Nov. 11, 1941. F. CHATFIELD 2,262,268

APPARATUS FOR PRESHRINKING FABRIC

Filed May 13, 1940 2 Sheets-Sheet 1

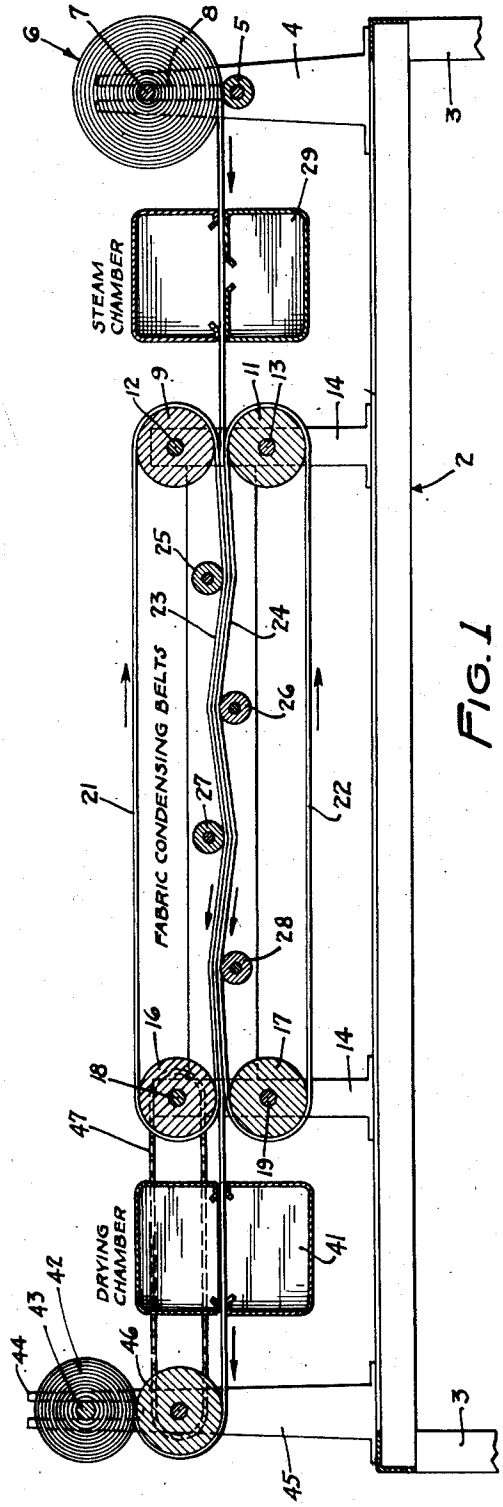



FIG. 1

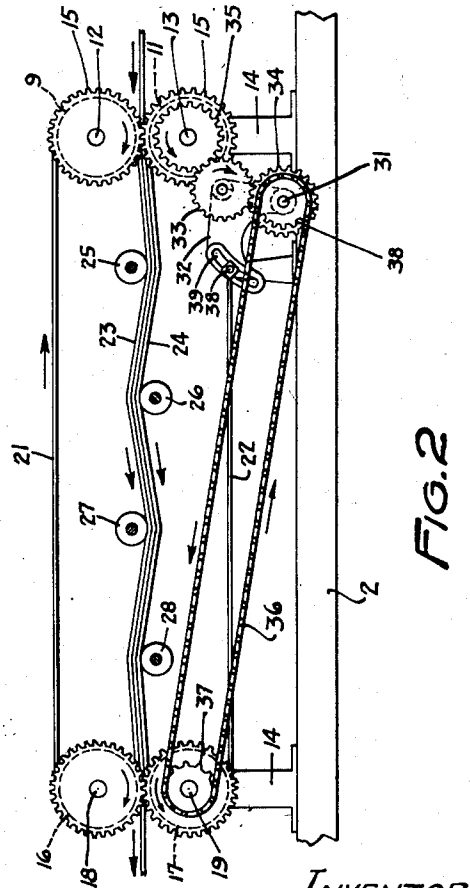


FIG. 2

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APPARATUS FOR PRESHRINKING FABRIC

