sheet, the tension increases at the middle of the sheet and decreases at the ends. As the bow is brought out of the sheet, the opposite occurs.

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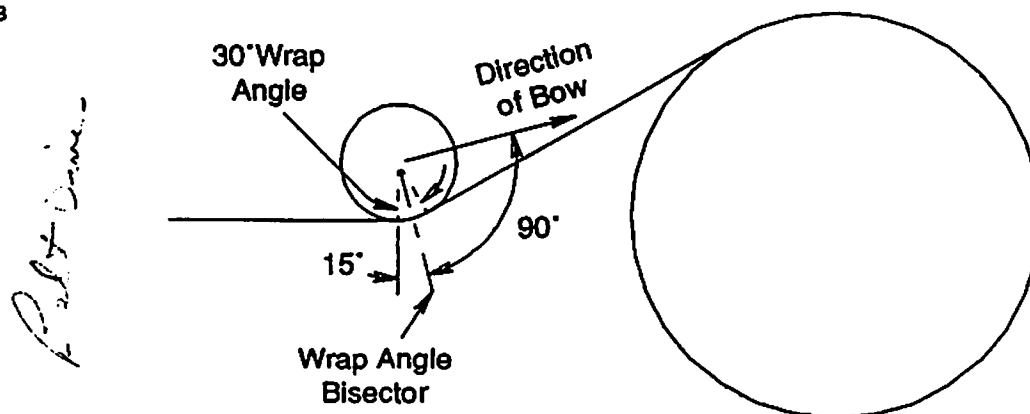


Figure 2-3. Wrap Angle

Spreader roll mountings are designed to permit roll movement for increasing or decreasing wrap. The wrap angle for bowed rolls (Figure 2-3) should be between 20 and 30 degrees. Wrap angles on plain crowned rolls should be from 30 and 45 degrees. Wrap angles on stationary bar is recommended at 35 degrees.

Align the spreader roll to the calender King roll using a tolerances of plus or minus .010".

Spreader rolls are usually grease lubed, but can be continuously lubed by the machine system. Grease them weekly or at reasonable intervals. For added information on lubrication see Section 5. of these instructions.

## 2.2 Reel Drum

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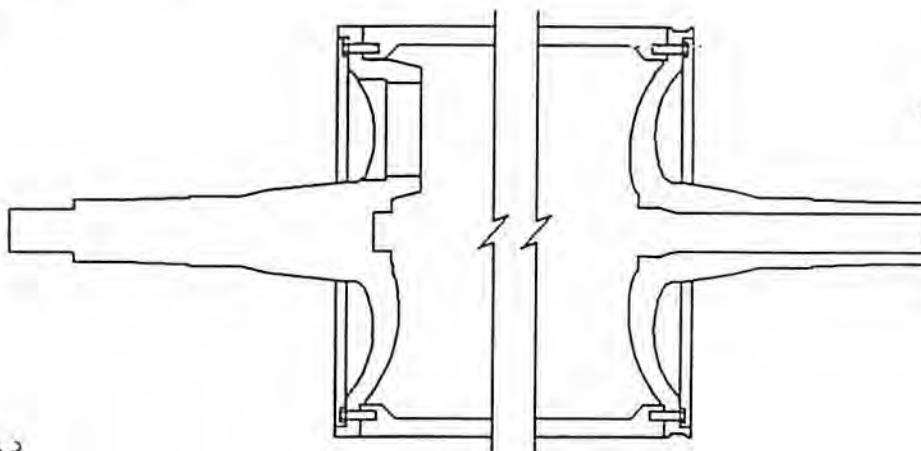


Figure 2-4. Reel Drum Construction

*we never have! ymison*  
The reel drum has a cast iron shell and bolted on heads. The drum should be ground every 1 or 2 years. Spool contact with the drum must be uniform for good efficient threading. Poor spool conditions and doctor blades wear the drum surface. Drum grooves are also to be kept clean.

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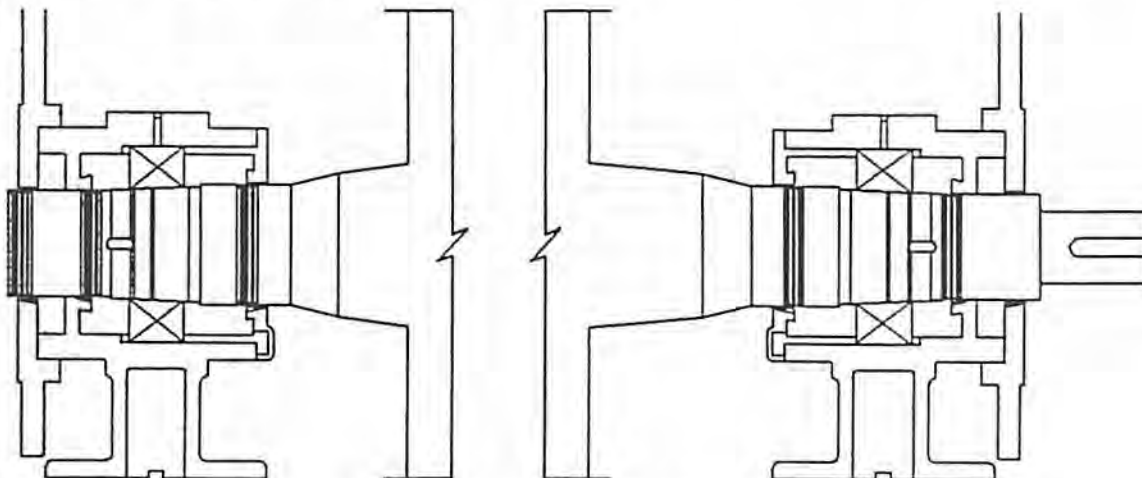


Figure 2-5. Reel Drum Bearings

The reel drum bearings, on the other hand, have a finite life. These bearings are static or continuously oil lubricated from the dry end lubrication system. When the reel drum bearings need to be replaced, the first items to be removed are the primary arms, because they are mounted on the bearing housings. The drum bearing housings are keyed to the reel frames to ensure proper alignment during reinstallation.

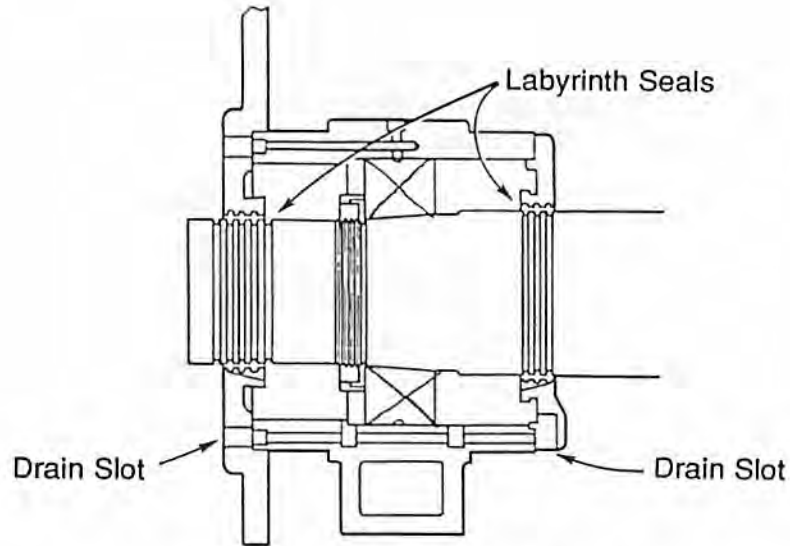


Figure 2-6. Front Drum Bearing

The drum journal is designed with hydraulic bearing removal holes. When it becomes necessary to remove taper fit bearings from the drum journals, refer to Beloit manual number N46-9645-0009, Mounting and Dismounting of Bearings.

Labyrinth oil grooves are provided in both the bore of the end covers and the outside diameter of the drum journal for oil lubrication.

Both bearing housing end covers have drain slots. Covers must be mounted with the drain slots at the bottom so oil can drain back into the housing.

For lube specs per Beloit Lubrication Recommendations, see Section 5 of these instructions.

### 2.3 Water Cooling

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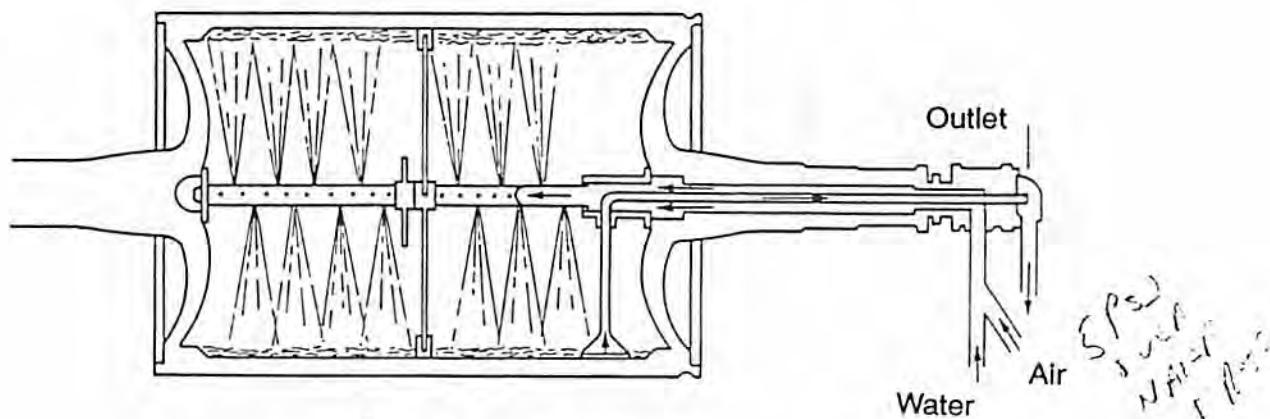


Figure 2-7. Water Cooling

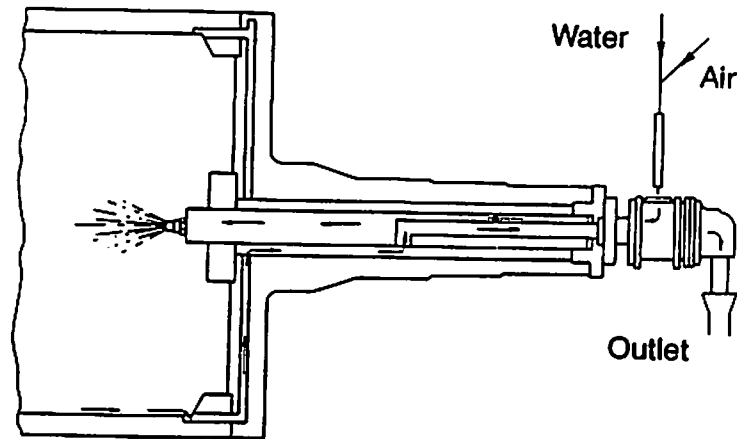


Figure 2-8. Water Cooling

Reel drums are water cooled. The water enters and exits through the front side journal. A carbon seal is used between the rotating and stationary sections of the water joint. The life of the seal is dependent on water lubrication. Turn the drum cooling water on as the drum starts to rotate. The water will help to:

1. Maintain a uniform temperature to reduce hot streaks and bands across the drum face.
2. Prevent the drum from going out of round (warping).
3. Reduce sheet temperatures in the built up paper log.

### 2. 3. 1 Water Joint Installation and Maintenance

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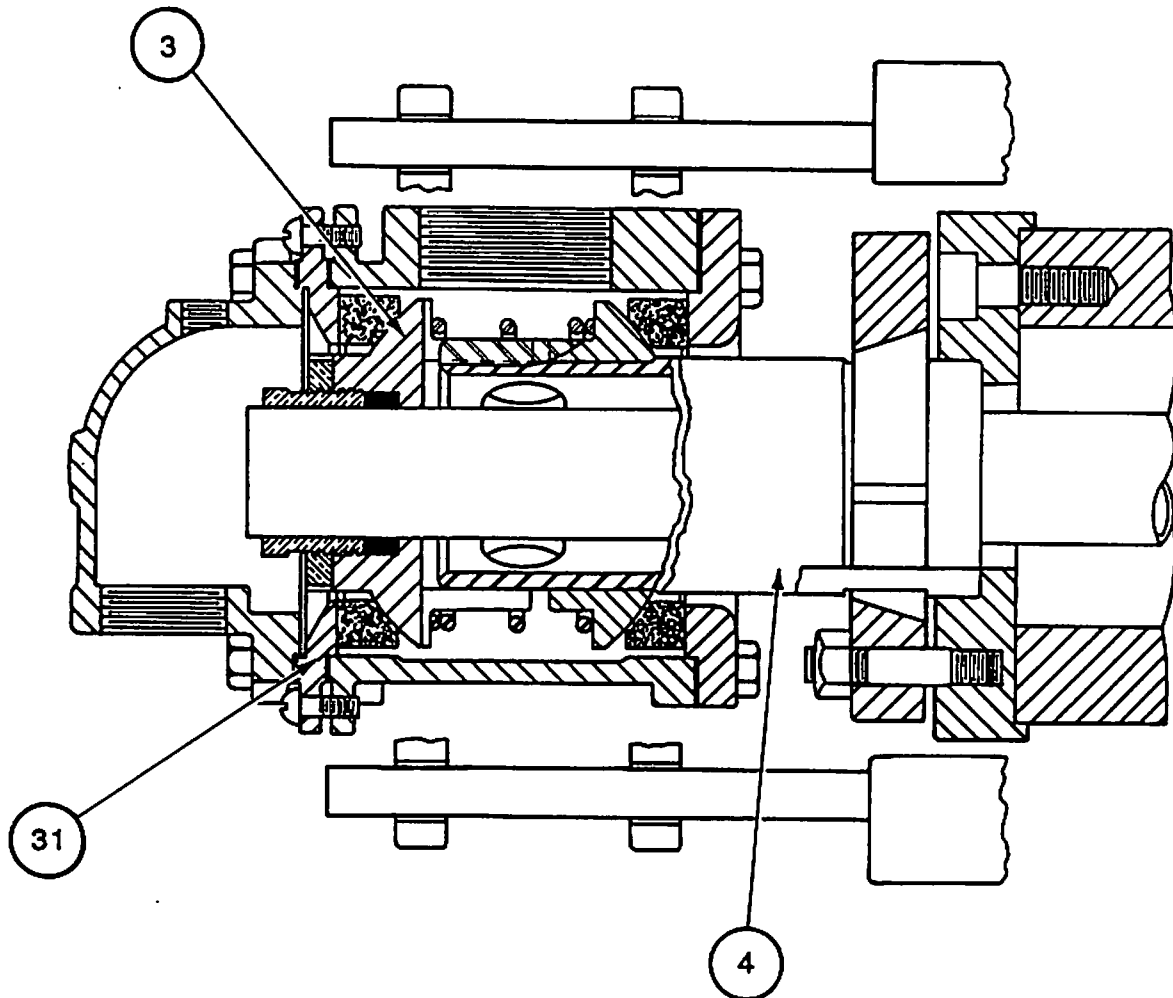


Figure 2-9. Cross Section of a Joint

The inner rotating syphon pipe should be connected to the inside of the roll and be driven by the roll or rotary syphon. It should project through the packing gland of the joint enough to extend slightly beyond the gland but not enough to touch the head.

It is necessary that this pipe be straight and true, affixed within the roll so it is concentric, otherwise strains will be set up on the internal parts causing leakage and ring breakage. It must be clean and smooth where it rides in the gland packing.

Remove the head but leave the assembly plate (31) attached. Remove the packing nut and gland. Slide the joint over the inner pipe being careful when the pipe passes through the opening in the thrust collar (3). Fasten the nipple (4) to the journal flange.

Using the packing furnished, pack the internal pipe in the thrust collar and tighten the packing gland just enough to seal but not so tight as to lock the pipe. Keep in mind that the rotary joint must be free to move endwise along the pipe with expansion and to compensate for seal ring wear.

Use a suitable support and mount the rotary joint to it. Pay special attention to their alignment. Be sure the rotating nipple and thrust collar are concentric where they pass through the wear plate and assembly plate.

Joints must be connected to the piping with flexible metal hose, preferably bronze or stainless steel. The hose lengths should be such that there is no binding or tension crowding the joint toward the roll. The joint must be reasonably free to move endwise to compensate for seal ring wear. Though rarely required, some installations call for two pieces of hose. One piece in the vertical and one piece in the horizontal leg to each connection will allow maximum movement to hose, connecting piping and joint, and give maximum relief to pipe strains.

To eliminate scoring of the carbon graphite seal rings as well as damage to the internal joint parts, be sure that all core sand, dirt, welding beads, pipe turnings, metal dust and other foreign matter has been removed from the roll, or cylinder before the joint is installed. This extra precaution prior to installation will eliminate unnecessary down-time and maintenance.

The stop rods should be Schedule 80 pipe. It is recommended that not more than two joints be joined with one stop rod.

#### NOTICE

Do not burden the joint with the weight of pipe and fittings. Connect the hose directly to the joint - provide suitable support for the pipe and fittings beyond the hose.

#### NOTICE

Do not run the joints dry - the saturated steam, the condensate or the liquid passing through is the only lubrication for the carbon-graphite parts.

If leakage occurs:

1. Check the hose for binding and crowding.
2. Check for dirt or pipe turnings inside the joint, especially on new installations.
3. If the machine has been idle, rust or similar deposits may have accumulated on the rotating surfaces. Cleaning or scraping these surfaces will usually suffice.

#### NOTICE

If the mineral or iron content of the water is high and deposits accumulate rapidly, it would be well to consider special material construction.

4. Check the seal rings periodically for wear. If the ring wears too thin the nipple will rub on the body, causing unrepairable damage.

**⚠ CAUTION**

The rotary joint should be checked on a regular basis to determine seal ring wear. Should the carbon seal ring wear completely away, the metal nipple can wear into the body and eventually through it allowing the rotary joint to be blown off the machine!

### **2. 3. 2 Parts List - Typical Joint**

Information required to order repair parts includes:

1. Size and type of nipple
2. Type of joint
3. Type of construction



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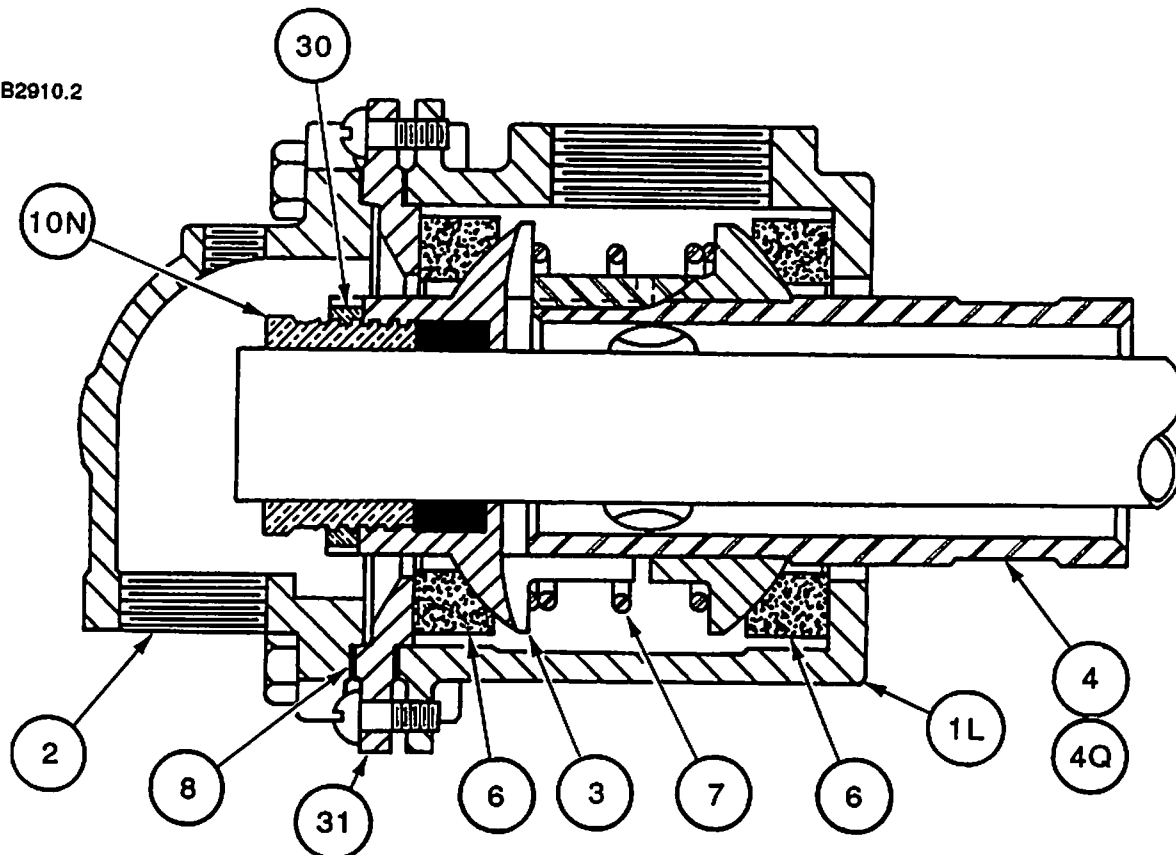


Figure 2-10. Joint With One Piece Body

Part No.	Description
1L	One Piece Body (150 psi)
2	Head
3	Thrust Collar (Specify "S" for Syphon Pipe Size)
4	Threaded Nipple (Specify Right or Left Hand)
4Q	Quick Release Nipple
6	Seal Ring
6G	"Green Streak" Seal Ring
7	Spring
7S	Stainless Steel Spring
8	Gasket
10N	Gland (Specify "S" for Syphon Pipe Size)
30*	Lock Nut
31	Assembly Plate

\*Joints 3-1/2" and smaller use a screwed type gland with lock nut.

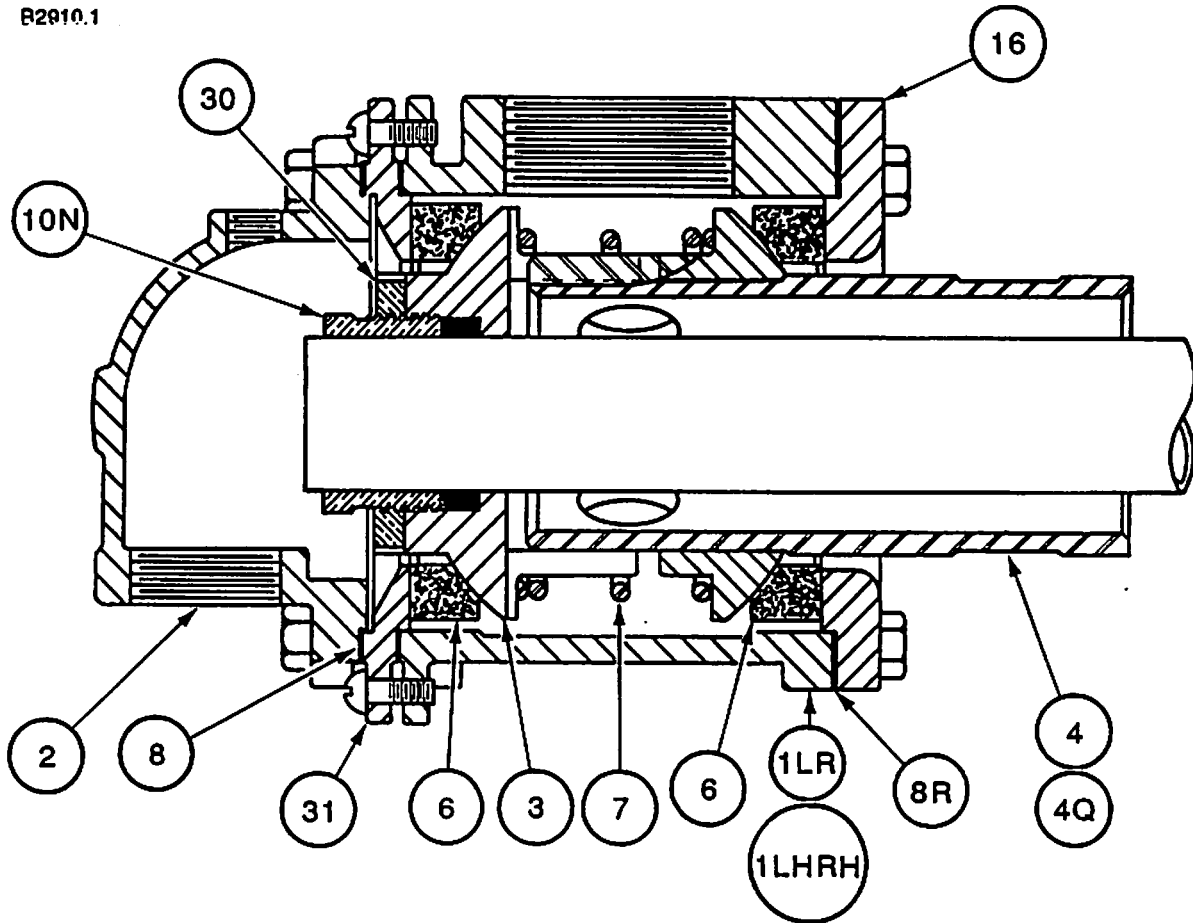


Figure 2-11. Joint With Renewable Wearing Plate

Part No.	Description
1LR	Body (150 psi) with renewable wearing plate
1LHRH	Body (250 psi) with renewable wearing plate
2	Head
3	Thrust Collar (Specify "S" for Syphon Pipe Size)
4	Nipple (Specify Right Hand or Left Hand)
4Q	Quick Release Nipple
6	Seal Ring
6G	"Green Streak" Seal Ring
7	Spring
7S	Stainless Steel Spring
8	Gasket
8R	Full Face Gasket
10N	Gland (Specify "S" or Syphon Pipe Size)
16	Renewable Wearing Plate
30*	Lock Nut
31	Assembly Plate

\*Joints 3-1/2" and smaller use a screwed type gland with lock nut.

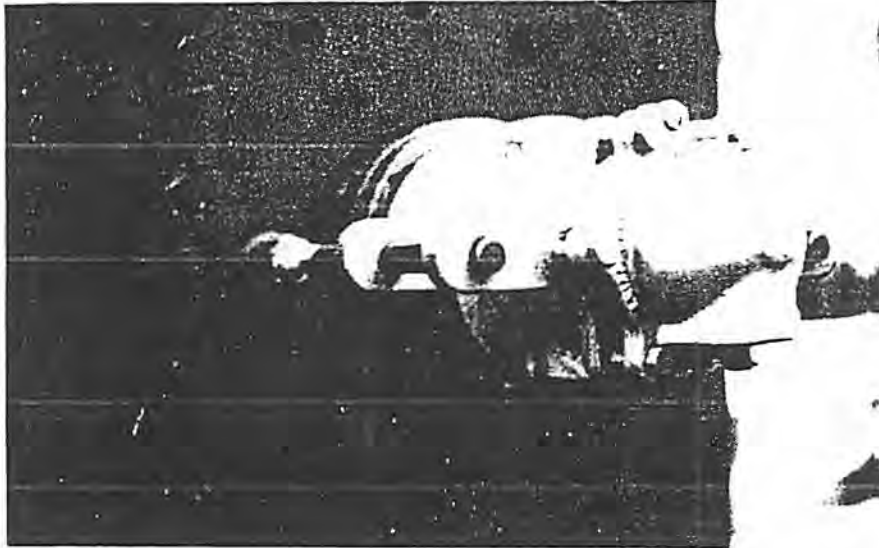


Figure 2-12. Reel Drum Water Joint

To assist the evacuation of water from the drum a differential air pressure is required. To accomplish this a greater air pressure is added to the inside of the reel drum than atmospheric air pressure outside the drum.

