



June 8, 1937.

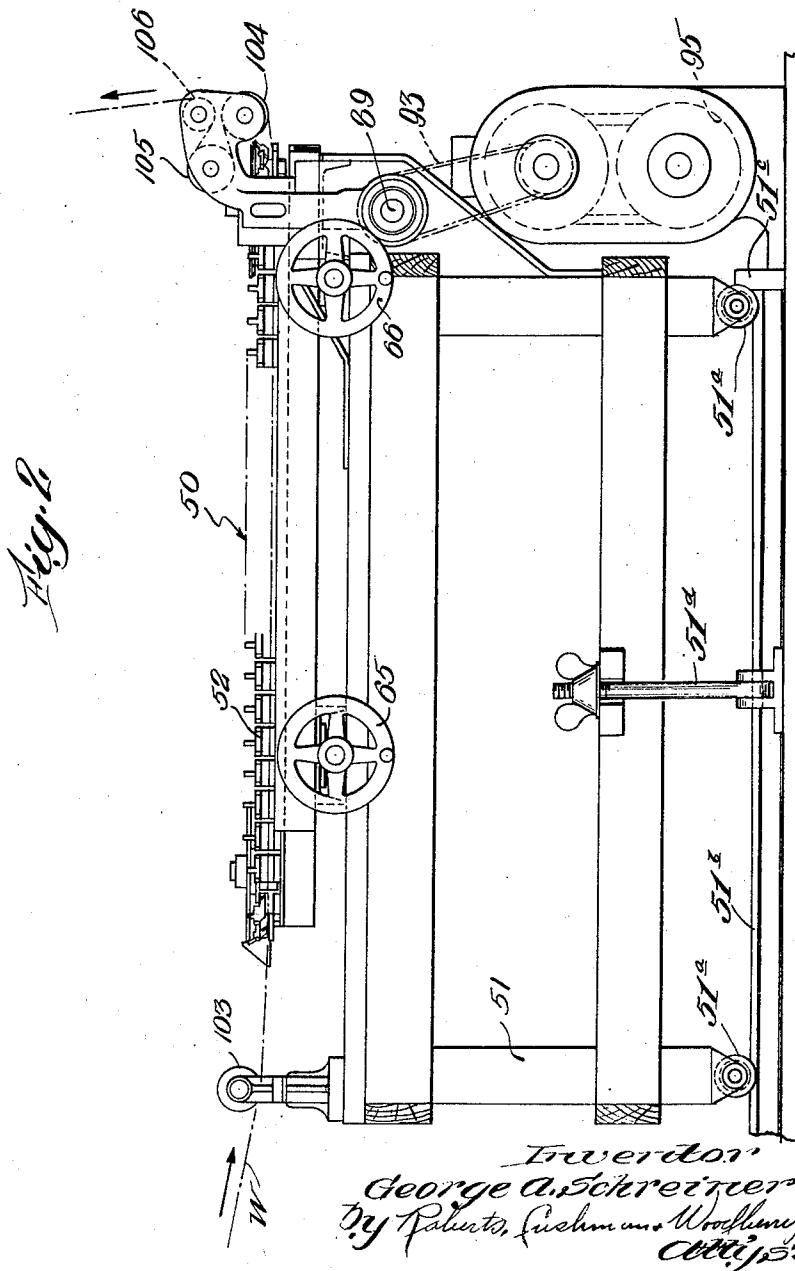
G. A. SCHREINER

2,082,981

CLOTH FINISHING

Filed Aug. 23, 1934

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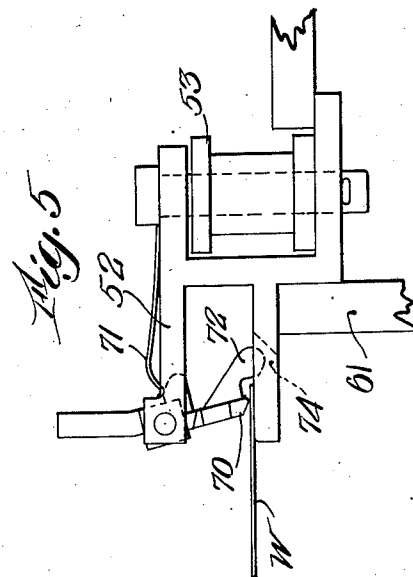
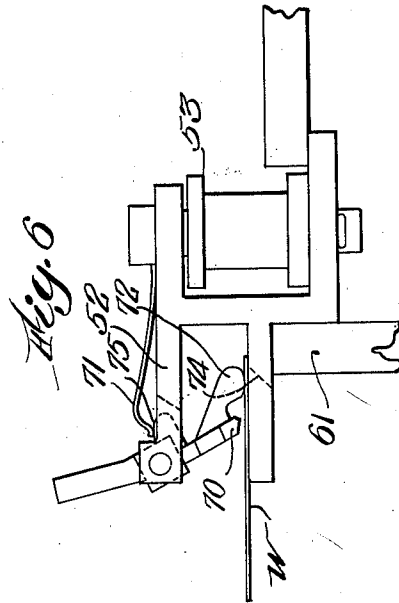
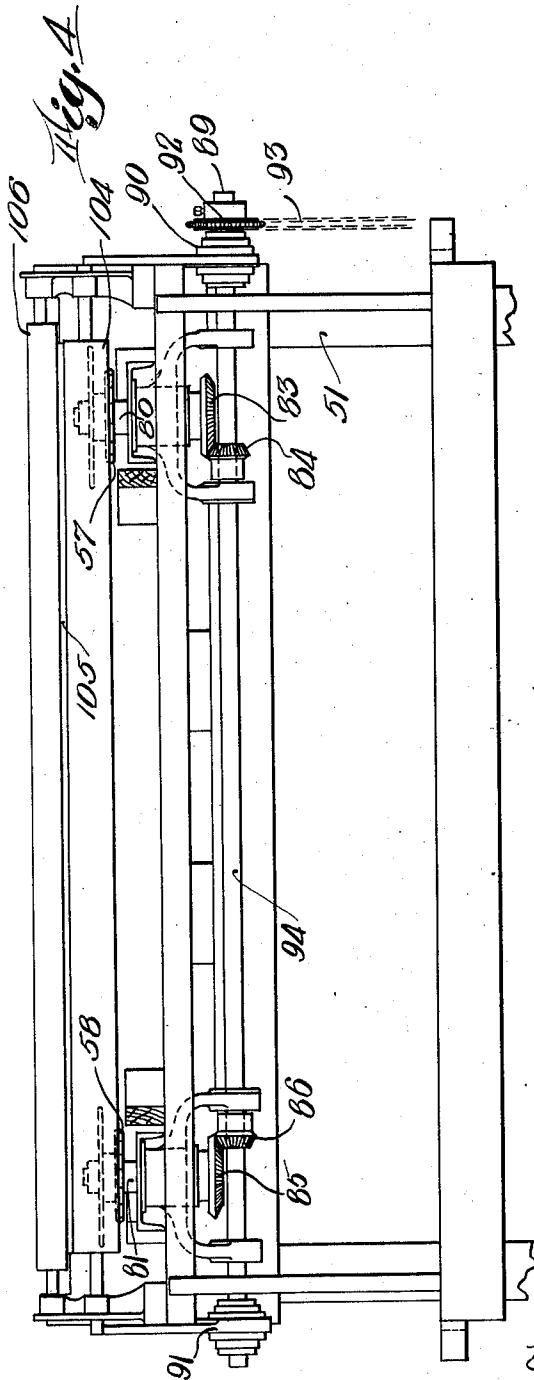
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## UNITED STATES PATENT OFFICE

2,082,981

## CLOTH FINISHING

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7 Claims. (Cl. 26—18.6)

This invention relates to cloth finishing and more particularly to the lateral stretching of continuous webs of cloth that are in the act of being longitudinally stretched as they approach or enter into a cloth-finishing machine. An example of the problem with which the present invention deals is found in cloth treating mechanism involving the combination of a cloth finishing machine (such for example as a machine having some or all of the features of a felt calender) and an input controlling device at some distance in advance thereof, with provision for causing the intervening cloth to be subject to dimensional change. United States Letters Patent No. 1,861,423 discloses the longitudinal stretching of such intervening cloth for the purpose, among others, of adjusting the net shrinking effect of apparatus containing a felt calender modified to shrink cloth compressively by the contracting action of a belt. In such case the longitudinal stretching of the intervening run of cloth is the preferred way of offsetting to a greater or lesser degree the subsequent longitudinal mechanical shrinking, thus to obtain whatever net dimensional effect is desired.