Filed May 13, 1940 2 Sheets-Sheet 2

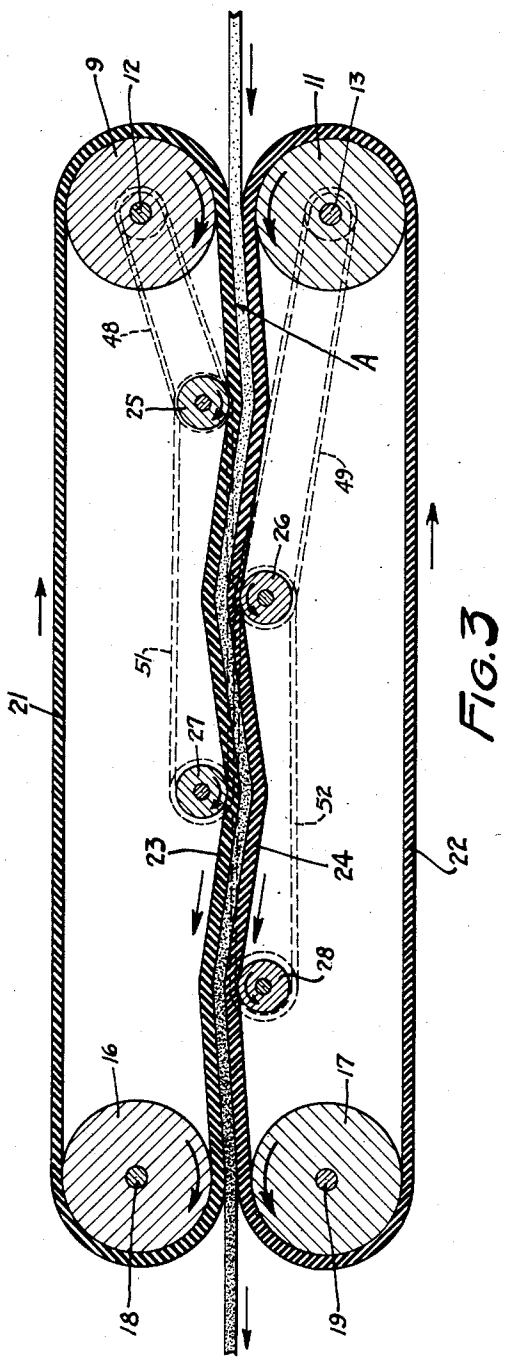



FIG. 3

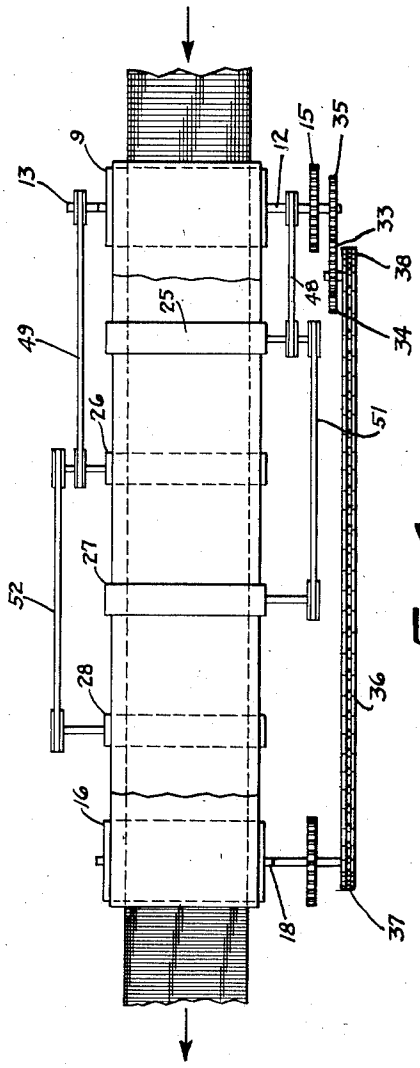



FIG. 4

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# UNITED STATES PATENT OFFICE

2,262,268

## APPARATUS FOR PRESHRINKING FABRIC

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Application May 13, 1940, Serial No. 334,874

10 Claims. (Cl. 26—18.6)

This invention relates to an improved method of and apparatus for preshrinking or "Sanforizing" knitted or woven fabrics prior to being made into garments.

In the manufacture of certain kinds of garments such as underwear, made from knitted or woven fabric, it is customary to preshrink the fabric before it is made into garments. Various types of apparatus have heretofore been used for thus preshrinking or condensing the fabric, but these have been more or less complicated and costly to operate and, as a result, tend to increase the cost of the resultant garments. It is therefore, highly desirable that some means be provided whereby the operation of preshrinking or "Sanforizing" the fabric before it is made into garments may be simplified.

