# CHAPTER 13

# MECHANICAL FINISHING

Mechanical Finishing is defined as any operation performed to improve fabric appearance or function by physical manipulation. Steam or water may accompany the physical manipulation; however, chemicals other than lubricants are seldom used. Fabric luster, smoothness, softness, residual shrinkage and hand are examples of the properties that can be altered by mechanical finishing. Topics to be covered in this chapter are:

- Compacting (Shrinkproofing)
- Calendaring
- Raising (Napping, Sueding)
- Shearing
- Polishing
- Corduroy Cutting
- Decating

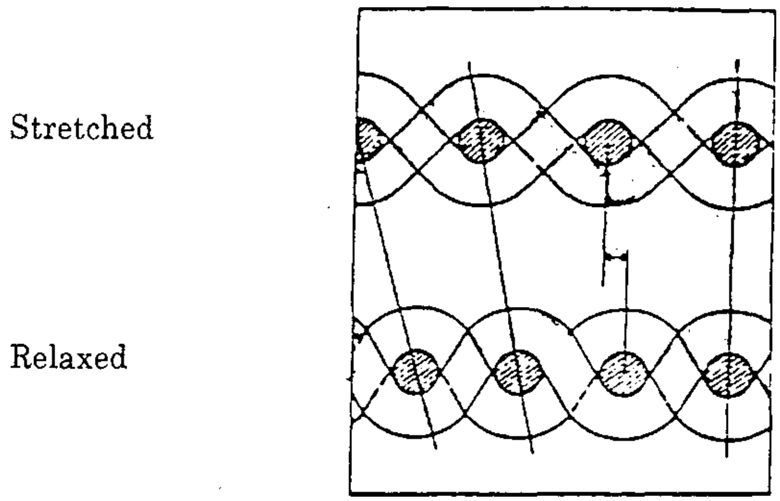
## I. COMPACTING - SHRINKPROOFING

Controlled residual shrinkage is an important quality parameter for many fabrics. For example, excessive shrinkage is undesirable for fabrics to be made into garments. Here, the residual shrinkage should be less than 2% otherwise the garment will not fit after it is laundered. Drapes cut to floor length will draw up from the floor and detract from their appearance unless the residual shrinkage is controlled. Before launching into the mechanical methods of reducing shrinkage, it will be instructive to discuss the causes of fabric shrinkage.

### A. Why Fabrics Shrink

Woven and knitted goods are 3-dimensional arrays of crimped yarns. Fabric forming processes take straight lengths of yarns and force them into 2-dimensional crimped lengths. The degree of crimp is a function of the yarn size and fabric construction. When fabric is completely relaxed, the crossing yarns will move around in relation to each other until a stable configuration is reached. This stable arrangement, the point where the relaxed fabric no longer shrinks in width and length, is also related to yarn sizes and fabric construction. When stretching tensions are applied to the fabric, the crimped amplitude decreases and the fabric grows in the direction of the stress. Later when the tensions are relieved and the fabric allowed to relax, the crimp amplitude returns to its stable configuration and the fabric shrinks. Many fabrics are stretched during wet processing as they are pulled from one operation to another. This is the major cause of fabric shrinkage.

**Figure 67. Fabric Crimp**




## B. Sanforizer

Mechanical compacting is one method of reducing residual shrinkage. The process forces yarns closer together and the fabric becomes thicker and heavier. As a result of this, the net yardage yield is reduced. A Sanforizer is a fabric compactor developed by Cluett Peabody. The term ***Sanforized,*** is their registered trademark and is used to market fabrics that meet certain shrinkage specifications. The term Sanforized is now generally accepted to mean a fabric that has low residual shrinkage and the term Sanforizing is used to describe shrinkproofing processes. While the patents on the machinery have expired, the trademark is actively promoted by Cluett Peabody. The effect of Sanforizing can be seen in figure 68 which shows that open fabric structure has been closed up somewhat. The process, figure 69, consists of a range where the fabric is first moistened with steam, to make it more pliable, run through a short tenter frame (pup tenter) to straighten and smooth out wrinkles, through the compressive shrinkage head and then through a Palmer drying unit to set the fabric. The fabric is wound into large rolls under minimum winding tensions. If the winding tension are excessive, the fabric will be pulled out and the degree of compaction lessened. Usually, a lubricant is added in preceding operations to assist in the realignment of the yarns as the fabric runs through the compactor. Selection of the proper lubricant is critical for some fabrics.

**Figure 68. Effect of Sanforizing**

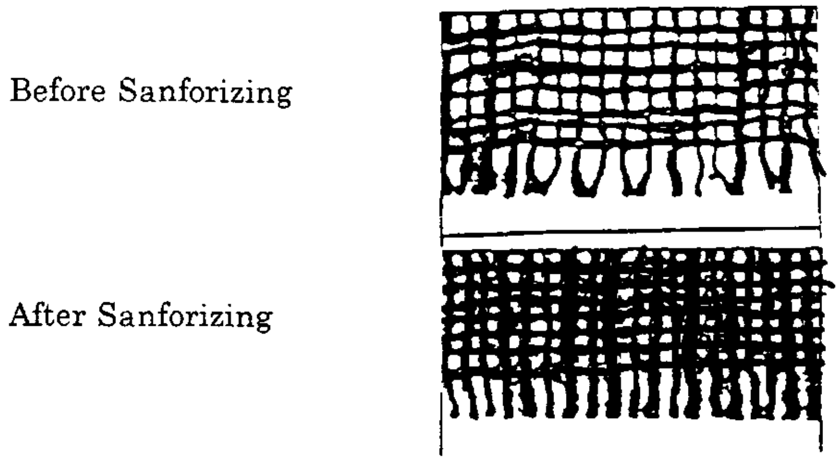
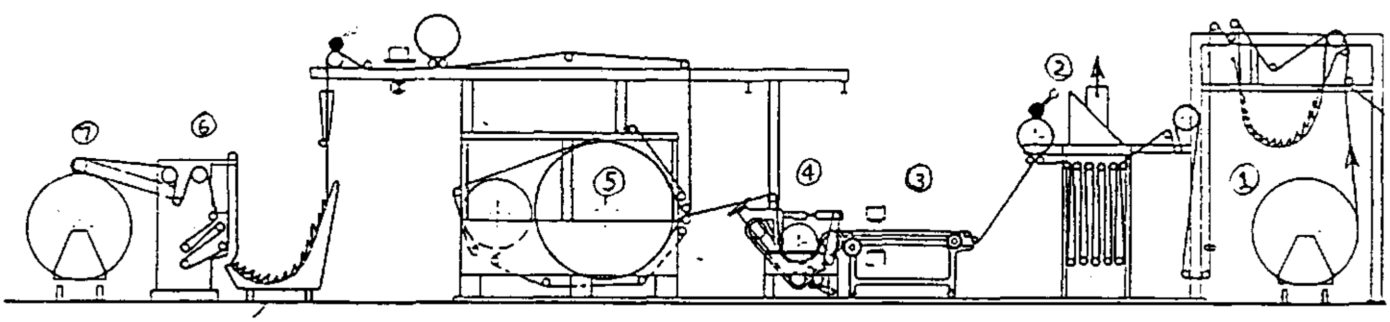