Obviously also an adjustment of final length of finished goods can be effected in similar manner by longitudinal stretching, even where the machine which receives the stretched goods is not per se a shrinking machine. For example, it is possible to shrink cloth mechanically and then stretch it out in greater or lesser degree, depending upon the net effect desired, and finally fix the cloth in the thus attained state by a suitable finishing machine.

In these and similar situations, longitudinal stretching action tends to narrow the cloth web, and while such narrowing can be of advantage in mechanically shrinking the cloth in widthwise dimension, a very strong lengthwise tension will, with many kinds of cloth, cause such narrowing that if the narrowing is not checked the web becomes unduly shrunken in width. Thus said Patent No. 1,861,423 suggests the use of the conventional smoothing and spreading bars or rolls to spread the cloth somewhat in width before it is fixed by ironing. However, ordinary kinds of spreaders have been found to be of limited applicability for this use in cases where it is essential that a good thread alignment be undisturbed. Ordinary kinds of roll or bar spreaders thus tend to exert their greatest stretching action on the central portion of the web, producing greater rearrangement of both warps and filling in this portion of the web than at the selvages.

Moreover, ordinary kinds of roll or bar spreaders do not serve to bring the cloth to any uniform width. There is a marked tendency for the cloth which is being longitudinally stretched to be of varying width when it reaches such expander, due for example to variation in the character of the cloth or to variation in degree of longitudinal stretching. The usual expander will merely widen all the cloth a uniform amount, leaving in it any previously acquired inequalities in width.

The present invention aims to avoid these difficulties, and to provide for acting on a moist run of cloth in such manner as to widen it to a uniform and predetermined width at the place of its entry into a cloth finishing machine.

For this purpose the invention provides at the entrance of the cloth-finishing machine, a widthwise spreading device comprising opposed diverging series of traveling edge-holding devices which may utilize many of the details of clip or pin tentering machines. However, as distinguished from a tentering machine as heretofore constructed to hold cloth in a stretched condition for a substantial interval of time to provide a lasting condition of widthwise stretch, or condition of finish or rearrangement of yarns, the spreading mechanism of this application is preferably adapted merely to bring the cloth to a temporary predetermined widthwise condition for subsequent fixing by some other means such as the subsequent cloth-finishing machine. In tentering machines it has been necessary to hold the cloth stretched in width a considerable time so that it could acquire a more or less permanent condition. In the practice of the present invention, the aim is to spread the cloth to an even width, without interfering with or by the forces acting longitudinally on the cloth.

It is highly preferable, for reasons described more fully below, that the spreading mechanism employed in this invention be very short, and that only a small part of the length of the longitudinally tensioned portion of the web be subjected to the spreading mechanism at one time. An important object of the invention is to provide in conjunction with finishing machinery a spreading mechanism adapted to operate on a web which is moist and longitudinally tensioned to a greater or lesser degree and of varying or variable width, to bring such web to an even width, and do this in such manner that under these varying conditions of the web there will not occur a bowing of the filling threads. It is known that a tentering machine of ordinary con-

struction has a tendency to cause filling threads of the web to bow. After a web has entered an ordinary sixty-foot tentering machine and its selvages are gripped by the tenter clips and held against contraction or elongation, subsequent  
 5 widthwise stretching of the filling threads tends to cause the middle portion of the web to take up longitudinally. Commonly this is rendered apparent by a noticeable inward bowing of the  
 10 filling threads from both ends of the tentering machine toward the center. In the apparatus in which the present invention is shown as applied there is a fairly long run of moist plastic web ap-  
 15 proaching the entrance of the widthwise expander, and this run of cloth because of its length and plasticity would normally be especially likely to permit an advance of the middle of the filling threads ahead of the selvedge portions thereof in a clip tenter into which the web  
 20 were passed.