An object of the present invention therefore is to provide a simple and inexpensive apparatus, whereby the operation of thus preshrinking the fabric may be expeditiously and inexpensively accomplished with a minimum of labor, and whereby the operation of preshrinking or condensing the material may be controlled at will to render the material more or less condensed, as may be desired.

A further object of the invention is to provide an improved method of preshrinking or condensing knitted or woven fabric which consists in subjecting the web of material to steam and then passing the steamed web between a pair of flexible elastic elements which are so arranged that the web is delivered thereto at a relatively faster speed than it is discharged therefrom, whereby the rows of stitches of the web are uniformly condensed longitudinally of the web, thereby to provide a preshrunk fabric which may readily be made into garments with the assurance that the fabric will not materially shrink, when the finished garment is subsequently washed or otherwise treated for cleaning purposes.

A further and more specific object of the invention resides in the provision of an apparatus comprising two elastic endless belts arranged in parallel relation and having adjacent runs arranged in fabric feeding contact, one over the other, and between which the web or tube of knitted fabric is fed, and means being provided at the receiving ends of said belts for thoroughly steaming the fabric, prior to its being received between said belt runs, and the driving means for said belts being such that the tube or web of fabric is received between said belts at a relatively higher speed than it is discharged therefrom, whereby said belt runs will contract and thereby cause the stitches of the fabric fed therebetween to become closely condensed or compacted, whereby the condensed fabric is less likely to further shrink, when made into garments.

A further object is to provide an apparatus of the class described comprising two pairs of rolls, the rolls of each pair being mounted one above the other, and a stretchable elastic belt being mounted on the lower rolls and a similar belt being mounted on the upper rolls, the adjacent runs of said belts being arranged in fabric feeding relation, and the rolls at the receiving end of said belts having a relatively higher peripheral speed than the rolls at the discharge ends of the belts, whereby the belt runs between which the fabric is fed may contract and thereby condense or compact the fabric fed therebetween, so that the resultant preshrunk fabric is less likely to further shrink, when made into garments.

A further object is to provide an apparatus of the class described, comprising a pair of stretchable belts arranged one over the other, with the adjacent runs arranged in fabric feeding relation, and means being provided whereby the peripheral speed of the rolls at the receiving end of the apparatus may be varied with respect to the peripheral speed of the rolls at the discharge end of the apparatus, thereby to control the preshrinking or condensing action of the belts on the fabric fed between said belts; means being provided adjacent the receiving end of the apparatus for thoroughly steaming the fabric, before being received between said belt runs, and means also being provided for drying the condensed web, whereby the treated fabric will retain its condensity.

Other objects of the invention reside in the unique arrangement and operation of the stretchable belts, whereby the fabric passed therebetween will be condensed, while the fabric is in continuous operation; in the means provided for positively controlling the contraction of the adjacent runs of said belts, whereby the condensing action of the belt runs on the fabric will be gradual, substantially the length of said belt runs; and, in the simple and inexpensive construction of the apparatus, as a whole, whereby it may be manufactured at small cost.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings, there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be

understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a longitudinal sectional view of an apparatus, showing the arrangement of the belt runs between which the fabric is fed;

Figure 2 is a view showing the driving means for the rolls at each end of the apparatus, and whereby the condensing action of the belts on the fabric may be varied;

Figure 3 is an enlarged diagrammatic veiw illustrating the condensing action of the belts on the fabric; and

Figure 4 is a diagrammatic plan view of Figure 1, with some of the parts omitted, showing a driving means for the auxiliary rolls which hold the belt runs in web feeding contact with each other.

In the selected embodiment of the invention herein disclosed, there is illustrated in Figure 1, for purposes of disclosure, an apparatus comprising a suitable frame, generally designated by the numeral 2, which may be provided with supporting legs 3, as shown. Suitable standards 4 are shown provided at one end of the apparatus upon which an idler roll 5 is mounted. This idler roll is adapted to support a roll of fabric, indicated by the numeral 6. The fabric is wound upon a suitable core 7 of well-known construction, the ends of which project beyond the ends of the roll of fabric, whereby they may be guided in vertical guides 8 provided in the standards 4.

If the fabric is knitted on a rotary knitting machine, it may be in the form of a tube which, in the operation of knitting the fabric, may be rolled into the roll 6 in the usual manner.