**Figure 69. Sanforizing Range**



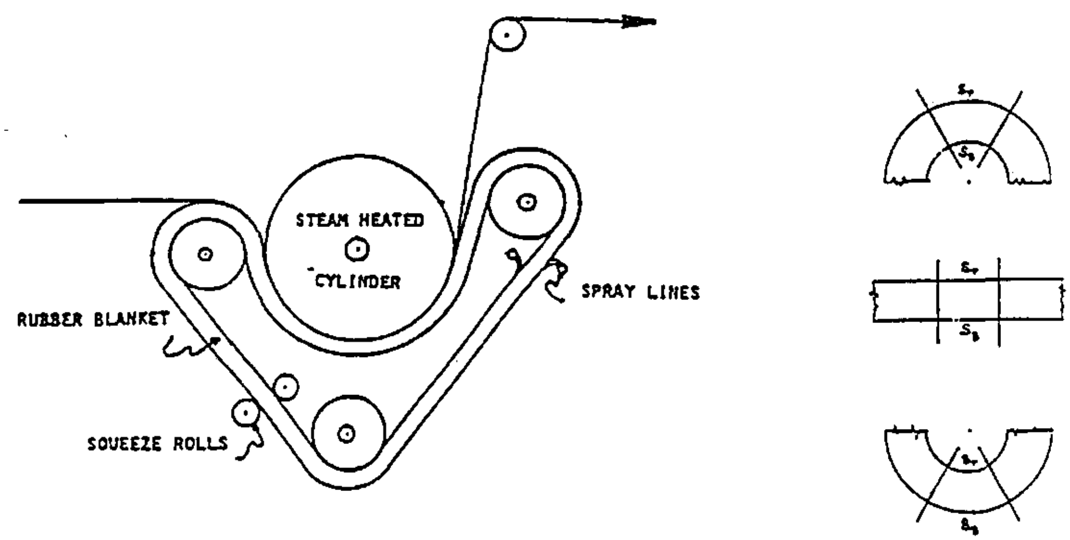
(1). Let-off (2). Steamer (3). Pup Tenter (4). Sanforizer Head (5). Palmer Unit (6). Fabric Straightener (7). Take-up

## 1. Compactor Head

The key to any compactor is the head where force is applied to move parallel yarns closer together. More fabric must be fed in than is taken off. A Sanforizer uses a thick rubber blanket running against a steam heated cylinder as the compacting force. The thick rubber blanket first goes over a smaller diameter roll which stretches the convex surface of the blanket. Fabric is metered onto the stretched blanket and the fabric and blanket together come in contact with the steam heated cylinder. At this point, the stretched rubber surface contracts to its original length and then is forced to contract an additional amount as it forms the concave configuration of the heated drum. Since the fabric is not elastic, an extra length of fabric is thrust between the rubber blanket and the heated cylinder. Friction between the rubber blanket and steel drum force adjacent yarns to move closer together until the unit length of fabric become equal to the unit length of rubber blanket it rests on. If the fabric construction does not allow the yarns to move, the extra fabric will buckle developing creases and wrinkles.

Figure 70 shows a schematic of the compactor head and how the fabric and blanket moves together. Heat is created by constantly stretching and relaxing the rubber blanket. The blanket is cooled by spraying water on it after the fabric exits from the unit. Insets in figure 70 also show the length variations that occur as the blanket surface goes from convex to straight to concave.

**Figure 70. Sanforizer Head**

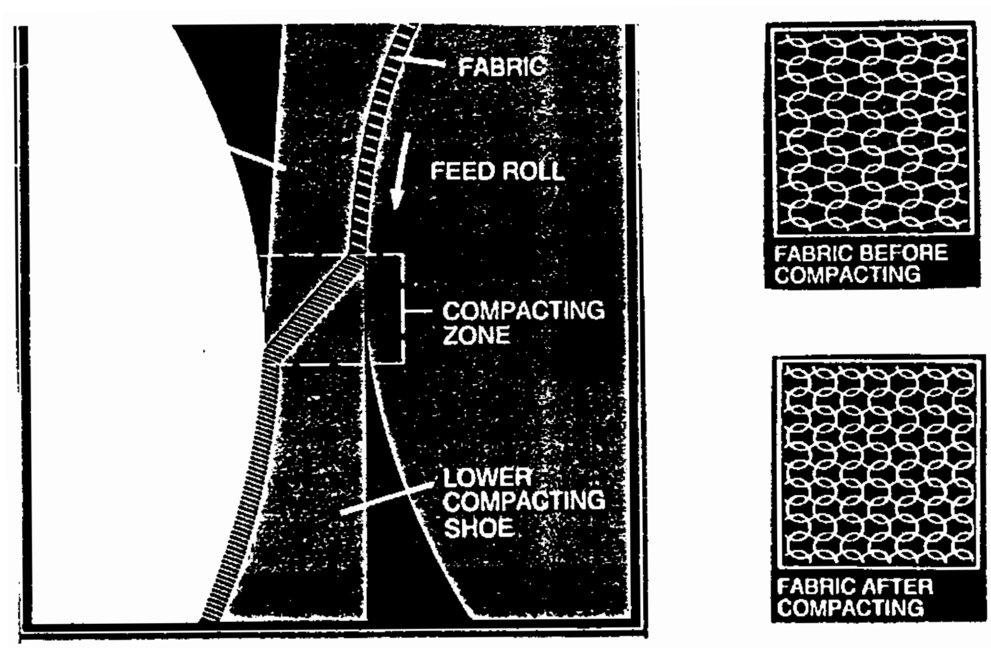



The degree of shrinkage can be controlled by the thickness of the blanket. The thicker the blanket, the greater is the stretched length at the bend. A longer length of fabric will be fed into the compactor causing the degree of compacting to be greater. Conversely if the blanket is thinner, a lesser degree of compacting will occur. Blanket thickness can be adjusted by means of a pinch roll compressing the rubber blanket. This allows for some degree of "dialing in" the degree of compacting desired. To be effective, the degree of compacting needed should be predetermined ahead of time. This is done by characterizing the shrinking behavior of the fabric by laundering. The degree of compacting should not exceed the degree of shrinking otherwise over-compacting will cause the fabric to "grow" when relaxed. This is as much a disadvantage as is shrinkage.

## B. Friction Calendar Compactors

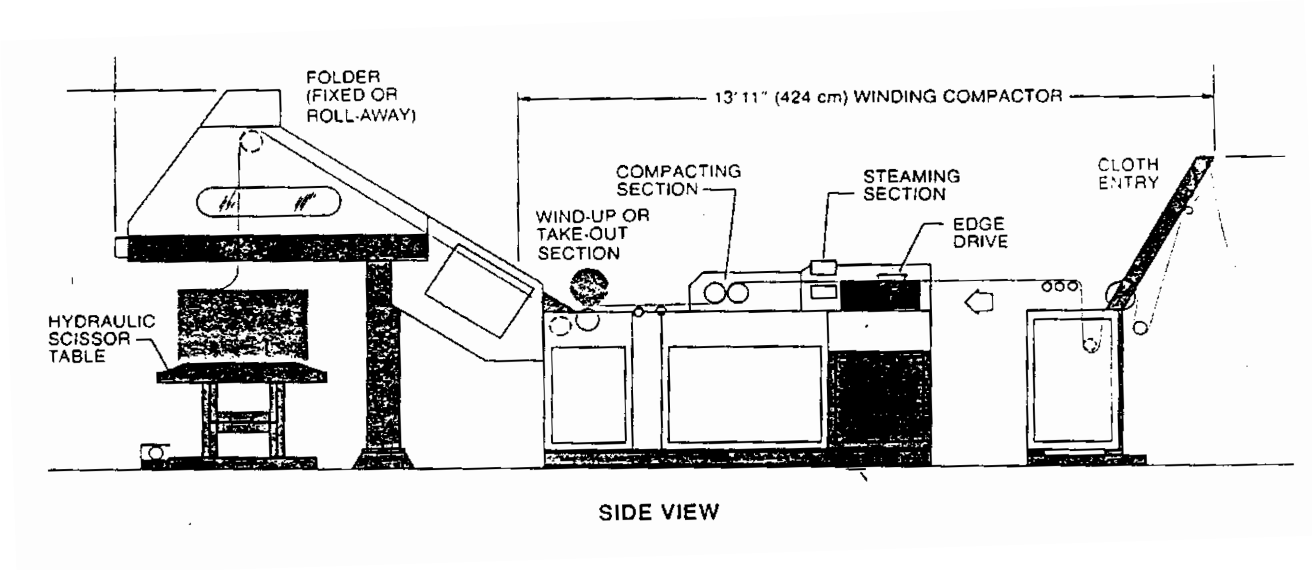
Another method of compacting fabrics is with calendar rolls. The fabric passes between two metal cylinders, one cylinder rotates faster than the other. The fabric is restrained by shoes that are positioned against the cylinders. The fabric delivery cylinder rotates faster than the take-off cylinder and the action is similar to stuffing a string into a straw. The friction causes filling yarns to move closer together and a loss of fabric length.