It is therefore important to prevent the filling-bowing tendency of diverging clip chains from becoming exaggerated and of harmful magnitude in the presence of this long run of plastic web.  
 25 I have discovered that this situation can best be dealt with by making the clip expander of very short length and of such construction that the middle warps cannot assume any shorter path than the selvages during widthwise spreading.  
 30 The short length of the expander greatly reduces the cumulative bowing tendency of the diverging clips, that is, the number of filling threads that are directly subject to simultaneous confinement and stretching by the clips at any one time, and  
 35 accordingly the total amount of distorting effect of the expander on the weave of the entering web. Moreover, the extreme shortness of the clip expander as compared with the usual tentering machine acts to render much more nearly equal  
 40 the interval of time in which the selvages are capable of dimensional alteration and the interval of time in which the inner portions of the web are capable of dimensional alteration in the whole apparatus of this invention, and accord-  
 45 ingly facilitates the maintenance of squareness of weave even under the necessary condition of subjection of the long moist run of the web to controlled dimensional change. The preferred plane condition in which the web is held during  
 50 widthwise spreading insures that the lengthwise tension in the middle warps will not result in the middle warps assuming a shorter path than the gripped selvages as occurs in the usual "Palmer stretcher".

I have found that there are other advantages in having the clip chains of very short length, among which is the possibility of great reduction  
 55 of size of parts from the usual sizes of corresponding parts of tentering machines. This reduction of size permits the spreading mechanism to be made small enough to be located much  
 60 closer to the entrance to the felt calender or other finishing machine than would be possible in the case of an ordinary tenter and therefore  
 65 provides that the cloth will enter the finishing machine as nearly as possible in the condition in which it left the widthwise expander. The reduction of size of parts moreover permits the clips and chains of the spreading mechanism to  
 70 be moved easily by the mere pull of the web.

My invention when applied to a compressive shrinking unit having a contracting belt surface, as for example the machine described in the said Patent No. 1,861,423, is adapted to increase the  
 75 accuracy of the shrinking operation. The mech-

anism of this invention, so applied, delivers the cloth to the shrinking unit in a state of uniform predetermined width regardless of local variations in the cloth and regardless of local variations in the longitudinal tension, while at the  
 5 same time permitting full freedom of control of the net longitudinal shrinking by means of variable lengthwise preliminary stretching of the cloth without involving corresponding adjustment of the widthwise spreading mechanism. In a  
 10 system such as described and illustrated in said Patent No. 1,861,423, the final control of the width of the cloth is had at the roll or bar expanders described therein adjacent to the entry of the  
 15 cloth into the longitudinal shrinking unit, and in that system, a change in longitudinal tension will tend to produce a change in width of the cloth at the expanders and hence may necessitate a subsequent adjustment of the expanders.  
 20 On the other hand, the present invention permits the longitudinal tension to be changed and the net longitudinal shrinking effect modified without involving any adjustment of the expander.

Other objects of invention and features of novelty and utility will be apparent from this  
 25 specification and its drawings wherein the invention is further explained.

In the drawings:

Fig. 1 is a diagram in the nature of a side elevation, showing a preferred form of the inven-  
 30 tion;

Fig. 1<sup>a</sup> is a diagram, to a smaller scale than Fig. 1, showing a modification of the path of the moist longitudinally tensioned web;

Fig. 2 is a side elevation showing the cloth  
 35 expander of Fig. 1 on a larger scale;

Fig. 3 is a plan view of the apparatus of Fig. 2;

Fig. 4 is a left end elevation of the upper portion of the apparatus of Fig. 2;

Fig. 5 is a detail showing one of the edge-  
 40 holding clips of the spreader mechanism completely closed on the selvedge of the web; and

Fig. 6 is a view similar to Fig. 5 showing the clip held by the fabric against closure.

From Fig. 1 of the drawings it will be observed  
 45 that, as in Patent No. 1,861,423, the cloth web W passes around and between two nipping controlling rolls 11, 12, then through a moistening chamber 13 where it is subjected to the moistening effect of one or more of the water sprays 14, 15,  
 50 and, if desired, to one or more of the steam sprays 16, 17, 18. The web then passes to the cloth-finishing machine 20, which is herein shown as adapted to perform drying and ironing functions and which comprises upper and lower heated  
 55 drying drums 21, 22 and an endless relatively thick felt carrier blanket 23 running thereon. Preferably and as illustrated, the finishing machine 20 is constructed so as to shrink the web W compressively by the contracting action of the  
 60 surface of the carrier blanket 23 as the latter reverses in curvature in running onto the heated drum 22, according to the invention of Patent No. 1,861,422, and in certain details the machine 20 preferably embodies the construction described  
 65 in Patent No. 1,861,424.