In newly knitted fabrics, the rows of stitches are, as a rule, not condensed or compacted, whereby the fabric may have a tendency to shrink or become condensed, when subsequently subjected to moisture, and it is therefore highly desirable that the knitted fabric be preshrunk or "Sanforized" before it is made into garments to prevent undue shrinking of the material constituting the finished garment.

A feature of the present invention resides in the novel means provided for thus preshrinking or condensing the fabric before it is made into garments. As shown in Figure 1, a pair of rolls 9 and 11 are shown mounted on shafts 12 and 13, respectively, journaled in suitable bearings provided in a pair of upright posts or standards 14 provided on the main frame 2 of the apparatus. The rolls 9 and 11 are geared together for simultaneous operation in opposite directions by suitable gears 15, secured to the shafts 12 and 13, as will be understood by reference to Figure 2.

A similar pair of rolls 16 and 17 are secured to shafts 18 and 19, respectively, journaled in similar uprights 14 provided adjacent the opposite end of the main frame. The rolls 16 and 17 are geared together for simultaneous operation in a manner similar to the rolls 9 and 11.

An endless elastic belt 21 is mounted on the upper rolls 9 and 16 and a similar elastic belt 22 is mounted on the lower rolls 11 and 17. These belts are under tension and have their adjacent runs 23 and 24 arranged in fabric feeding contact, as will readily be understood by reference to Figures 1 and 3. A plurality of auxiliary rolls 25, 26, 27, and 28 are mounted intermediate of the belt supporting rolls 9—11 and 16—17, and are preferably arranged in slightly staggered relation, thereby to hold the adjacent runs 23 and 24 of the belts in fabric feeding relation, as clearly illustrated in the drawings.

A suitable steam chamber, generally designated by the numeral 29, is provided between the supply roll 6 and the receiving ends of the belts 21 and 22. The steam chamber may be of any suitable design applicable for the purpose and functions to thoroughly steam the web of fabric as it passes therethrough, so that the web is thoroughly steamed and moistened when it is received between the belt runs 23 and 24.

An important feature of the invention resides in the unique operation of the belts 21 and 22, whereby the portions of the belts constituting the runs 23 and 24 which engage the fabric, are constantly contracted, thereby imparting a condensing or compacting action to the web of fabric fed therebetween.

To thus cause the belt runs 23 and 24 to contract, the rolls 9 and 11 are driven at a relatively higher peripheral speed than the rolls 16 and 17, whereby the belts leave the peripheries of the rolls 9 and 11 relatively faster than they are taken up by the rolls 16 and 17 at the discharge end of the apparatus. The differential in peripheral speed of the rolls 9 and 11 and the rolls 16 and 17 may be accomplished by making the diameters of the rolls 9 and 11 slightly larger than the diameters of the rolls 16 and 17 in which case, all of the rolls may be driven at the same speed.

Because of the variation in the characteristics of different fabrics, I have found it highly desirable to provide means for controlling the contraction of the belt runs 23 and 24, whereby the condensing action imparted to the fabric may be controlled.

To thus control the contraction of the belt runs 23 and 24, I provide means for varying the speed of the rolls 9—11 with respect to the rolls 16—17. In the apparatus, as shown on the drawings, the rolls 9—11 and 16—17 are all of the same diameter. It is therefore necessary that the rolls 9—11 at the receiving end of the belts be driven relatively faster than the rolls 16—17, in order that the belt runs 23 and 24 may be contracted to produce the desired condensing of the fabric. To thus vary the speed of the rolls 9—11 with respect to the rolls 16—17, I have shown in Figure 2, a drive which is so constructed that the differential between the rolls at the receiving and discharge ends of the machine may readily and conveniently be changed at will, whereby the apparatus may be quickly adapted for handling fabrics having different characteristics.

The drive shown in Figure 2 comprises a main drive shaft 31 disposed crosswise of the apparatus and having a driving connection with a suitable driving means or motor, not shown in the drawings. A suitable arm or bracket 32 is mounted for pivotal movement on the shaft 31 and carries an intermediate gear 33 which is in constant mesh with a gear 34 secured to the shaft 31. A suitable change gear 35 is removably secured to the shaft 13 of the roll 11 and meshes with the intermediate gear 33. The rolls 16—17 may be driven by a suitable chain 36 mounted on sprockets 37 and 38 secured respectively to the shafts 19 and 31, as best shown in Figure 2. The gear change bracket 32 may be secured in adjusted position by a suitable bolt 38 mounted in a slot 39 of the bracket, as shown.