**Figure 71. Friction Compacting Principle**



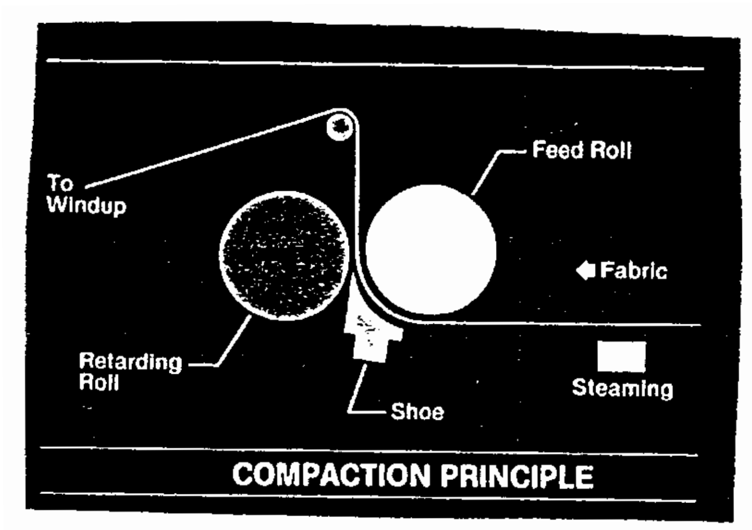
The degree of compacting can be controlled by the differential speeds of the two calendar rolls. Pac Nit II is a machine designed by Tubular Textile Company for tubular knits and operates simultaneously on both layer of the tubular fabric as it passes through the unit.

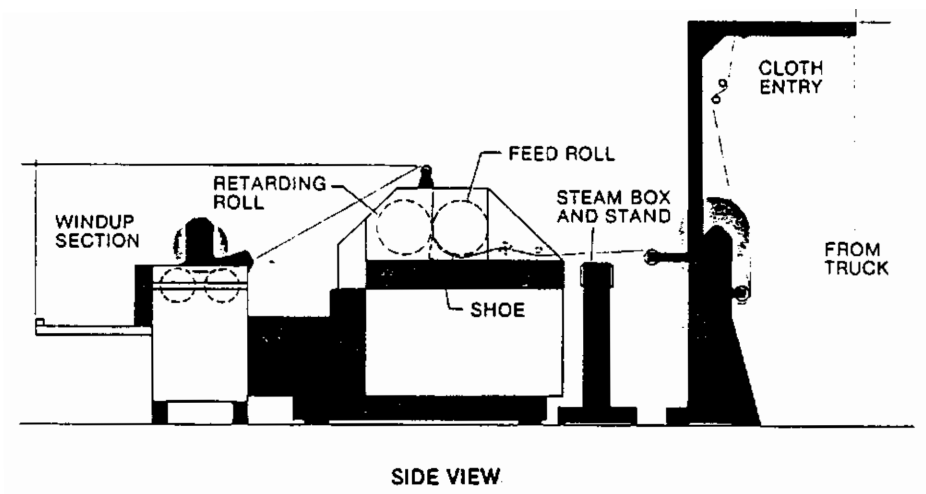
**Figure 72. Tubular Knit Compactor**




Tubular Textile Machinery Co has also designed a wide version compactor (Model CS 2000) that can handle single layers as wide as 90 inches. It is effective on open width knit goods such as tricots and slit circular knits.

**Figure 73. Wide-Width, Single-Layer Compactor**

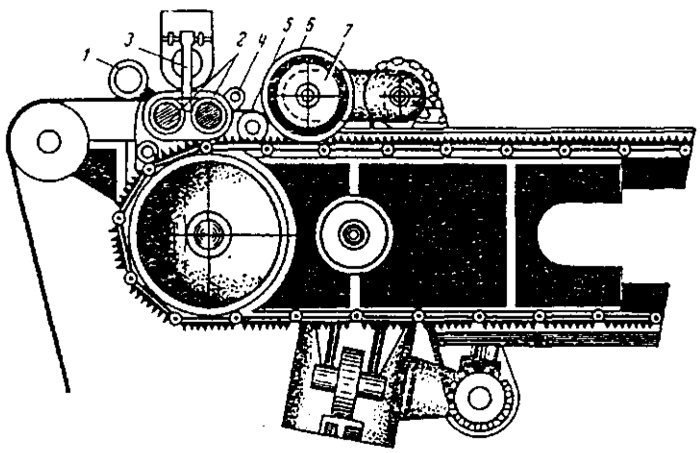


## C. Overfeed Pin Tentering

A third method of pre-shrinking fabrics is by overfeeding wet cloth onto the pins of a pin tenter oven during drying or heatsetting. Certain tenter frames are equipped with an auxiliary fabric feed drive that is independent of the tenter chain drive. These devices deliver fabric at a faster rate than the linear speed of the pin chains. The excess fabric is forced onto the pins by pinning wheels. Drying forces causes the fabric to shrink so the fabric exits the oven in a pre-shrunken state.

**Figure 43. Overfeed Pin Tenter**




*1* — tension roller of selvedge straightener; *2* — fluted rollers; *3* — feeler; *4* — selvedge safety device roller; *5* — feed roller of the leading mechanism; *6* — pressing roller; *7* — brush for pinning the fabric

## II. CALENDARING

Calendaring is a process where fabric is compressed by passing it between two or more rolls under controlled conditions of time, temperature and pressure. A calendar is a machine consisting of two or more massive rolls which are compressed by means of hydraulic cylinders applying pressure at the journals. One roll is considered the pattern roll and is responsible for the finished appearance of the fabric while the other roll is called a bowl and serves as the pressure back-up for the pattern roll and also serves to transports the fabric through the machine. There are many types of calendars, each designed to impart specific effects to cloth. The composition of the rolls, number of passes, temperature controls, moisture control and pressure can vary to fit the desired effect. For example, the pattern roll can be engraved and serve to emboss a three dimensional pattern into the fabric. The engravings can be shallow or deep depending on the desired effect. The pattern roll can be smooth, made of steel or nylon to give the fabric a high luster and sheen. The backing bowls can be made from corn husks, kraft paper, hard or soft rubber and deform to receive the pressure of the pattern roll. In calendaring, the yarns are flattened and become more oval in shape. This causes them to spread in two dimensions and closes up the fabric structure, leaving less open spaces between the yarn crossovers. In the process, the fabric becomes thinner and more lustrous.

The reason fabrics are calendared is to improve aesthetics. The major fabric changes are: 1. reduced fabric thickness. 3. increased fabric luster, 3. increased fabric cover, 4. smooth silky surface feel, 5. reduced air porosity and 6. reduced yarn slippage.

## A. Types of Calendars

The type of calendar used depends on the type of cloth to be run and what the desired effect is to be. There are embossing calendars, friction calendars, swizzing calendars, chase calendars, and compaction calendars. The difference between them is the number of rolls and the drive system.

### 1. Swizzing Calendars

Swizzing is a British term used to denote that the fabric runs through all of the nips at the same surface speed as the rolls. Swizzing calendars usually consists of seven to ten bowls and are run at ambient temperatures. The fabric effect is closed interstices, a smooth appearance and gloss without the high glaze characteristic of a friction calendar. A schematic of 7 bowl calendar is shown in figure 75.

