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METHOD OF MAKING ELASTIC FABRICS

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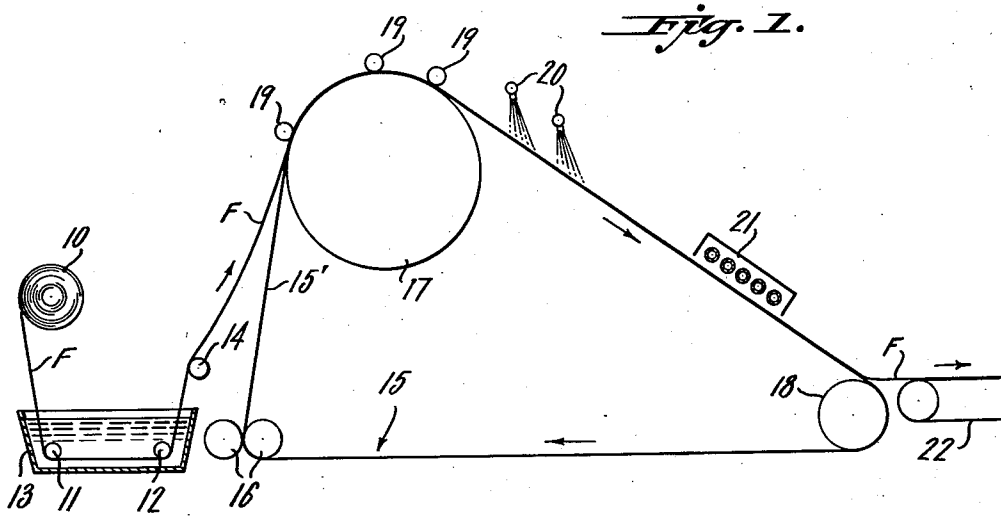


Fig. 2.

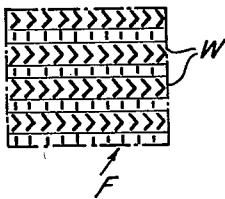


Fig. 3.

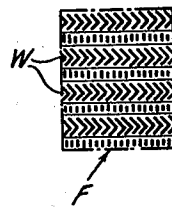


Fig. 4.

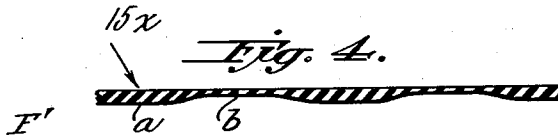


Fig. 5.



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METHOD OF MAKING ELASTIC FABRICS

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5 Claims. (Cl. 154-2)

This invention relates to a method of treating various textile fabrics to impart to them elastic properties.

It has been proposed heretofore to impart elastic properties to stretchable fabrics such as knitted goods, by calendering sheet rubber onto a surface of the fabric, or by applying to a surface of the fabric a rubber-containing fluid such as solvent rubber cement or an aqueous rubber dispersion such as latex, the purpose of the rubber being to contract after being stretched and return the fabric to its unstretched condition.

It has also been proposed heretofore to stretch knitted fabric in one direction and then apply a coating or sheet of rubber thereto to normally retain the fabric stretched in this direction so as to increase its stretch in a direction at right angles thereto. While the effect of such prior treatments has been to produce elastic fabric and to increase the property of the fabric to stretch in one direction with a loss of such property in a different direction, the result of such prior treatments has not been to increase on the whole the property of a fabric to elongate over that which the textile fabric originally possessed before the rubber treatment.

The present invention relates to a method of and apparatus for treating woven, knitted and other textile fabrics by condensing the fabric, and then securing the fabric normally in this condensed condition by an elastic binder of rubber, but is directed more particularly to the method whereby the fabric is wetted to approximately a saturated condition with water or other non-adhesive liquid to render the fabric more plastic, and the tendency of a wet fabric to cling to a contacting surface is utilized in condensing the fabric and to retain the fabric in a condensed condition until it can be secured in this condition by a rubber binder.

