

June 2, 1931.

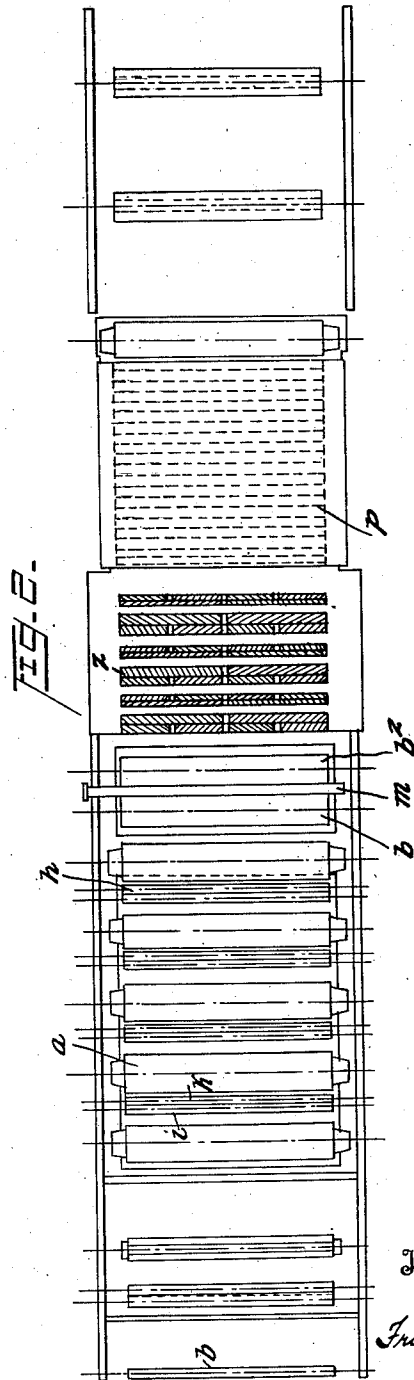
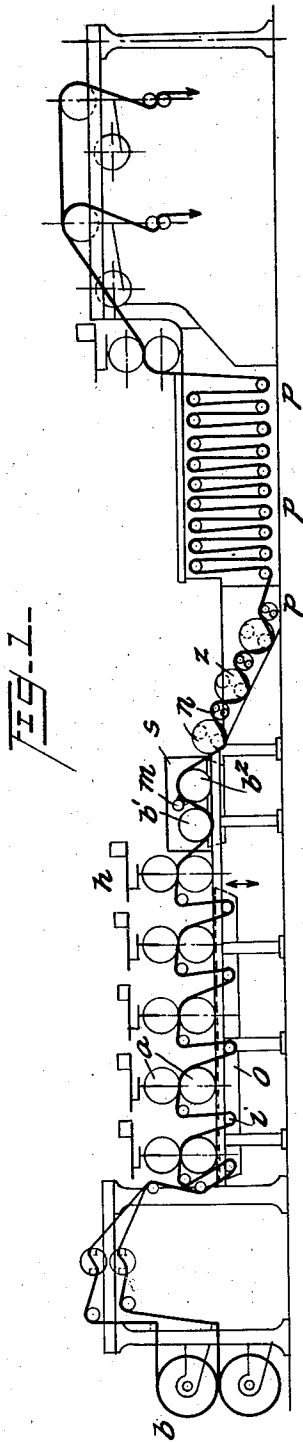
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MERCERIZATION OF PIECE GOODS

Filed March 4, 1927

2 Sheets-Sheet 1



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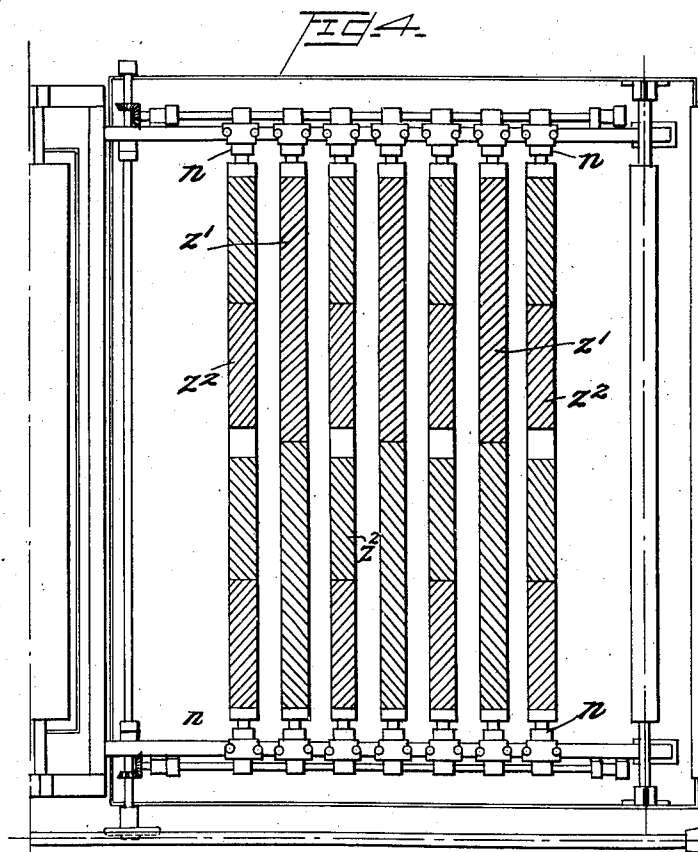
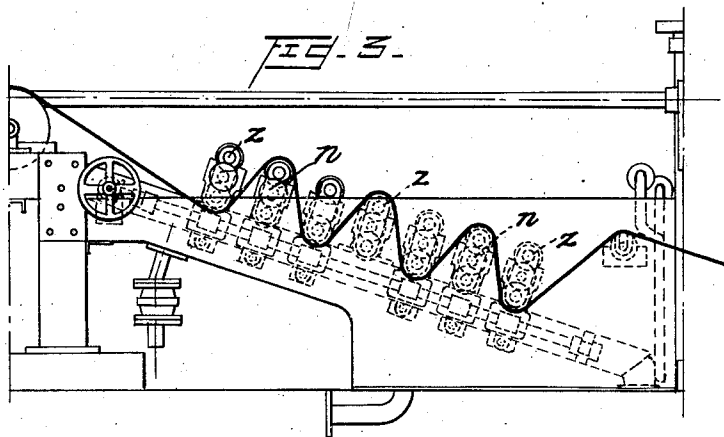
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MERCERIZATION OF PIECE GOODS