1. For speeds of 3000 fpm or greater, the water cooled drum must be pressure coded due to the air pressure required to evacuate the water.

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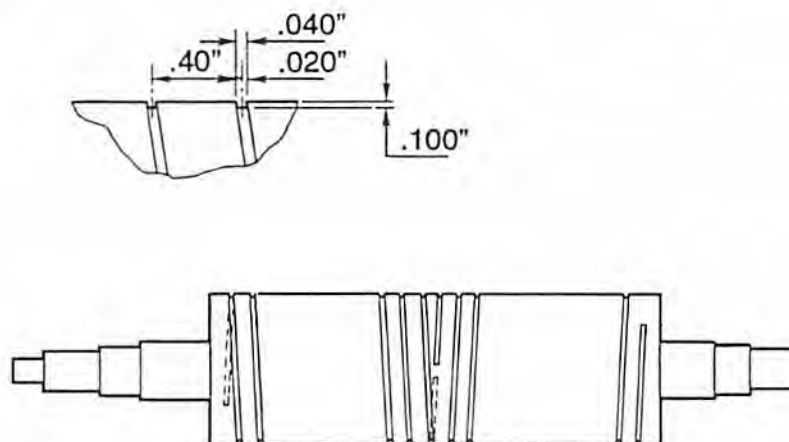


Figure 2-13. Drum Grooving

2. For speeds of above 2000 fpm, the drum is normally spiral grooved to allow air traveling under the sheet to evacuate and allow the sheet to lay flat on the drum. This helps build a good paper log.

Drum Grooves: .4" centers; .020-.040" wide; .1" deep.

Regroove the drum when groove depth is worn to 50%. The groove must be periodically cleaned because of buildups of paper dust and particles.

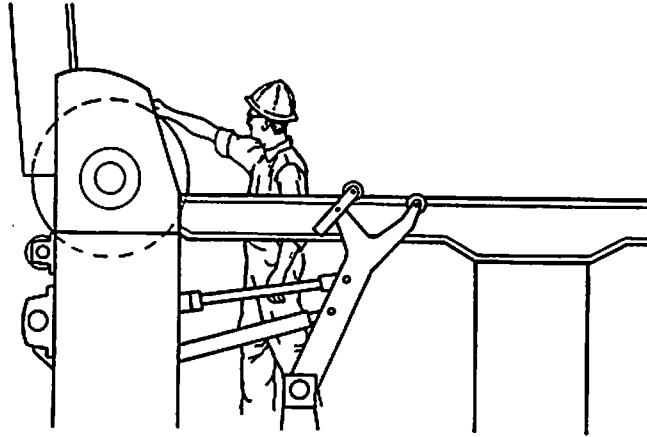


Figure 2-14. Reel Drum Alignment Check

## 2. 4 Drum Alignment Check

**Operation:** Level Across Machine

**Tolerance:** .002 Per 100 Inch Roll Face

**Operational Problems:** Possible Sheet Wrinkling and Weaving

**Procedure:** 1. Check with optical level on Top Dead Center and at 90 degree points of rotation.

**Correction:** 2. Shim under drum bearing housing.

**Operation:** Squareness to the Calender King Roll

**Tolerance:** Not to Exceed .005 Inch

**Operational Problems:** Possible Sheet Wrinkling and Weaving

**Procedure:** 1. Locate established square line or drum and set drum to same.

**Correction:** 2. Shift front side of main reel frame in machine direction.

## 2.5 Drum Doctor

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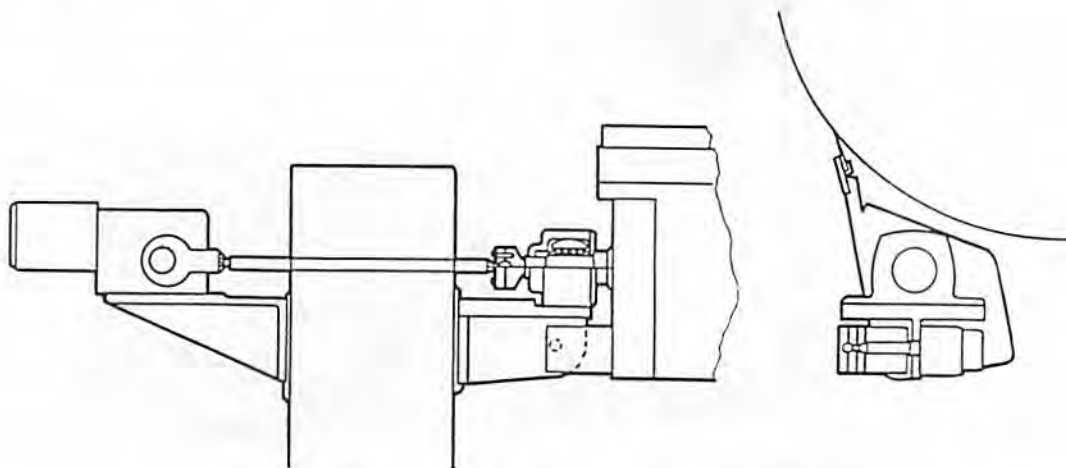


Figure 2-15. Doctor Oscillator and Loading

The reel drum doctor shown in *Figure 2-15* is air cylinder loaded and electric motor oscillated. Normal blade pressure on this doctor should be 1/2 pli with a maximum of 1 pli. If the operators need to use more than this, identify the problem and correct it. Remove and discard the doctor blade if it is worn or damaged. A worn or damaged blade can cause hot spots on the roll and allow the paper to wrap the drum.

### NOTICE

Doctor oscillation is not required on spirally grooved reel drums.

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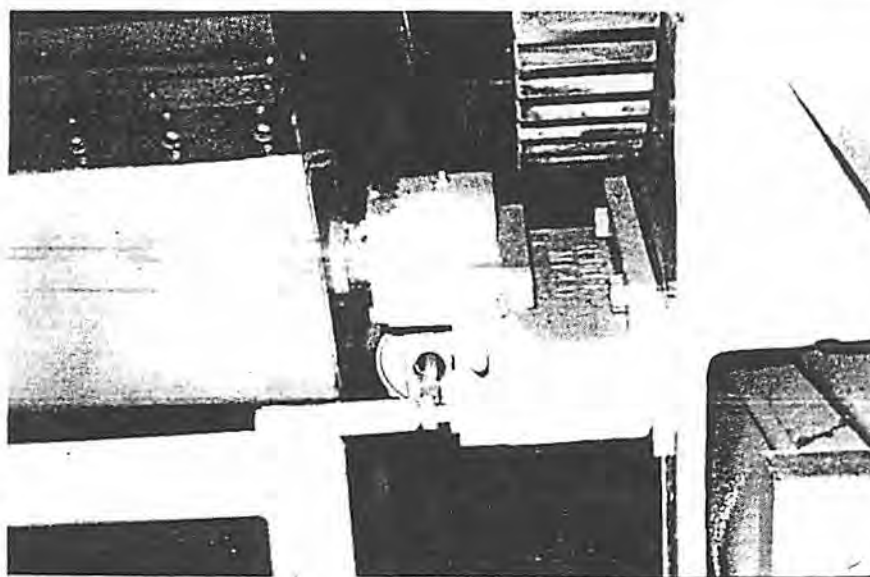


Figure 2-16. Drum Doctor Mounting

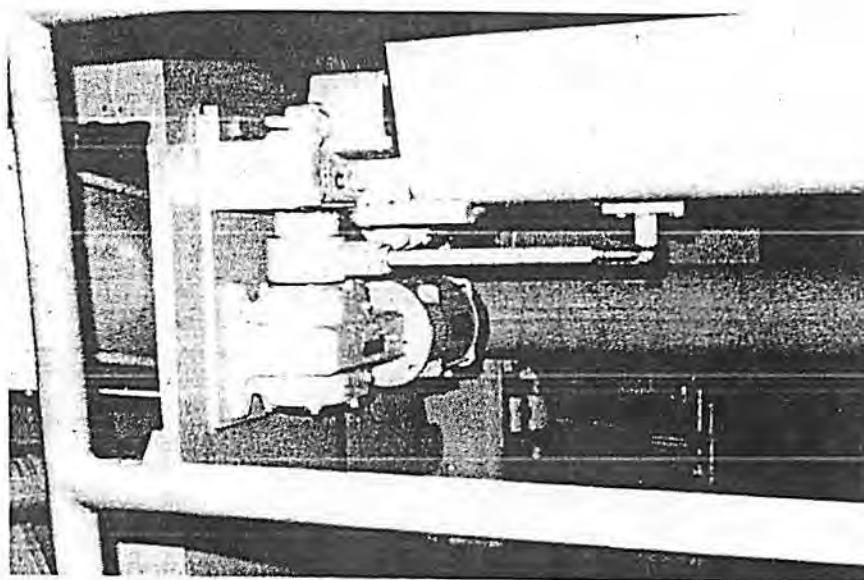


Figure 2-17. Reel Doctor Oscillator and Motor

Inspect the doctor assembly, including the blade holder, loading air cylinders and oscillator. Replace a damaged blade holder. Replace all damaged and missing microadjusting screws. Repair or replace damaged or worn cylinder rods and casings, pivots and leaking rod packing and hose connections on the loading air cylinders. Repair or replace inoperative motor and loose or worn eccentric bearing on the oscillator.

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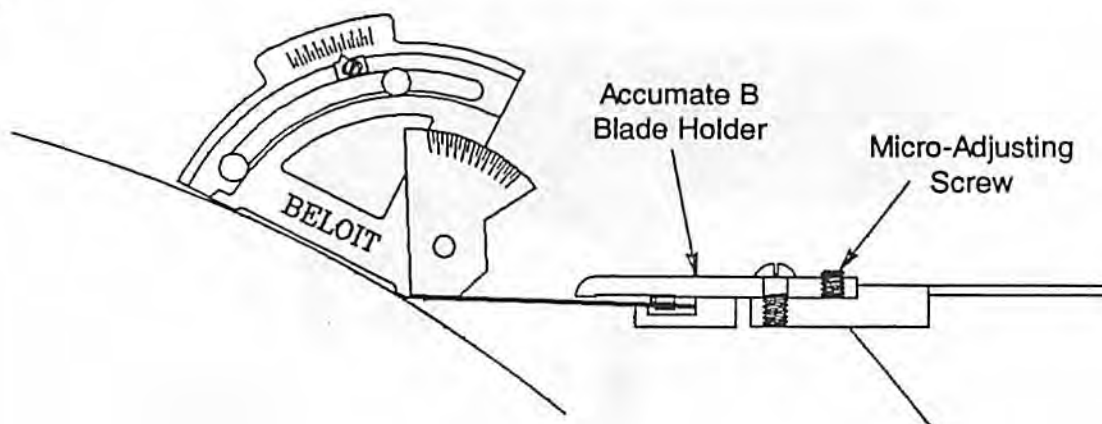


Figure 2-18. Beloit Blade Angle Tool &amp; Accumate B Blade Holder

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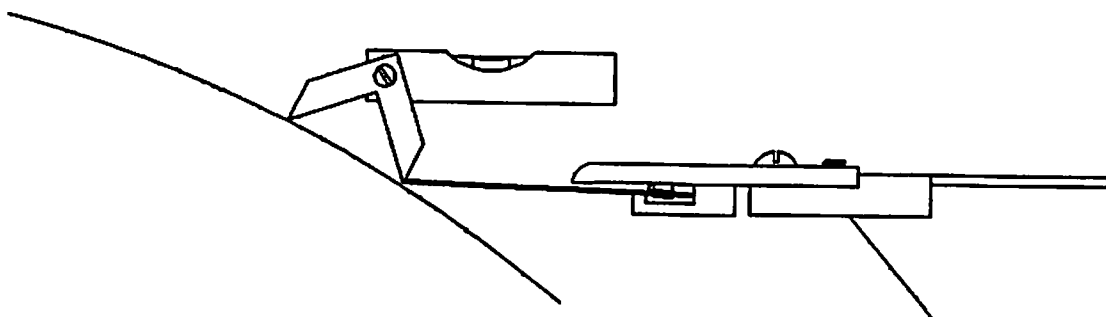


Figure 2-19. Doctor Level Tool

Check the doctor for angle, level and blade fit whenever installing a new blade and when the doctor is not performing adequately. Check the blade angle with a blade angle protractor and set at 25 degrees from roll tangent.

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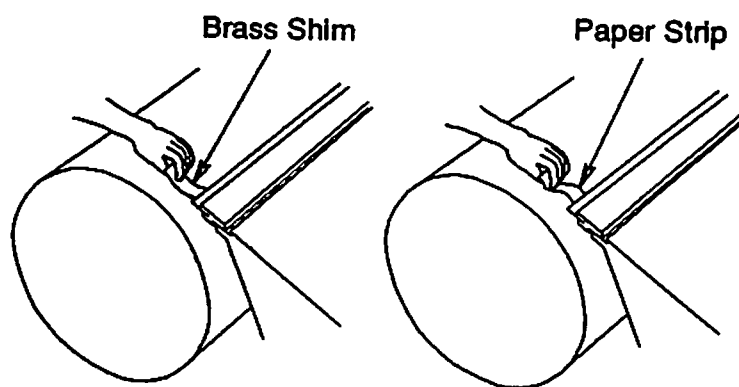


Figure 2-20. Checking Blade Pressure

## 2. 6 Reel Drum Doctor Maintenance Checklist

Operation: Blade Contact with Drum

Operational Problems: Sheet Wraps Drum, Uneven Blade Wear

Angular Location: 1. Check location and contact angle of blade for agreement with Beloit assembly drawing.

Uniform Contact: 1. Check for uniform pressure against drum.  
a. Load blade at approximately zero pli pressure.  
b. Place narrow strip of .005" thick shim stock between blade and drum. Slide Shim across full length of drum, noting pull required to do so. Light and hard pulling indicate loose and heavy loading, respectively.

2. Adjust to uniform pressure against drum.  
a. Turn micro-adjusting screws appropriately in areas which need adjustment.  
b. For holders without micro-adjusting screws, use shims as required.

## 2. 7 Primary Arms

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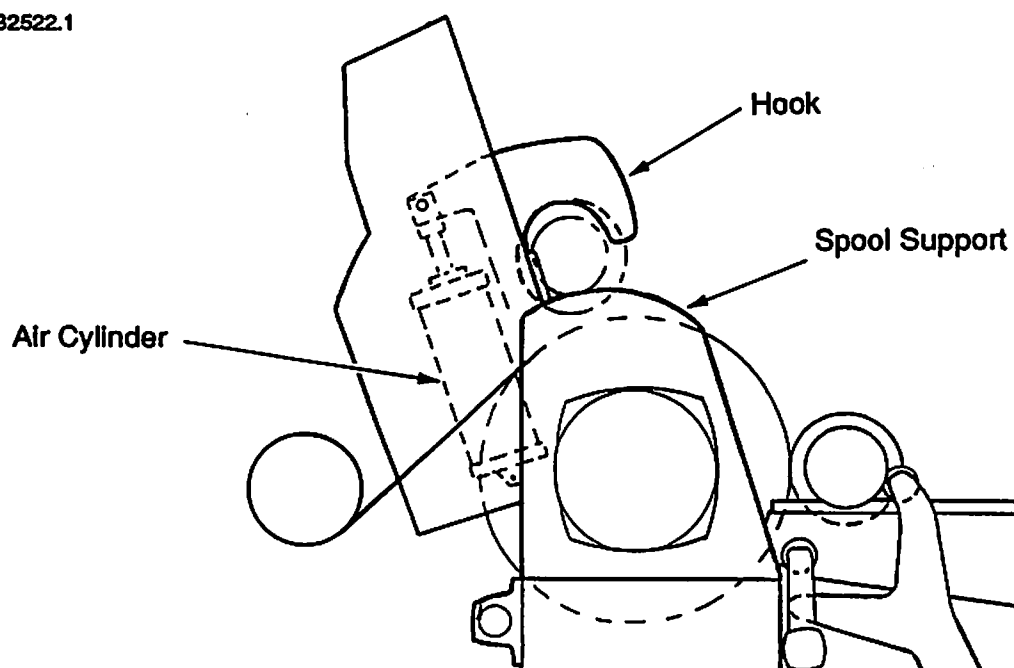


Figure 2-21. Reel Primary Arms



The primary arms receive the empty spool, position it into location for turn-up and transfer it to the rails for log building. The primary arms contain air loaded hooks which hold the spool against the spool supports and drum. There are control interlocks for safe operation that prevent unloading the hooks at the wrong time and dropping the spool.

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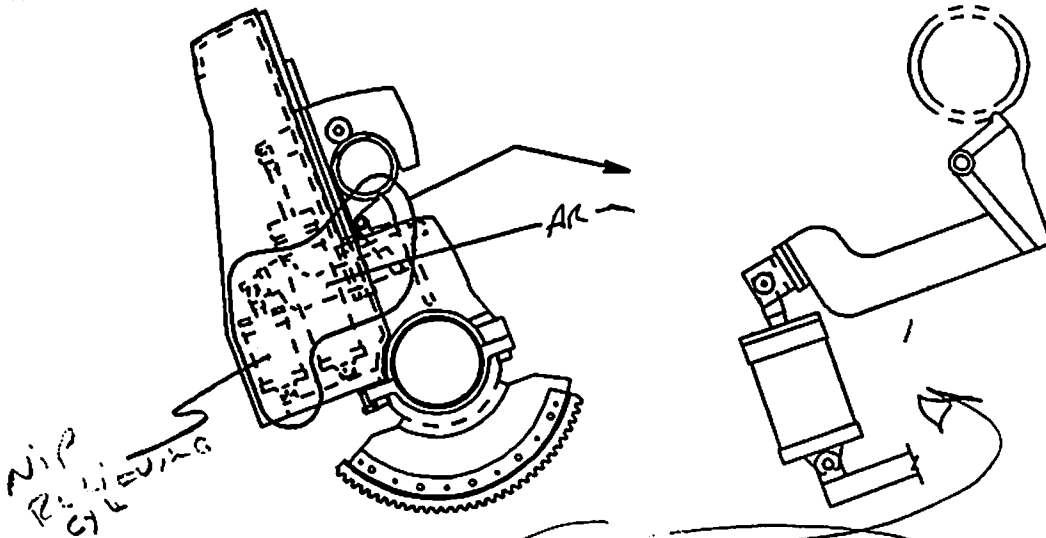


Figure 2-22 Primary Arm Nip Relieving

There are two distinct motions involving the primary arms.

1. The hooks slide within the primary arms, activated by air cylinders mounted inside the arms (see Figure 2-22). The sliding surfaces to be lubricated with a dry lubricant to eliminate a buildup of paper dust. This contamination can cause a jerking sliding motion of the hook and possible wearing of the slide surfaces. Periodic cleaning and relubrication of the sliding surfaces are required. Check the air cylinders occasionally for leaking packing and air connections, worn or bent cylinder rods and worn pivots. Small shear pins are used in the cylinders to act as a safety device in case the hooks become restricted and can not be operated to the unload position when a spool building paper log is on the secondary rails.
2. The primary arms rotate around the reel drum bearing housings. Gear segments are fixed to the lower portions (caps) of the arms which are driven by two pinions mounted on a cross shaft. Grease the pivot fit between bearing housing and primary arms regularly to prevent undue wear. Grease fittings for this are provided (see Figure 7-9).

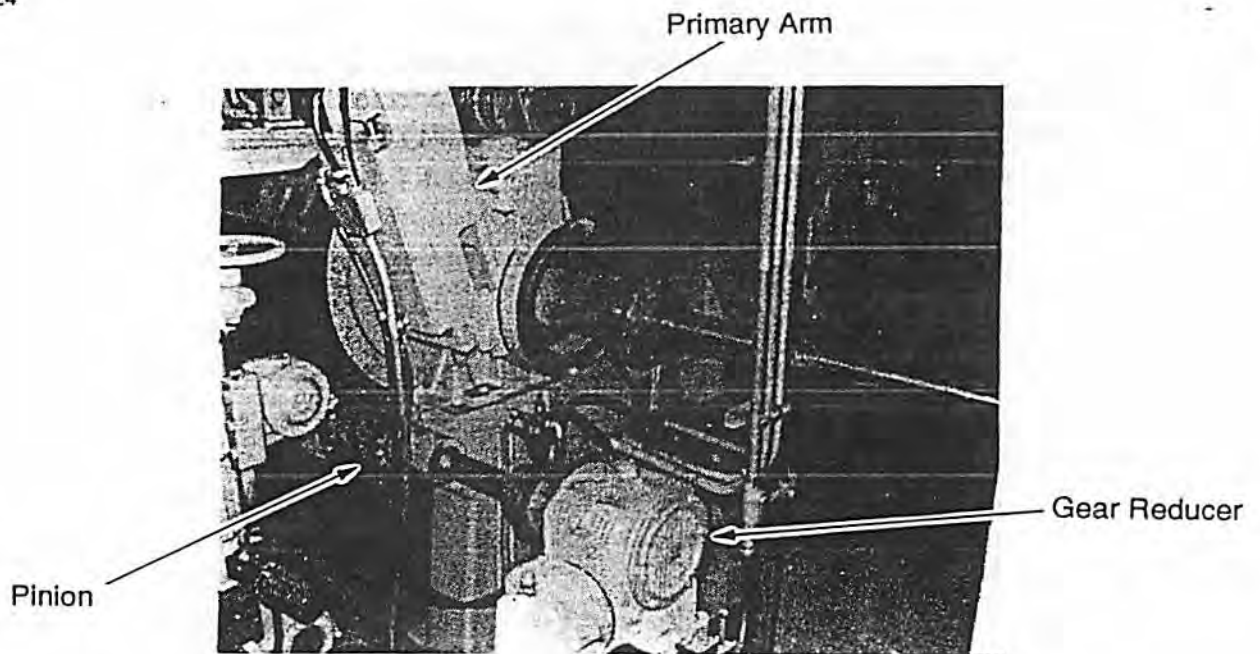


Figure 2-23. Primary Arm Drive

The primary arm cross shaft drive consists of an electric magnetic brake motor and gear reducer which drive the shaft through a torque coupling (slip clutch).

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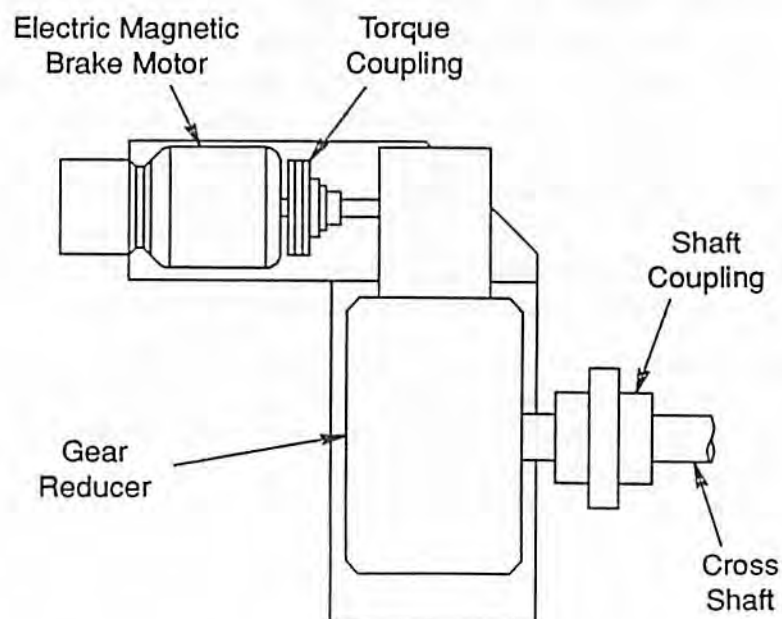


Figure 2-24. Primary Arm Cross Shaft Drive

## 2. 8 Electric Magnetic Brake Motor

### 2. 8. 1 Maintenance

**Purpose:**

The brake motor stops and holds the primary arms when the motor current is shut off. Many brake motors are self-adjusting and those that are not have a wear indicator to show when adjustment is necessary.

**Operational Problems:**

Inability to Stop and Hold Maximum Transfer Log Slightly above Rails

**Procedure:**

1. In order to check the brake properly, it will be necessary to have a maximum diameter transferable log to work with.
2. If the brake is set correctly, it should be possible to stop and hold this log slightly above the rails.
3. Possible causes of slippage: excessive lining wear, oil or grease on lining, improper brake adjustment.

**Correction:**

1. Read instructions (usually printed on or inside brake cover) and proceed accordingly.

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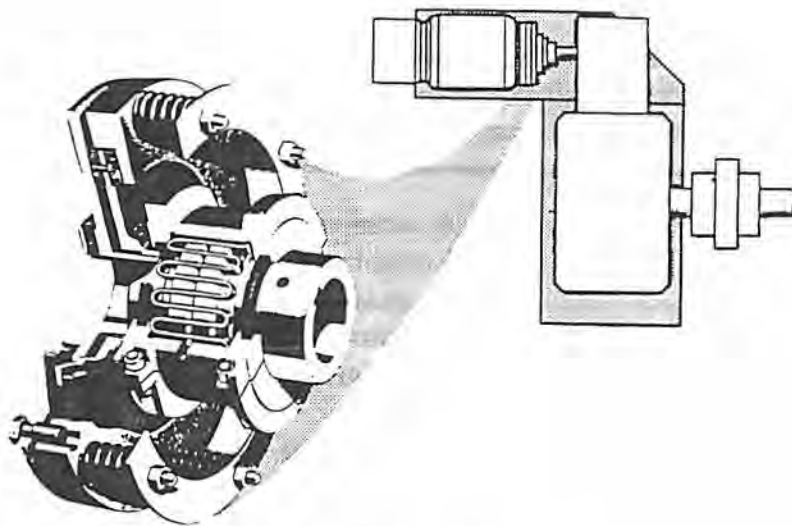


Figure 2-25. Torque Coupling

## 2. 9 Drive Motor Coupling Check-Out

Operation:	Torque Coupling Adjustment (Electric Motor Drive)
Operational Problems:	Inability to Stop and Hold Maximum Transferable Log Slightly above Rails
Procedure:	<ol style="list-style-type: none"><li>1. Although the coupling is usually set at the supplier's factory and supplied with spring spacers, it has been found that its torque capacity is not always correct, due to several factors.</li><li>2. In order to set the torque coupling properly, it will be necessary to have a bare spool in the primary arms and resting on the rails.</li><li>3. Loosen the springs (keeping uniform spacing between plates) until torque coupling slips instead of lifting spool.</li><li>4. Retighten springs approximately 1/16" to 1/8", depending on size of torque coupling (keep plate spacing uniform), so that empty spool can be lifted from rails to fully raised position.</li></ol>

### Notice

If the torque coupling is set only tight enough to lift an empty spool, it will usually not slip while lowering a built up spool, due to efficiency loss through the double reduction gear reducer.

Correction:	<ol style="list-style-type: none"><li>1. If, after start up, the torque coupling slips while the motor brake is trying to stop the primary arms approaching the rails, tighten the coupling springs until the coupling does not slip under such conditions.</li></ol>
-------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### ⚠ Caution

A torque coupling that is set too tight is no longer a safety device.

2. Other causes of slippage are excessive lining wear and oil or grease on the lining material. In the last case, remove friction plates and clean them in Stanisol or other suitable solvent. Reinstall plates at light spring pressure and force to slip for short periods; DO NOT allow them to overheat. Re-adjust springs as described previously.

