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1,944,001

APPARATUS FOR TREATING FABRICS

Original Filed April 18, 1930

Fig. 1

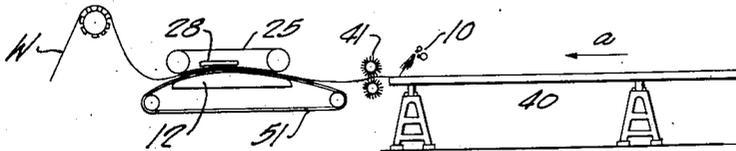


Fig. 3

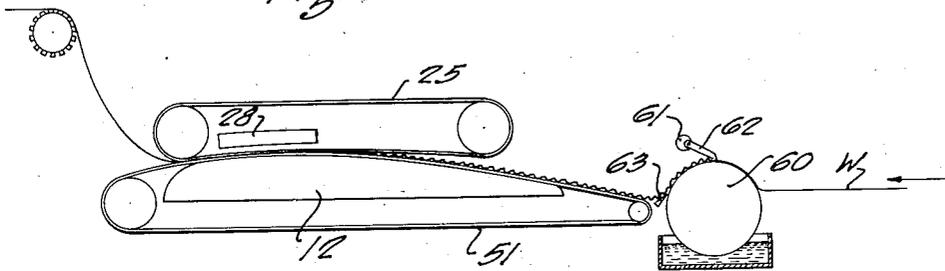


Fig. 4

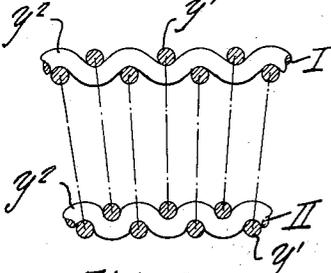


Fig. 2

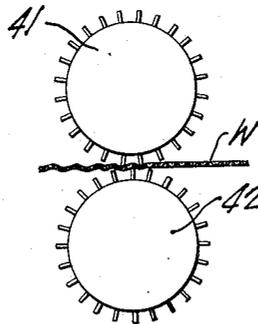


Fig. 5

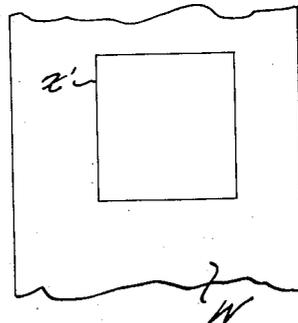


Fig. 6

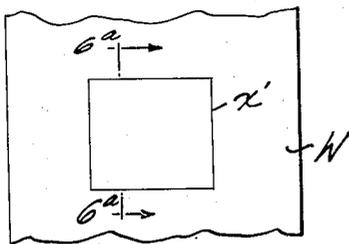


Fig. 5a

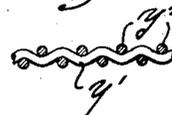
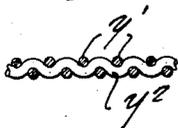


Fig. 6a



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1,944,001

APPARATUS FOR TREATING FABRICS

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Original application April 18, 1930, Serial No. 445,300. Divided and this application April 16, 1932. Serial No. 605,649, and in Australia August 23, 1930

9 Claims. (Cl. 26—20)

This invention relates to mechanism for altering the superficial dimensions of textile fabrics and is a division of my application Serial No. 445,300, filed April 18, 1930.

One object of the present invention is to provide improved mechanism adapted to operate upon cloth, which may already be finished in the sense of having been bleached, mercerized, printed, dyed, calendered, starched, ironed, polished or any of these, in such a way as to secure and set in the cloth a maximum contraction in at least one dimension of the web. Another object of this invention is to provide mechanism adapted to complete or supplement a state of one dimensional shrinkage by causing the cloth to shrink in another dimension, and to do this without detriment to the effect, if present, gained by shrinkage in the first dimension.

In a preferred series of steps which can be carried out by the mechanism of this invention, the cloth may be subjected to a humidifying or a moistening treatment tending to soften adhesions or stiffnesses caused by starchy or gummy dressings and then be caused to collapse or lie in a shorter extent in one dimension upon a suitable carrier, and concomitantly or thereafter be fixed in its collapsed state in that dimension, preferably by heat and pressure.

The invention will now be explained in connection with the accompanying drawing which illustrates preferred mechanisms only by way of illustration of the invention.

In the drawing:

Fig. 1 is a diagrammatic side elevation of apparatus according to the present invention;

Fig. 2 is an enlarged diagram in elevation of an instrument of said apparatus;

Fig. 3 is a diagram in side elevation of modified apparatus of the present invention;

Fig. 4 is a diagrammatic section of the fabric comparing its condition in two stages of the treatment;

Figs. 5 and 6 are respectively comparative diagrams in plan of cloth not treated and cloth after it has been treated;

Fig. 5^a is a section either warpwise or weftwise of the said cloth in the state illustrated in Fig. 5; and

Fig. 6^a is a section warpwise showing the state of the cloth illustrated by Fig. 6.