### 2. Chasing Calendars

Chasing calendars are similar to swizzing calendars. The major difference is that the thread-up is such that the cloth makes several passes through the nips before it exits to a take-up roll. This is done by having cloth pass over chasing rolls which feed it back through the nips. The cloth is compressed against itself with as many as 5 to 6 layers being in a nip. This gives the cloth a thready-linen appearance and a soft special feel.

**Figure 75. Swizzing Calendar**

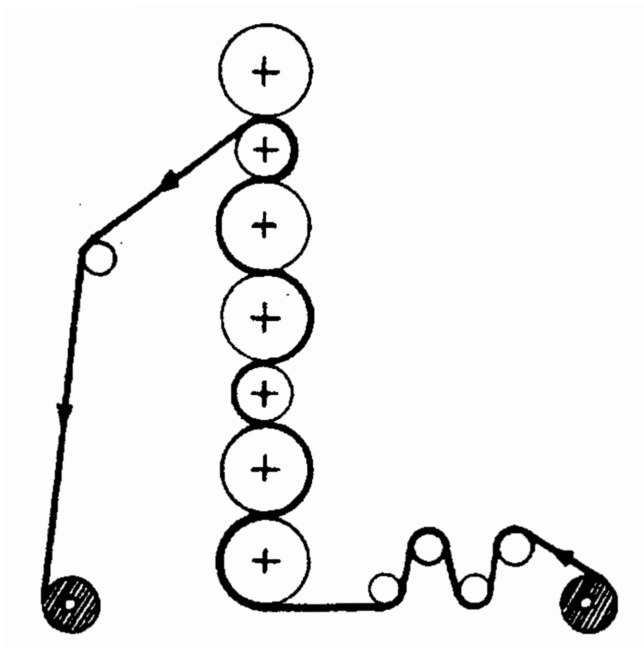
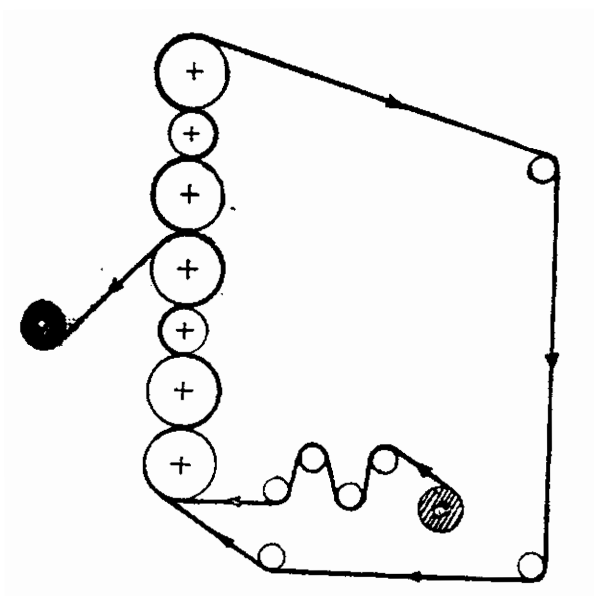


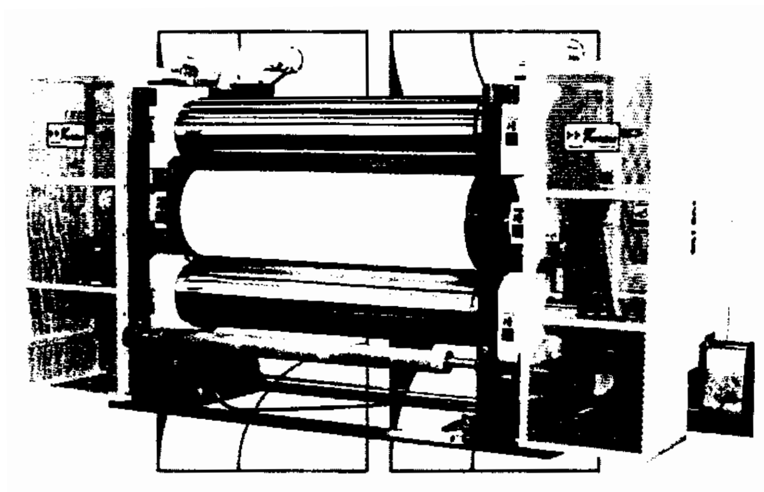
**Figure 76. Chase Calendar**



## 3. Friction Calendars

As the name implies, friction calendars (see figure 76) apply a friction force to the face of the fabric. This is done by driving the pattern roll faster than the support bowl. Friction is created by speed differentials ranging from 5% to 100% so it is necessary to have a strong fabric to withstand the strains. Frictioning produces a high degree of luster on one side and the final effect is similar to ironing with a hot iron.

**Figure 76. Friction Calendar**



## 4. Compaction Calendar

A compaction calendar has an adjustable gap between the pattern roll and bowl. This type of calendar is used to make filter media of certain thickness.

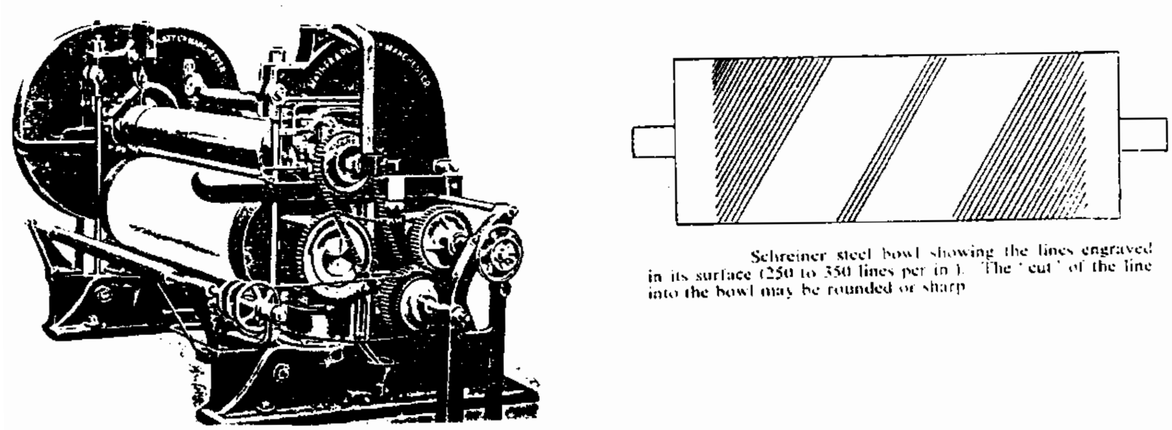
## 5. Embossing Calendar

Embossing calendars are normally two or three roll calendars with one engraved roll and one or two bowls. The patterns range from polished rolls or cire' to very deep floral patterns. Moire is a watered appearance which resembles paper after it has been wet with water. The moire effect can be obtained by using a moire pattern embossing roll. Thermoplastic fabrics can be permanently embossed with heated rolls and the effect can withstand repeated laundering. Natural fibers are more difficult to emboss and usually starch is needed for the embossing to take; however, this effect is not durable to laundering. Certain melamine resins can be added prior to embossing and when properly cured, the embossing effect is more durable.

### 6. Schreiner Calendar

Often it is desirable to increase fabric luster without overly thinning the cloth. Schreinering is a method of doing this. Schreinering is actually embossing by the use of a very special pattern. The pattern roll has anywhere from 250 to 350 lines per inch, etched at 26 degrees from the vertical. These lines are lightly embossed into the fabric and being regular, reflect light so as to give the surface a high luster. This operation gives a silk-like brilliance to cotton fabrics. Schreinering mercerized cotton fabrics gives the nearest resemblance to silk.

**Figure 78. Schreiner Calendar**



Schreiner steel bowl showing the lines engraved in its surface (250 to 350 lines per in.). The 'cut' of the line into the bowl may be rounded or sharp

## B. Construction of the Rolls

### 1. Pattern Rolls

Pattern rolls are turned from sold steel billets. The pattern is engraved onto the roll surface and the roll is heat treated to harden it and make the pattern more durable. The rolls are chromed which also increase wear resistance and protects them from rusting on storage. The center of these rolls is bored out to accommodate various heating systems. Steam, electrical heaters, natural gas and recirculating hot oil systems have been used to heat these rolls.