The torque coupling is protection against limit switch failure to turn off the primary arm drive motor in the fully raised or lowered position. It allows slippage between shafts to prevent gear segment breakage.

## 2. 10 Primary Arm Alignment

True alignment is done with optical equipment. The field methods described below will be close.

Due to spool loading shock loads against the primary arms the capscrews or nuts that hold the top and bottom sections of the arms together occasionally come loose. The same holds true for capscrews in the drum bearing housing areas. Check all of these and the framework mounting capscrews regularly for tightness. Check the primary arm gear segment and cross shaft pinion gear backlash. This clearance should be between .005 and .015". Do this both on the front and back sides. This is the first step in checking primary arm alignment.

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Figure 2-26. Drum Bearing Housing Area

## NOTICE

Align primary arms and rails in conjunction with each other.

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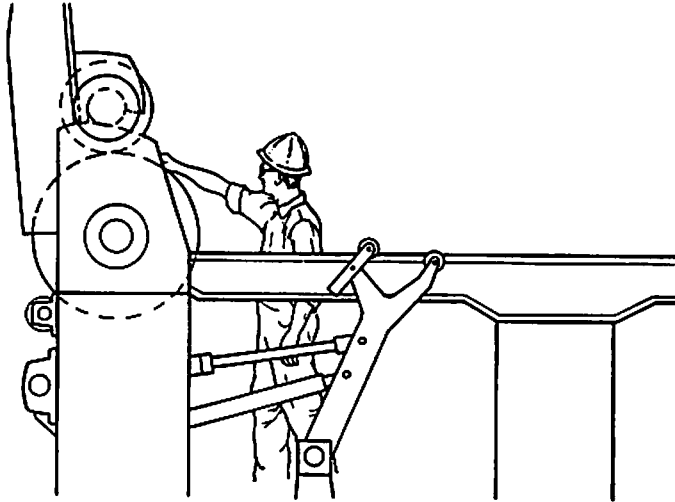


Figure 2-27. Primary Arm Alignment Check

Operation: Parallel to Each Other

Tolerance: Within .010"

The primary arms must remain in proper alignment front to back. Misalignment causes sheet wrinkling, breakage, gauling and missed turn ups.

Check primary arm alignment on a regular basis. With a spool in the arms in the fully raised position, lower the spool towards the drum until a minimum of light may be viewed between the spool and drum. This clearance front to back is to be within .005 inch.

The spool is then lowered to within .020 inch contact with rails. This should be maintained with a .005 inch tolerance between the reel spool bearing housing and the rail.

To correct alignment:

Cross-shafting timing takes place at this time.

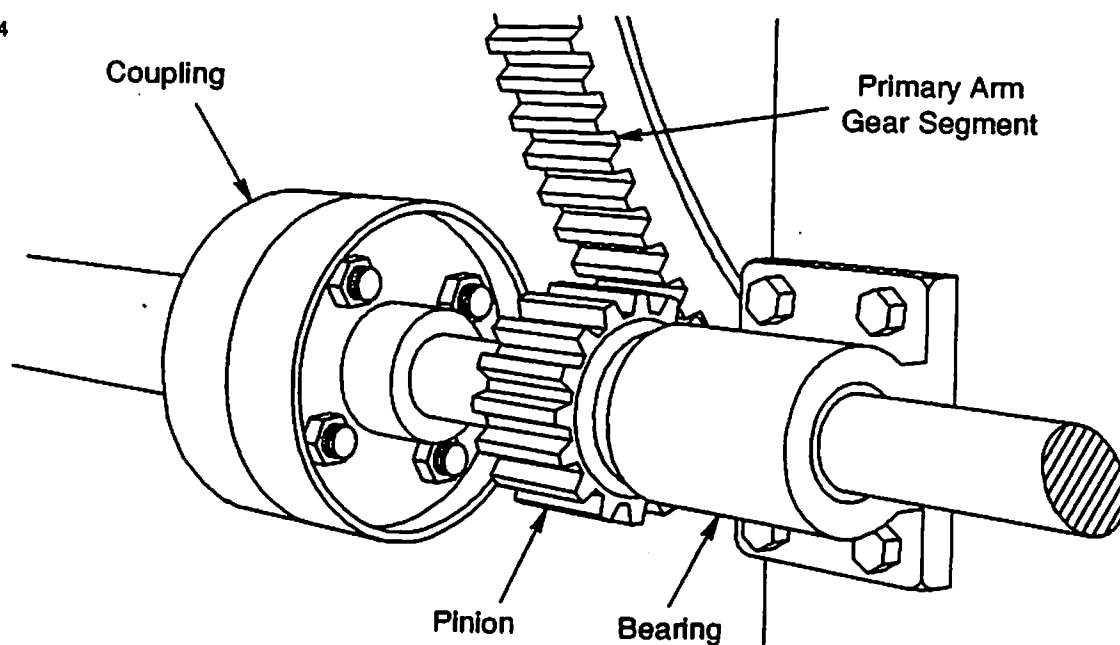


Figure 2-28. Primary Arm Drive Cross Shaft Coupling

1. Cross shaft coupling.

- a. Remove bolts from the coupling. This frees the primary arms. Align the primary arms.
- b. Clamp coupling halves together and match mark.
- c. The spool is then checked at the minimum light position. The tolerance of .005 inch level must be maintained.
- d. The spool is then lowered to within .020 inch of contact with rails. This should be maintained with .005 inch between the reel spool bearing housing, and the rail.
- e. With the spool on rails, and in contact with the drum, the spool is checked for level and square. Tolerance should be:

Level: .002 inch per 100 inch roll face

Square: Determined by drum as spool is in contact

- f. Check alignment after cycling arms up and down several times.
- g. Drill coupling for clamp bolts, bolt together, recheck alignment and dowel in place.

On tissue operations the primary arm gear segment and cross shaft pinion gear nips should be checked weekly. Keep paper dust and broke from building up in the gear teeth. Excess dust and broke can cause shearing of the capscrews and taper pins that hold the cross shaft in place. Some mills have added a small air blow pipe near the nip to keep contamination out. Air comes on when primary arms are activated. Beloit offers a variety of gear guards, one is shown below.

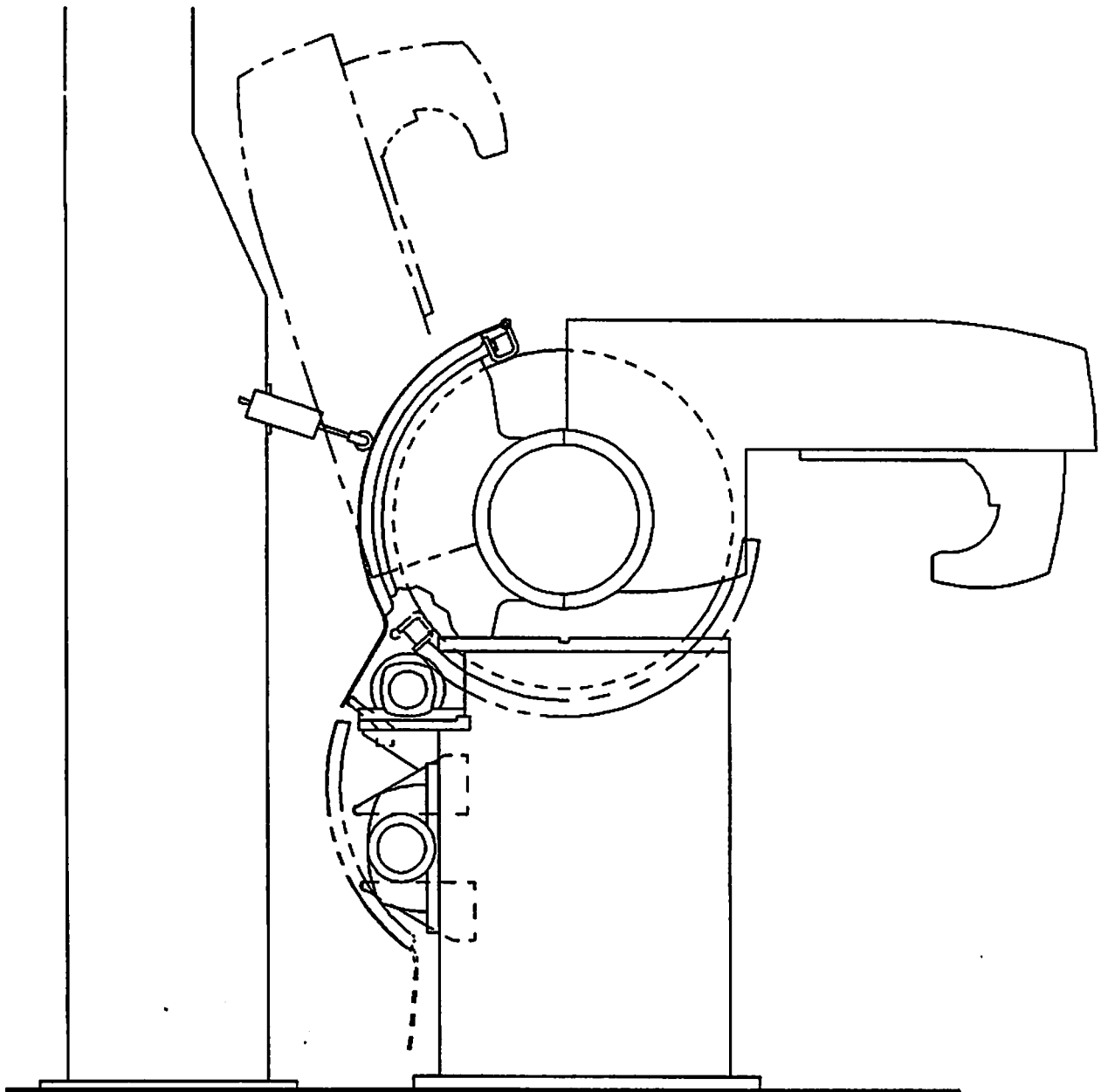


Figure 2-29. Gear Guard

This guard is used primarily on tissue applications. It is designed to be simple in operation and to keep paper dust and dirt out of the primary arm cross shaft pinion and gear segment nips.

When the primary arms are lowered, the gear segments move the guards into position. The guard will protect the nip and gear segment when the segment is in position to collect the most contaminants.



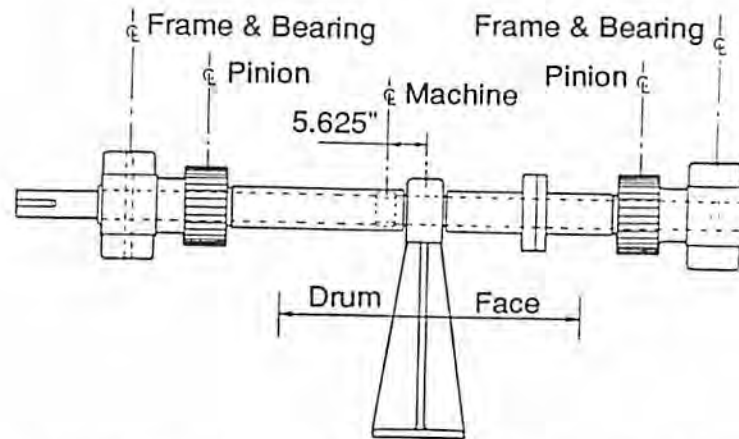


Figure 2-30. Primary Arm Drive Cross Shaft Alignment

Some primary arm cross shafts are supported by a stand in the middle. This eliminates deflection problems that can cause the pinion gears to bind and inhibit movement of the primary arms.

Position and anchor primary arm air cylinder hoses and limit switch wiring so as to prevent them from being caught in the cross shaft pinion gear nips and mechanical stops.

B1080.21

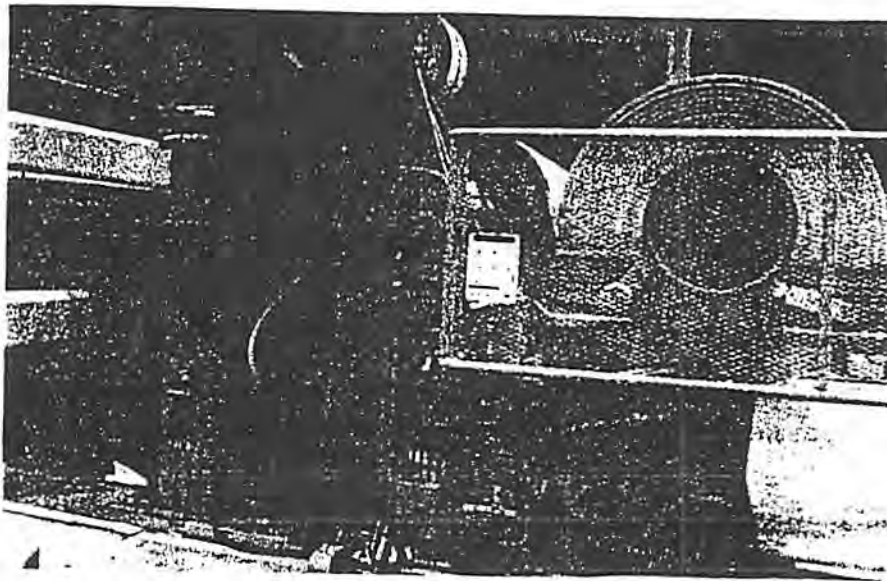


Figure 2-31. Primary Arm Piping

Wear can occur between the primary arms and the drum bearing housings due to loose screws or nuts holding the top and bottom portions of the primary arms together. This produces a galling effect. Wear occurs if lubrication is inadequate and due to normal friction from use.

A rebuild is available to insert replaceable bushings between the arms and housings.

The problems encountered by this wear is wrinkling of the sheet at turn up and/or sheet breaks during transfer to the secondary rails.

B2079

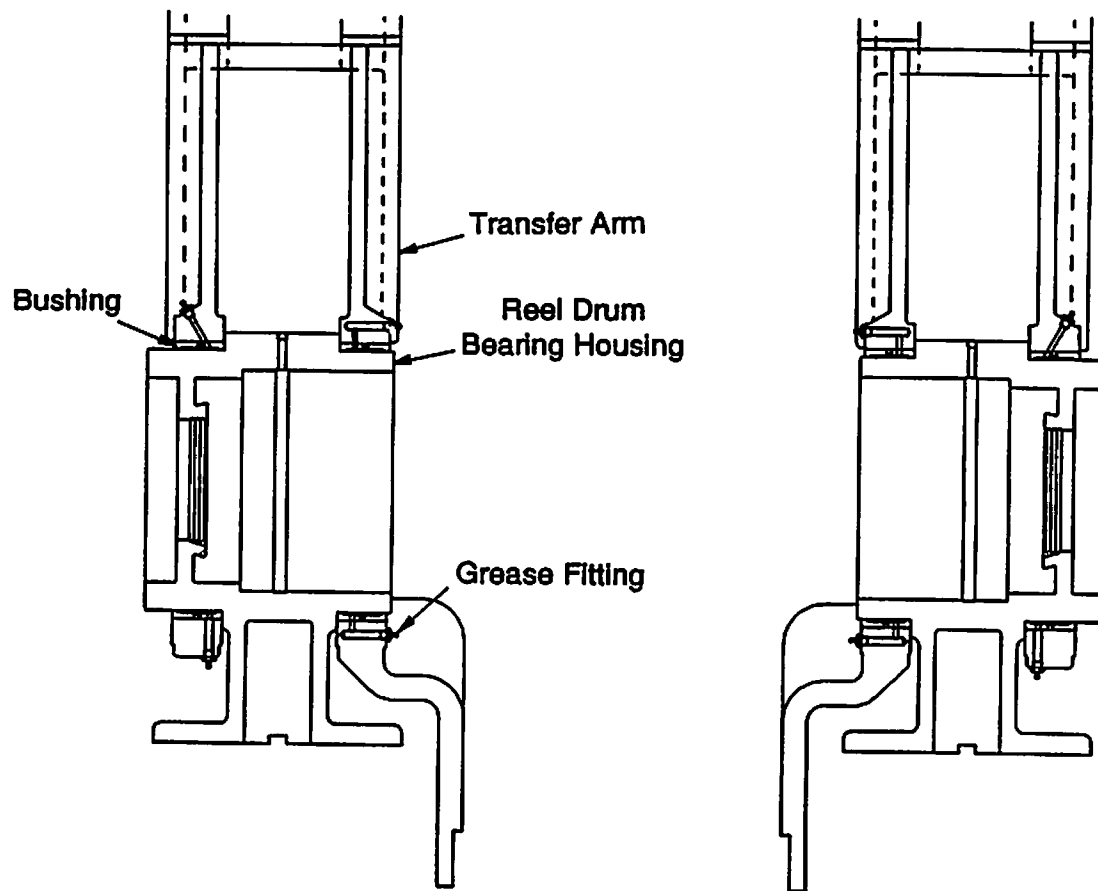


Figure 2-32. Primary Arm Bushings

## 2. 11 Spool Clearance Check

Move the primary arms down to the fully lowered position. Measure the clearance between the spool bearing housings and the hook surfaces (*see Figure 2-28 and the bearing drawing*).

Check the clearance dimensions with the spool in both the loaded and unloaded positions.

A check for the unloaded position can be made by comparing a rail to primary arm dimension at the end of the primary arms with one near the arms and the drum.

To adjust the primary arms to meet the proper clearance dimensions, adjust the mechanical stops. There are adjustable stops for both raised and lowered positions. Required clearances are found on the primary arm assembly drawings.

B2523.3

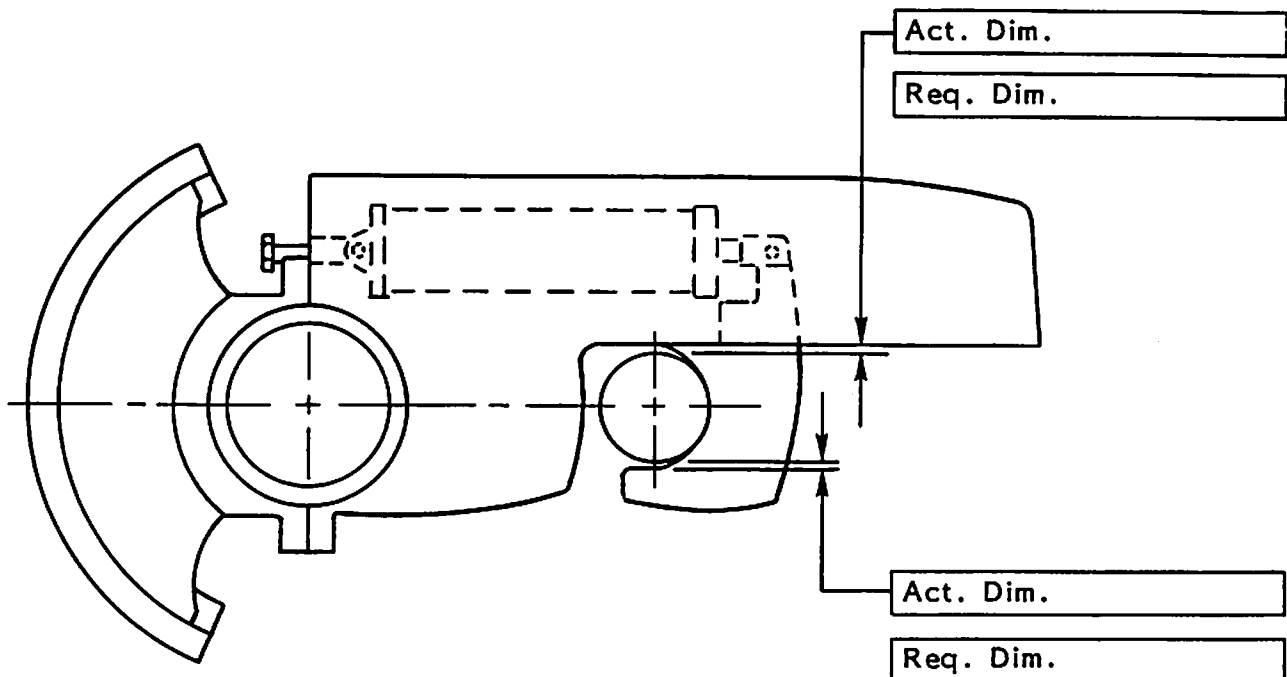


Figure 2-33. Checking Primary Arm Alignment

## 2. 12 Mechanical Stops

B2522.2

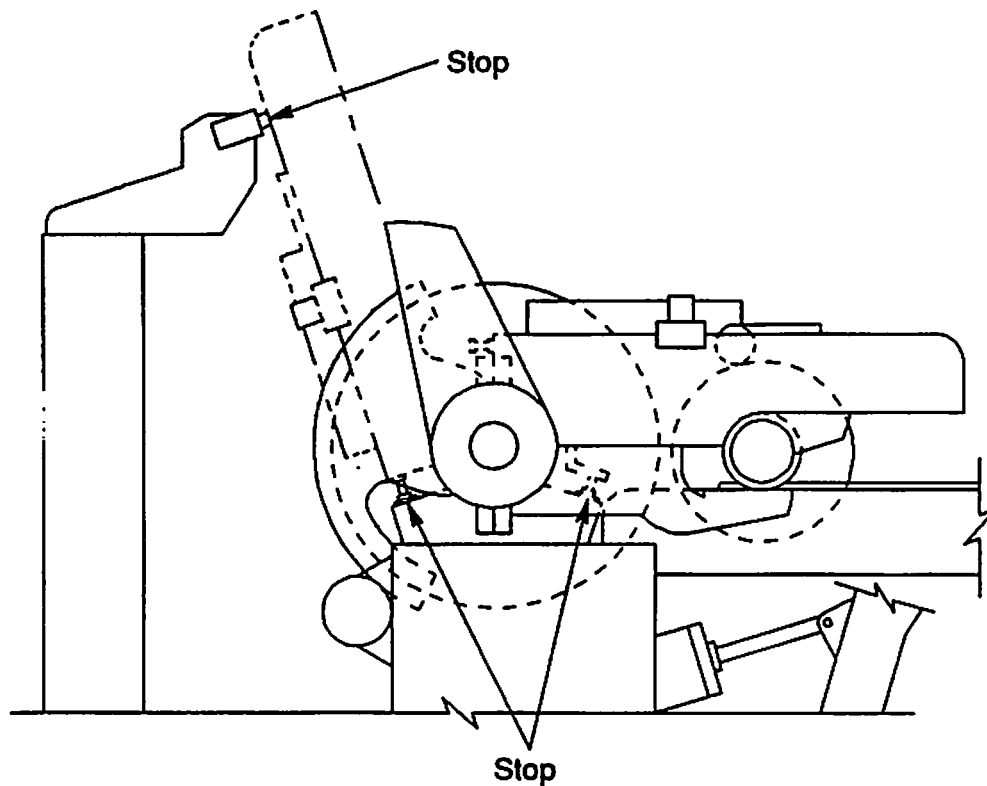


Figure 2-34. Locations of Mechanical Stops

Operation:	Mechanical Stops
Tolerance:	Within .005"
Operational Problems:	Improper Primary Arm Alignment with Rails
Test Equipment:	Level
Procedure:	<ol style="list-style-type: none"><li>1. Set the lower mechanical stops (on front and back frames) so that each arm is parallel to rail and clearances with spool are as specified on assembly drawing.</li><li>2a Fork Type. If the arms are too high, the spool bearing housing will contact the lower part of the fork as it moves out on the rails. If too low, it will contact the upper part of the fork.</li></ol>

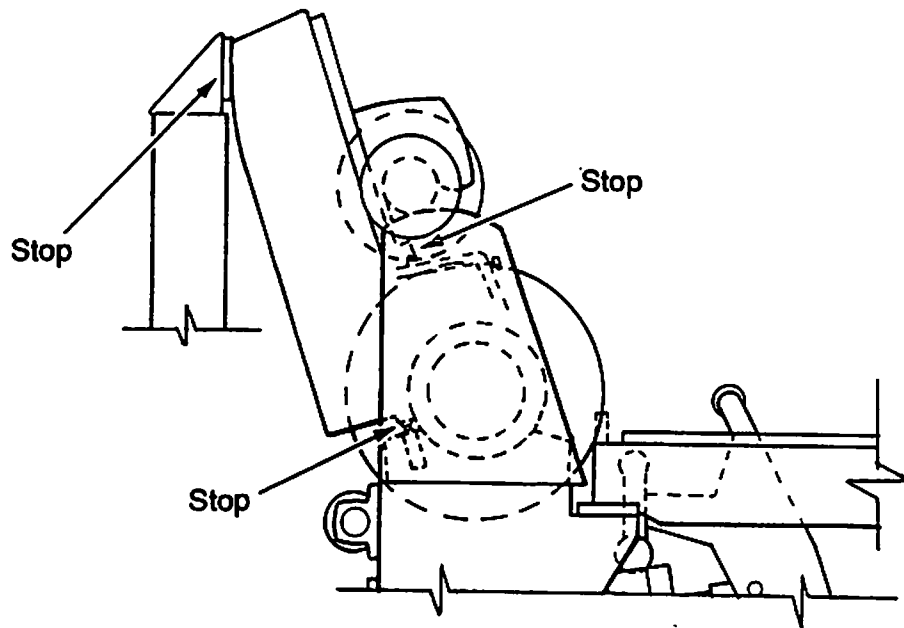


Figure 2-35. Locations of Mechanical Stops

- b. **Hook Type.** If the arms are too high, the spool weight will be carried by the hooks rather than the rails. If too low, the primary arms will bear down on the spool. Either case will cause excessive wear in the primary arm slides, may prevent the hooks from extending and cause damage and machine downtime. Check for these conditions by extending the hooks with a spool in place on the rails.
3. Set the upper stops so that both arms contact them at the same time. These stops also affect the position of the spool bearing housings on the spool supports.

**Correction:**

1. **Adjusting Screw Type.** Loosen the stop locknuts and adjust stops as required. Retighten locknuts.
2. **Solid Block Type.** Shim as required.
3. Cycle arms several times and recheck.

Since spool loading shock is the main cause for primary arm misalignment Beloit offers several solutions.

B2414.1  
B2418

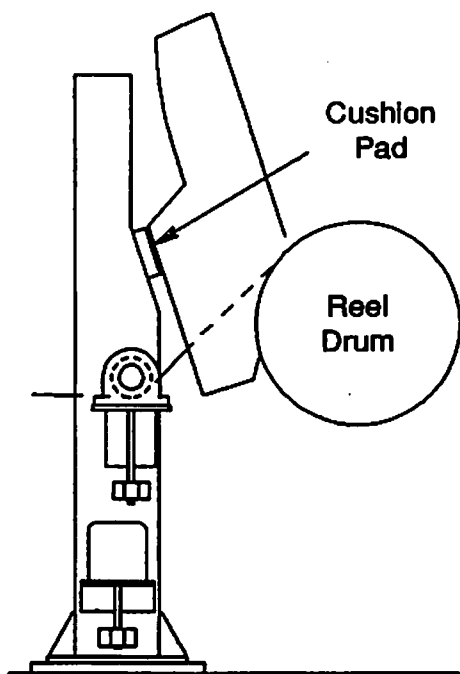


Figure 2-36. Primary Arm Cushioning

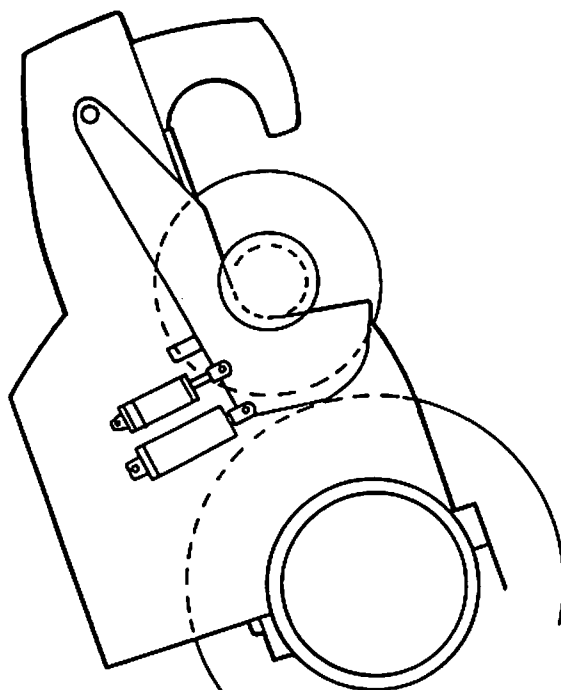


Figure 2-37. Hook Area Shock Absorbers

One sure way to eliminate banging and jolting that can occur in spool loading of the primary arms is to install an automatic spool loading system.

