Papier Extensible
C L U P A K
Extensible Paper

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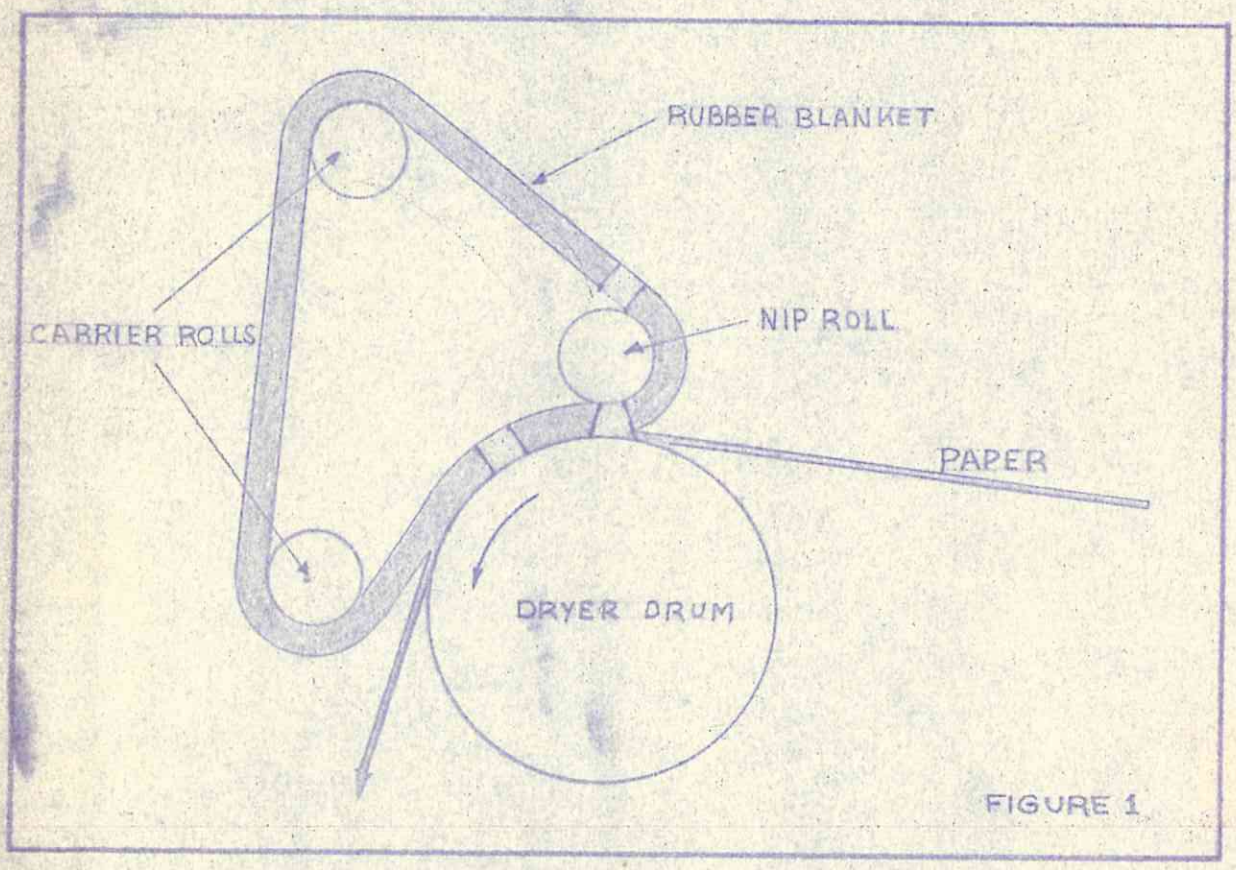

FIGURE 1

S E C T I O N 1 - OPERATION OF EXTENSIBLE UNIT

EXPLANATION OF THE PROCESS

The process for producing CLUPAK paper consists of subjecting a moist web of paper, while still in plastic form, to the recoil action of an endless rubber blanket. Figure (1) below is a sketch of the main parts of extensible unit.