## 2. Bowls

Bowls are filled with cotton, combination of wool and cotton and/or corn husks. Cotton is used to produce very hard, dense surfaces. These are not very resilient and are susceptible to being marked or scarred should hard objects inadvertently pass through with the cloth. Wool or wool/cotton is used because the surface will be more resilient and less likely to be damaged if a seam passes through. A disadvantage of wool is that the scales on the fiber tends to pick certain fabrics and create surface defects. Corn husk is a very pure form of cellulose and makes bowls that are cheaper and more resilient than cotton, however they are weaker than cotton filled bowls. Paper is also used to fill bowls. The latest in bowl design is nylon bowls - a one inch thick nylon shell fitted over a roll. The advantage of nylon is it resiliency; it is more resistant to being marked than are the other surfaces. Seams and wrinkles can run through without having to refurbish them all the time. Cloth having selvages thicker than the body of the fabric can be run through without problems. One disadvantage, however, is that temperatures are limited to less than $375^0$ F, otherwise the nylon will melt.

## 3. Crowning

When pressure is applied to the journals of both the pattern roll and the bowl, the rolls tend to deflect. The wider the calendar the greater will be the deflection. To take care of the deflection, all bowls are crowned, i.e. the diameter of the middle is greater than the diameter at the edges. The amount of deflection and therefore the amount of crown depends on the pressure per lineal inch. Therefore it is necessary to change the crown on the bowl to accommodate different pressures otherwise the calendaring effect will not be uniform across the width of the fabric. Too little crown will cause weak calendaring of the center as compared to the edges while too much crown over-calendars the center and under-calendars the edges. Older calendars require changing of the bowls when different pressure require a different crown profile. Also when the bowl surface is severely damaged, it must be removed and reground to true it up. Modern calendars with nylon shells are designed to alleviate these problems. There are two systems designed to overcome the need to change bowls for different crown profiles. One system uses a hydraulic reservoir under the nylon shell to change the profile. Chambers across the width of the bowl can be individually pressurized to accommodate whatever profile is desired. The second system differs from the above in that the actual calendaring pressure is applied from within the bowl and not from the pressure applied at the journals.

### 4. Auxiliary Equipment

Other devices are necessary for running the calendar. Let-off and take-up rolls geared-in with the calendar rolls are important. Proper tensions must be maintained to produce a consistent product. Edge guides and spreader bars are necessary to keep wrinkles from developing and being permanently pressed into the fabric. Seam detectors signaling the machine to prepare to jump the seam are necessary otherwise the seam will mark the bowl. A marked up bowl will spoil many yards of cloth.

## III. RAISING

Raising is the term used to describe the creation of a pile surface on a fabric. Fibers are deliberately pulled part way out of a yarn to give the fabric a hairy or fuzzy appearance and a soft surface texture. Napping, sueding and shearing are techniques for developing a surface pile and in conjunction with calendaring are lumped into a category referred to as *Surface Finishing.* Surface finishing effects, especially raising, have been used for years to enhance the appearance and hand of fabric. Many of the finest wool and cashmere fabrics are still mechanically finished - not only to improve their hand and appearance but to increase their bulk, to impart the feeling of warmth, to increase the number of fiber ends on the surface of the fabric, to provide improved adhesion for laminating purposes and to improve the profit margin per yard sold. Many of the same techniques are used to finish woven and knitted goods made from synthetic and synthetic blended fabrics. Sueding and napping machines are used on both filament and spun constructions while shears, polishers, calendars and decaters are used singly or in combination to create specific surface effects.

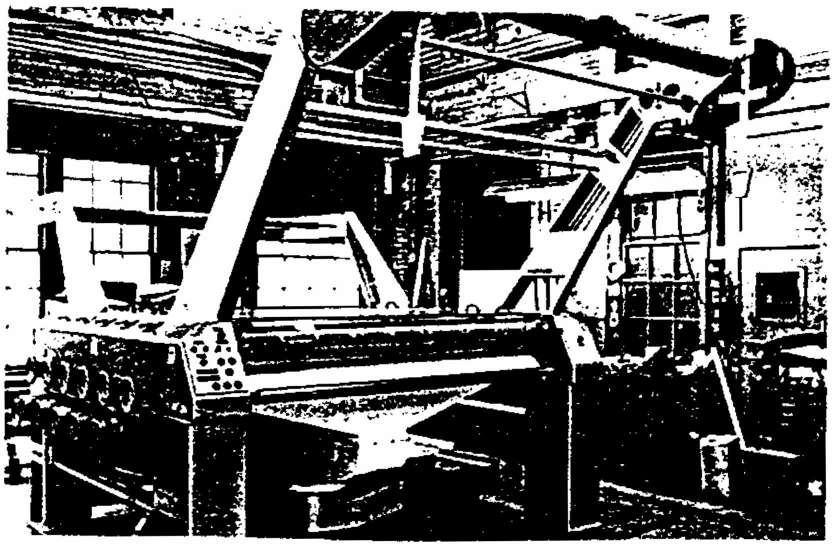
### A. Sueding

A sueder is sometimes referred to as a sander since the machine consists of one or more rolls covered with sand paper as the abrasive. Fabrics traveling over these rolls develop a very low pile and the material's surface can be made to feel like suede leather. The hand will depend on the fiber composition, the filament count in the yarn and the intensity with which the fabric is worked. Filament fabrics can be made to feel like a spun fabric and generally speaking, all fabrics will have a softer hand.

### 1. Multi-Cylinder Sueders

There are two basic categories of sueders, multi-cylinder and single cylinder machines. The multi-cylinder machine usually has five rotating cylinders, each independently driven and they can be rotated clockwise or counter clockwise. Cylinder construction can vary between machines made by different manufacturers. Some are abrasive covered rolls either free standing or as tubes mounted around the periphery of a rotating cylinder shaft. Others are fluted cylindrical rolls with the high portions of the flutes covered with abrasive. Ahead and behind each cylinder are adjustable idle rolls which control the pressure of the fabric to a greater or lesser degree against the abrasive cylinder. Entry and exit drive rolls transport and control the fabric tension as it progresses through the machine. Figure 79 shows a multi-cylinder sueder.

**Figure 79. Multi- Cylinder Sueder**



## 2. Single Cylinder Sueder

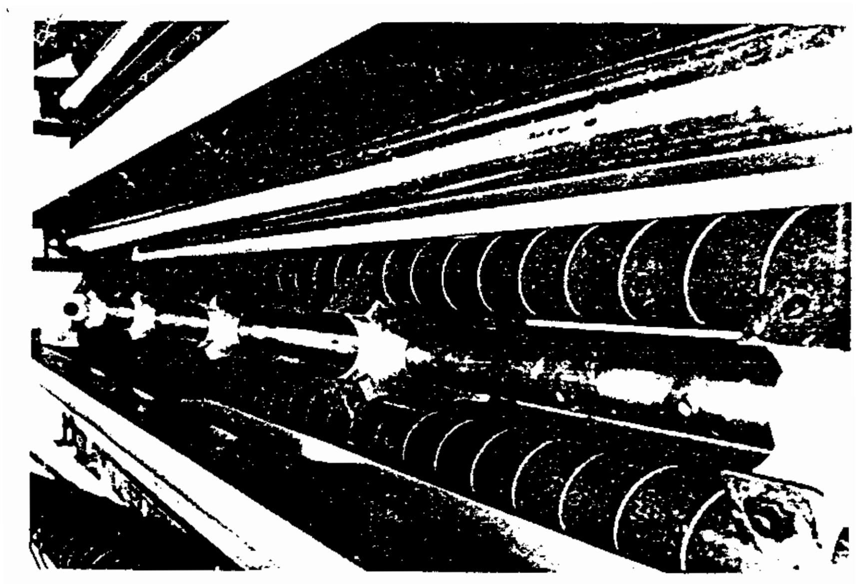
The single-cylinder sueder has one abrasive covered metallic roll and one rubber covered pressure roll. To keep the abrasive covered cylinder from expanding from the heat generated' from friction, water is circulated through the cylinder interior to keep it cool. The pressure roll presses the fabric against the abrasive cylinder and is micrometer adjustable. The abrasion of the fibers on the surface of the fabric takes place in the nip between the pressure roll and the abrasive cylinder.