The apparatus of this invention is adapted to perform the process described in my said application, Serial No. 445,300 to alter the superficial dimensions of cloth which has not been subjected to any shrinkage operation, or has been only

partially shrunken or has been shrunken in one direction only. For comparison, as shown in Figs. 5 and 5^a, a typical cloth w of simple weave may present a warp or weft system of yarns y' interengaged with a cross system of yarns y^2 , the relative lie, crinkle, or arrangement of the said yarns in respect to each other, whether they are longitudinally extending warps or laterally wefts, being such that the yarns are bent over members of the other series of yarns so as to extend from side to side of the superficial faces of the fabric and to be substantially evenly distributed on either side of a medial longitudinal plane of symmetry. If such a piece of cloth w should have laid off upon it at x^2 a marked square, the dimension of the marked area would be changed by shrinkage. Such a change will not be effected in any manner without causing some different relation of the yarns y^1 to the yarns y^2 . This condition is true whatever the weave-construction of the fabric may be.

The effect desired is to shrink the longitudinally extending or warp system yarns y^2 by causing the collapse or take up of the yarns y^2 and recession or contraction of the distances separating wefts y' (Figs. 4 and 6^a) to or slightly beyond the degree which would be attained by repeated laundry washings of the fabric. Referring to Fig. 4 this is accomplished by so operating upon the moistened and internally mobile cloth as to take up the crinkled warp yarns illustrated by the typical warp system member y^2 at I in said figure, through a desired degree to occupy the shorter space of the said yarn as shown at II in said figure, in order to cause the cloth originally in the condition shown in Figs. 5 and 5^a to be longitudinally shrunken as illustrated in Figs. 6 and 6^a.

The mechanism of this invention is adapted to produce the desired shrinkage or dimensional contraction of the textile fabric by subjecting it, while in such plastic or internally mobile condition, and in a state of undulation, to compressive forces directed generally normal to the web, to condense or crowd together the yarn components, so as to enhance in degree the yarn undulation or crinkle originally produced by the weaving operation.

A preferred treatment of the cloth, as indicated at 10, Figs. 1 and 2, includes the direct application to the web, as shown, to its upper face, of a fine spray or mist of water, steam or other suitable saturant capable of entering the capillary spaces of the yarns. A preferred form of moistening device 10, indicated in the draw-

ings, is a form of air-blast atomizer using water, and adapted to apply a predetermined quantity according to the speed of passage of the cloth in order to accomplish the desired moistening or capillary filling of the yarns, and not to have any permanent detrimental effect on the attained finish of the goods, so as to leave its trade finish substantially unimpaired. I have determined by experience that these quantities can be ascertained for any particular cloth, having regard to its contained moisture when delivered to the apparatus, the temperature of subsequent treatment, and especially the distance separating the moistening station at 10 from the place where the cloth is dried, for example by application of heat, to secure the degree of effect desired. Added water to the extent of from 5 to 10 per centum of the weight of the cloth is usually sufficient for collar and shirting cloths.

Referring to Figs. 1 and 2, the cloth web *w* is fed in the direction of the arrow over a table 40, and moistened by the spray device 10. It then passes through a web-crinkling device, comprising suitably driven rolls 41, 42 equipped with radial, parallel, rounded-edged vanes, set so that the edges of the vanes intermesh, as shown in detail in Fig. 2, and produce undulations in the web. The web then passes to an endless belt 51 which travels at a rate slower than that at which the web is fed or drawn into the crinkling vanes 41, 42, so that the undulations or ridges formed in the web shall not be disturbed, either by extension or contraction.

The carrier belt 51 travels over the surface of a convex bed 12, which may if desired be hollow, perforated and exhausted by any suitable suction device, to facilitate removal of moisture from the belt 51 and web *w*. On the surface of bed 12, the belt 51 enters the nip between said surface and a tense, flexible, endless band 25, preferably of smooth metal, which presses the cloth against the belt 51, supported by the bed 12, the band and belt traveling at the same rate, so that the pressure exerted on the web *w* shall be transverse only, i. e.—normal to its general surface. A radiating heater 28 is provided, which, as indicated may be an electric resistance heater, or might be a steam box.