In this device, the rubber blanket is passed through a constriction formed between the pressure roll and the dryer drum. The effect of this constriction is illustrated by the segments drawn on the edge of the blanket. At the nip, the blanket is squeezed and elongated. As this squeezed section leaves the nip area, it contracts or recoils. This recoil action, which is continuous, is used to shrink the paper in the following way. The moist web is fed into the nip where the blanket is elongated. From this point, the web is held in close contact with both the blanket and dryer surfaces by a combination of nip pressure and blanket tension. As the blanket recoils it applies compressive forces to the web in a direction parallel to the plane of the web. These forces cause the web to shrink while it is under restraint from constrictive force due to blanket tension. Consequently, the web is locally compacted and compressed, resulting in smooth surfaces and high extensibility. Since this recoil action takes place, there is a slippage between the dryer and paper proportional to the shrinkage. This slippage is possible because of the formation of a thin film of steam between the dryer and moist web. For this reason, temperature control of the dryer and general condition of the dryer surface are important.

DESCRIPTION OF UNIT

An extensible paper unit consists primarily of a smooth-surfaced, steam-heated "dryer drum" a "nip roll", a rubber blanket and several blanket carrier rolls as shown in Figure (2) on page two.

The pressure roll is pressed against the dryer drum to make a constriction or "nip" which is smaller than the thickness of the blanket. The shrinking action, as noted before, takes place in this area. The blanket is used so that this shrinking action can take place continuously, and the blanket carrier rolls serve merely to bring the blanket back to the nip area for the action to be repeated. The dryer drum is heated and a very small amount of release agent is sprayed on the dryer to facilitate further the sliding action of the paper on the dryer drum surface.

Blanket

The blanket presently used is constructed as shown in Figure (3) on page two. Although the blanket hardness can be varied, present production units are using blankets approximately 50 Shore A hardness (approximately 122 P& J Plastometer). As shown in the sketch, a backing is embedded in the blanket. This backing will stretch only slightly. Therefore, the blanket will stretch less than 1% beyond its original length.

This blanket is extremely tough and will absorb an astounding amount of punishment, with three important exceptions:

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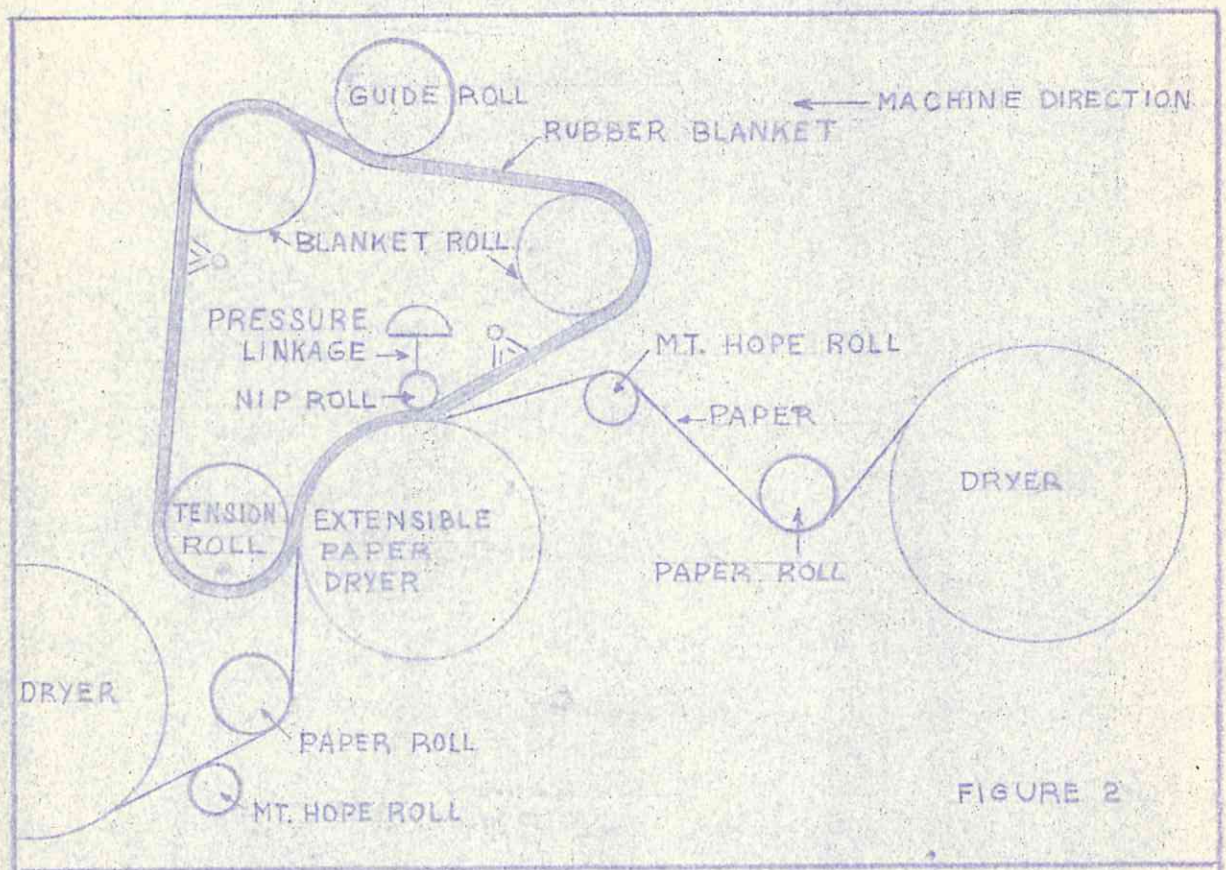