When the drive shaft 31 is operated, the intermediate gear 33 is driven in the direction indicated by the arrow, whereby rotation is imparted to the shaft 13 as a result of the gear 33 meshing with the change gear 35. Simultaneously, the rolls 16—17 at the discharge end of the apparatus are driven, as a result of their driving connection with the drive shaft 31, through the chain 36. The above driving mechanism, it will be noted, makes it possible to quickly change the differential in speed between the rolls at the receiving and discharge ends of the apparatus by simply substituting for the gear 35, a slightly larger gear or a slightly smaller one. Some knitted or woven fabrics may be more condensed than others, and it is therefore highly desirable that means be provided whereby the contraction of the adjacent belt runs 23 and 24 may readily be varied to adapt the apparatus for condensing different types of fabric.

In order that the condensed fabric will retain its density, a suitable drying chamber, generally designated by the numeral 41, is shown provided adjacent the discharge end of the apparatus. This chamber may be connected with a source of warm, dry air which may be circulated through the chamber in such a manner that as the condensed fabric passes therethrough, it will be thoroughly dried before it is wound into the finished roll, generally indicated by the numeral 42. The condensed web of fabric is wound onto a suitable core 43, the ends of which project from the ends of the roll and are guided in upright guides 44 provided in standards 45, similar to the standards 4 at the opposite end of the apparatus. A suitable windup roll 46 is mounted in bearings provided in the standards 45, and may be driven from the shaft 18 by a suitable chain drive, generally indicated by the numeral 47. The peripheral speed of the roll 46 is so related to the peripheral speed of the roll 16, that the condensed web of fabric will be wound into the roll 42 at identically the same speed as the fabric is discharged from the belt runs 23 and 24.

In some instances, it may be deemed desirable to operate the rolls 25, 26, 27, and 28 as idlers, whereby they are rotated as a result of their frictional engagement with the surfaces of the belt runs 23 and 24. When the auxiliary rolls operate as idlers, the major portion of the condensing action on the fabric by the belt runs 23 and 24 may take place at point A or immediately after the web of fabric is received between the belt runs 23 and 24. Such immediate condensing of the fabric may be practical for various kinds of fabric, it being understood that the fabric is retained in its condensed condition throughout its travel between the belt runs 23 and 24, and as the peripheral speed of the take-up roll 46 is substantially equal to the traveling movement of the fabric, as the fabric leaves the belt runs 23 and 24, there is no tendency to stretch or elongate the web of fabric as it passes from the belt runs through the drying chamber to the take-up roll 46.

In some instances, however, it may be found more desirable to distribute the contraction of the belt runs 23 and 24 substantially over their entire lengths. This may readily be accomplished by positively driving the auxiliary rolls 25, 26, 27, and 28, as shown in Figures 3 and 4. To thus positively drive the auxiliary rolls, the auxiliary roll 25 may be driven from the shaft 12 of the roll 9 by a suitable belt or chain drive, generally designated by the numeral 48. In like manner, the auxiliary roll 26 may be driven from the shaft 13 by a suitable drive or V-belt 49, and the auxiliary roll 27 from the shaft of the auxiliary roll 25 by a suitable belt 51. The auxiliary roll 28 may be driven from the shaft of the auxiliary roll 26 by a suitable V-belt 52, the pulleys supporting the belts 48, 49, 51, and 52 being so proportioned in size that the peripheral speed of the auxiliary roll 25 will be slightly less than the peripheral speed of the rolls 9—11, and the peripheral speed of the auxiliary roll 26 will be slightly less than the peripheral speed of the auxiliary roll 25. The peripheral speeds of the rolls 27 and 28, in like manner, are progressively diminished whereby the peripheral speed of the roll 28 may be substantially equal to or slightly greater than the peripheral speed of the rolls 16—17 at the discharge end of the apparatus.

By thus positively driving the auxiliary rolls at different speeds as above stated, the adjacent belt runs 23 and 24 of the belts may be uniformly contracted their entire lengths, whereby the condensing action imparted to the web of fabric engaged with the belt runs 23 and 24 will gradually increase in the direction of travel, as will be readily understood.