A7810.3

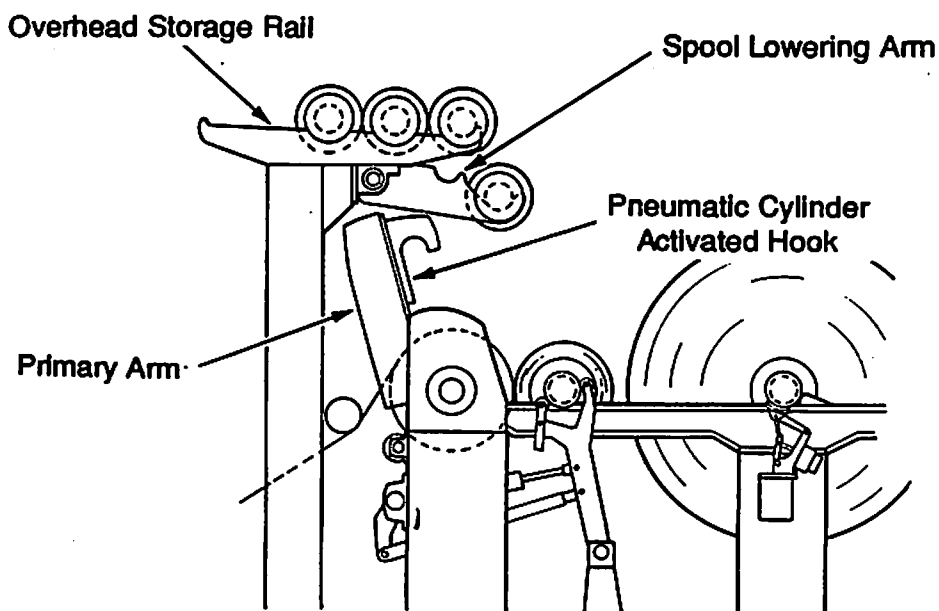


Figure 2-38. Automatic Spool Loading System

## 2. 13 Secondary Arms

B2415.2A

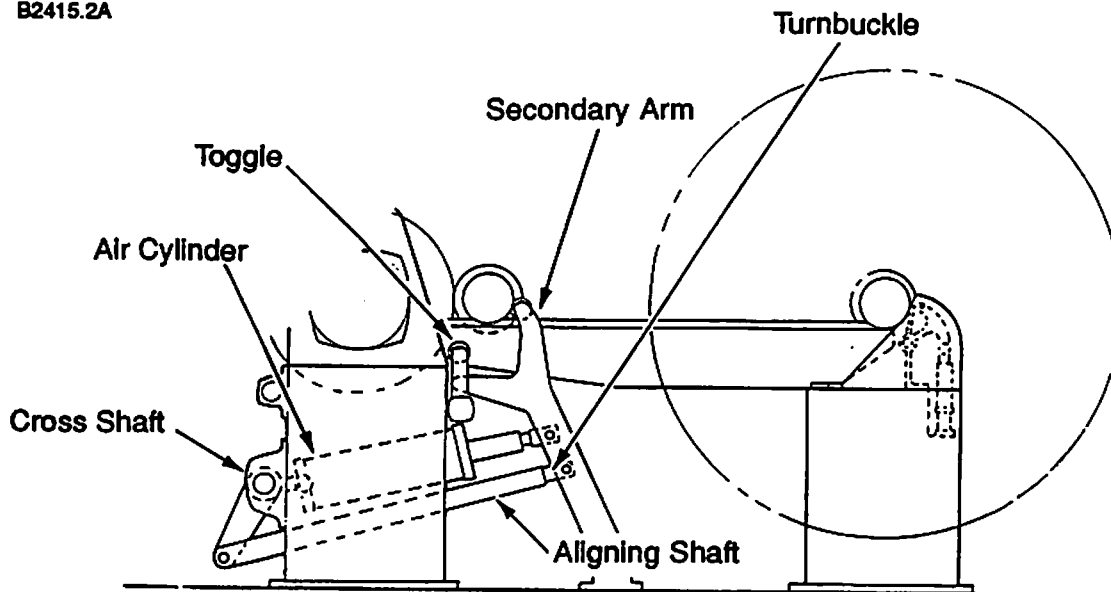


Figure 2-39. Location of Secondary Arms

The secondary arms load the paper log against the reel drum, then ejects the log to the brake position. The functioning of the secondary arms greatly influences paper quality. Double nip loading occurs when both the primary arm hooks and the secondary arms are in contact with the spool at the same time. This occurs when the primary arms have just set the spool on the rails and the secondary arms have loaded. This double nip action is controlled by a time delay relay pressure switch - keep this double loading time to a minimum.

Air cylinders, one front and one back, control the motion of the secondary arms. Check the cylinders periodically and repair or replace damaged or worn cylinder rods and casings, pivots and leaking rod packing and hose connections. The alignment of the secondary arms is just as important as that of the primary arms. The secondary arms are cross shaft connected. Newer designs have a remote cross shaft located on the wet end side of the main frame. A turnbuckle is located on the backside aligning shaft connecting the secondary arms to the cross shaft.

Align the secondary arms as follows. Load an empty spool against the reel drum with the secondary arms loading at nearly zero psi air pressure. Adjust the turnbuckle until the secondary arm rollers which contact the spool bearing housings have the same drag, front and back, when rotated.

Grease the loading rollers and toggles periodically to keep them in good condition. Flat spots worn into the loading rollers will cause uneven loading. If the toggles don't function properly, the finished paper log will not be ejected from the secondary arms correctly and may not travel down the rails. Toggle must contact the spool bearing housings front and back, together to start the log down the rails at the same time. Grind the bottom of the toggle against the stop to align.

## 2. 14 Reel Spool Brakes

A3690  
B2371

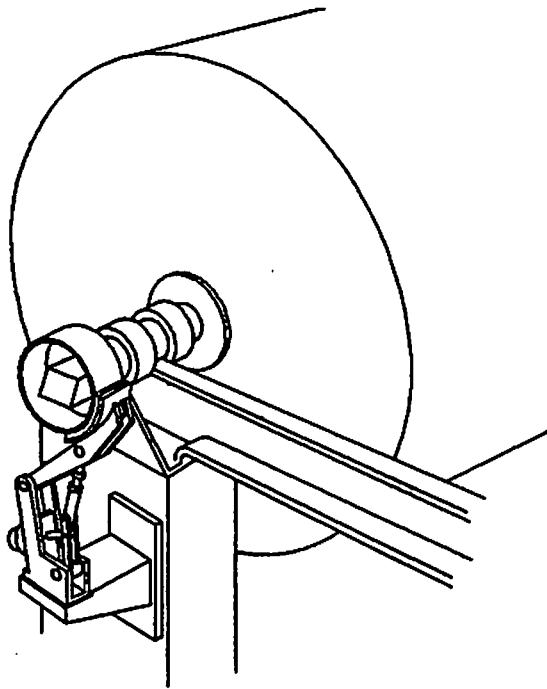


Figure 2-40. Reel Spool Brake Area

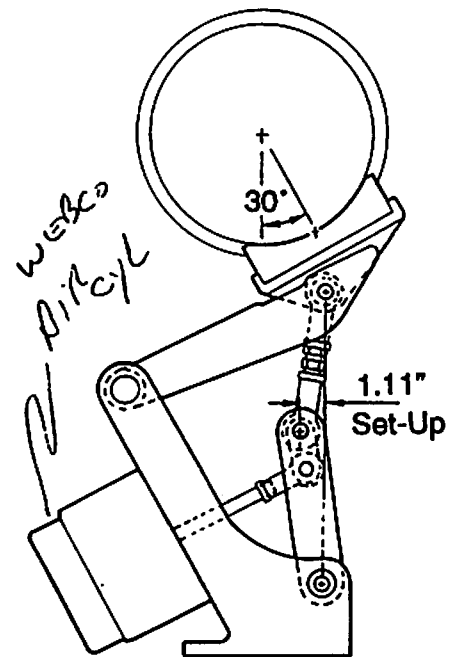


Figure 2-41. Reel Spool Brake

The spool brake consists of a brake pad which is forced against the spool clutch block shroud by an air rotochamber and linkage. For optimum brake operation, set up the linkage according to instructions on the brake assembly drawing. Adjust the turnbuckle in the linkage to maintain proper set-up (see assembly drawing) as the pad wears.

A3623

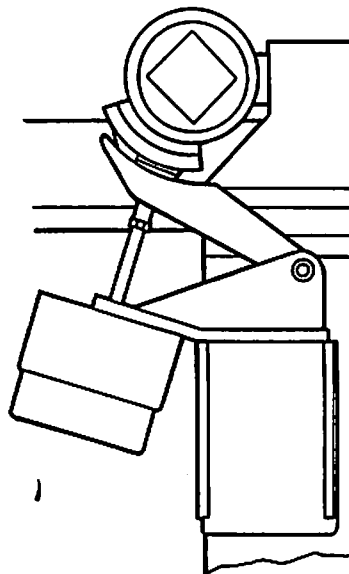
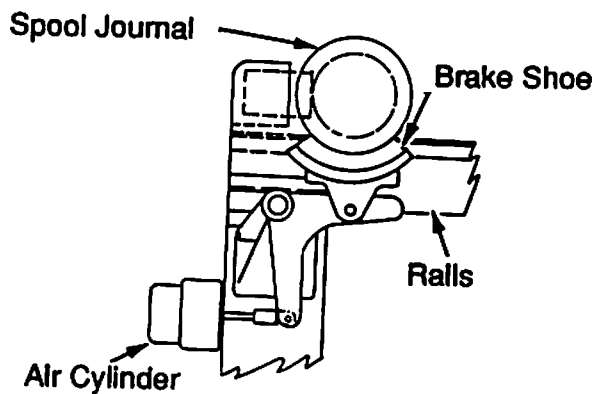


Figure 2-42. Reel Spool Brake

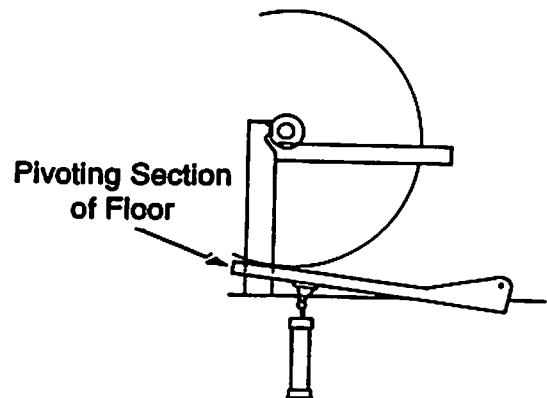


Check the brake shoes, pivots and cylinders of the spool brake regularly for required maintenance.

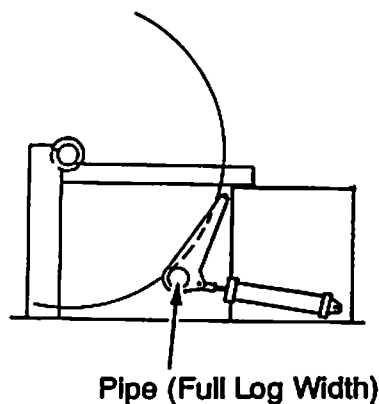
B2562



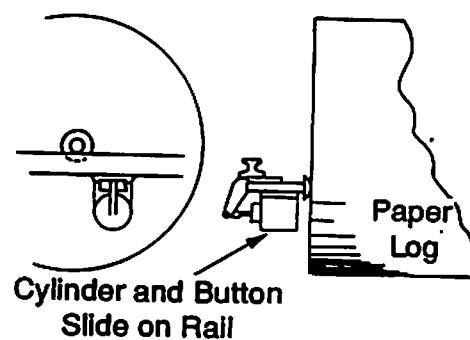
Spool Brake



Floor Brake



Pipe Brake



Piston Brake

Figure 2-43. Other Types of Brakes

#### NOTICE

The floor brake and the pipe brake destroy the outside layers of paper when used. The piston brake leaves a groove in the end of the log.

## 2.15 Extended Rails

B1185.19

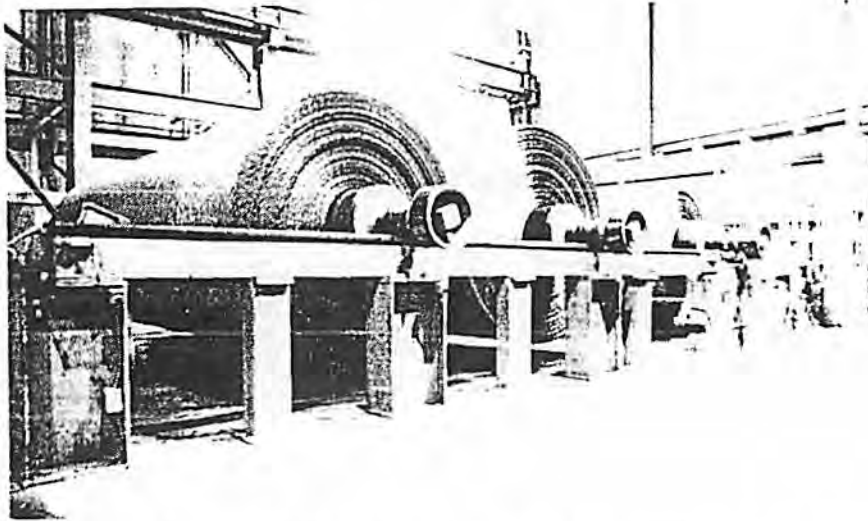


Figure 2-44. Extended Rail Installation

The condition of the top surfaces of the rails is important because the only thing propelling the logs down them is gravity in conjunction with the rail slope of .007" per inch. Keep the entire rail top surfaces as dent free and clean as possible to ensure efficient operation.

A9538.2

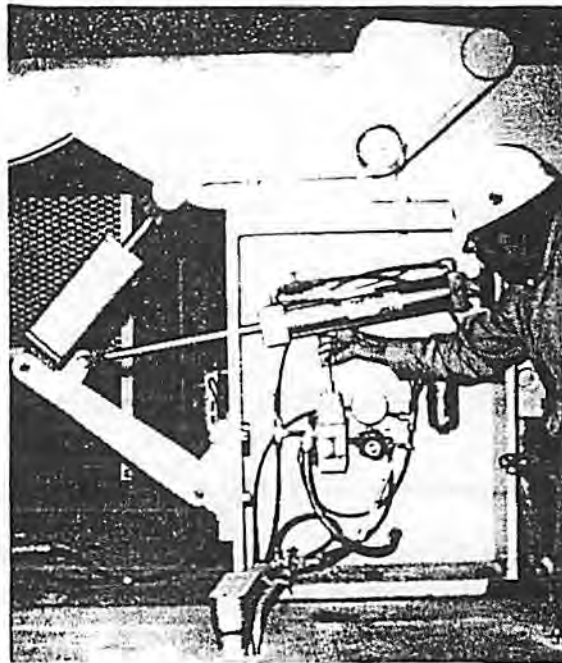


Figure 2-45. Checking Connections on Spool Stop

## 2. 16 Spool Stop

The first spool stop position contains a pair of hydraulic shock absorbers (to absorb the impact of the log) and a brake. Check the hydraulic shock absorbers occasionally, as they may at times require adjustment or addition of hydraulic fluid.

With extended rails, a pair of air cylinders is used to retract the stop mechanisms. This allows the log to roll down the extended rails. Flow control valves regulate the air cylinders to synchronize this "spool kicker" motion front and back.

## 2. 17 Hydraulic Shock Absorber

B2527

EFDYN CORPORATION  
Adjustment Setting Instructions  
ASA-1, ASA-2 and ASA-4 Shock Absorbers  
Front Adjustable Type

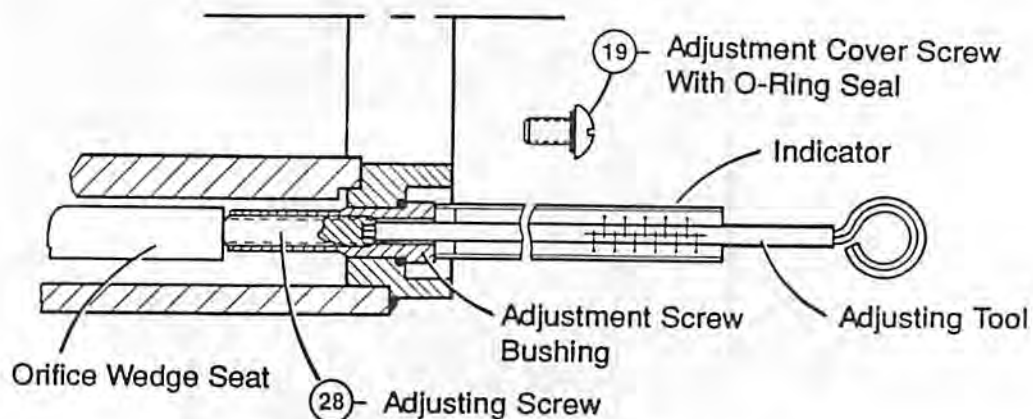


Figure 2-46. Shock Absorber Adjustment

The adjustment screw (Part No. 28, *Figure 2-46*) actuates a precision-ground, hardened orifice wedge seat that moves axially. Flow metering orifices are opened or closed simultaneously as the adjustment screw is rotated. Turning the adjustment screw clockwise opens the orifices and decreases unit resistance; counterclockwise closes the orifices and increases unit resistance.

An easy to use tool is available for adjusting or determining the flow setting. The tool consists of a special hex key with attached indicator which are housed in a graduated plastic tube. The tube graduation scale is calibrated to indicate complete 360 degree turns of the adjustment screw. The scale divisions, numbered zero to twenty, indicate the range of adjustment. Because scale readings are directly related to metering orifice size, zero indicates total shut off and should only be used as a setting reference.

Use the adjustment tool as follows:

1. Remove adjustment cover screw (Part No. 19, *Figure 2-46*) and place graduated tube firmly against adjusting screw bushing.

2. Insert hex key to full engagement in adjusting screw. (Because degree of setting accuracy depends on hex key engagement depth, be sure key is fully engaged in adjusting screw.)

3. Note position of indicator in graduation scale and use this as setting index.

The shock absorbers may also be adjusted by using an Allen wrench and counting the number of turns made.

The range of adjustment turns varies with the shock absorber bore size as follows:

ASA-1 . . . . 15 Turns

ASA-2 . . . . 20 Turns

ASA-4 . . . . 20 Turns

B1080.20

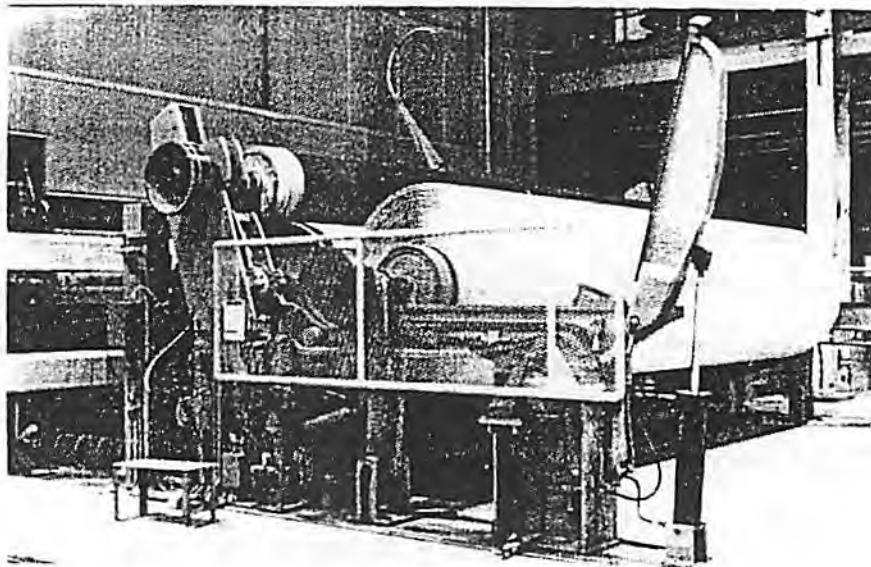


Figure 2-47. Extended Rail Gate

**NOTICE**

Air flow controls regulate the gate operations.

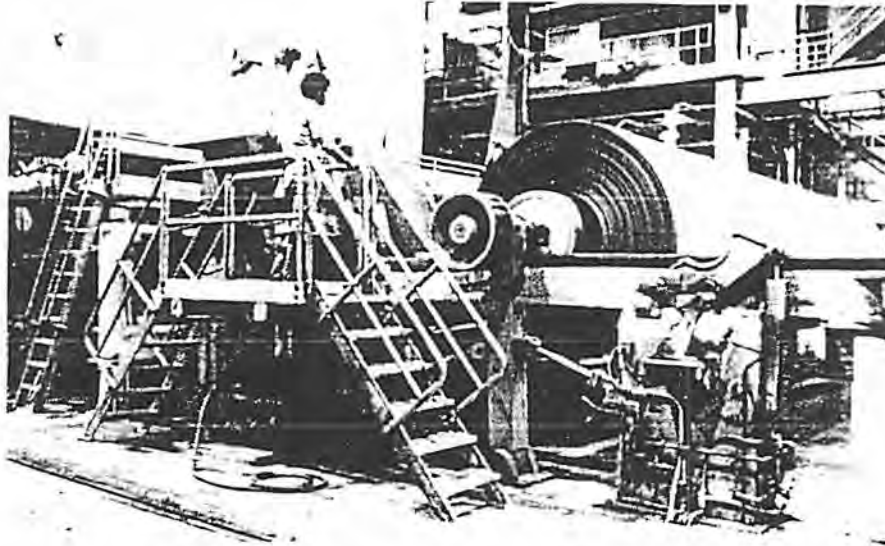


Figure 2-48. Extended Rail Spool Stop

There are numerous pivot pins used in the spool stop and brake. Grease all of these periodically. These pins are held in place by setscrews which may loosen and allow the pins to slide out. Check all of these setscrews periodically and do not allow the pins to begin sliding out.

## 2. 18 Extended Rail Alignment Checklist

Operation: Location Across Machine

Tolerance: Within .010"

Operational Problems: Spool Bearing Housing Binding on Rails

- Procedure:
1. Confirm that the drum is level and square to machine.
  2. Place a spool in the primary arms and lower so that the spool is resting on the rails. With the front spool bearing housing centered in the primary arm locating lug, the rails should provide clearances shown in *Figure 2-50*.
  3. Align both rails square to drum and parallel to each other.

Operation: Vertical Location and Level

Tolerance: Within .005"

- Procedure:
1. Check top surfaces of rails across machine for level. Be sure to check squarely across machine where rails are sloped.
  2. Confirm that proper cross machine distance has been maintained between rails.

## 2. 19 Rail and Spool Housing Design

B2522.7

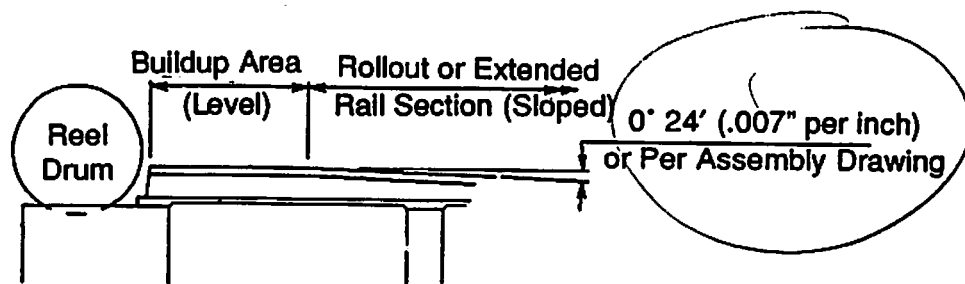
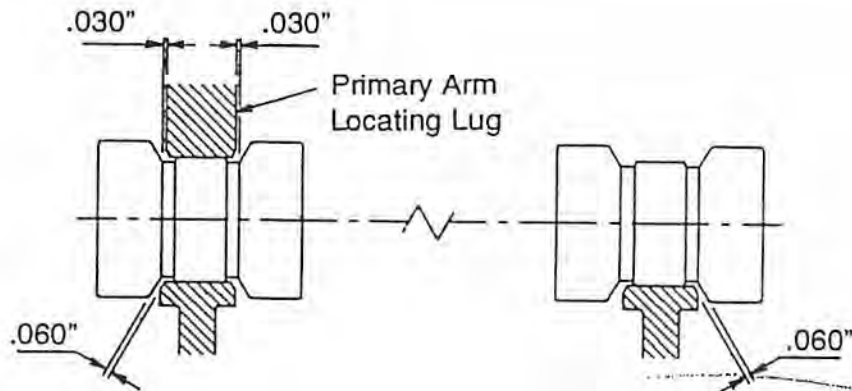


Figure 2-49. Rail Slope Design

### NOTICE

Centerline to centerline rail across machine to be within .010".  
Level and vertical to be within .005".

B2522.6

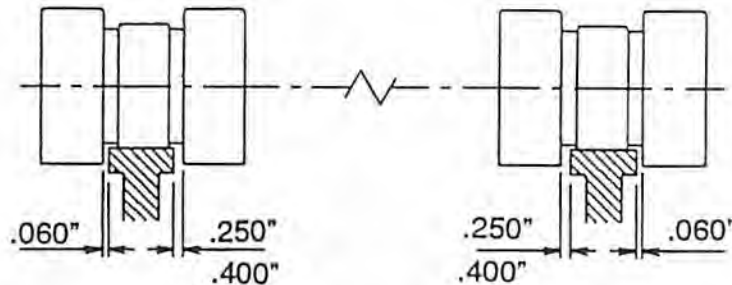


Rails and bearing housings with 15 degree tapered sides.

### NOTICE

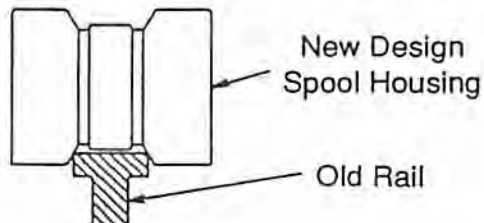
The most common cause of logs not moving down the rails is an increase in the .060 inch clearance between the spool bearing housings and the outside of the rails.

B2522.5



Rails and bearing housings with straight sides.