FIGURE 2

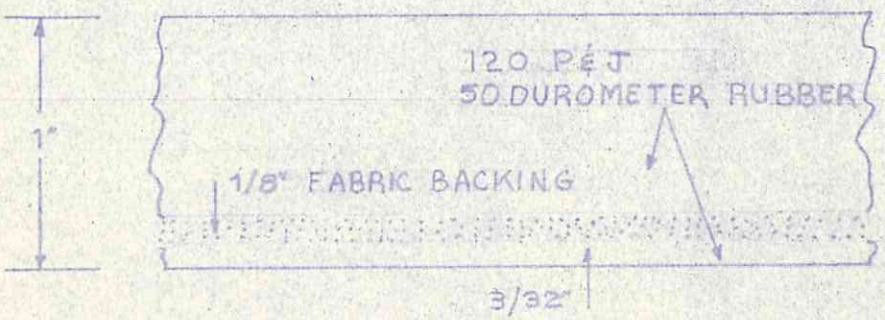

FIGURE 3

1. Sharp objects or rough edges on rolls, draping poles, etc can cut the rubber.

2. Excessive heat will tend to break down or carbonize the rubber, reducing its useable life.

3. Grease, oil, gas or kerosene or similar hydrocarbons will cause rubber to swell, forming a blemish. Precautions must therefore be taken to prevent oil or grease drippage on the blanket surface.

Since the friction between dry rubber and metal is high, the handling of rubber blankets on draping poles, rolls, etc., is simplified by generous use of water or soap solutions as lubricants.

Pressure Roll

Although pressure rolls are common on paper machines, the one used on an extensible unit is unusual in two respects. First, the roll diameter length ratio is very low. Second, except in special instances, it does not rotate. During operation, a continuous film of water is maintained on the inside surface of the blanket by the shower shown in Figure (2). This film acts as an excellent lubricant between the pressure roll and blanket. Even at maximum nip pressures, there is not enough friction between the blanket and the pressure roll to cause rotation. Only at very low speeds (50 feet per minute or less), or in the absence of water film, does this roll turn.

Dryer

The dryer drum used is of standard type construction, except that it is chromium plated and designed to withstand the high loads applied by the pressure roll. For wide machines, the dryer is 48 inches O.D. (30 diameter on ours), and progressively smaller for narrower widths. Because of the chromium plating, normal precautions must be taken to prevent damage.

1. No spears or knives must be used to clean the paper from its surface.

INSTALLATION OF UNIT

The extensible unit as described above, is installed in the paper machine dryer section at a point where the sheet moisture content has been reduced to about 35%. Since the drying characteristics of paper machines vary, the exact location of the unit will vary. In Figure (2), the typical installation shows the paper entering from a top dryer and leaving to a bottom dryer. This arrangement permits simplification of nip loading and eliminates to a large degree the hazard of paper wads passing through the unit. Paper threading is also facilitated.

Drive arrangements for the unit again will vary depending on the particular paper machine involved. The unit itself is driven at the speed of the dryer immediately preceding with the usual draw control. All sections following the unit must be reduced in speed in proportion to the shrinkage imparted to the sheet. Except for these, no other modifications are required in the paper machine. The unit can be by-passed by lifting the blanket above the dryer.