A preferred system of driving and controlling connections, not herein claimed per se, may include a motor 30 geared to a shaft 31 which carries a series of gears of progressive diameter 32.  
 70 A pinion, suitably mounted to slide on shaft and spline 33, as indicated at 34, is adapted to be positively geared to any one of the several cone gears 32 by means of suitably mounted intermediate gear. Shaft 33 is positively connected to both  
 75

of the controlling rolls 11, 12, by means of a vertical shaft 35, and suitable bevel gears, with the result that the speed of these rolls 11 and 12 can be positively controlled in steps represented by the number of teeth of the several gears 32. A main drive shaft 37, geared to the short shaft 31, extends longitudinally of the apparatus and terminates in gearing which connects it positively to another short shaft 38 similar to shaft 33, and likewise having thereon a sliding gear and intermediate gear 39 as previously described. The horizontal shaft 41 on which the cone gears are fixedly mounted is in turn connected by bevel gearing to a cross shaft 42 from which the heated cylinder 22 is driven by any suitable positive connection, including for example a chain 43, a pinion 44, and a large gear 45 fast on the side of the cylinder.

By means of the above-described driving and controlling connections, the speeds of the cylinder 22 and of the rolls 11, 12 can be varied with respect to each other in small definitely predetermined steps, and a positive relation maintained between the length of web passing the rolls 11, 12 and the length of web discharged by the cylinder 22. The web W between rolls 11, 12 and cylinder 22 since moist, can undergo rearrangements in accordance with the longitudinal tension imparted thereto. Such longitudinal tension, together with the effect of moisture on the web, tends to straighten the warps of the web, and such straightening of the warps tends to cause the filling threads to become more sinuous, and the web thereby narrower.

The softening effect of the water sprays takes place somewhat gradually as the moisture has time to penetrate and act on the web, and the rearrangement of both sets of threads of the cloth accordingly takes place progressively as the web travels from the rolls 11, 12 toward the cylinder 22. The more the cylinder 22 of the finishing machine is accelerated with respect to the rolls 11, 12, or the rolls 11, 12 retarded with respect to the cylinder 22, the greater is the longitudinal stretching effect on the intervening moist web, and the greater the tendency of the web to narrow.

For the purpose of bringing this intervening longitudinally stretching web to a predetermined width, usually substantially greater than it would otherwise assume, the present invention provides the spreading mechanism indicated generally by the reference character 50, operating on the intervening tensioned web in the manner now to be described.

The spreading mechanism 50 is conveniently mounted on any suitable frame 51 and comprises opposed series of traveling web edge-holding devices, preferably in the form of edge-grasping clips 52, linked together by links 53 (Figs. 5 and 6) in the form of endless chains similar to but smaller than the chains generally used in clip tenters. A preferred dimension for the clips is two inches distance between centers of adjacent clips. These endless clip chains pass around suitable pairs of sprockets 55, 57 and 56, 58 mounted respectively on members 60 and 61, parts of which serve as guides for the clips 52, as indicated in Figs. 5 and 6. The opposite guide members 60, 61 and their associated clip chains are adjustable toward and away from each other and angularly with respect to each other by means of hand-wheels 65, 66 (Fig. 2) operating through suitable screws. The clip chains may when necessary set

at a very substantial angle of divergence, amounting for example to  $7\frac{1}{2}^\circ$  as illustrated in Fig. 3.

In Fig. 1 it will be observed that the exit end of the spreading mechanism is placed as near as practical to the intake of the finishing machine 20, thus to deliver the web thereto as nearly as possible in the widthwise condition imparted by the spreading operation.

Another feature of my machine is the small diameter of the chain driving sprockets,—this diameter being in the neighborhood of 5" or 6" as compared with more than double this amount for the driving sprocket on an ordinary tenter. The small sprocket permits the delivery end of the expander to be placed very close to the felt calender or other device which receives the cloth therefrom. Thus, while the cloth is under tension, there is much less tendency for the cloth to become narrow on its way from the expander to the adjacent machine. The result of this is that much less lateral stretching of the cloth is required than there would be with an ordinary sized sprocket. For the purpose of avoiding a jumpy motion to the chain, the pitch, which in a tentering machine is ordinarily about 4", is reduced to 1", and the clip is also reduced from 4" to 2". The sprocket and the clips may be still further reduced in size if necessary. It has been found, however, that the present small size functions properly under almost all conditions.