Wrong



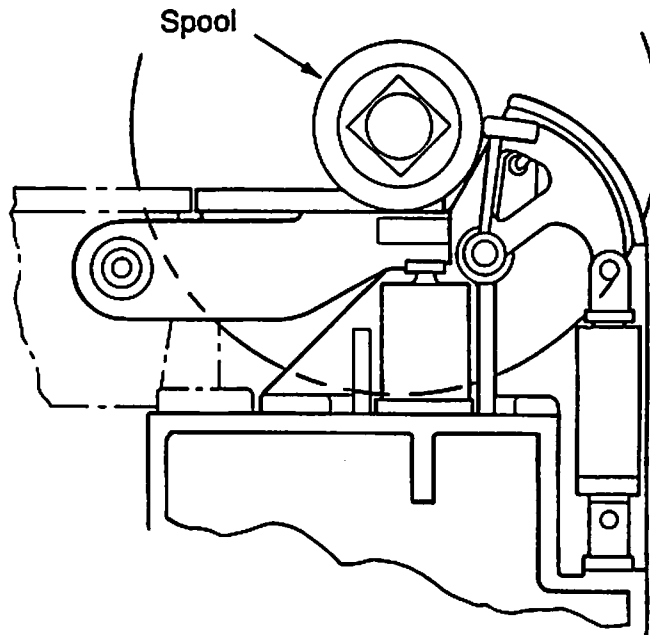
Do not use new design (tapered) spool housings on old design (straight side) rails.

Figure 2-50. Rail/Spool Housing Clearances



## 2. 20 Weigh Station

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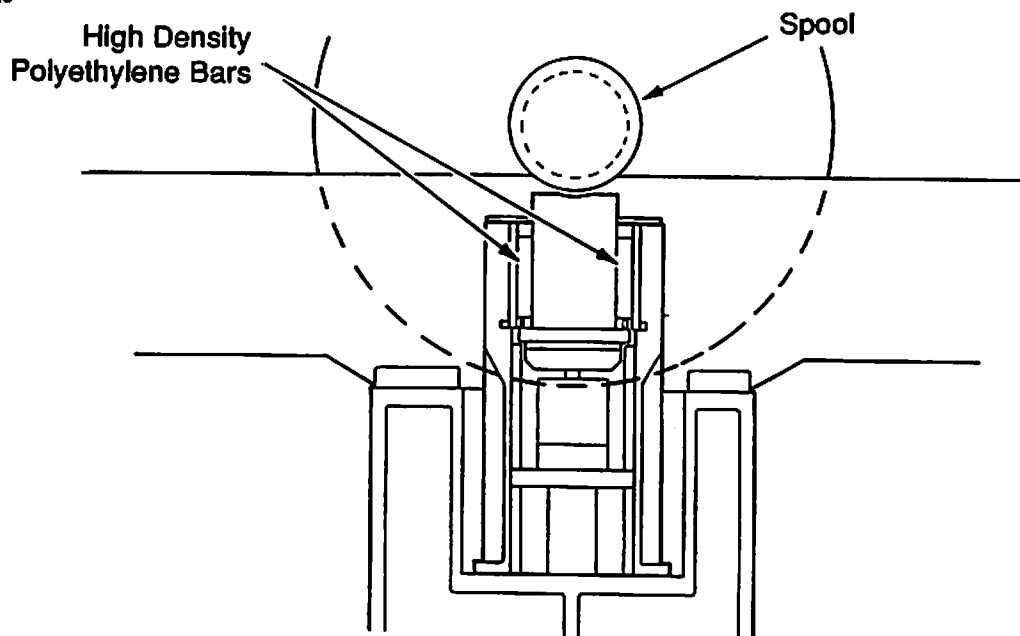


Figure 2-51. Weigh Stations

High density polyethylene bars (4 each side) act as bearings to insure accurate measure.

A small hydraulic pump unit is supplied with the weigh station to provide force to lift the paper logs. It is usually mounted on the machine room floor.



## 2. 21 Spool Starter

B2419

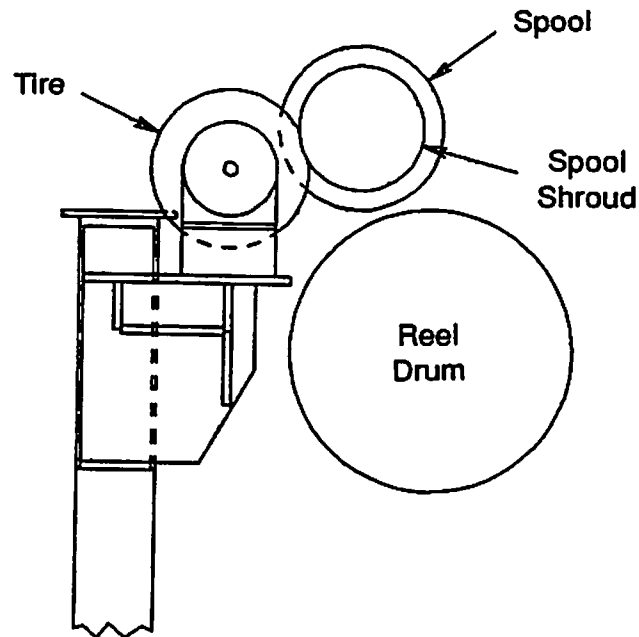


Figure 2-52. Spool Starter

The spool starter accelerates the empty spool to machine speed in the primary arms before the spool is brought into contact with the sheet and drum for turn-up.

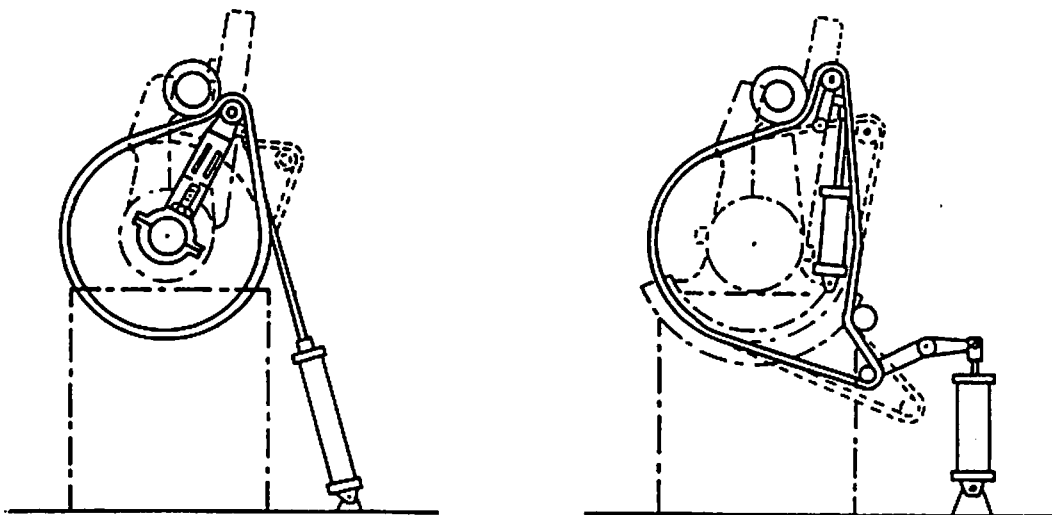
## 2. 22 Spool Starter Alignment Checklist

Operation:	Rubber Tire Type <i>Electric Motor D.C. Drive</i>
Tolerance:	1 to 5% greater than drum speed (Depending on Paper Grade)
Operational Problems:	Sheet Breaks When spool Speed is Above or Below Machine Speed When Spool Contacts with the Drum
Test Equipment:	Tachometer
Procedure:	<ol style="list-style-type: none"><li>1. Place spool into primary arms and apply primary arm loading.</li><li>2. Bring drum up to speed.</li><li>3. Engage starter and accelerate spool.</li></ol>

**Correction:**

1. Check speed of spool versus drum speed.
2. Check tire for correct air pressure (see spool starter drawing).
3. Check penetration of spool shroud into tire. Should be approximately .25" to .50". Refer to spool starter drawing.
4. Check spool bearings for excessive grease.
5. Check for sufficient air pressure and volume at air motor (if used).
6. Check electrical control adjustments.
7. Check acceleration rate and for tire wear. Design acceleration rate is 60 seconds.
8. Check tire mounting on hub, should be centered.
9. Check tire alignment with the spool shroud.

B2525.1



**Figure 2-53. Belt Type Spool Starters (Direct Drive)**

<b>Operation:</b>	<b>Belt Type (Direct Drive from Drum)</b>
<b>Operational Problems:</b>	<b>Sheet Breaks when New Spool is Brought into Contact with Drum</b>
<b>Test Equipment:</b>	<b>Hand Tachometer</b>
<b>Procedure:</b>	<ol style="list-style-type: none"> <li>1. Check crown on the idler pulley for belt tracking problem</li> <li>2. Bring drum up to speed (Maximum preferred).</li> <li>3. Engage starter and accelerate spool.</li> <li>4. Check surface speeds of drum, belt and spool. If speeds don't match or maximum speed is not within the allowed tolerance, correct as follows.</li> </ol>
<b>Correction:</b>	<ol style="list-style-type: none"> <li>1. Check for sufficient air cylinder pressure to provide proper belt tension.</li> <li>2. Check for piston stroke in air cylinder, should not bottom out.</li> <li>3. Check for proper belt contact with spool.</li> <li>4. Check spool bearings for excessive grease.</li> <li>5. Check for proper belt alignment.</li> </ol>

#### NOTICE

Polymer type belt should remain tight at all times;  
Minimum stretch: 1/2 of 1%  
Maximum stretch: 4.5%

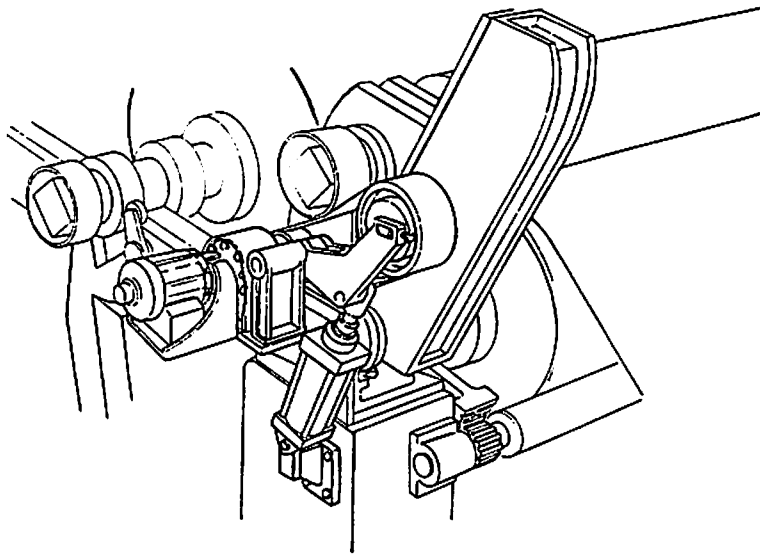


Figure 2-54. Belt Type Spool Starter

## 2. 23 Reel Spools

A7799

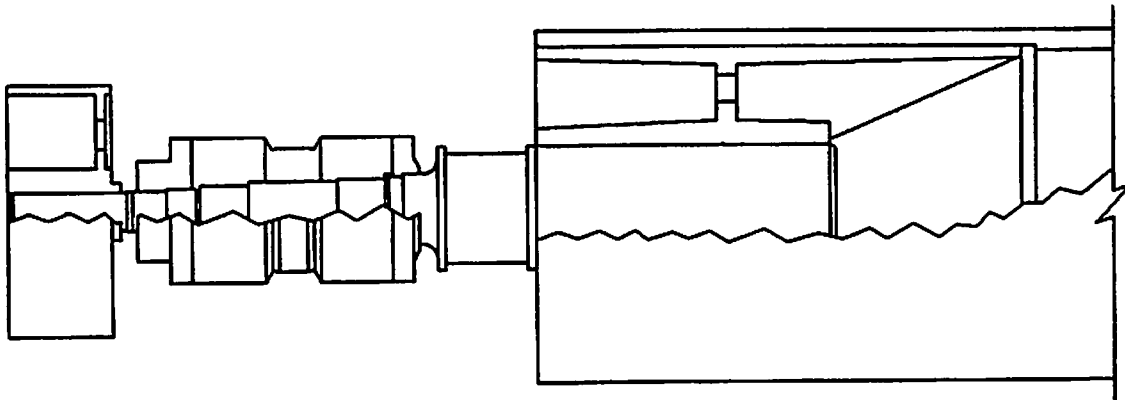


Figure 2-55. Reel Spool

Beloit provides spools 6.5-36 inches in diameter with bearing and clutch blocks with shrouds on each end.

### Types of Spools

1. Plain Steel
2. Core Spools
3. Vacuum Spools

#### 4. Rubber Covered Spools - Recommended specs .5" thick by 15-20 P & J hardness

##### a. Advantages of R.C. Spools

1. Quiet Operation with a bare spool riding on the drum waiting for paper.
2. Allows some forgiveness at the nip - an advantage to turn ups.
3. Less harsh on the outside drum diameter.

##### b. Disadvantages of Rubber Covered Spools

1. Cut with knives during the slab off operations. Some wooden slab off tools are used in some mills.
2. Become unbalanced when the cover is damaged.

Reel spools are the most misused roll of the paper machine because they are:

1. Set on floor.
2. Subjected to jerky motion of the crane. Lifting and lowering logs causes tremendous stress to spool journals.
3. Used to move broke down broke chutes.
4. Used to bump jumbo logs down rails.
5. Moved to and from reels, rereelers, supercalendars, winders, etc.

## 2. 24 Spool Grinding

1. Variations in outside diameter to be within .002".
2. Straightness
  - a. Within .004 over total length.
  - b. Within .002" over any 2 foot length.

3. Outside Diameter 125 Micro inch.
4. Bearing shoulder to shoulder diameter to be held within .+02".

## 2. 24. 1 Balance

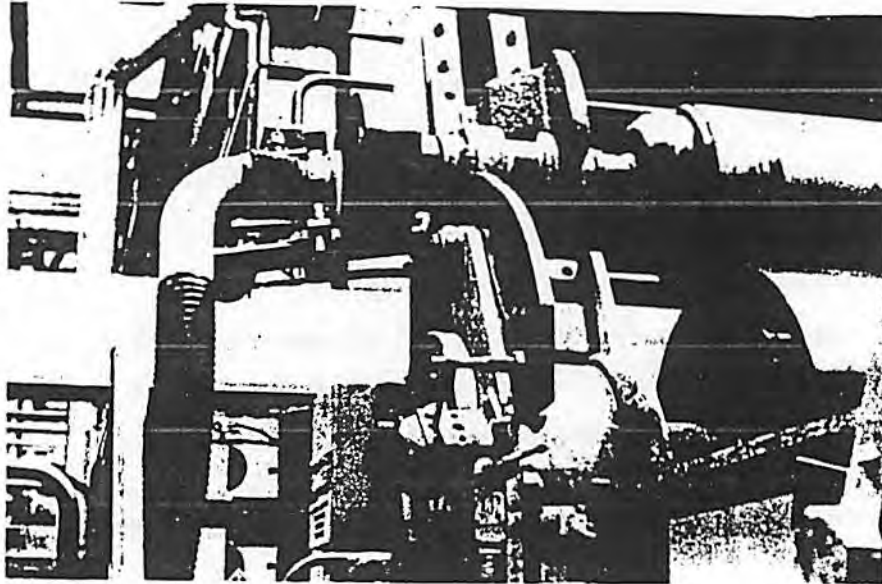
1. Static balance 1000 fpm and under
2. Dynamic balance 1001 fpm

## 2. 25 Spool Bearing Removal

To remove spool bearings:

1. Remove outer bearing housing end cover.
2. Remove capscrews from inner bearing housing end cover.
3. Remove bearing lock nut from journal.

A9647.2



A9647.3

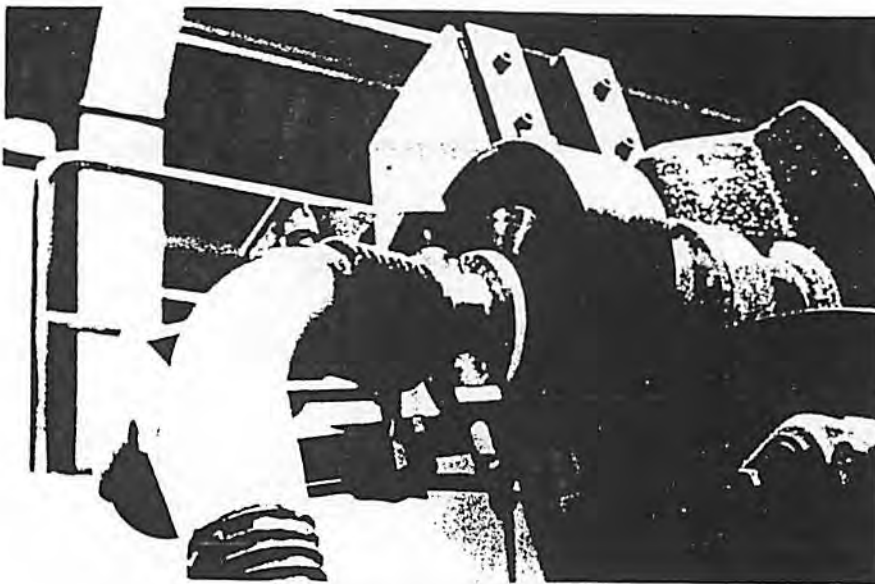


Figure 2-56. Vacuum Spool Connection

4. Pull bearing housing and outer bearing off of journal together. Support the hydraulic bearing puller from the end of the journal pulling on the inboard side of the bearing housing.
5. Remove inner bearing. Be careful not to nick or gouge journals during removal.
6. Use new bearings for reassembly.
7. Lubricate bearings.

## **2. 25. 1 Spool Maintenance**

1. Heat bearings to 250° in oil before installing.
2. When replacing bearings install the inside bearing housing cover first - then the inside bearing, next the housing. Then the outer bearing on the shaft into the housing.
3. Tighten the bearing lock nut to allow .003" to .005" clearance between the bearings and the spool bearing housing.

Check clearance with a dial indicator gage secured to the spool journal.

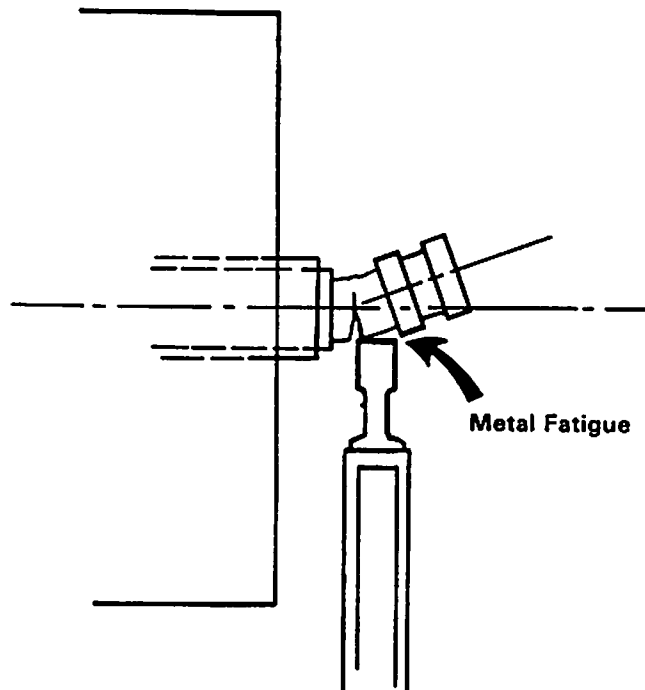
4. When replacing journals use a steel 4340 heat treated material.

## **2. 25. 2 Spool Safety**

Reel spools carry more load for their size than any other roll in the paper mill. Because spool journals are more highly stressed than other rolls and are subjected to a fatigue stress, a hazardous situation may develop should they become bent. Bent journals can break, causing the log to fall from the reel or storage reels onto the floor and bump into equipment and personnel.

**BELOIT RECOMMENDS THE FOLLOWING PRACTICES AND PRECAUTIONS:**

B2913.1



**Figure 2-57. Bent Journals Must Be Replaced**

1. Bent reel spool journals must be replaced. Metal fatigue occurs in a bent reel spool journal due to residual stress. As the spool revolves, the fatigue becomes greater. When the reel spool bends, the metal becomes work hardened, making the journal brittle at the fatigue point, resulting in notch sensitivity. When this occurs, the journal can break.
2. Bent journals must never be straightened. Journals subjected to fatigue stresses will not tolerate yielding. Three problems are created in straightening the journal: First, it is impossible to straighten a journal without overloading the head. Second, in straightening the journal, the headfit may be lost. Third, if the journal could be straightened, it would probably creep back 20 to 30% due to residual stresses.
3. Care should be taken to prevent stress raisers. Due to notch sensitivity of metals in fatigue, a stress raiser can be detrimental. Some common causes of stress raisers are:
  - a. Punch or chisel marks on fillet radii due to improper bearing removal.
  - b. Scored crane pickup areas from picking up rotating spools.
  - c. Dents or scrapes from mishandling.



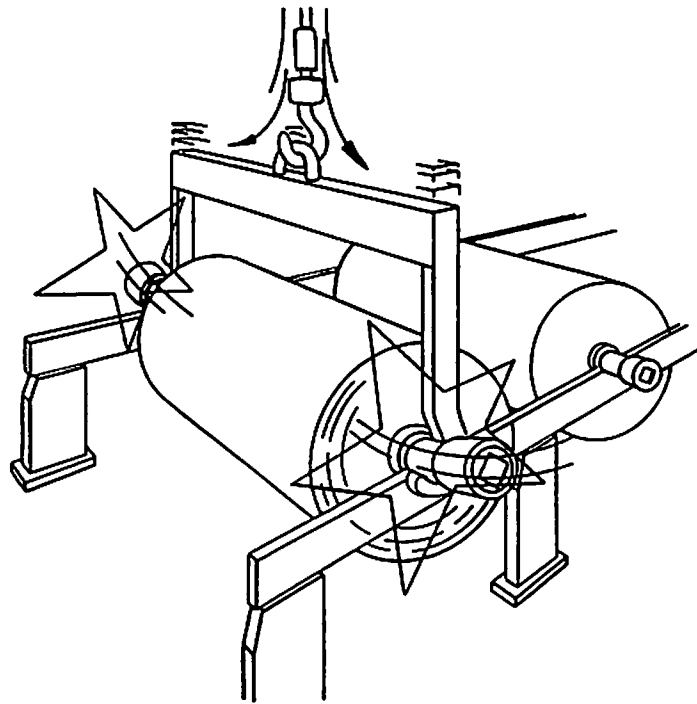


Figure 2-58. Do not bang full spools on rails when moving completed paper logs, the result is bent spool journals.

4. Slowly lower jumbo logs into storage stands or unwind. Journal failures can easily be caused by lowering jumbo logs too quickly with the mill crane. An impact load may cause both bent journals and journal failures.
5. All replacement journals should be 4340 heat treated steel. Journal replacement steel should be ordered to ASTM Spec. A434 Class Bd. This spec. gives the chemical composition, heat treating procedure and mechanical properties required for replacement journals.
6. Replacement journals should have polished fillet radii. When new journals are machined, care should be taken to obtain the proper fillet radii and each radii should be polished. Since fillet radii are areas of high stress concentration, tool marks can be detrimental.

In all cases, personnel must stay clear of logs being transferred by crane or logs in motion on storage rails. Warnings are to be given when a log is being transferred by crane from storage rails to the winding station. Because of the massive weight of paper rolls, they must be handled with caution.

Proper attention to spool journals can reduce potential hazards at the dry end of the paper machine.

7. Always lift and carry spools at the proper crane hook area. The spools are designed to be carried close to the main load to reduce stress.

8. Never build a log larger or run a spool faster than originally designed for without consulting the manufacturer. Considerable time and effort is spend in the design and balance of spools for safety. Building larger logs causes more weight, therefore more bending and torque stresses. Damaging vibrations can be set up in spools if speed exceeds the balance limits.
9. Never walk under a paper log or empty spool being carried by a crane.
10. Always inspect spools carefully and thoroughly. They require all affordable attention.

Maintenance personnel responsibility includes:

1. Operator instruction on the correct use of equipment for longer and safer continuous production runs.
2. Loading of spools into primary arms.
3. Practice and enforcement of safety requirements.

Of special importance is correct loading of spools into the primary arms. Always keep alignment in mind and always use crane hooks with their open ends towards the wet end of the machine. Keep the crane hooks on the spool until the primary arm hooks have secured the spool.

B2563

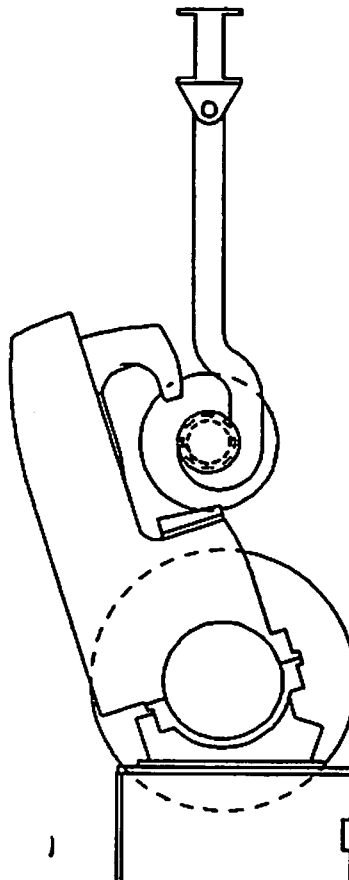


Figure 2-59. Loading Spool into Primary Arms with Crane and Strongback

Maintenance of the reel crane is necessary to allow operators to load spools into the primary arms smoothly and without shock load.

## 2. 26 Air Tube Threader

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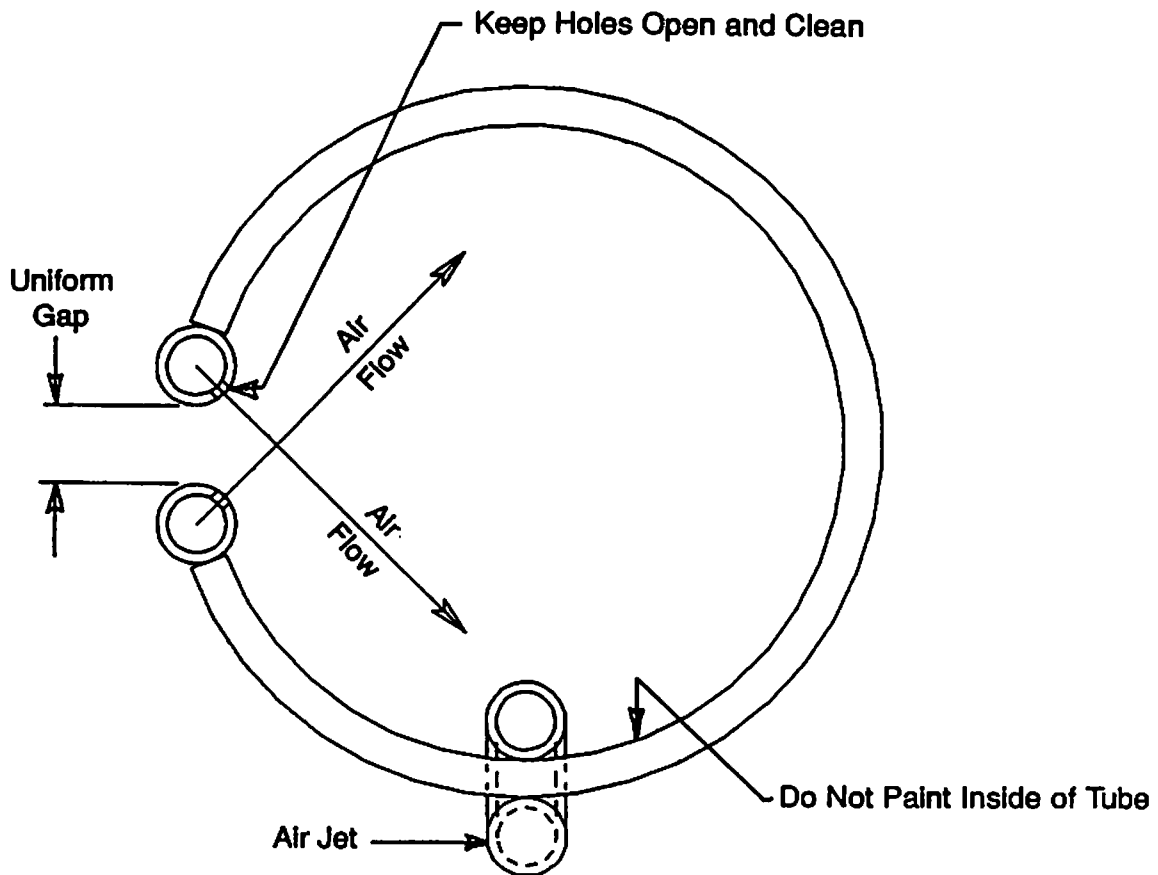


Figure 2-60. Air Tube Threader Cross Section

As the full sheet comes over the calender king roll and down the broke chute, cut a tail on the wet end side of the king roll. Feed the tail into the air threader tube pan using the pipe located on the king roll doctor. Air tubes located on each edge of the threader slot have holes spaced along the entire threader length which direct air into the threader. This holds the tail in the threader.