The controls for the unit, installed on a single console panel, consist of:

1. Air pressure loading for nip roll.

2. Air pressure for blanket tension.

3. Steam pressure control to dryer.

4. Drive controls including crawl drive, draws controls, and paper roll drives.

5. Spray system controls.

OPERATION OF UNIT

This section outlines by steps the procedure for placing an extensible device in operation.

1. Inspection - Before start-up, the blanket (inside and outside) should be free of any foreign objects or dirt which may have accumulated. Before engaging crawl drive, both inside and outside water lubricating showers must be turned on. During the first few revolutions, the blanket should be checked closely much the same as fourdrinier wire.

2. Heat-up Period - About one-half hour is required to bring the dryer up to operating temperature (275 degrees F or more). Exact steam required will vary, but 75 psi minimum should be obtained. After engaging crawl drive, proper operation of blanket guides, loading and tracking alarms should be checked.

A light nip loading may be necessary to permit start-up of the blanket.

A check should be made to insure good condensate removal, since this can be a source of trouble.

The release agent shower can be checked out during this period but should not be operated for an extended time, since an excessive film may accumulate on the dryer surface causing blanket slippage.

Two small sprays are installed to spray on the surface at the deckle edges of the blanket to prevent overheating of these surfaces because they are always exposed to direct contact with the dryer. These exposed surfaces should be kept to a minimum but will necessarily vary somewhat with grade and trim run.

3. Threading - After shifting from crawl to main drive, the extensible dryer and lead-in paper rolls are set at speed of preceeding dryer section. Trailing paper roll speeds should be set at the speed of the following section. The latter speeds will be determined by the amount of shrinkage desired.

Shower water on the outside of the blanket is controlled automatically by the photocell in the dryer section (actuated by the sheet); therefore, this shower will not turn off until the unit is threaded and the sheet widens. However, manual control is available. Caution should be taken to regulate the volume of this shower water so that enough is present to lubricate the blanket in the absence of the wet web, but not enough to overcool the dryer surface.

As soon as the tail starts through the preceding dryer section, the release agent can be turned on. However, practice varies as to this timing depending on the method used to thread. Excessive release agent should not be applied prior to sheet entrance, but should be on the dryer before the tail enters the nip. The usual threading practice is used from this point on through the paper machine.

The step of widening from a tail to full machine width should be done continuously. Widening to an intermediate width may cause uneven friction in the nip and result in the blanket tracking rapidly to the back side.

Draws are adjusted in the normal manner and speeds checked to determine the amount of shrinkage. It is impossible to determine the amount of draws after the unit by sight, so some type of speed indicator is required. Best sheet quality is obtained by running minimum draws particularly after the last dryer section.

4. Operation - Moisture content of the sheet entering the device influences the finished product in the following ways. If the sheet is too dry, a smooth finish cannot be obtained. If the sheet is too wet, desired stretch may be difficult to obtain. Poor moisture distribution (wet streaks, dry edges, etc.) across the web can cause irregularities in the reel.

Nip pressure should be regulated to give adequate shrinkage but should not be higher than required for normal draw tention.

Steam pressure should be set to maintain proper dryer surface temperature. This will normally be about 75 psi, but may vary with speed and sheet moisture.

Release agent should be regulated to minimum flow while maintaining proper shrinkage and power consumption.

5. Shut-down - When shutting down, release agent and steam are shut off, the belt and mechanism are lifted above the dryer and the cooling water showers are shut up.

6. By-passing.- To by-pass, after lifting the belt above the dryer, the sheet is passed over the dryer as usual after having adjusted the speed of the following sections.

7. Blanket change - Blanket change sequence is described in the machinery manufacturer's drawing. General precautions mentioned earlier should be observed, since irreparable damage can be done. During change, all rolls should be inspected.

8. Grinding. - Periodically the blanket must be ground to remove surface blemishes and deteriorated rubber. This will occur after approximately fifteen to twenty million feet. 20 days. From 0.015" to 0.020" of thickness is removed by each grinding. In general, maintenance of the blanket surface is comparable to a rubber-covered roll. The technique of grinding will be demonstrated on the first grinding for each device.