While pastes, glues and other adhesives may be used to temporarily retain the fabric in the condensed condition, the use of a non-adhesive liquid such as water for this purpose has the advantage that the water may be readily removed by a drying operation after the fabric has been set in the condensed condition by the rubber binder, whereas if an adhesive is used for this purpose its subsequent removal requires an additional step of washing.

The fabric to be condensed, in carrying out the present invention, is preferably placed upon a stretched elastic belt or apron and the fabric may be wetted either before or after it is placed upon this belt. The quantity of water used

should be sufficient to practically saturate the fabric in order to render the fabric more plastic and sufficiently adhesive to cause it to adhere to the stretched belt. The quantity of water used should not, however, be sufficient to tend to float the fabric upon the belt. The primary function of the water is to hold the fabric in place upon the belt so that when the belt is permitted to contract it will condense the fabric. The fabric may then be yieldingly secured in this condensed condition by a rubber binder which may take the form of a rubber sheet or rubber coating firmly secured to a face of the fabric.

Another feature of the present invention resides in the method whereby the fabric may be condensed more at some portions than at others to thereby impart to the fabric design or pattern effects and to make the fabric more elastically extensible in some areas than in others.

The invention will be more fully understood from the following description when read in connection with the accompanying drawing illustrating one form of mechanism for carrying out the present method.

In the drawing:

Figure 1 is a diagrammatic side elevation of one form of mechanism for carrying out the invention;

Figure 2 is a conventional showing of a piece of knitted fabric before it has been condensed;

Figure 3 is a similar view showing the fabric as it may appear after it has been condensed;

Figure 4 is a sectional view through a rubber belt of varying thickness which is adapted to condense portions of the fabric differently; and

Figure 5 is a view similar to Fig. 3 but showing the fabric as having pattern effects produced by condensing it upon the belt of Fig. 4.

The method of the present invention may be employed in treating knitted, woven, lace or other fabrics to render them elastic, and these fabrics may be condensed either longitudinally or transversely, or both longitudinally and transversely, as desired. However, the degrees to which it is practical to condense the fabric will depend largely upon how open a construction the fabric possessed, as it is obvious that an open loosely constructed fabric may be condensed to a much greater extent than a tightly formed fabric.

A construction is shown in Fig. 1 of the drawing for employing water or other non-adhesive liquid as a plasticizer to condition the fabric in a way that makes it more responsive to the condensing operation, and the water or other liquid

serves also to cause the wet fabric to cling to the condensing belt. The fabric F to be treated, in the construction shown, is drawn from the supply roll 10 about bars or rollers 11 and 12 placed in the tank 13 below the surface of the liquid. This tank may contain water or a diluted aqueous solution. The wet fabric upon leaving the tank 13 may pass upwardly in contact with a guide roll 14 and then onto a stretched elastic belt or apron 15. This belt may be formed of a sheet of rubber or of elastic webbing, and may be porous or non-porous as desired. The porous belt will permit a more rapid drying of the fabric. In practice it is found important in treating woven fabrics in accordance with the present invention to use a constant width belt such as a woven elastic belt or a rubber belt which has been treated to maintain its width constant. This is necessary because woven fabric tends to lift off the belt in condensing if the width of the belt changes at this time. If the rubber or elastic belt is subject to high temperatures, the rubber within the belt may be specially constructed or may contain special compounds to prevent its over-cure during subsequent heat treatments. The belt may, if desired, have its fabric-receiving surface made tacky or rough, or it may be flocked or otherwise treated to increase the frictional engagement between the belt and fabric. The belt is shown as passing between a pair of pinch rolls 16 which grip the belt to prevent slippage therebetween, and these rolls or at least one of them is positively driven to feed the belt. The belt passes upwardly from the pinch rolls 16 about a relatively large drum 17 and after passing part way around this drum its upper run extends in a downwardly inclined direction, in the construction shown, to a free-running roll 18, and then around the roll 18 and to the pinch rolls 16.