From Fig. 1 it will be observed that the relation of the clip chains to the whole length of tensioned web between the rolls 11, 12 and cylinder 22 is such that only a small portion of this length of web is confined by the clips. For example, the clip chains at any instant may confine only a forty inch portion of a total of fifteen feet of web being stretched between the rolls 11, 12 and cylinder 22. This results, as indicated at the beginning of the specification, in avoidance of bowing of the filling threads even in the presence of strong warpwise tension in the portion of the web. In Fig. 1<sup>a</sup> is shown a convenient arrangement for still further increasing the linear quantity of moist web between the rolls 11, 12 and the expander. In the construction of this figure, the interior of the chamber 13 is provided with a series of easily running rolls 13<sup>a</sup> around which the moist web W passes in a sinuous path, thus increasing the time in which the moisture can penetrate and act on the web while the latter is being conveyed to the expander 50. A further important result is, that, after the cloth leaves the grasping rolls 11, 12 and is moistened, ample opportunity is afforded for the cloth to elongate before it is grasped by the clips in the expander 50, in which device the clips hold the selvages positively so that no further elongation can take place in the selvages.

As indicated above, the spreader is adapted to bring the web reliably to a predetermined width without continual manual adjustment even when, through changes in longitudinal stretching or from other causes, there are large variations in the width of the web reaching the spreader. The clips 52 preferably include pivoted gates 70 urged toward the closed position by springs 71 but adapted to be restrained from closure as in an ordinary clip by contact of a tail portion 72 of the gate with the web of cloth. As indicated in Fig. 6, the edge of the cloth may lie a substantial distance beyond the gate 70 in first entering the clips, but as the clips diverge the web uncovers a slot 74 in the clip, permitting the tailpiece 72 to swing partly into the slot and

permitting the gate 70 to grasp the web at about  $\frac{1}{8}$ " inside the edge of web as indicated in Fig. 5.

The provision of the spring 71 bearing against a portion 75 of the pivoted gate is deemed an advantage, since this spring prevents any accidental opening of the gate when vibration occurs. It will be understood that at the entering end of the expander there is little transverse tension in the web held by the clips, and that under such circumstances there is a tendency for vibration to open the swinging gate sufficiently to release the web. This tendency is resisted, and unintended opening of the clip prevented, by the spring 71.

While the short and relatively easily running clip chains of the expander described above may be allowed to be run merely by the pull of the cloth web W, means is preferably provided for driving these chains at controllable speeds synchronously with the finishing machine 20. This provides for advancing or retarding the clip chains of the expander with respect to the travel of the middle portion of the traveling web W, thereby permitting any previously bowed filling thread structure to be straightened out before entry into the finishing machine 20. Preferably the driving connections to the expander are of a suitable construction such as to permit the expander to be moved away from the finishing machine 20, for the reason indicated hereinafter.

Referring to Fig. 4, the sprockets 57 and 58 on which the clip chains run have their shafts 80 and 81 connected by bevel gearing 83, 84 and 85, 86, to a transverse drive shaft 89, which is mounted on bearings 90 and 91 on the frame, gears 84 and 86 being splined to shaft 89. A detachable sprocket 92 and chain 93 (Fig. 4) may be employed to connect the shaft 89 to suitable driving mechanism. Referring to Fig. 1, this chain 93 may for example connect the shaft 89 to a Reeves variable speed friction drive 95 which in turn is connected by a chain 96, sprockets 97, 98 and chain 99 to a sprocket 100 on the cross shaft 42 which drives the cylinder 22. Increasing or decreasing the speed of the driven elements of the Reeves drive 95 will thus correspondingly advance or retard the speed of the clip chains of the spreading mechanism. By suitably making this latter speed either greater or less than the general rate of advance of the web at the spreader, the selvages of the web can be advanced or retarded with respect to the central portion of the web. If desired, by disconnecting the spreading mechanism 50 from its Reeves drive, the clip chains can be advanced by the mere pull of the web thereon.