Air jets located in the bottom of the threader tube keep the tail moving down the machine.

To move the tail through a moisture device either a gate is provided or the tail is blown through.

At the end of the threader tube the tail enters the nip between the spool and drum. After the tail is wound around the spool, complete threading by widening tail to full sheet width.

Air threader tube instructions are furnished with each threader and the component drawings contain installation advice.

## 2. 27 Tail and Sheet Handling

Air tube threaders are available to replace rope threaders in many reels, but are limited to use with maximum paper basis weight of 120 lbs/3000 sq ft.

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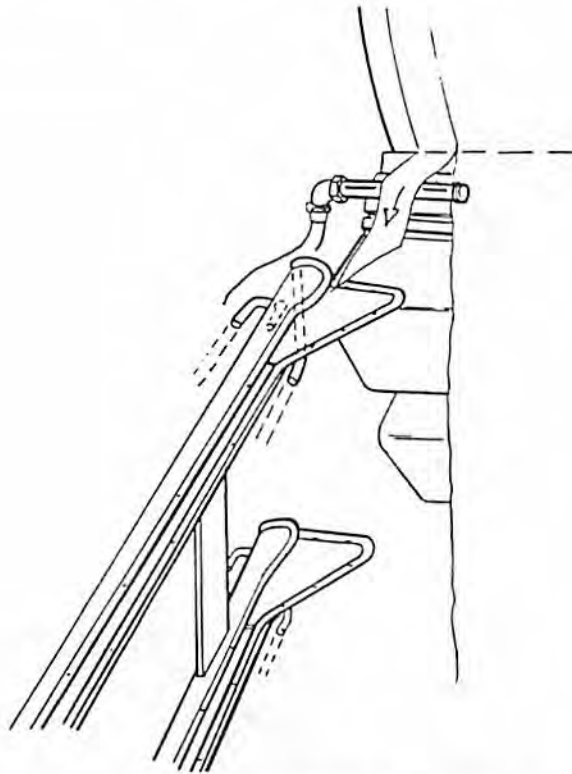


Figure 2-61. Air Tube Threader

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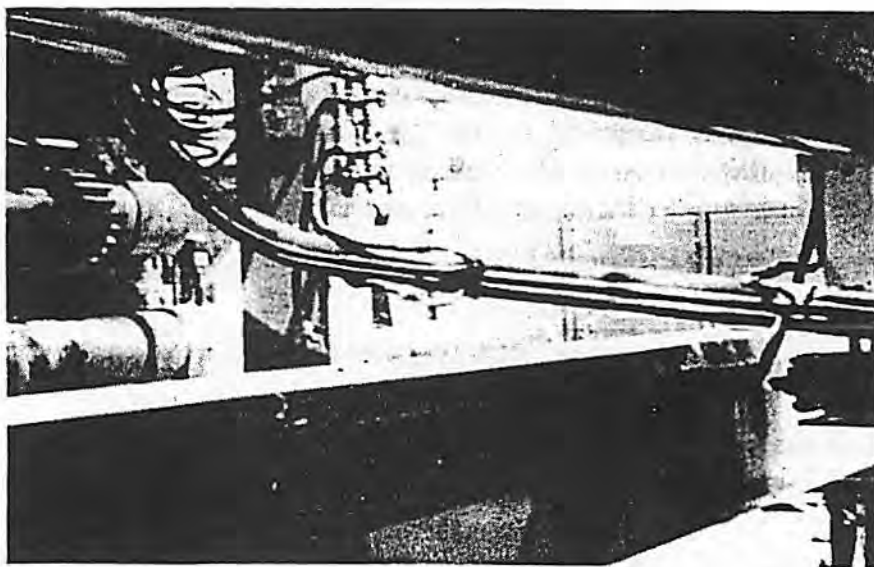


Figure 2-62. Air Tube Threader Showing Slot for Tail

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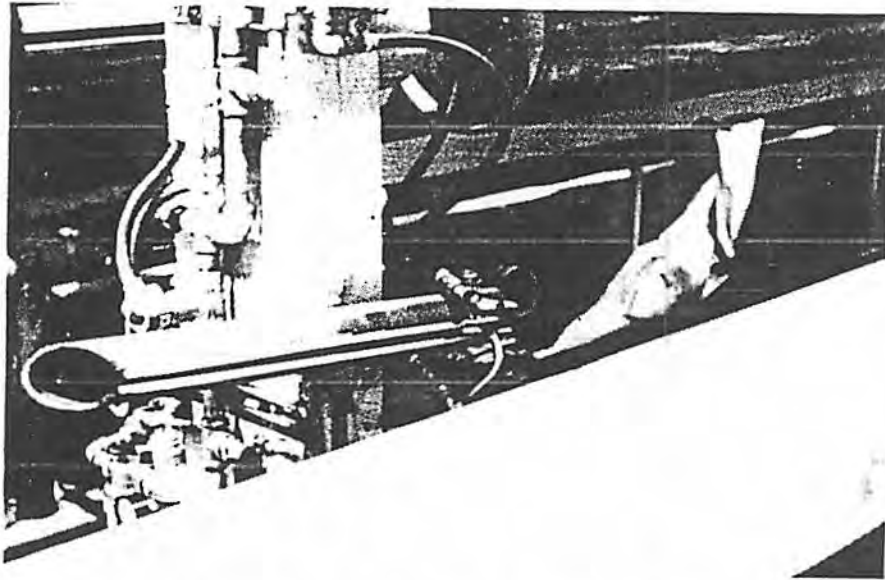
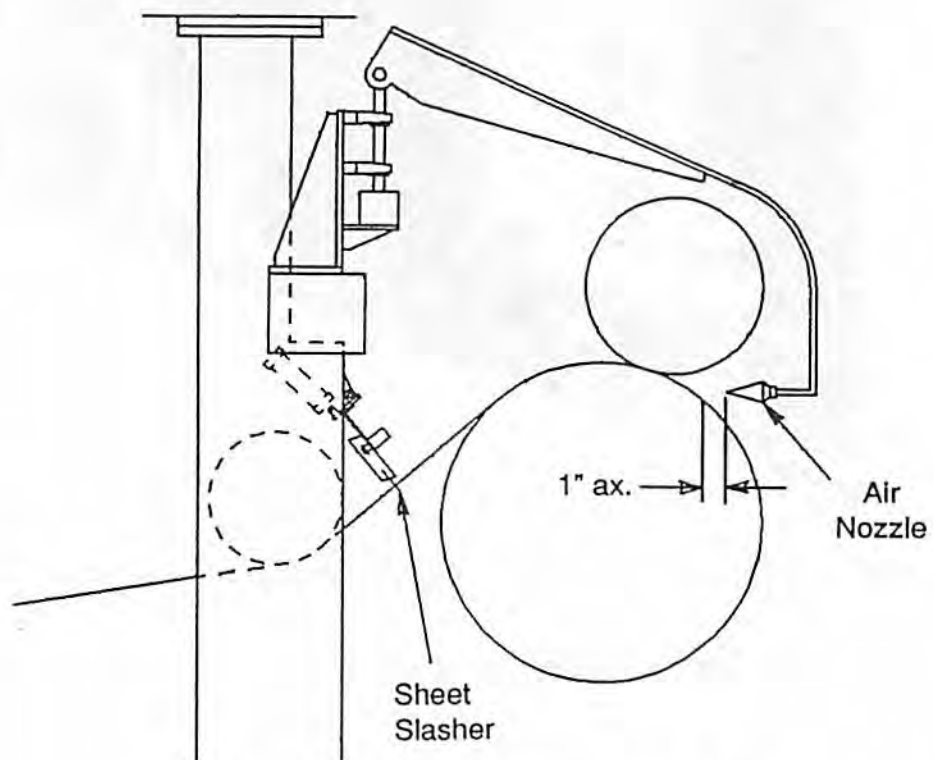


Figure 2-63. Entrance End of Tube Threader and Gate Through Moisture Device

Gate motion is controlled by a flow torque actuator.

## 2. 28 Turn-Up Devices

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A9649.11



Figure 2-64. Turn-Up Devices, Gooseneck Type

The sheet slasher (*Figure 2-65*) is located at the centerline of the machine. It consists of an air actuated slasher which cuts a 10 to 12 inch cross machine direction slit in the sheet before it enters the spool nip. An air nozzle is used to separate and lift the sheet up at the center slit to wrap around the spool. The sheet then continues separating outwards towards the edges and turn-up on the new spool is completed. This arrangement works well for paper grades up to 70 lbs/3000 sq ft.

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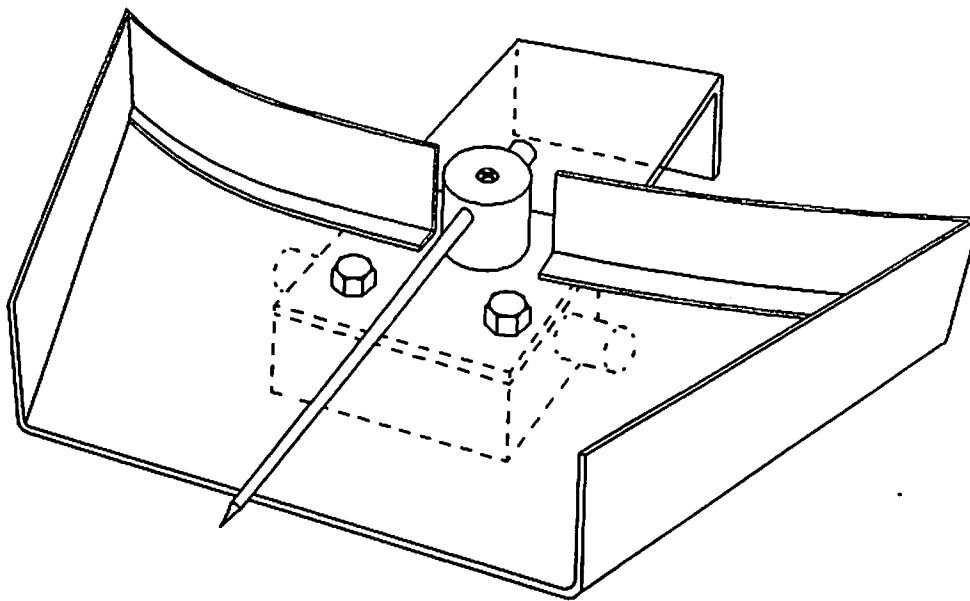
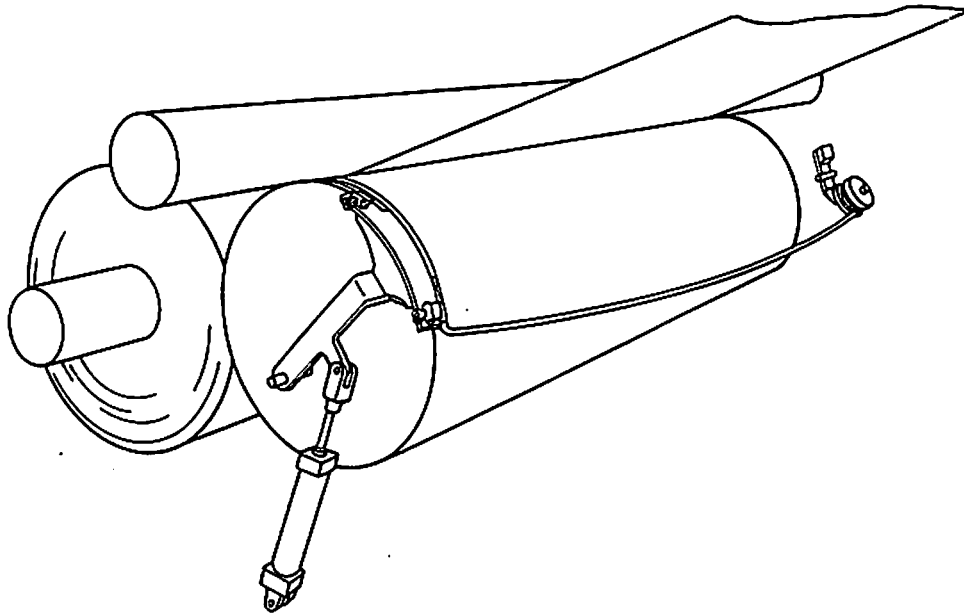


Figure 2-65. Sheet Slasher

1. Air nozzle to be approximately 1" from perpendicular to the reel drum.
2. The Slasher in the operating position should be 1" from the sheet. The rod should cut 1" into the sheet.
3. If the turn up device does not work, first check the slasher rod it may be bent, broke or missing. Replace the rod with the same material.

## 2. 29 Tape Turn-Up Devices

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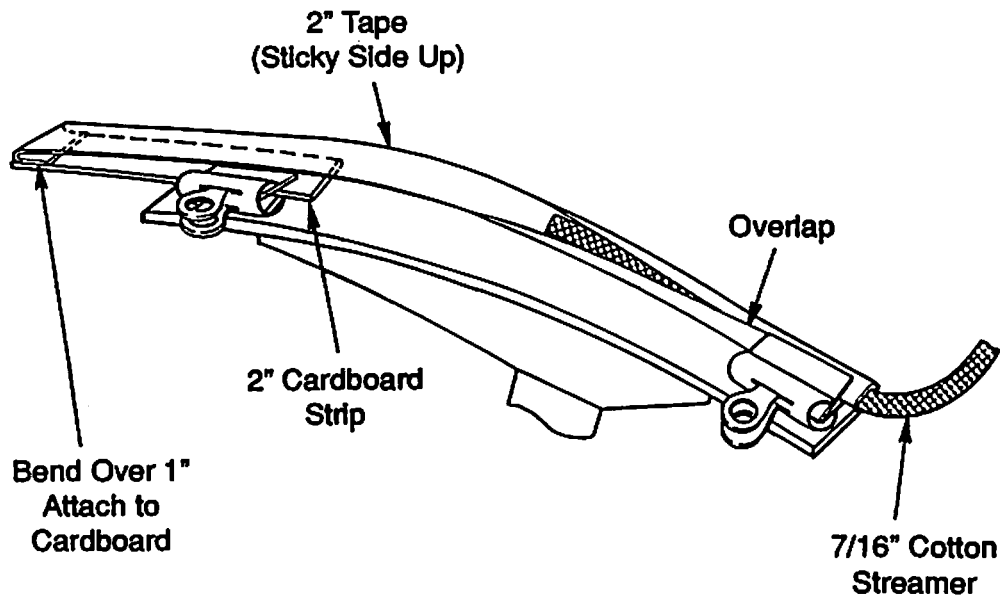


Figure 2-66. Tape Turn-Up Device

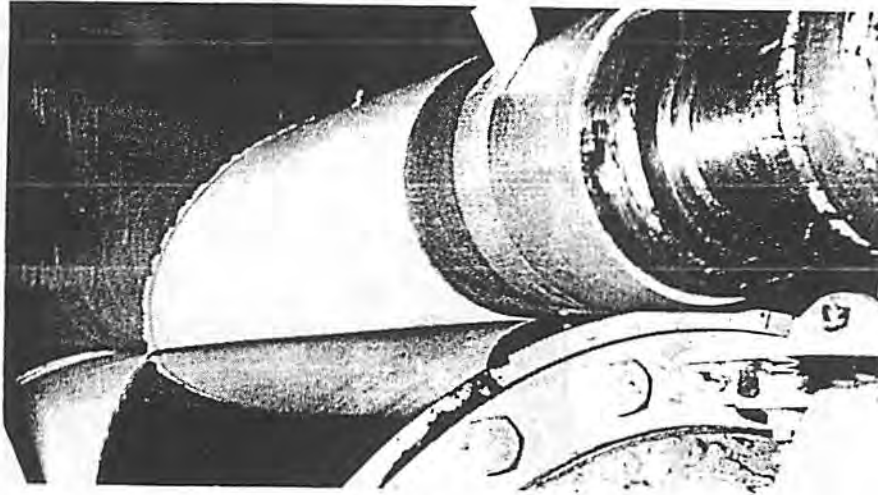
The tape turn-up device works well for paper grades over 70 lbs/3000 sq ft basis weight. Various tapes are available for different strength sheets. Some are repulpable. A cross machine tape conveyor is furnished with each tape turn-up device.



## 2. 29. 1 Disadvantages of Tape Turn-Ups

1. A new tape must be strung up for each turn-up.
2. Some tapes are non-pulpable and should not enter the stock system.

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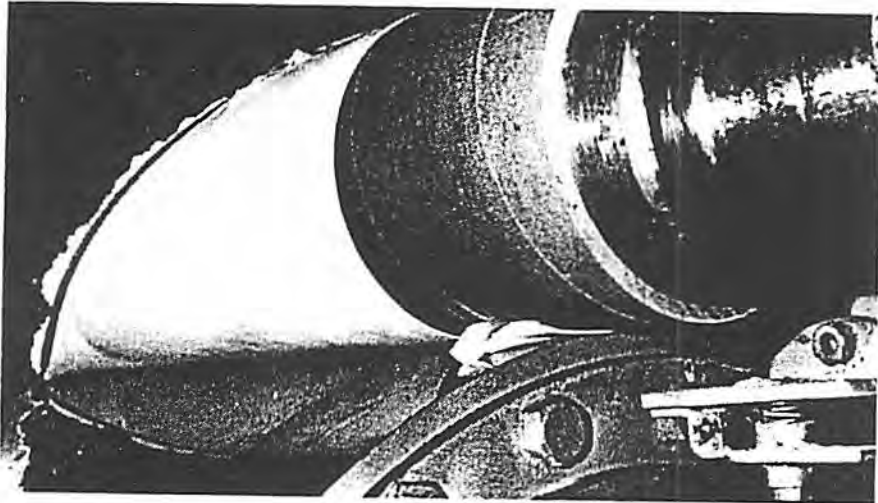


Figure 2-67. Tape Turn-Up Operation

## 2. 30 Bubble Turn-Up

A bubble type turn-up can be used on most flat grades, including tissue.

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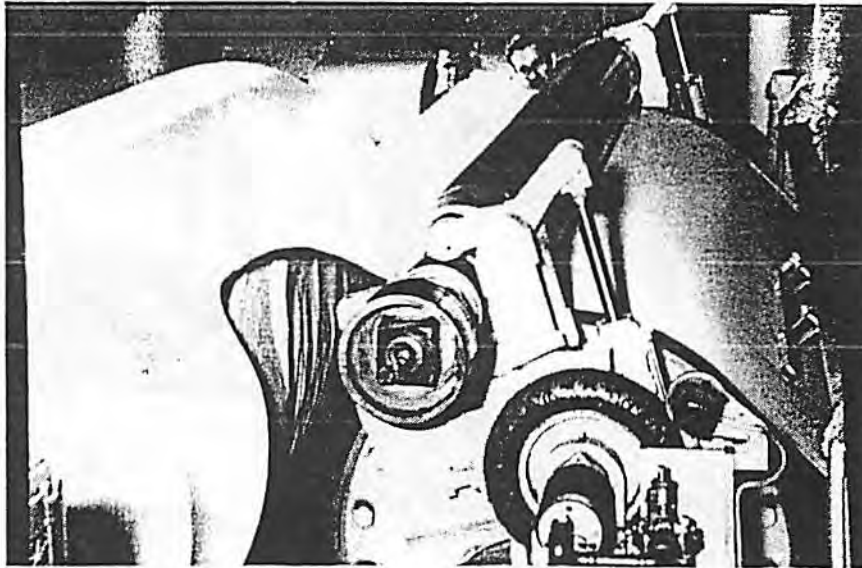
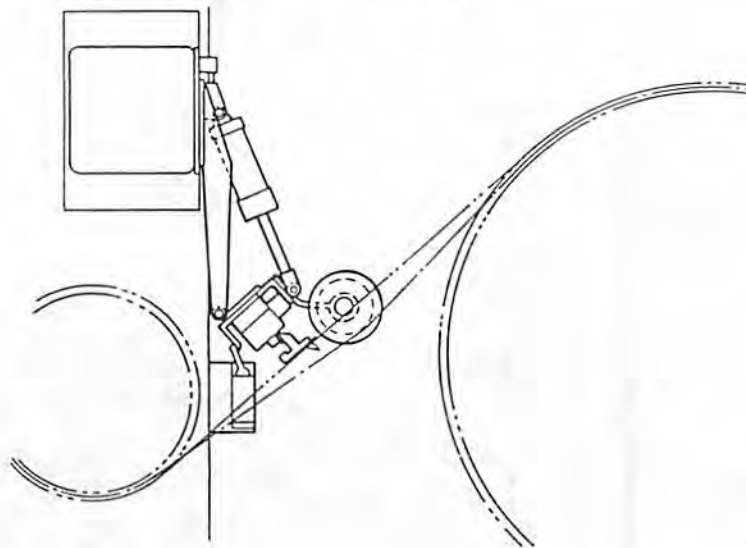


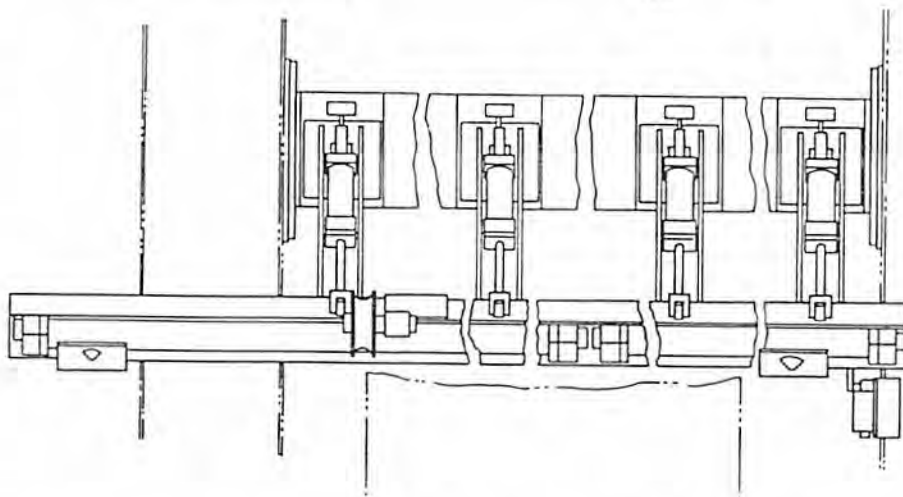
Figure 2-68. Bubble Type Turn-Up

## 2. 31 Transversing Sheet Cutter Turn-Up

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B2370



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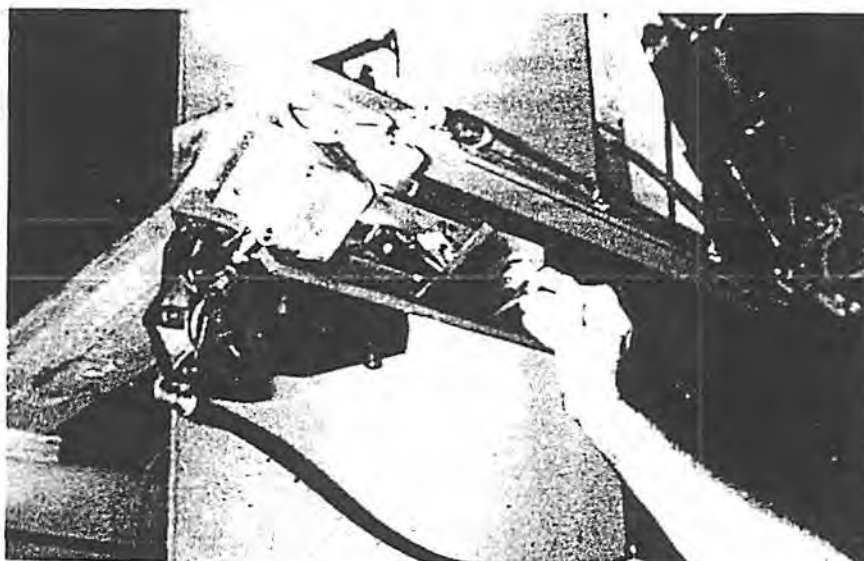


Figure 2-69. Transversing Sheet Cutter Type Turn-Up

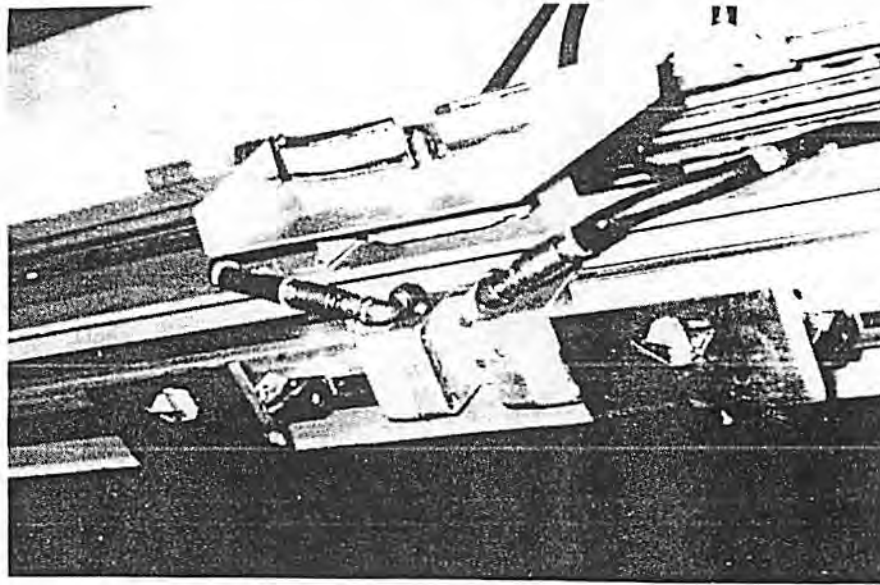


Figure 2-70. Transversing Sheet Cutter Type Turn-Up

The transversing type sheet cutter works as follows:

Two knives are located on a cross machine beam. The beam is pivoted towards sheet position by air cylinders.