## 3. Abrasive Covered Rolls

The quality of the nap will depend on the fabric construction and selection of abrasive grit. Fabric construction will determine the abrasive grit size, the wrong grit may over sand the fabric and either weaken woven fabrics or perforate knit fabrics. Since the abrasive material deteriorates with use, it must be changed on a regular basis to guarantee a uniform suede throughout a production run.

A new abrasive now available which last much longer than the silica based paper. The abrasive roll is made from diamond chips embedded in a Kevlar paper base.

**Figure 80. Abrasive Covered Rolls**



## 4. Advantages and Disadvantages

Both machine designs perform very well and produce very acceptable products. However one machine may have advantages over the other on a specific style. For example: 1. fabrics with knots or slubs on their backsides, or fabrics with selvages thicker than the body of the fabric are best run on a multi-cylinder machine. Knot holes or over-sanded selvages may occur on the single cylinder machine because the fabric is compressed against the abrasive cylinder. This is not the case with the multi-cylinder machine. 2. A single roll sueder is more effective on fabrics with terry loops on the face that must be broken. Also difficult styles that require shaving the face to develop a surface effect are more effectively and more efficiently sanded on a single cylinder machine. 3. Some fabrics tend to develop a directional pile when sanded on a single cylinder machine. The multi-roll machine may be operated with the cylinders rotating in opposing directions eliminating this effect.

## B. Napping

Nappers also change the aesthetics of fabrics by developing a pile on the surface of the fabric. The depth of pile developed on a napper can be much greater than can be obtained by sueding, assuming the fabric construction is correct. For example fleeces, velours, high-pile fur-like effects, flannels and bed blanket finishes are produced by napping. Proper fabric construction is a prerequisite to napping. It is important that the yarns acted on by the napper are not the ones responsible for the strength and integrity of the fabric. The reason for this is that the napped yarns are weakened by the napping action. Fabric to be napped should have a napping lubricant or softener applied prior to napping to allow the fibers in the yarn to slide more freely during the napping operation.

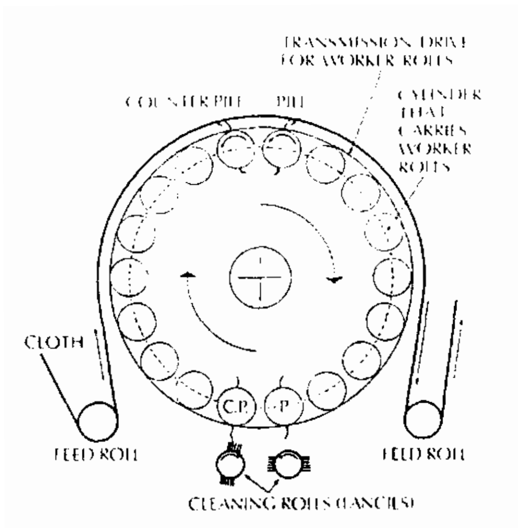
### 1. Nappers

Wire nappers, known as planetary nappers, are the most commonly used machines in the industry. The basic design of a wire napper is 24 to 36 small, pile wire clad rolls (worker rolls) mounted on the periphery of a large main cylinder. The large napper cylinder rotates in the same direction as the flow of the fabric at a constant speed while the worker rolls rotate on their own axis in a direction opposite to the rotation of the main cylinder. Cleaning rolls or brushes below the main cylinder remove lint and entangled pile to keep the wires at high efficiency. The speed of the worker rolls, the type of wire, the angled direction of the wire all influence the degree of nap. There are many arrangement of these components each designed for their individual specialty.

#### a. DoubleActingNappers

The double acting napper is the most commonly used machine in the industry. The main cylinder carries 24, 30, or 36 napper rolls. Every other worker roll is wound with napper wire angled in the same direction as the rotation of the cylinder. This roll is called the pile worker roll. The alternating worker roll, called the counter-pile roll, is wound with counter-pile wire having points angled in the opposite direction. Adjustments of the counter-pile and pile roll speeds relative to the speed of the fabric travel results in the raising of fibers. The napping action is such that the counter-pile rolls dig into the yarn to pull out fibers while the pile roll felts or tucks the fiber ends into the base of the fabric producing a product that roughs less and retains better appearance after laundering. The double acting napper develops a dense, tangled nap which is very desirable on many fabrics

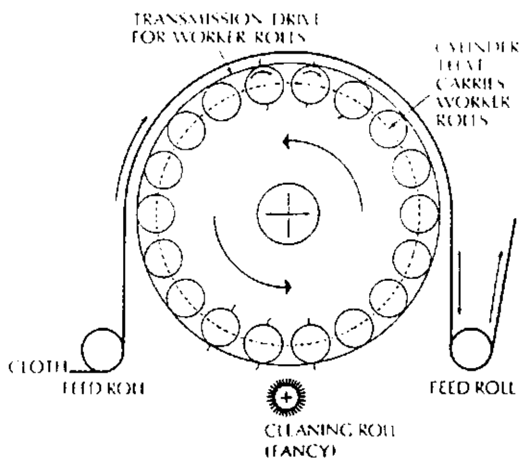
**Figure 81. Double Acting Napper**




### b. Knit Goods Napper

The knit goods napper is designed to be used almost exclusively in the knit industry. These machines can handle tubular fabrics as well as open-width knits. The knit goods napper differs in that the main cylinder rotates on its own axis in a direction opposite to the flow of the cloth. Half of the worker rolls are covered with straight wire called traveler wire and the other half are covered with hooked wire whose points face the rear of the machine. While it looks like pile wire, it act like counter-pile wire because of the direction of rotation of the main cylinder. Both sets of worker rolls rotate on their own axis in a direction opposite of the cylinder rotation. Fourteen to 24 worker rolls are mounted on the main cylinder. The hooked wire roll does the napping and the traveler wire roll speed is adjusted to control the tension of the fabric on the cylinder. Correct speeds prevent wrinkles from forming in tubular goods and longitudinal wrinkles in flat goods.

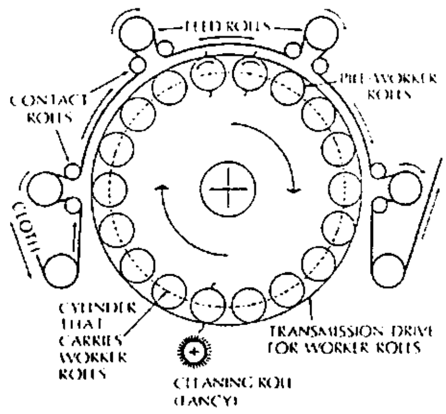
**Figure 82. Knit Goods Napper**




### c. Single Acting Napper

The single acting napper is generally used as a finishing napper. The double acting and knit nappers generally develop a directional nap with parallel fibers that can be lofty or flat. The purpose of the single acting napper is to untangle and comb the fibers parallel. The single acting napper's main cylinder rotates in the same direction as the flow of the cloth. There are 20 to 24 pile worker rolls in the cylinder whose wire points face the rear of the machine. The pile worker rolls rotate in a direction opposite to the main cylinder. A distinguishing feature of this machine is the way the cloth is fed to contact the main cylinder. The cloth is fed over contact rolls that permit 2 to 4 tangential contacts. Were the cloth to hug the entire cylinder, the wire ends all pointing in the same direction would tear it to shreds.