PREPARING EXTENSIBLE UNIT FOR OPERATION

What To Do	Why It is Done and Precautions to be taken
1. Inspect extensible machine, especially rubber blanket, inside and out.	Prevent damage to rubber blanket.
2. Turn on blanket lubricating showers	To lubricate blanket on inside.
3. Turn on blanket cooling shower.	To lubricate blanket on outside and prevent overheating.
4. Turn on steam to extensible dryer drum.	Do not exceed 110 psi under normal operating conditions. Do not allow heated dryer to remain stationery when blanket is on it.
5. Turn on crawl motor	
6. Engage crawl clutch.	To rotate blanket one complete revolution so that it can be visually inspected and all controls can be checked.
7. Check Operation of blanket guide.	To keep blanket in place on machine. If blanket does not track in center of rolls adjust air guide palms accordingly and also adjust position of front guide roll bearing by means of handwheel.
8. Operate on crawl drive.	To heat dryer to operating temperature.
9. Engage main drive clutch.	As unit comes up to speed, check carefully for proper operation of blanket guide roll and lubricating showers.
10. Check and set extensible dryer speed.	Speed does not have to be exact, since draw will be set by observation after sheet is running through.
11. Set speed on lead-in paper rolls.	This will eliminate undue strain on sheet entering extensible unit.
12. Set speed of trailing Dryer Section.	Speed differential between extensible unit and third dryer section will be proportional to amount of shrinkage in paper For example, paper entering extensible unit at 1000 FPM, 10% MD shrinkage in the extensible unit, speed paper leaving unit about 900 FPM.
13. Set speed of trailing paper rolls.	Paper leaving extensible unit is very sensitive to draw tension until dried. A tight draw can pull out all of the MD stretch which has been put in to the shee by the unit. Revolving the rolls at the proper speed will prevent, drag on the sheet and assist in preserving the MD stretch.

PREPARING EXTENSIBLE UNIT FOR OPERATION (Cont'd)

14. Set extensible unit doctor blade.	
15. Load nip roll	Load nip roll to operating pressure.

THREADING EXTENSIBLE UNIT

What to do	Why it is done and precautions to be taken.
1. Bring tail down machine	
2. Turn on release agent sprays	Check for uniform spray distribution.
3. Turn off blanket cooling shower.	This will normally be done automatically If sheet breaks, blanket cooling shower will automatically turn on and prevent the blanket from overheating.
4. Bring tail through extensible unit and on through machine.	
5. Widen tail to full sheet.	Do not allow partial width sheet to run through unit for any length of time as it may run blanket off.
6. Adjust draw between preceding dryer section and extensible unit.	
7. Set draw between extensible unit and following dryer section.	
8. Establish final settings for desired MD stretch.	Setting of nip pressure and draws for desired MD stretch will have to be correlated with test lab results to obtain exact settings.

SHUTTING DOWN EXTENSIBLE UNIT.

What to do	Why it is done and precautions to be tak
1. Knock down sheet at couch.	
2. Turn off release agent sprays.	
3. Relieve nip pressure	If blanket stops turning, reapply pressure, but reduce it to minimum required to keep blanket turning.
4. Turn off steam in dryer.	
5. Lift blanket above cylinder.	To prevent damage to the blanket, do not allow unit to remain stationary with steam in dryer drum for more than a few seconds.

SHUTTING DOWN EXTENSIBLE UNIT (Cont'd)

What to do	Why it is done and precautions to be taken
	C a u t i o n - allow unit to come to complete stop before engaging crawl motor.
6. Turn off auxiliary equipment	C a u t i o n - Do not permit ocillating doctor blade to run when unit is stopped

NOTE:- If the blanket must stay in contact with the dryer for one reason or another, the unit must be turned in crawl until the dryer surface temperature is down to 150 degrees F, or at a point where the dryer can be touched with the hand.