Each knife is mounted on a cylinder of approximately half cross machine length. The knives are moved to approximately 18" apart at the center of the sheet. The beam is then pivoted towards the sheet and the knives begin cutting a tail.

A slasher located at the center of the sheet provides a cross machine cut in the tail.

A gooseneck turn-up device blows the tail up to wrap around the spool.

After the tail has wrapped the spool, the knives are moved outwards, widening the tail to full sheet width. The beam is then pivoted away from the sheet and spool threading is complete.

The entire process is conducted from the control console.

### 3 RECOMMENDED SPARE PARTS

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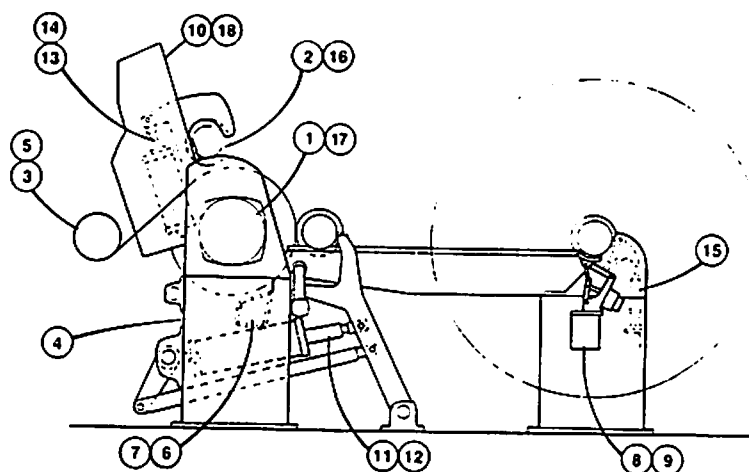


Figure 3-1. Spare Parts Location

Spare parts should be kept at the mill for emergency repairs to keep downtime to a minimum. For part numbers, refer to assembly drawings furnished with the reel.

A minimum of three spools are recommended for efficient operation. However, most mills prefer to keep more than three spools on hand to provide greater flexibility of operation.

Based on experience, the following list of spare parts has been compiled (this does not include optional equipment ordered in addition to basic reel):

1. Reel Drum Bearing
2. Reel Spool Bearings
3. Spreader roll Bearing
4. Rope Sheave Bearings (not shown)
5. Spreader Roll Sheave Bearing
6. Doctor Blades
7. Rotochamber for Doctor
8. Rotochamber for Spool Brake
9. Reel Spool Brake Shoe Linings (complete set for front and back)
10. Reel Limit Switches
11. Secondary Arm Cylinder
12. Complete Set of Piston and Rod Packing for Secondary Arm Cylinder
13. Primary Arm Cylinder
14. Complete Set of Piston and Rod Packing for Primary Arm Cylinder
15. Spool Stop Shock Absorber
16. Tire for Reel Spool Starter
17. Water Joint Packing and Seals
18. One Spare Each for all Gauges, Regulators, Flow Control Valves, Filters, Solenoid Valves and Pressure Switches in Control Circuitry

## 4 CONTROLS

The reel is very controls intensive. If a control device such as a limit switch, pressure switch or solenoid valve fails, the machine operators will probably be the first to notice. Therefore, maintain close communication with the operators. Each control interlock has a specific function in the safe operation of the reel. Do not attempt any bypassing of any interlock.

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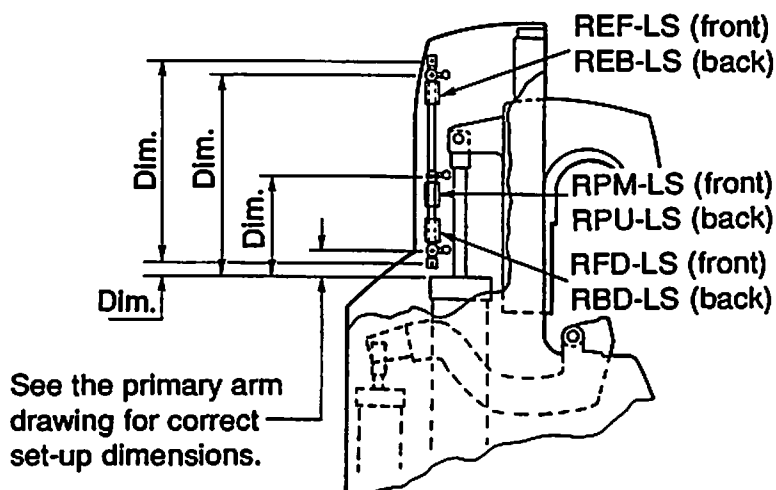


Figure 4-1. Primary Arm Hook Limit Switches

Limit Switch	Function	Direction of Hook to Operate Contacts
RFD-LS RBD-LS	Detects primary arm hook is down on spool; Tripped by hook cylinder lug.	Towards the Reel Drum
RPM-LS	Detects 35" diameter roll in primary arm; Tripped by hook cylinder lug.	Away from the Reel Drum
RPU-LS	Detects 42" diameter roll in primary arm; Tripped by hook cylinder lug.	Away from the Reel Drum
REF-LS REB-LS	Detects full extension of hooks; Tripped by hook cylinder lug.	Away from the Reel Drum

Note: Limit switch arms are shown in set-up position unless otherwise noted.

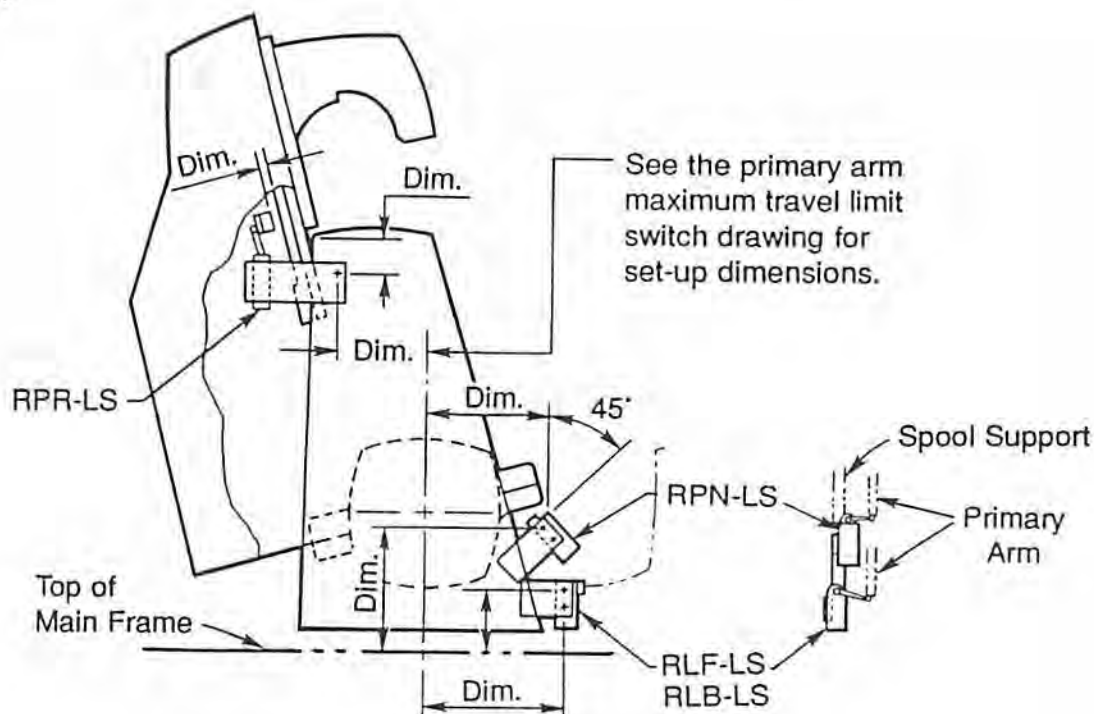


Figure 4-2. Primary Arm Limit Switches

Limit Switch	Function	Direction of the Primary Arms to Transfer Contacts
RPR-LS	Stops primary arm motor when arm is in maximum raised position; Tripped 1/2" before arm hits mechanical stop.	Raise
RLF-LS RLB-LS	Stops primary arm motor when arm is in maximum lowered position; Tripped 1/2" before arm hits mechanical stop.	Lower
RPN-LS	Increases primary arm nip pressure when arm is 45 degrees above rails; Tripped by primary arm.	Lower

Note: Limit switch arms are shown in set-up position unless otherwise noted.

The maximum travel limit switches stop primary arm movement in the maximum raised and lowered positions. Set the limit switches to be activated approximately 1/2" before they contact the positive mechanical stops. This allows the arms to coast to the stops and relieves tension between the gear segments and cross shaft pinion gears.



## 5 LUBRICATION

For type of oil or grease necessary, refer to Beloit manual No. P10-9600-0010, Lubrication Recommendations.

### 5. 1 Points of Lubrication

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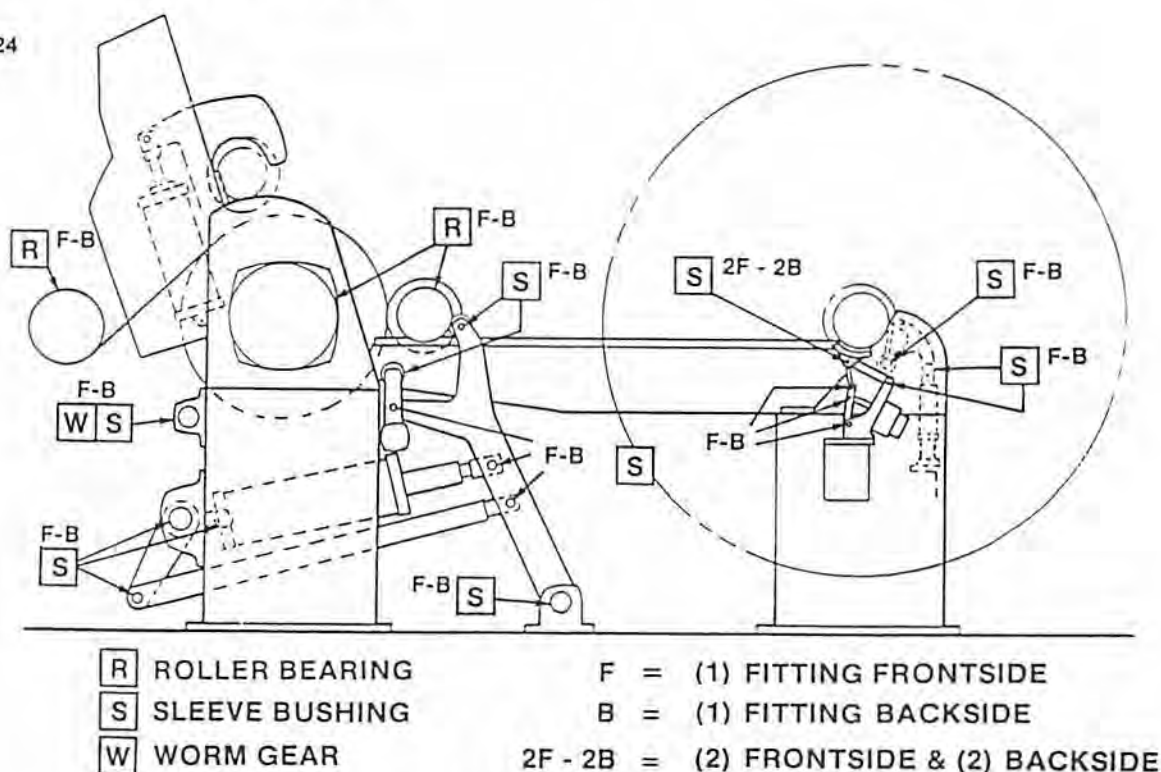


Figure 5-1. Review of Lube Locations

### 5. 2 Reel Drum

If the drum bearings are not connected to the paper machine continuous oiling system, check the oil level regularly (while the bearings are not operating). The oil level should be as close as possible to the top of the oil inlets. Check sight feeds for continuous oiling systems.

Inspect the mechanical coupling driving the drum periodically and lubricate, when necessary, with the manufacturer's recommended oil.

### 5. 3 Primary Arm Cross Shaft

Apply grease to the cross shaft bearing housings monthly.

### 5. 4 Primary Arms

The primary arms, primary arm caps and gear segments have grease fittings on the pivoting members that rotate around the drum bearing housings. Grease these and the lube fittings on the cross shaft approximately every two weeks.

On some of the new series reels, the primary arm hooks have cam followers inside the arms. Grease these every two weeks.

### **5. 5 Secondary Arms**

Grease all the pressure and loading rollers and the lube fittings on the cross shaft every two weeks.

### **5. 6 Rails**

Keep the top surfaces of the rails clean to provide good rolling surfaces for the spools. Always consider good care of the rails when setting paper logs on them by crane.

### **5. 7 Reel Doctor**

Grease the doctor oscillating and eccentric bearings monthly.

### **5. 8 Reel Spools**

Inspect the spool bearings once a month and grease as necessary. Do not over-grease these bearings to the point of grease being forced from the end covers.

### **5. 9 Spreader Roll**

Inspect the oil level periodically (while the bearings are not operating). The oil level should be as close as possible to the top of the oil inlets.

### **5. 10 Spool Starter (Belt Type)**

Grease the lube fitting (located on the spool starter pulley journal) once a month.

### **5. 11 Sheahan Rope System**

Grease the sheave lube fittings (if a Sheahan system is used) once a week.

### **5. 12 Air and Electric Motors**

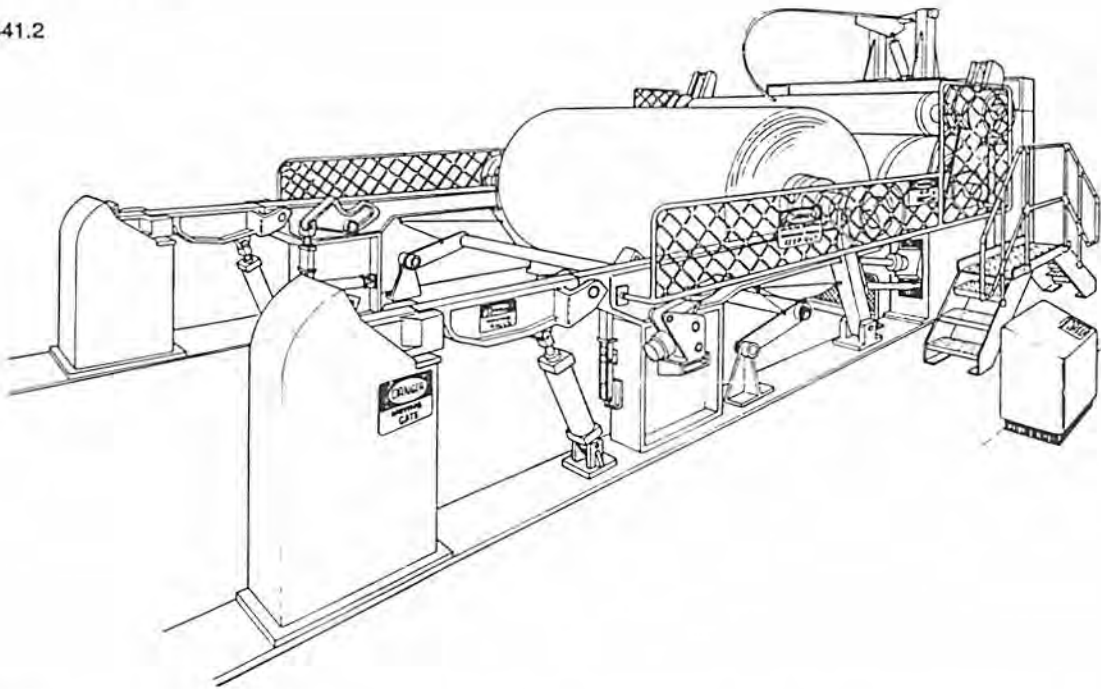
Follow the manufacturer's lubrication recommendations for each air and electric motor.

### **5. 13 Lubricators**

Keep the air line lubricator for all air cylinders filled with SAE 10 oil, to ensure efficient operation.

## 6 SAFETY

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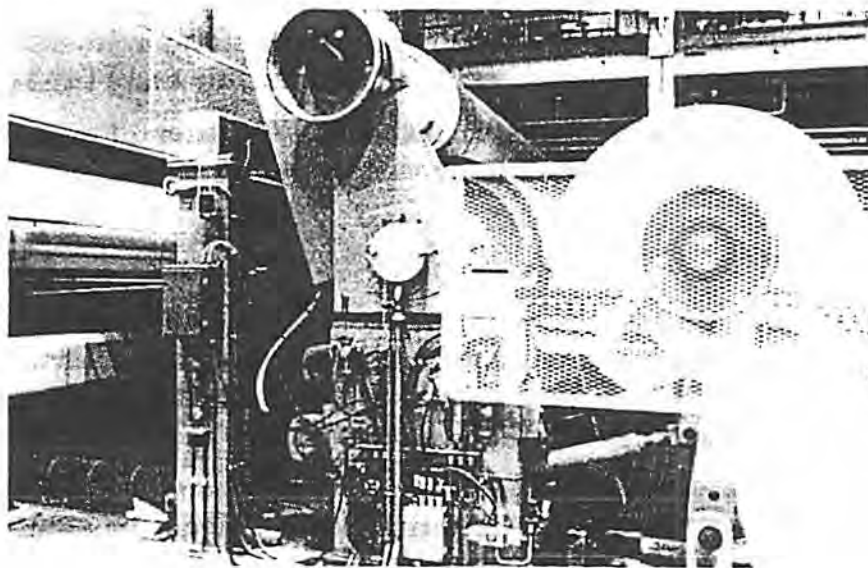


Figure 6-1. Safety Guards



## **6. 1 Reel Safety Requirements**

### **6. 1. 1 General**

These instructions are provided in the interest of reducing reel related injuries. The safety requirements listed here are not all inclusive, but they should be used to reinforce a mill safety program.

Do not operate the reel without first reading these and other operating instruction provided

1. Do not remove warning signs. They are installed to warn personnel of possible danger.
2. Have all footwalks, handrails, barriers and guards inplace before starting the machine. They have been installed for operators safety.
3. Make sure all rope sheaves have a minimum clearance of three inches at the rope nips, to prevent hand injuries.
4. Position all air cylinder hoses and limit switch wiring so as to prevent them from being caught in gear and rope nips and mechanical stops. (See installation instructions.)
5. Use extreme caution when cleaning up or removing broken particles. Keep clothing and all parts of the body away from ingoing nips and rotating or moving equipment.
6. Do not lean, climb or stand on equipment that is not intended for such purposes. Doing so may cause you to slip or fall into the machine or off the equipment.
7. Keep all areas clean and clear of obstructions. Wipe up all spilled oil, grease and water. Keep foreign articles off of walkways. Practice good housekeeping, to prevent injuries.

### **6. 1. 2 Operation**

1. The reel crane should not require manual spool unhooking. Eliminate any necessity for operating personnel to reach over equipment. Strongbacks are to be cable supported at each end and not pivoted from a center support hook. Reel hooks are to pivot in the machine direction only.
2. Be certain all non-operating personnel are out of the area before activating drives or controls, to prevent injuries. Use mirrors to provide good view of drive side to operators.
3. When placing a spool into the primary arms, be certain spool is clamped in position by the primary arm hooks removing crane hooks.



4. Do not use hand held devices to turn up a new spool. If an emergency air hose is required, the hose must be equipped with a metal nozzle approximately three feet long. Situate the hose and connections so as prevent operator from becoming entangled in the hose. Enforce the use of safety belts and ropes with work around broke chute area and above reel.
5. Do not mark paper defects manually (such as by placing cards into the nip). Use a mechanical device to mark the log edge.
6. Keep the area between calendar and reel free of broke, which may become entangled with rotating equipment and cause personal injury. Always stop the reel before removing broke.
7. Do not operate reel with damaged parts. Do not use a spool with a bent journal or otherwise out-of-balance condition.

### 6. 1. 3 Maintenance

Observe the following safety rules when performing maintenance on the reel:

1. Lock and tag out all drives and controls where possible before performing maintenance. Accidental startup may cause personal injury.
2. Inspect all slings, cables, etc. for wear and weak spots before use. Keep all personnel from under machine components being lifted or carried, to prevent personal injury.
3. Do not depend on hydraulic or pneumatic devices to hold equipment in raised position while performing maintenance. Always pin, chain or block the equipment to secure in raised position.
4. Use lifting points per manufacturer specifications. When using eyebolts be certain all are tightened to their shoulders and all eyebolt heads are parallel to lifting plane, to prevent bending, shear breakage.
5. Be certain all slings are tied securely when using to lift machine components, to prevent hazardous shifting of out of balance loads.
6. Release pressure from steam, water and air lines before disassembling connected equipment. Hot steam and high water and air pressure present personal danger.
7. Use proper stops when using hydraulic equipment to remove bearings, heads gears, etc. These parts may spring out of position rapidly upon breaking loose from fit.
8. Repair all hydraulic and pneumatic leaks immediately.



## 7 RECENT DEVELOPMENTS

Many new and exciting developments are occurring in the world of reels. Some of these are illustrated on the following pages. We feel that you, as maintenance people, will benefit by seeing and hearing about these items. It is possible that some of these ideas might be incorporated into your operations. At least, they may stimulate your way of thinking and finding new ways to perform your job faster, safer, more economically and with greater efficiency. We also realize that maintenance people can and do influence the purchase of new or rebuilt equipment and should be kept up to date with what the industry has to offer.

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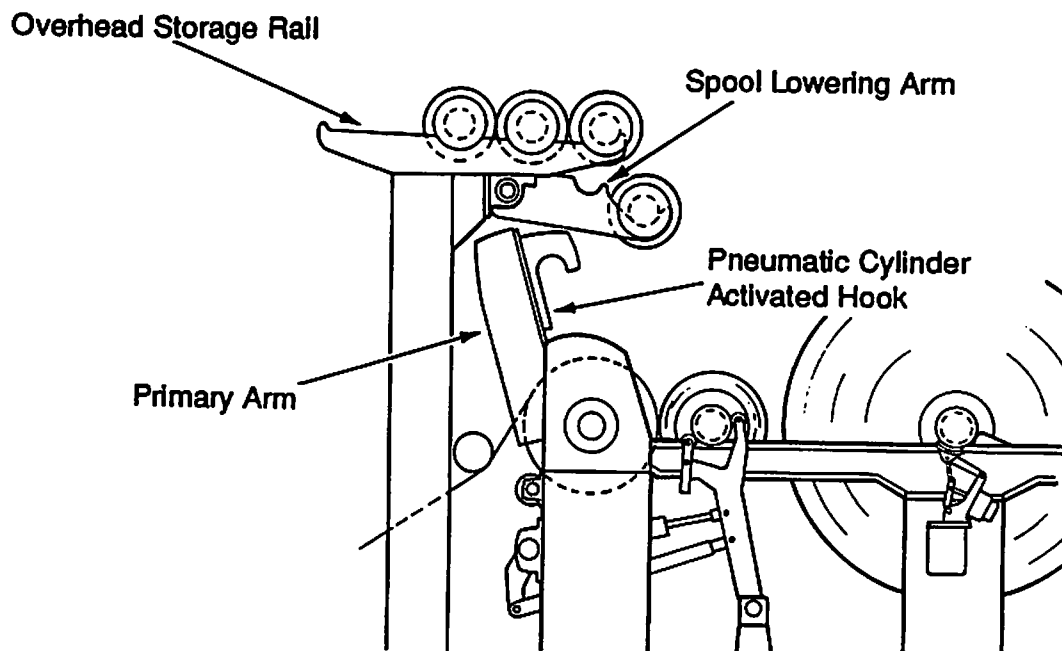


Figure 7-1. New Spool From Storage Rail

Automatic spool loading operation is basically the same as in conventional reel operation except that instead of placing empty spools in the primary arms, they are placed on an overhead storage rail (Figure 7-2). Empty spools are transferred by spool lowering arms to the reel primary arms, where they are held in place by pneumatic cylinder activated hooks.

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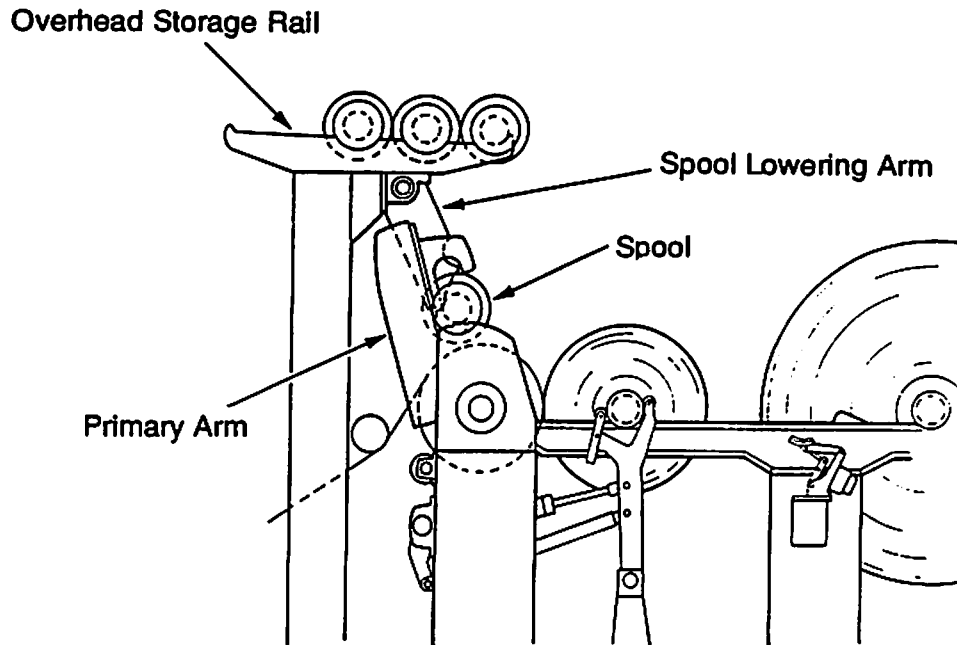


Figure 7-2. Spool To Primary Arms

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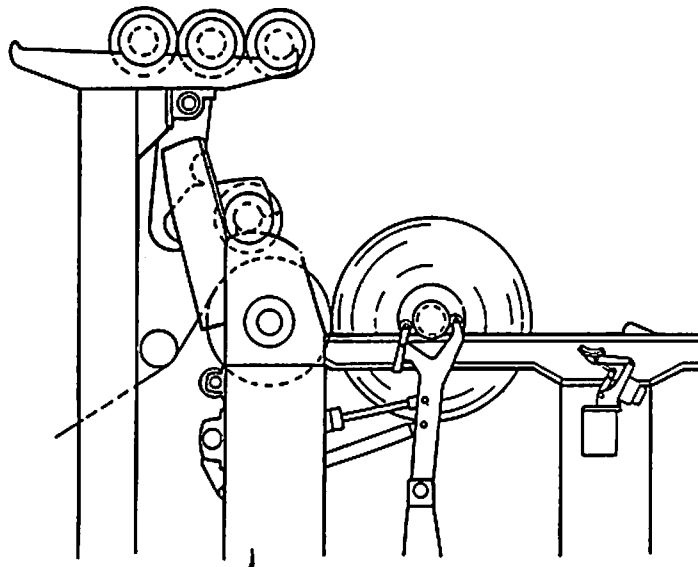


Figure 7-3. Spool Clamped In Primary Arms

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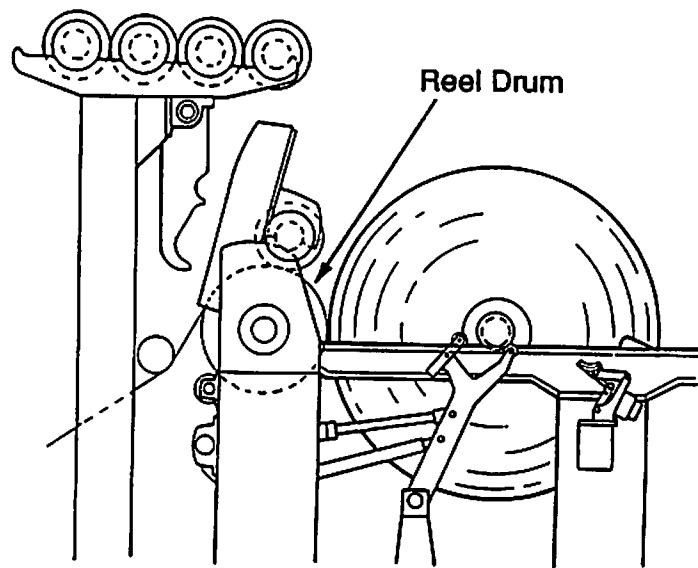


Figure 7-4. Turn-Up Position

The spool starter is activated, spool brought up to machine speed and lowered to the drum, where a turn-up is made.