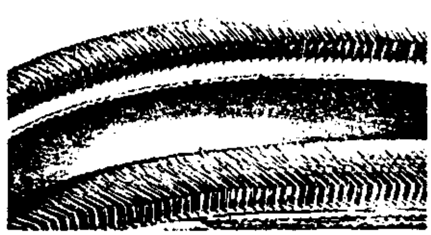
**Figure 83. Single Acting Napper**




**d. NapperWire**

The characteristics of the napper wire are just as important as the machine design. Most wires have a 45 degree bend at the knee and are ground needle sharp. The wire protrudes through a tough flexible backing, built-up and reinforced to securely hold the wires. The backing and wire are wound spirally over a hollow supporting roll to become the worker roll.

**Figure 52. Napper Wire**



For certain fabrics, e.g. tricot warp knits, it has been found that a bumped or mushroomed wire point with tiny barbs underneath will develop a denser nap in fewer runs, As the wire point withdraws from the yarn bundle, the minute barbs will raise more fiber than a single needle point producing more fiber coverage per napping run. Wires with less severe knee bends can be used to raise unbroken loops from filament yarns. In this instance, the wire raises the filament from the yarn and drops it off without breaking the yarn.

## IV. SHEARING

Shearing is the process where a raised fiber is cut at an even height. Some spun fabrics are sheared close to the fabric as a means of removing the raised hairs giving the fabric a clear, smooth surface. Shearing is an alternative to singeing. More often however, shearing follows napping to: 1. clear out random lengths of fibers and produce a uniform and level pile., 2. reduce the height of wild fibers and prevent pilling, 3. to produce a certain hand, 4. improve color and appearance and 5. produce sculptured effects.

Knitted and woven fabrics with loops on the face or back are not necessarily napped first - they can be sheared directly to cut off the tops of the loop and produce plushy velours such as knit velours and plush towels. Terry looped bath towels can be sheared on one or both faces to produce a plush pile surface.

### A. Shearers

The shearer head consists of a spiral blade revolving on its own axis in contact with a ledger blade. This creates a shearing action similar to that produced by a pair of scissors. When fibers are presented to this cutting head, they will contact the ledger blade and be cut off by the rotating blade. The fabric travels over a cloth rest (bed) in front of the ledger blade and the design is such that an acute angle is formed by the fabric. This sharp angle causes the pile to stand erect and be more easily cut. The distance between the bed and the ledger blade is adjustable so the height of the pile can be regulated.

Most shearers are equipped with expander rolls to straighten and flatten the fabric as it approaches the bed and a vacuum system to remove the lint produced at the cutter. Specially designed support beds, i.e. embossed rolls in place of the support bed, endless embossed support aprons acting as support rests are available for producing sculptured patterns on high pile fabrics. Variations can produce stripes, zig-zag, checks etc. Very often the fabric is brushed prior to shearing. The object of brushing is to lay the fibers in one direction and thus facilitate the cutting process.

**Figure 85. Shearer Head**

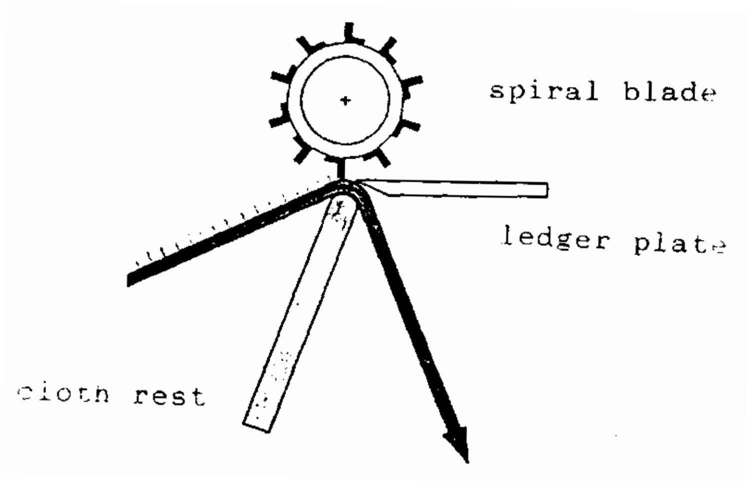
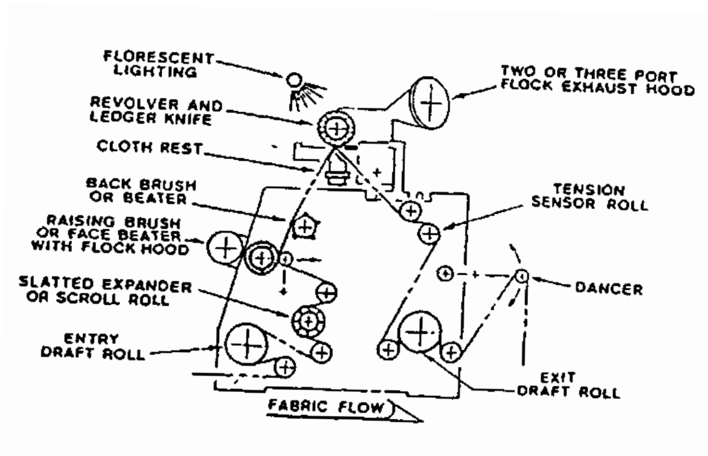



**Figure 86. Shearing Machine**

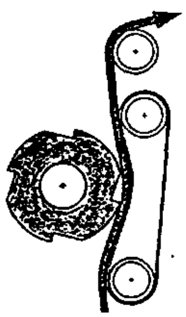


## V. POLISHING

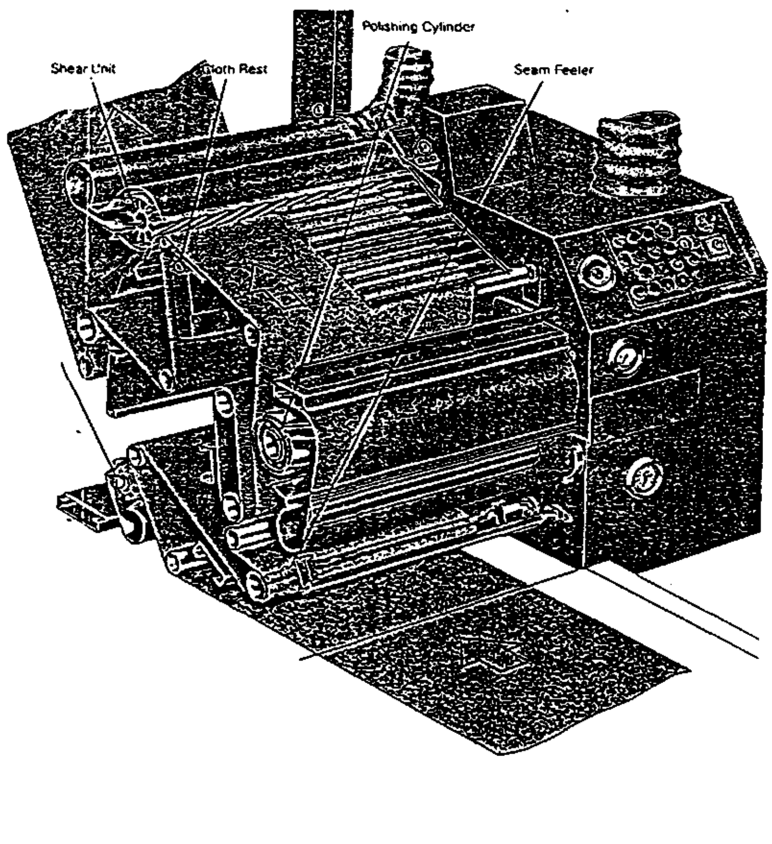
Polishers are primarily used on synthetic pile fabrics when either an erect lustrous pile or a laid down pile is required. The machine consists of a fluted heated cylinder driven by a variable speed motor and an endless felt blanket. The fabric passes over the endless blanket which is adjustable and brings the fabric face in contact with the heated cylinder. The serrations on the cylinder draw through the fibers to raise and parallelize them. Heat facilitates the straighten process and sets the fibers. Polished fabrics appear more lustrous because the parallel fibers result in more uniform light reflection. By running the cylinder so that the edges of the serrations revolve against the fabric flow, the pile will be made to stand more erect. However if the edges of the serrations run in the same direction as the cloth, the pile will be made to lay flat.