TROUBLE SHOOTING

DIFFICULTY	POSSIBLE CAUSE	MEANS FOR CORRECTION
1. Blanket won't turn or stops turning.	a. Dryer drum not hot enough	a. Raise steam pressure to maximum of 110 psi. Allow at least 30 minutes to bring drum up to operatin temperature (275-300 degr F.)
	b. Too much release agent on dryer	b. Flush nip with water or turn on cooling shower.
	c. Not enough blanket tension.	c. Increase tention air pressure.
	d. Not enough nip pressure.	d. Increase nip pressure.
	e. Too much water on blanket.	e. Turn off cooling shower and allow blanket to run dry - watch to see that e tensible unit doesn't ove load.
	f. Too much nip pressure	f. Decrease nip pressure.
	g. Mechanical Defect	g. Check unit for loose tool pipe, etc., inside blanke or broken circuits, pipin etc., in drive system.
	h. Paper wad or other obstruction in nip.	h. Check visually and remove obstruction.
	i. Lack of lubrication inside blanket	i. Check showers for adequate supply of water in front of each roll.
2. Not enough MD stretch in paper.	a. Draw between extensible unit and third dryer section too tight.	a. Slack draw by means of draw control.
	b. Not enough pressure on nip roll.	b. Increase nip pressure.
	c. Not enough release agent on dryer.	c. Increase amount of release agent flow through spray by adjusting valves or by increasing concentr tion of release agent.

TROUBLE SHOOTING (Cont'd.)

DIFFICULTY	POSSIBLE CAUSE	MEANS FOR CORRECTION
	d. Temperature of extensible dryer drum too low,	d. Increase steam pressure in extensible dryer drum to maximum of 110 psi. Check condensate removal
	e. High moisture content of sheet entering extensible unit.	e. Increase steam in preceding dryer sections.
3. Too much stretch in sheet.	a. Slack draw after extensible unit.	a. Tighten draw by use of draw control buttons.
	b. Nip pressure too great	b. Decrease nip pressure.
	c. Low moisture content of sheet entering extensible unit.	c. Increase moisture conten by decreasing steam in preceding dryer sections
4. Uneven stretch across sheet.	a. Uneven moisture across sheet entering extensible unit.	a. Level moisture content of sheet entering extensible unit by changes in press section, Grewin system or basis weight.
	b. Uneven application of release agent.	b. Check spray for clogged nozzles.
5. Rough surface on sheet.	a. Low moisture content of sheet entering extensible unit.	a. Increase moisture conten of sheet by decreasing steam in preceding dryer section.
	b. Slack draw between preceding dryer section and extensible unit.	b. Tighten draw between dryer section and extensible unit.
	c. Insufficient amount of release agent on dryer.	c. Increase volume of release agent being sprayed o by adjusting needle valv or increase concentratio of solution.
6. Unit stops due to overloading.	a. Excessive nip pressure, lack of lubrication inside blanket, lack of release agent on dryer, lack of cooling water on blanket (running without paper).	a. Relieve nip pressure. Engage crawl motor clutch after starting crawl motor. Correct difficulty and restart.

TROUBLE SHOOTING (Cont'd.)

DIFFICULTY	POSSIBLE CAUSES	MEANS FOR CORRECTION
7. Blanket begins squealing, sheet takes on fuzzy appearance.	a. Lack of release agent on dryer.	a. Increase amount of release agent by adjusting needle valves or increase concentration of solution.
	b. Extensible dryer temperature too low.	b. Increase steam pressure.
	c. Too much cooling water (when running without paper).	c. Decrease blanket cooling spray flow.
8. Sheet breaks entering unit.	a. Draw too tight.	a. Slack draw.
	b. Moisture content too high.	b. Increase steam pressure in preceding dryer section.
	c. Moisture content too low.	c. Decrease steam pressure in preceding dryer section.
	d. Extensible dryer temperature too low.	d. Increase steam pressure
9. Sheet breaks leaving unit.	a. Draw too tight.	a. Slack draw.
	b. Sheet sticking to blanket, pulling out stretch.	b. Increase draw to pull sheet out of nip.
	c. No nip pressure.	c. Check controls and system.
10. Sheet leaving unit goes slack.	a. Loss of stretch in nip.	a. Check nip pressure, increase if necessary.
	b. Increase moisture content of sheet entering unit.	b. Check system into preceding dryer section, increase if necessary.
	c. Lack of release agent.	c. Increase amount by adjusting valve or increase concentration.
11. Not enough CD stretch in paper.	a. Draws before extensible unit slack.	a. Increase all draws before preceding dryer section.

TROUBLE SHOOTING (Cont'd.)

DIFFICULTY	POSSIBLE CAUSE	MEANS FOR CORRECTION
	b. High moisture entering extensible unit.	b. Increase steam pressure preceding dryer.
	c. Low MD stretch.	c. See paragraph 2.
12. Holes and picking appearing in sheet (lightweights particularly.)	a. Lack of release agent on dryer.	a. Increase release agent.