The large drum 17 is positively driven at a faster surface speed than the surface speed of the rolls 16. The effect of this is to stretch the portion 15' of the belt between the rolls 16 and drum 17 and to permit this stretched portion of the belt to contract gradually as it approaches the point where it leaves the drum 17 and moves towards the roll 18. The gradual condensing of the fabric such as is secured as the rubber belt 15 passes around the upper part of the drum 17 is much more desirable than a rapid condensing.

It will be seen that in the construction shown the wet fabric F is delivered to the stretched portion 15' of the belt, and it preferably is pressed firmly against the belt by one or more floating and free-running rollers 19. The effect of this is to cause the wet fabric F to cling to the stretched underlying belt, and since this belt is permitted to contract gradually as it approaches the point where it leaves the drum, the fabric will be condensed by the contraction of the belt to which it clings as a result of its wet condition. That is, the adjacent parts of the fabric will be crowded more closely together in the direction in which the belt contracts. The roller 19 nearest the discharge point is preferably so positioned that it serves to press the fabric against the belt after it is condensed.

The condensed fabric may be conveyed by its supporting belt beneath the spraying nozzles 20 which serve to spray upon the fabric a rubber containing liquid such as solvent rubber cement, or an aqueous dispersion of rubber such as latex with or without compounding and/or vul-

canizing ingredients and in either a vulcanized or unvulcanized condition of a workable degree. The nozzles are preferably inclined as shown to prevent the rubber solution from penetrating too deeply below the surface of the fabric. If desired, the rubber containing liquid and a coagulant may be deposited upon the fabric before it is condensed but the setting of the rubber should not take place until after the fabric is condensed. When the rubber containing fluid is to be deposited upon fabric before the latter is condensed, it preferably is applied to the fabric as the fabric passes around the drum 17. In this case the rollers 19 which would engage the rubber treated surface, should be omitted so that this rubber containing fluid will not be forced through the fabric by the pressure of the rollers. The fabric upon leaving the spraying nozzles 20 may be carried by the belt past the heating or drying elements 21 to set the rubber containing liquid sufficiently to hold the fabric condensed after it leaves the belt 15.

The fabric may then be delivered to a conveyor apron 22 to be conducted to a vulcanizing chamber, or subjected to any other desired treatment. When water or other non-adhesive liquid is employed to secure the fabric to the condensing belt it can be readily removed from the belt and fabric by drying, whereas if a paste, glue or other adhesive is used for this purpose its subsequent removal from the fabric may be more difficult.

Fig. 2 shows in a conventional manner a piece of knitted fabric before it has been condensed, and Fig. 3 shows the same piece of fabric after it has been condensed in the direction of the wales *w* so as to crowd the courses extending transversely thereto more closely together. The effect of condensing a knitted fabric as shown in Fig. 3 and yieldingly securing it in this condition by a rubber binder is to produce an elastic fabric having a relatively long stretch in the direction of its length, which stretch may be well over 100%. The fabric may or may not have its width altered during the condensing operation depending upon whether or not the width of the belt changes. It is also possible through the present method to produce woven and other textile fabrics having a substantial stretch. The rubber binder may be so applied to the fabric that it will only slightly diminish the porosity of the original fabric, or if desired it may serve to impart waterproof properties to the fabric.

Elastic fabric constructed in accordance with the present invention may have one face that is free from rubber so that this face will have the feel and general appearance of the fabric before it was treated, or if desired two such fabrics may be plied together and held by a rubber adhesive applied therebetween, in which case both outer faces of the plied fabric will have the feel and appearance of ordinary textile fabric. Elastic fabric constructed in accordance with the present invention may be used in corsets and girdles or for various other purposes.