**Figure 54. Polisher**

POLISHING HEAD



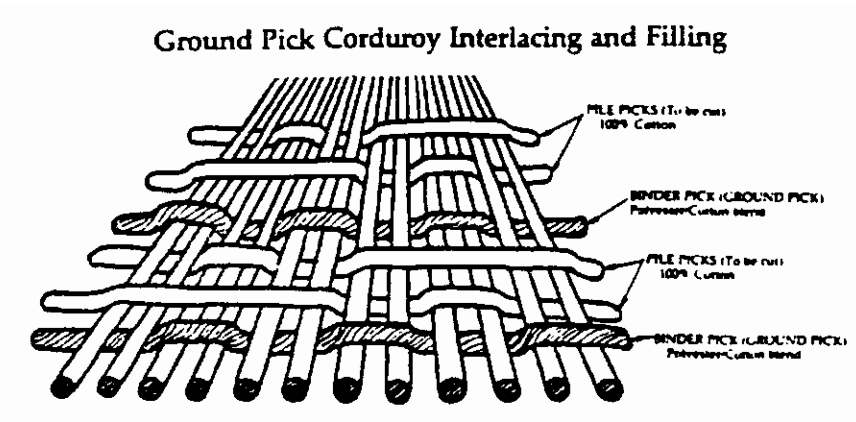
POLISHER



## VII. CORDUROY CUTTER

Corduroy fabrics are distinguished from other fabrics by parallel pile ribs running lengthwise in the warp direction. The pile ribs. called wales, are produced by passing the fabric through a cutter which slit specific filling yarns across the face of the fabric. The design of the fabric is such that the filling consist of ground yarns and pile yarns. The ground yarns provide fabric strength and integrity while the pile yarns, will be cut later to form the rib or wale. Figure 88 shows a weave arrangement for anchoring the pile.

**Figure 88. Corduroy Fabric as it Come off the Loom**

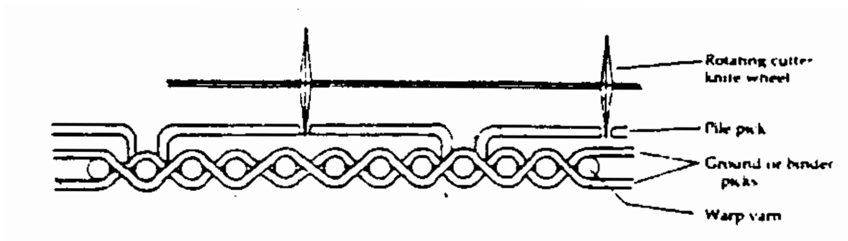



The principle of raising the pile is relatively simple, the filling yarn is slits in two places creating two legs anchored by warp yarns. The two legs become erect when brushes traverse the fabric in the filling direction. The brushing action also causes the individual fibers in the two legs to disentangle and become a single rib.

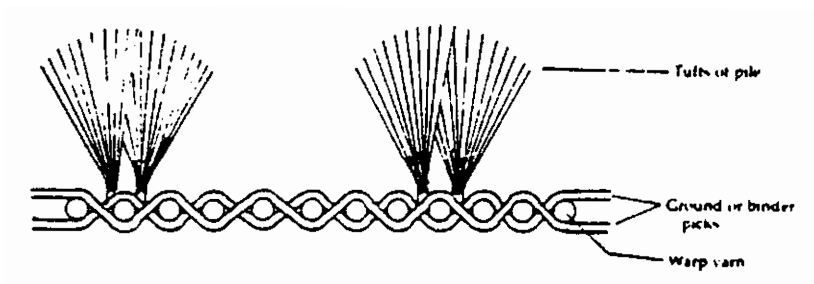
The cutter too is a simple device. It consists of circular knife blades positioned over a slotted base plates. The slotted base plates resembles thin needles which are inserted under the floating filling yarns that are to be cut. Each wale requires two cutters so the number of cutters will depend on the number of wales per inch. Once the fabric is threaded onto each base plate, the fabric is pulled through the machine at an angle. Some fabric require that they be run through the machine more than once. The reason for this is that there are limitations as to how close the cutters can be placed together. For fine wale corduroys, it would take two or more passes before all the appropriate cuts can be made. As mentioned earlier, brushing is necessary to stand the pile and brushing follows the cutting operation. In addition, an adhesive is applied to the back of some styles to improve the anchoring of the pile. It is not very difficult to pull the pile from the back unless it is well anchored in.

**Figure 89. Corduroy Cutting**

Cutting the Pile




Appearance after Cutting and Brushing




## VIII. DECATING

Decating is normally the last finishing process for some fabrics. It is a method of steaming fabric between two layers of cotton press cloths. The process is used to: 1. improve the hand and drape, 2. brighten the colors and enhance natural luster, assist in setting the finish, or refinish fabrics after sponging or cold water shrinkage. Decating is a normal step for many wool and wool blend fabrics. It is an effective mechanical softening treatment resulting in a luxurious, soft, smooth handle. The process is also effective on acetate, acrylic, rayon, spun polyester and other synthetic blends.

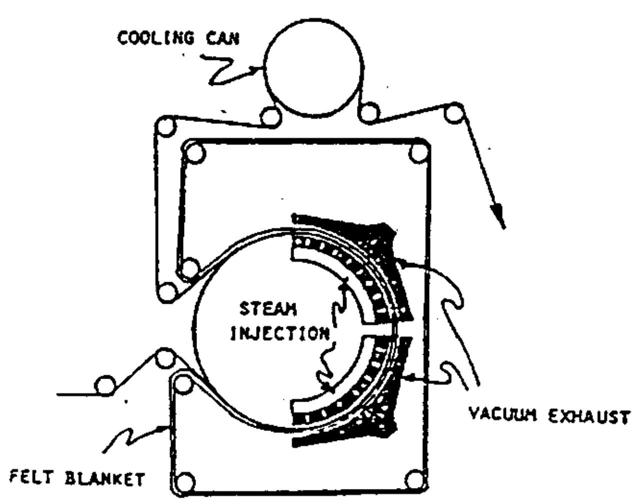
## A. Semi-Decating

Semi-decating is a bach process requiring three steps: 1. winding the fabric onto a perforated cylinder between a cotton decating apron, 2. steaming and followed by cooling the fabric and 3. unwinding and batching the finished fabric. Proper pressure, heat, moisture, cooling and time are prerequisites for quality results. The procedure requires that the fabric be wound onto a perforated drum between the interleaving cotton decating apron to form a reasonably thick roll. Steam is forced through the roll (inside - out) for several minutes to provide moisture and heat. Compressed air is then blown through the roll in much the same manner as the steam to remove some of the moisture and cool down the fabric. To insure that the effect is uniform from the inside to the outside of the roll, the fabric and blanket are rewound onto another perforated drum so that the outside layers become the inside layers and the cycle is repeated. At the end of the cycle, the fabric and blanket are separated and wound into individual rolls.

## B. Continuous Decating

The continuous decater has one steaming cylinder and one cooling cylinder. An endless decating apron carries the fabric around the steaming cylinder and around the cooling cylinder. The fabric is continuously moving so the time element of the process is affected by the speed of the machine - being somewhat less than the batch-wise semi-decating process. Nonetheless, excellent results are obtained on many fabrics.

**Figure 90. Continuous Decater**



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