In order to permit easy access to the entrance portion of the felt calender 20 when desired, such for example as in changing the belt 23, the expander 50 is preferably mounted for easy movement away from the felt calender a distance of for example three or five feet. As indicated in Figs. 1 and 2, this may be accomplished by mounting the frame 51 of the expander 50 on flanged wheels 51<sup>a</sup> which run on rails 51<sup>b</sup>. In operation, the expander is held close to the felt calender, with its front wheels 51<sup>a</sup> against a suitable stop 51<sup>c</sup> by means of one or more pivoted clamps 51<sup>d</sup> which detachably engage the frame 51. When the sprocket 92, chain 93 and the clamps 51<sup>d</sup> are detached from the expander, the expander can quickly be moved back away from the entrance to the felt calender. The expander may also be restored to its normal working position and put into operation in a few seconds.

As indicated in the drawings, there is preferably provided at the entrance end of the spreading mechanism a guide roll 103 under which the web W passes, and at the exit end of the mechanism a series of guide rolls 104, 105, 106, about which the web passes, guide rolls 103 and 104 being substantially tangent to the plane in which the web is held by the traveling clips. Since the web is in a plane while being spread, its middle warps cannot assume a shorter path than its selvages.

The operation of the machine will now be apparent from this description of its several functions. By the use of any suitable indicator or markings to show the adjustment of the exit end of the pairs of clip chains with respect to each other, the spreader can be accurately preset to discharge the web to the finishing machine 20 at any appropriate width, and this width is thereafter maintained even though the condition or width of the entering web changes, or even though the amount of longitudinal stretching is altered, or in both of these events. Moreover, as pointed out above, the lateral stretching is conducted without interference by or with the longitudinal stretching. Thus when applied to a system of mechanical shrinking machinery involving a warpwise compressive shrinking operation, a fixing operation such as ironing, and a longitudinal stretching operation to adjust the net longitudinal shrinking effect, the present invention renders it possible to change the amount of longitudinal stretching (and net longitudinal shrinking) without any subsequent adjustment of the spreading mechanism that finally determines the ultimate width of the web. Moreover, in any event in which the present invention is applied to a moist web being fed under stretching tension to a finishing machine, the invention provides for spreading a web of variable width to a constant width without distortion of the filling threads.

I claim:

1. Cloth treating mechanism comprising a cloth finishing machine adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth such as to stretch it longitudinally, and lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web adjacent to the finishing machine.

2. Cloth treating mechanism comprising a cloth finishing machine adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth such as to stretch it longitudinally, and lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web adjacent to the finishing machine, said lateral stretching mechanism including means whereby the edge-holding devices are

caused to cooperate with a web of varying width presented thereto to equalize the width thereof.

3. Cloth treating mechanism comprising a cloth finishing machine adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth such as to stretch it longitudinally, lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web adjacent to the finishing machine, and means for varying the rate of travel of said edge-holding devices with relation to the speed of the finishing machine.

4. Cloth treating mechanism comprising a cloth finishing machine adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth such as to stretch it longitudinally, lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web adjacent to the finishing machine, and means for advancing and retarding the edge-holding devices with relation to the general rate of advance of the stretched web.

5. Cloth treating mechanism comprising a cloth finishing machine adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth

such as to stretch it longitudinally, and lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web substantially in a plane adjacent to the finishing machine.

6. Cloth treating mechanism comprising a cloth finishing machine adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth such as to stretch it longitudinally, lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web adjacent to the finishing machine, and a movable mounting for the lateral spreading mechanism permitting it to be moved away from the cloth finishing machine, so as to provide easy access to the entrance to the cloth finishing machine.

7. Cloth treating mechanism comprising a cloth finishing machine constituting a compressive shrinking device adapted to operate on a long moist cloth web, an input controlling device adapted to control the rate of travel of cloth toward the finishing machine at a substantial distance in advance thereof, the input controlling device and finishing machine being adapted to apply a tension to the intervening web of cloth such as to stretch it longitudinally, and lateral spreading mechanism comprising opposed diverging series of traveling edge-holding devices having contact with the said intervening tensioned web only at its edges and through a relatively short part of the length of said intervening tensioned web adjacent to the finishing machine.

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