The crinkled or undulated web, in which the yarns have been softened and their contained starchy or sizing materials rendered plastic by moistening, is subjected to progressively increasing transverse (i. e. normally exerted) pressure as it passes into the gradually reducing space between the belt 51 and band 25. The crests or salient features of these undulations are depressed, this depression develops a compressive component of force, exerted at all points in parallel with the surfaces of the web, which by reason of its frictional adhesion to the carrier belt 51 can not creep on the belt to any appreciable degree. The lengthwise (e. g. warp) yarn components are by this compressive force constrained to assume a more sinuous crinkle, while the widthwise (e. g. weft) yarn components are crowded more closely together. The web as a whole is dimensionally contracted, occupying in its flattened condition the same length as in its previously undulated condition. When thus flattened and compressively condensed, sufficient moisture is eliminated, as by the heater 28 to fix the web in its shrunken state.

The longitudinal state of collapse and fixation of this state of collapse of the longitudinal element of the cloth may be secured by the modified

form of apparatus of Fig. 3. Referring now to Fig. 3, the web *w* may be delivered in the direction of the arrow on to the surface of a moistening and tractor roll 60 to which the surface of said web adheres in the manner of wet cloth by the capillarity of the wetting fluid. While in this condition of moist adhesion, a rapidly reciprocating doctor knife 62 worked by an eccentric 61 of very slight eccentricity may act upon the cloth to detain it in fine crepe-like ridges which are retained during passage of the cloth over a doffing knife 63 on to the carrier belt 51, which may be caused to pass at a rate which is less than the rate of delivery to the roll 60, so as to conserve the ridge-formation, over a bed 12 and enter under a tense band 25, between which and the belt 51 the crepe-like ridges are flattened to effect a longitudinally collapsed arrangement of the web components, which arrangement is then fixed as by heat and pressure. The heat may be supplied by the heater 28 of the apparatus above described.

In both forms of apparatus herein illustrated the effect of transverse pressure is to cause the longitudinal system of yarns to assume a more crinkled form when the applied pressure reduces the fine and slight wrinkles to the common plane of the space between pressure devices. The length of these yarns taken up in the wrinkles or creplings, when these are flattened, is subjected to endwise compression as a result of flattening the blisters or wrinkles. A degree of wrinkling which would cause the cloth to lap on itself in folds on being subjected to transverse pressure is of course avoided.

I claim:

1. Apparatus for shrinking fabric webs, comprising in combination, means for moistening the web, means for forming undulations in the web, means for applying pressure generally normal to the web to flatten the undulations, and means for applying heat to the web to dry it.

2. Apparatus for shrinking fabric webs, comprising in combination, a traveling web carrier, web-crinkling means adapted to deliver a web to said carrier in an undulated state, and pressure means acting on the web on the carrier to flatten the undulations.

3. Apparatus for shrinking fabric webs, comprising in combination, web-crinkling means for forming undulations in a traveling web, and pressing means acting to flatten said undulations, said pressing means including a pressure surface traveling with the web delivered by said web-crinkling means.

4. Apparatus for shrinking fabric webs, comprising in combination, web-crinkling means for forming undulations in a web, a traveling carrier belt adapted to receive the undulated web, an ironing bed on which the belt travels, a traveling band converging gradually with said carrier belt to press the web thereagainst, and means for heating the web while under such pressure.

5. Apparatus for shrinking fabric webs comprising web-crinkling means for forming in a traveling web undulations adapted for flattening into the plane of the web, and means operating in timed relation to the web-crinkling means for thereafter applying flattening pressure to the undulations while conserving a substantial preceding reduction in dimension caused by the formation of said undulations.

6. Apparatus for shrinking fabric webs comprising web-crinkling means for forming in a traveling web a systematic pattern of undulations

adapted uniformly for flattening into the plane of the web, and means operating in timed relation to the web-creasing means for thereafter applying flattening pressure to the undulations while conserving a substantial preceding reduction in dimension caused by the formation of said undulations.

7. Apparatus for shrinking fabric webs comprising cooperating web-creasing means and a web carrier for presenting a continuous web in a dimensionally reduced state in undulations adapted for flattening into the plane of the web, and means operating on the thus presented web to flatten said undulations while substantially conserving the reduced dimension of the web.

8. Apparatus for shrinking fabric webs comprising cooperating web-creasing means and a web carrier for presenting a continuous web in a

dimensionally reduced state in a systematic pattern of undulations adapted uniformly for flattening into the plane of the web, and means operating on the thus presented web to flatten said undulations while substantially conserving the reduced dimension of the web.

9. Apparatus for shrinking fabric webs comprising web-creasing means for forming in a traveling web undulations adapted for flattening into the plane of the web, pressure means for thus flattening the undulations while conserving a substantial reduction in web dimension represented by the deviation of the undulations from a common plane, and means for conveying the undulated web from said web-creasing means to said pressure means without substantial extension of the undulations.

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