From the foregoing, it will be noted that a web of fabric, whether in the form of a flattened tube, or of single thickness, may readily and quickly be condensed or preshrunk by passing it between the belt runs 23 and 24 as herein disclosed. The apparatus is adapted for continuous operation, and requires no particular attention on the part of an attendant except to keep the apparatus supplied with fabric and to remove the roll 42 of condensed fabric from the standards 45. The electric belts 21 and 22 may be made of any suitable material applicable for the purpose. Rubber has been found to provide a very practical material. The belts are of such thickness that a compensating action takes place within the belts as they pass around the rolls 9—11 and 16—17, thereby to compensate for the differential in peripheral speed of the rolls 9—11 and 16—17. It is also to be understood that any suitable means applicable for the purpose may be utilized for steaming the fabric. In the apparatus as herein disclosed, the fabric is steamed before it enters the belt runs 23 and 24. In some instances, however, it may be found desirable to condense the fabric before it is steamed, in which case, the fabric is first passed between the belts and condensed, after which it is steamed and dried while retained in its condensed condition. The means for drying the condensed web before it is wound into the take-up roll 42 may also be varied to suit conditions, it being understood that the condensed fabric is preferably thoroughly dried before it is wound into the take-up roll 42.

In some instances, it may also be found desirable to mount the auxiliary rolls in pairs, whereby the rolls of each pair will engage the belt runs at points directly opposite from one another.

In the foregoing, I have referred to the fabric as being knitted, but it is to be understood that other materials which require preshrinking or "Sanforizing," before being made into garments, may also be handled in the apparatus herein disclosed, without departing from the scope of the invention.

I claim as my invention:

1. In an apparatus for preshrinking a textile fabric, means for steaming the fabric, a pair of endless elastic belts arranged in parallel relation and having adjacent runs disposed in web feeding relation and between which the steamed fabric is fed, means for positively driving the receiving and discharge ends of said belts and whereby the receiving ends are driven slightly faster than the discharge ends thereof, thereby to cause said belt runs to contract between said driving means and thereby condense the stitches of the fabric as the fabric is passed between the belt runs, and means for drying the fabric after it has been condensed by said belts, whereby it will retain its density, and means whereby the relative speeds of the driving means at opposite ends of the belts may be varied to change the condensing action of the belt runs on the fabric.

2. In an apparatus for preshrinking a web of knitted fabric, a steam chamber through which the web is passed, a pair of endless elastic belts arranged in parallel relation and having adjacent runs disposed in web feeding relation and between which the web is fed from the steam chamber, and means for positively driving the receiving and discharge ends of said belts and whereby the receiving ends of said belts are driven relatively faster than the discharge ends thereof, whereby the web is discharged from said belts at a slower rate than it is received, thereby causing said belt runs to contract and thereby condense the web in its passage between the belt runs.

3. In an apparatus for preshrinking a web of knitted fabric, a steam chamber through which the web is passed, a pair of endless elastic belts arranged one over the other in parallel relation and having adjacent runs disposed in web feeding relation and between which the web is fed from the steam chamber, means for driving the receiving ends of said belts faster than the discharge ends thereof, whereby the web is discharged from said belts at a slower rate than it is received, and whereby said belts contract and thereby condense the web in its passage between the belt runs, and a plurality of driving elements in driving engagement with said belt runs along their length to cause the contraction thereof to be substantially gradual throughout the length of said belts.

4. In an apparatus for preshrinking a web of knitted fabric, a steam chamber through which the web is passed, a pair of endless elastic belts arranged one over the other in parallel relation, lengthwise of the apparatus, and having adjacent runs disposed in web feeding relation and between which the web is fed from the steam chamber, rolls for supporting said belts, means for driving the rolls at the receiving ends of said belt runs slightly faster than the rolls supporting the discharge ends thereof, whereby said belt runs will contract and thereby condense the fabric in its passage between said belt runs, and means whereby the respective speeds of the rolls at opposite ends of said belts may be varied, thereby to vary the condensing action of the belts on the fabric web fed therebetween.

5. In an apparatus for preshrinking a web of knitted fabric, means for steaming the web, a pair of endless rubber belts arranged one over the other in parallel relation, lengthwise of the apparatus, and having adjacent runs disposed in web feeding relation and between which the web is fed from the steaming means, rolls for supporting said belts, means for driving the rolls at the receiving ends of said belt runs faster than the rolls supporting the discharge ends thereof, whereby said belt runs will contract and thereby condense the fabric in its passage between said belt runs, and means adjacent to the discharge ends of said belts for drying the condensed web whereby it will retain its density.