Should it be desired to condense the fabric so as to impart design or pattern effects to the finished product, this is readily accomplished by substituting for the rubber belt 15 of Fig. 1 the rubber belt 15a of Fig. 4, the thickness of which varies as indicated at *a* and *b*. The belt 15a of Fig. 4 when placed under tension will stretch more at the thin areas *b* than at the thick areas *a*, and when this belt of Fig. 4 is permitted to contract the fabric resting there-

upon will be condensed unevenly. That is, the fabric resting upon the thin area *b* will be condensed more in the direction of the wales *W'* than the fabric resting upon the thick areas *a*, and as a result a design or pattern effect will be imparted to the fabric *F'* as shown in Fig. 5.

It will be apparent from the foregoing that various forms of rubber products may be employed as an elastic binder to yieldingly hold the parts of the fabric in the condensed condition. The term rubber as used in the claims is therefore to be understood as including sheet rubber, rubber cement, aqueous dispersions of rubber such as latex, artificial dispersions of rubber, and other forms of rubber or rubberlike materials and other elastic materials containing rubber.

Should it be desired to employ the method of the present invention to condense the fabric transversely then the portion of the belt 15' of Fig. 1 instead of being stretched longitudinally should be stretched transversely, for example, by the use of tentering mechanism arranged to engage the sides of the belt and stretch it sideways as the belt approaches the drum 17. If the fabric is to be condensed both longitudinally and transversely then the portion 15' of the belt should be stretched both longitudinally and transversely as it is delivered to the drum 17.

Having thus described my invention what I claim and desire to protect by Letters Patent is:

1. The method of making an elastic fabric which consists in laying a fabric formed of interconnected threads on a surface which has been stretched under tension and providing the fabric with a sufficient quantity of water to cause it to cling to the stretched surface, releasing a substantial amount of the tension on the stretched surface to permit said surface to contract while the fabric is held in place thereupon by the action of the water to thereby condense the fabric by decreasing the distance between its rows of threads, and yieldingly securing the parts of the fabric in the condensed condition by an elastic binder of rubber.

2. The method of making an elastic fabric which consists in laying a fabric formed of interconnected threads on a surface which has been stretched longitudinally under tension, providing the fabric with a sufficient quantity of water to cause it to cling to the stretched surface and contract therewith, releasing a substantial amount of the tension on the stretched surface to permit said surface to contract while the fabric is held

thereupon to thereby condense the fabric by decreasing the distance between its rows of threads, and applying an elastic binder of rubber to the fabric to retain it in the condensed condition.

3. The method of making an elastic fabric having some areas more condensed than others which comprises stretching an elastic surface more in some areas than in others, adhering a fabric to the unevenly stretched surface, releasing at least some of the tension in the stretched surface to permit the areas which were stretched to a greater extent to contract more than the other areas and thereby condense the fabric in the direction of the contraction of the surface by crowding the threads of the fabric closer together in the areas adhered to the areas of the surface having the greater contraction, and yieldingly securing the condensed fabric in the condensed condition with rubber adhered thereto.

4. The method of making an elastic fabric comprising the steps of wetting a fabric composed of interconnected rows of thread with a non-adhesive liquid adapted to cause it to cling to a supporting surface, applying said fabric to a stretched elastic supporting surface, releasing a sufficient amount of tension on the surface to cause said surface to contract while the fabric is held thereon by the clinging action of the non-adhesive liquid, so as to cause the adjacent rows of threads to be crowded closer together and thereby condense the fabric, utilizing the action of the non-adhesive liquid to hold the fabric in the condensed condition, and yieldingly securing the threads of the fabric in this condition by an elastic binder of rubber.

5. The method of making an elastic fabric comprising the steps of wetting a fabric composed of interconnected rows of thread with a non-adhesive liquid adapted to cause it to cling to a supporting surface, applying said fabric to a stretched elastic supporting surface, releasing a substantial amount of tension on the surface to cause said surface to contract while the fabric is held thereon by the clinging action of the non-adhesive liquid, so as to cause the adjacent rows of thread to be crowded closer together and thereby condense the fabric, utilizing the action of the non-adhesive liquid to hold the fabric in the condensed condition, depositing a coating of latex composition on the condensed fabric, and drying and vulcanizing the latex composition to yieldingly hold the fabric in the condensed condition.

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