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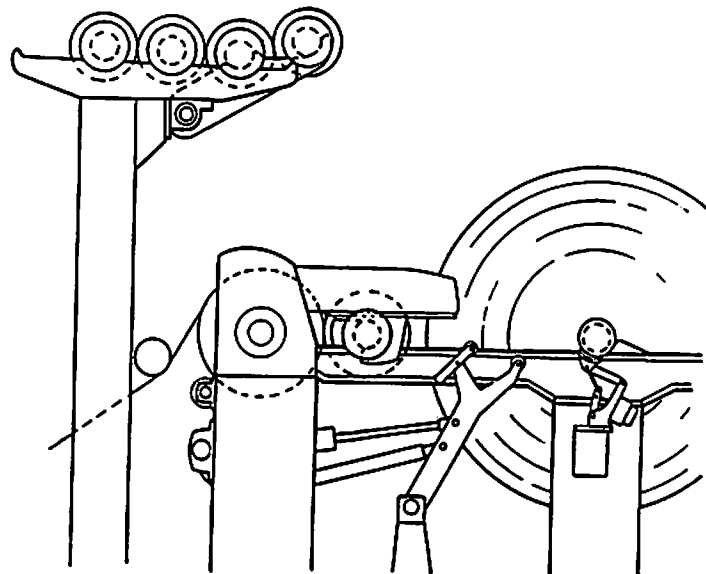


Figure 7-5. Spool To Rail, Winding

The spool is lowered to the reel rails in the primary arms. Before this operation, the finished log has been released by the secondary arms and rolled down the rails to the spool stop. As the new spool is lowered to the rails the spool lowering arms retract to pick up a new spool (Figure 7-5) and the secondary arms begin to return to operating position.



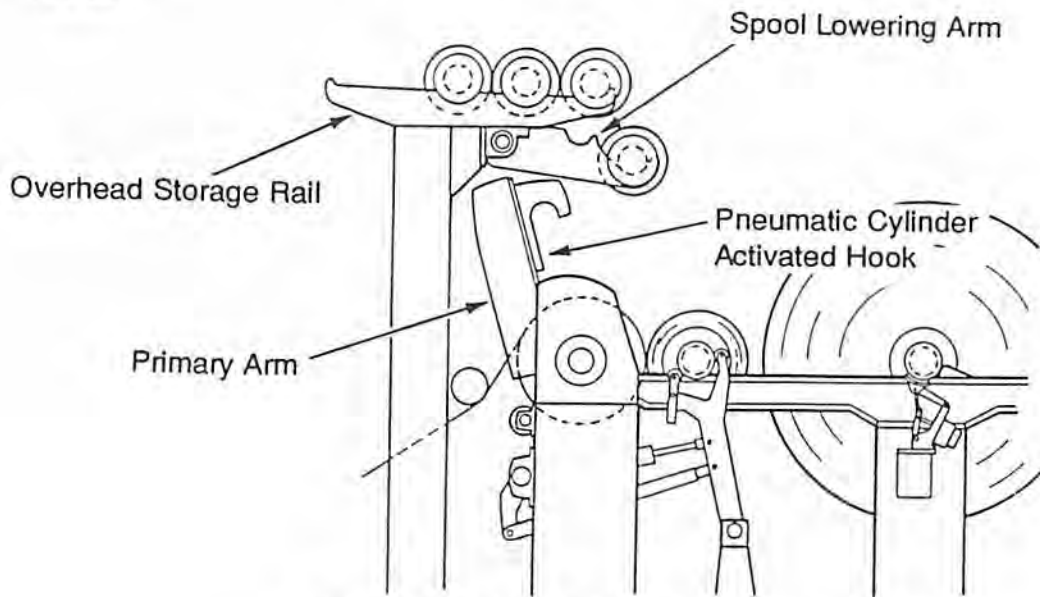


Figure 7-6. New Spool Lowering to Primary Arms

The primary arms return to the fully raised position and the cycle starts over.

### 7.1 Empty Spool Lift

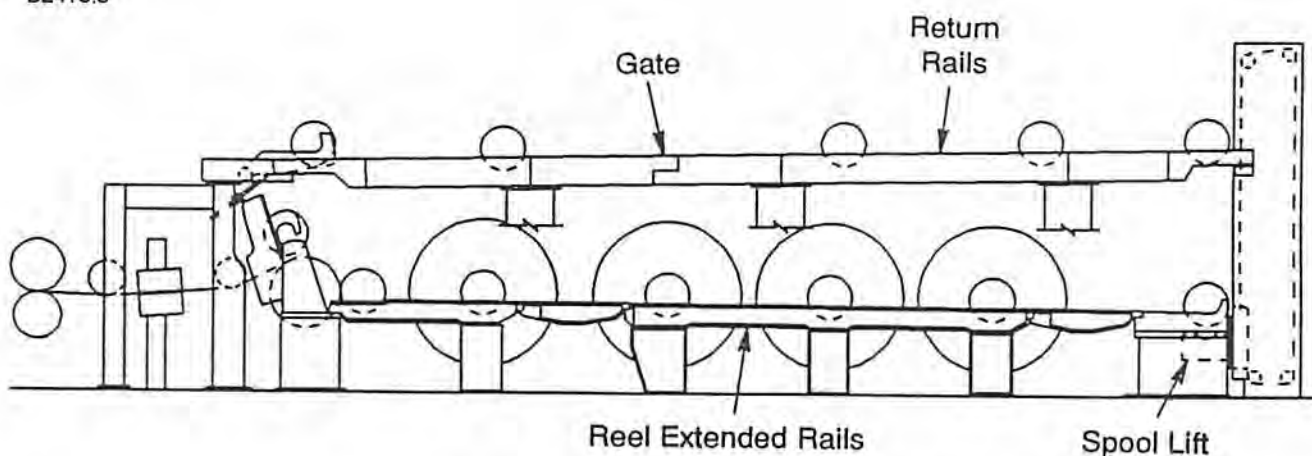


Figure 7-7. Unwind Spool Lift With Return Rails

The empty spool lift allows for automatic spool loading without use of a machine room crane. The unwind stand is located at the end of the reel extended rails. After the existing log expires on the unwind stand, a spool carriage picks the empty spool from the stand and carries it up to storage return rails located above the reel extended rails. A new log of paper is then gravity fed into the unwind stand from the reel extended rails. The empty spool on the upper rails moves back through a series of stops to the spool loader. Gates located above log #2 position allow removal of the parent roll if required.

## 7.2 Primary Arm Nip Relieving

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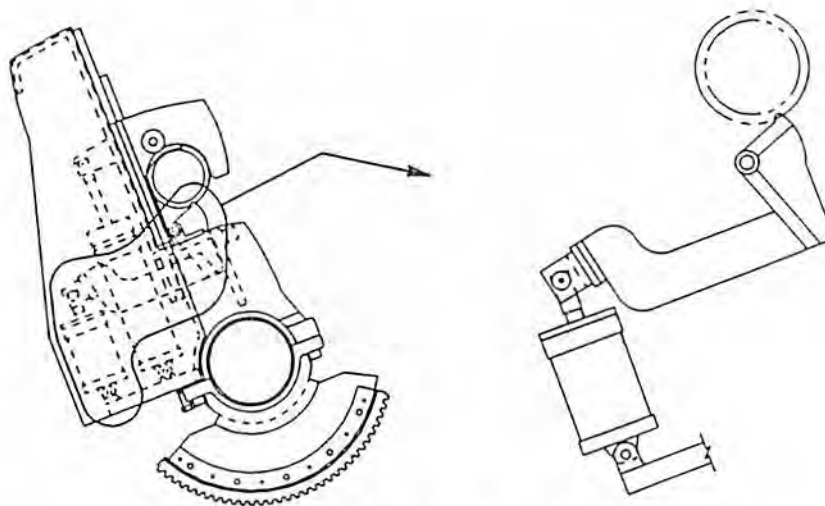


Figure 7-8. Primary Arm Nip Relieving

Primary arm nip relieving has become a standard feature in our reels. By up-loading on the spool journals, the weight of the spool on the drum surface is reduced, resulting in a more efficient turn-up on the spool and a better start in log building.

## 7.3 Primary Arm Bushings

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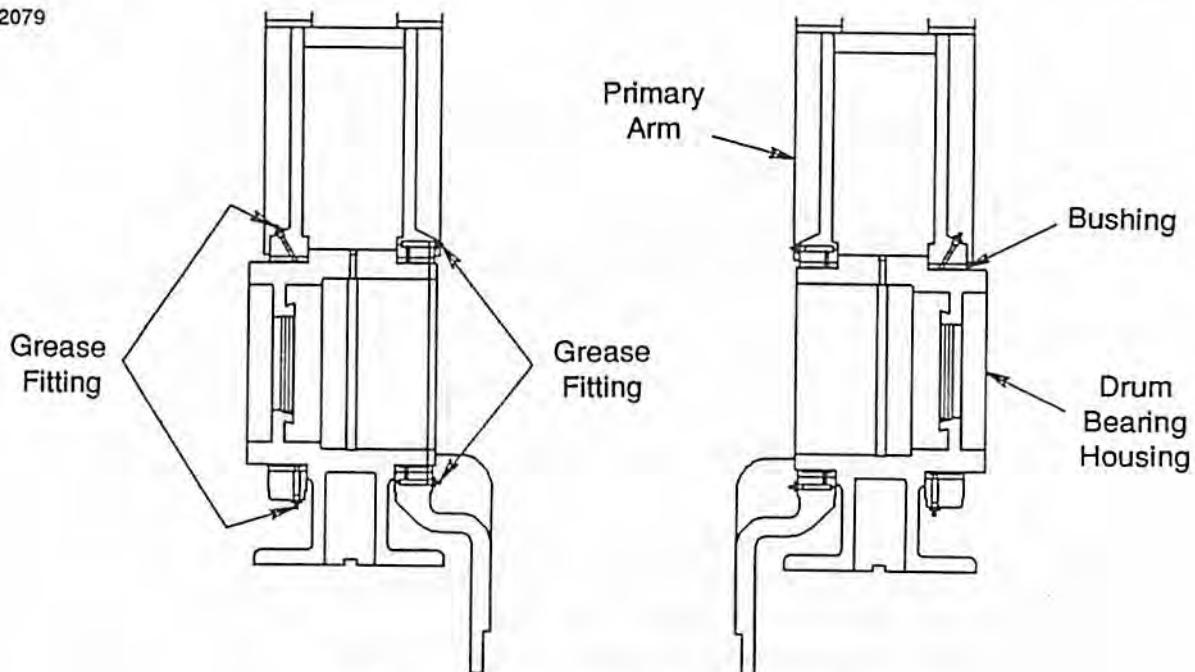


Figure 7-9. Primary Arm Bushings

The bushings on the primary arm provide a replaceable wearing surface between the arm and drum bearing housing.

## 7.4 Vacuum Sheave

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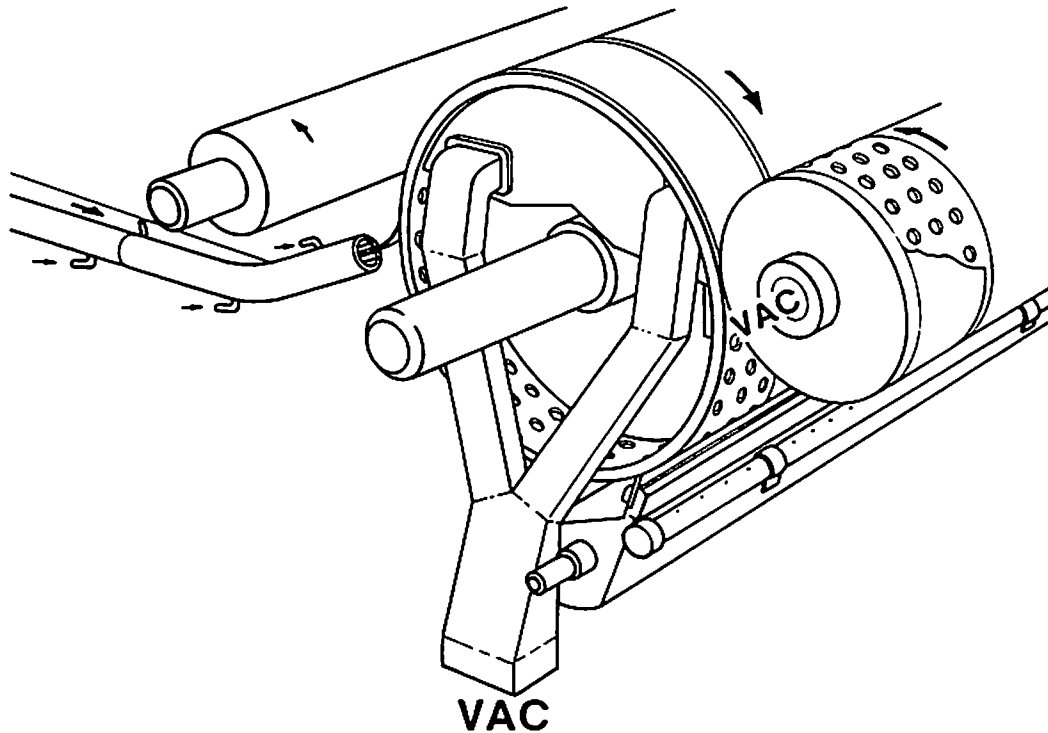


Figure 7-10. Vacuum Sheave

The vacuum sheave was developed as an aid to threading tissue grades. The vacuum aids in bringing the tail over the drum to where it can be wound around the spool, which may also use vacuum.

## 7.5 Secondary Arm Brakes (Tissue)

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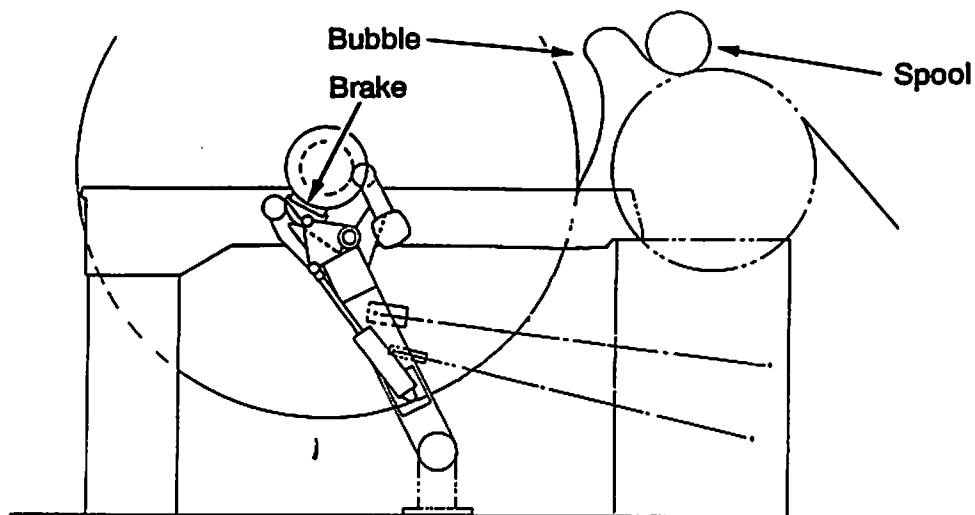


Figure 7-11. Secondary Arm Brakes for Tissue

Secondary arm brakes are offered to aid in the turn-up operation on tissue grades. The speed at which the log is rotating can create problems in forming a bubble to wrap the new spool. By applying braking to the log at the secondary arm position, the amount of billowing can be controlled and a more efficient transfer accomplished.

## 7.6 Foils for Tissue

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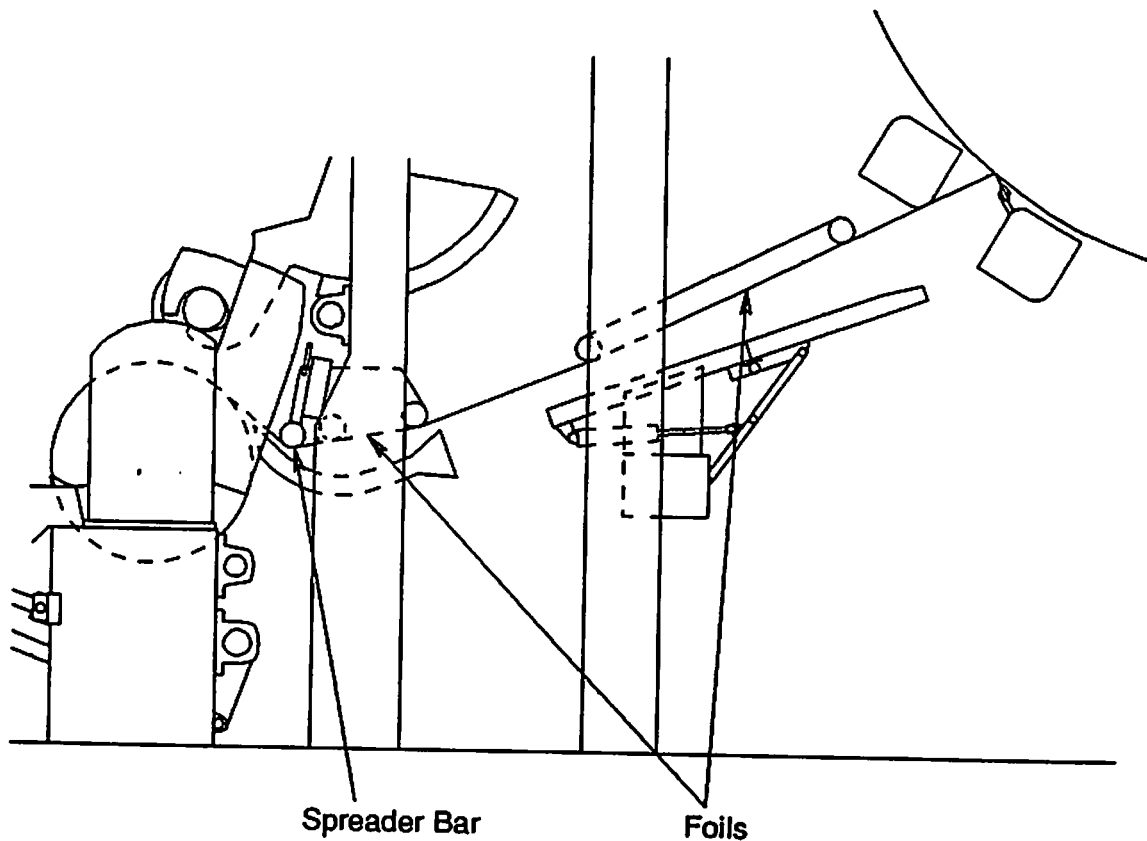


Figure 7-12. Foils for Tissue

Another feature offered for tissue applications are foils to control sheet flutter in the transfer from the calender or Yankee section to the reel. The foils dampen and control air turbulence around the sheet and also transport the sheet to the reel. A spreader bar mounted on the last foil provides the capability of delivering a wrinkle-free sheet to the reel spool. The foils replace conventional paper and spreader rolls and their drives, and thus provide economy along with improved sheet control.

## 7.7 Reel Centerwind Drive

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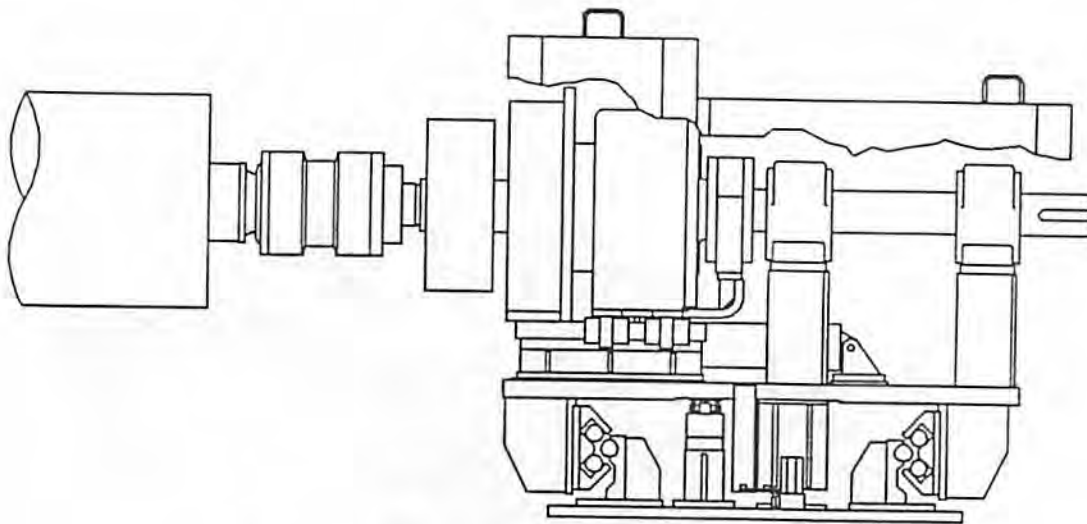


Figure 7-13. Reel Centerwind Drive

The electric helper drive and clutch attach to the reel spool during the winding operation. They provide a means of assuring constant wound in sheet tension while winding smooth or coated surfaced paper grades. The centerwind drive adds torque to the reel spool which assists the surface winding traction to prevent slipping on the reel drum.

## 7.8 Air Tube Threading

A9458.1

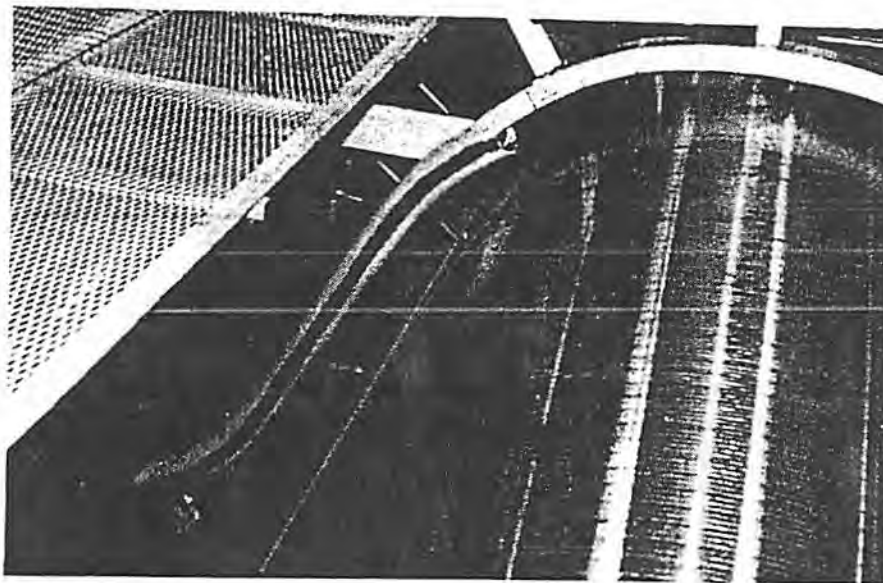


Figure 7-14. Air Tube Threader

## 7.9 Air Tube Threaders

Air tube threaders provide a safe alternative for transferring the tail to the reel. The tube threader eliminates the problems, dangers and malfunctions of the rope threading systems.

B0059

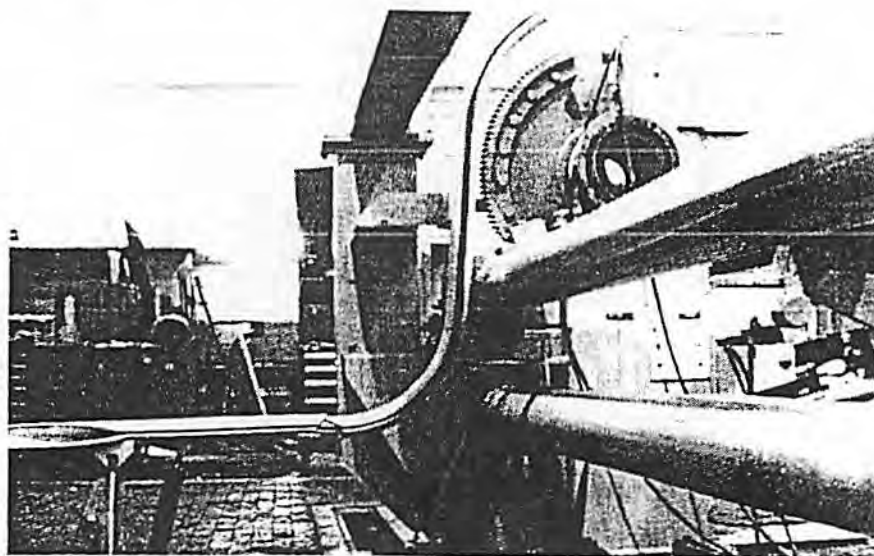


Figure 7-15. Air Tube Threading System

## 7.10 Extended Rails

A6326

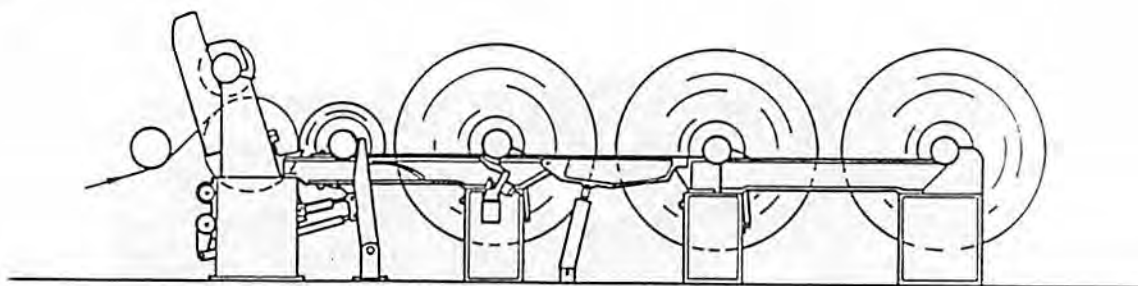


Figure 7-17. Extended Rail Reel

Extended rails for storage are not a new item, but are now fabricated of steel and furnished with replaceable wear strips which can extend the life and efficiency of the rails.





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**BELOIT** CORPORATION