6. In an apparatus for preshrinking a web of knitted fabric, means for steaming the web, a pair of endless rubber belts arranged one over the other in parallel relation, lengthwise of the apparatus, and having adjacent runs disposed in web feeding relation and between which the web is fed from the steaming means, rolls for supporting said belts, means for driving the rolls at the receiving ends of said belt runs faster than the rolls supporting the discharge ends thereof, whereby said belt runs will contract and thereby condense the fabric in its passage between said belt runs, means for drying the condensed web whereby it will retain its density, a plurality of auxiliary rolls engaged with said belt runs and adapted to hold them in feeding engagement with the web, and means for driving said auxiliary rolls at different speeds to control the contraction of said belt runs.

7. In an apparatus of the class described, a pair of rolls at the receiving end of the apparatus geared together for simultaneous operation in opposite directions, said rolls being arranged, one over the other, a second pair of rolls located towards the opposite end of the apparatus and similarly geared together for simultaneous operation in opposite directions, said second pair of rolls also being arranged, one over the other, an endless elastic belt mounted on the two upper rolls and a similar belt mounted on the two lower rolls, whereby adjacent runs of said belts are disposed in fabric-feeding relation and travel at the same speed, means for positively driving said pairs of rolls and whereby the pair of rolls at the receiving end of the apparatus may be driven faster than the rolls at the discharge end of the apparatus to cause said belt runs to contract, whereby when a strip of fabric is fed between said belt runs, the stitches of the fabric will be condensed as a result of the contraction of said belt runs, means for steaming the web before it is delivered to said belts, and means for drying the condensed web, whereby it will retain its density.

8. In an apparatus of the class described, a pair of rolls at the receiving end of the apparatus geared together for simultaneous operation in opposite directions, said rolls being horizontally disposed and arranged, one over the other, a second pair of similarly arranged rolls adjacent the discharge end of the apparatus, said second pair of rolls being similarly geared together for simultaneous operation in opposite directions, a pair of endless elastic belts mounted respectively on the upper and lower rolls of said pairs of rolls whereby adjacent runs of said belts are disposed in fabric-feeding relation, means for positively driving said pairs of rolls and whereby the pair of rolls at the receiving end of the apparatus are driven faster than the pair of rolls at the discharge end of the apparatus, whereby when a web of fabric is fed between said belt runs, the stitches of the fabric will be condensed as a result of the contraction of said belt runs, means for steaming the web before it is delivered to said belt, and means for drying the condensed web whereby the web will retain its density.

9. In an apparatus of the class described, a pair of rolls at the receiving end of the apparatus geared together for simultaneous operation in opposite directions, said rolls being horizontally disposed and arranged, one over the other, a second pair of similarly arranged rolls adjacent the discharge end of the apparatus, said second pair of rolls being similarly geared together for simultaneous operation in opposite directions, a pair of endless elastic belts mounted respectively on the upper and lower rolls of said pairs of rolls whereby adjacent runs of said belts are disposed in fabric-feeding relation, means for positively driving said pairs of rolls and whereby the pair of rolls at the receiving end of the apparatus are driven faster than the pair of rolls at the discharge end of the apparatus, whereby a web of material fed between said belt runs will be condensed as a result of the contraction of said belt runs, means for steaming the web before it is delivered to said belt runs, means for drying the condensed web whereby the web will retain its density, and means for varying the speed differential between said pairs of rolls, whereby the condensing action of the belts on the fabric, as the fabric passes therebetween, may be varied.

10. In an apparatus for preshrinking a web of knitted fabric, a steam chamber through which the web is passed, a pair of endless elastic belts arranged one over the other in parallel relation, and having adjacent runs disposed in web feeding relation and between which the web is fed from the steam chamber, means for driving the receiving ends of said belts faster than the discharge ends thereof, whereby said belt runs are contracted, a plurality of auxiliary rolls engaged with said belt runs at spaced points between the ends thereof and operating to hold the belt runs in feeding engagement with the web, means for driving said auxiliary rolls at progressively diminishing speeds whereby the contraction of said belt runs is gradual the length thereof, and means for drying the condensed web whereby the web will retain its density.

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