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This invention comprises improvements in and connected with the mercerization of piece goods and is concerned with what is known as the elastic mercerization treatment, that is a treatment with concentrated soda lye or other impregnating medium, which allows the goods only to shrink so far that an 8-10% excess stretching is necessary, in order to prevent the return of the goods to the width before the stretching. A material is not elastic if about 3-5% excess stretching leads to deformation. By excess stretching is understood a further stretching beyond the usual maximum stretching of 1-3% which occurs in practice. In the mercerization of woven materials under tension, there is a sharp distinction between the elastic and non-elastic treatments. The problems of the latter may be said to have been solved, for the most part successfully, by the employment of stretching chains and width-maintaining rollers. The elastic mercerization treatments have not been successful, either because the fundamental principles have not properly been understood or because a suitable practical construction has not yet been devised.

With elastic mercerization the material may be given any desired width during the further treatment, so that it may have the original width of the untreated material or some greater width. This is, of course, conditional upon the mercerization effect not suffering owing to the subsequent widening or stretching.

Hitherto, it has been fundamental in the whole art that the material, when neutralized, should be stretched to the utmost. However, it frequently happened that parts which diverged from the stretching chains could not be brought back to the width of the original material so that they remained in a belled or mis-shapen condition. This is obvious for it is not possible to stretch individual sections of inelastic material. Further, it is to be presumed that the known methods of carrying out the treatment were never such as to impart elasticity to the said mis-shapen parts. Elastically mercerized material is characterized by its ability to stretch like a rubber web and upon being re-

leased from tension it springs back to its original width. In this respect it differs also from fully shrunk material which is treated in an unstretched condition not only during impregnation but also during neutralization. This latter material cannot be brought back to full width, or only to a very limited extent, by moistening and drying treatment on frames, and it never acquires the full, genuine and permanent mercerization brilliance. The elastically mercerized material, on the contrary, is even more beautifully brilliant after the final treatment. Finally, with the elastic mercerization there is an avoidance of all the difficulties which attend the subsequent treatment of non-elastically treated material, even including dyeing.

In the development of mercerizing machines, the chainless machine has come to the fore, and an object of this invention is to remedy and avoid defects and deficiencies experienced with this type. If goods of different width have to be neutralized on a chainless machine without being subjected to maximum tension, then either the narrower or the wider material does not emerge uniformly since the operation of the width-maintaining devices which are adapted for one particular width must always favour one width or another.

It is possible, by careful experiment, to determine the result to be attained by any particular arrangement of guide rollers, squeezing rollers and width-maintaining rollers of a given construction, number and relative disposition. In any case, however, the conditions for the spreaders are not the same for wide and narrow materials. Consequently, these improvements seek to provide a readily modifiable arrangement adapted for preserving the general relation of unguided lengths of material relatively to one another.

The problems hereinbefore indicated are solved by the following provisions in accordance with these improvements:—In the first place, the shrinkage of the fibres due to impregnation is contracted as far as possible without impairing the swelling which must attain a maximum value, then the liquor is

brought as rapidly as possible to the boiling point, and finally the hot but little shrunk material is conducted through a width-maintaining arrangement the rollers of which
 5 are entrained by the material which is there-upon passed through a large hot water or steam chamber working on the counter-current principle. To utilize to the full the tension arising, during the impregnation, in the
 10 warp so that shrinkage of the weft threads is avoidable to a considerable extent, but not to such an extent that the steeping of the fibres does not reach a maximum value, a number, say five, heavy pressers or foulards are so ar-
 15 ranged that the distance between the bites of neighbouring roller pairs is reduced to a minimum. This proximity or minimum spacing is, however, limited because the material must be saturated afresh with mercerization
 20 liquor after each pressing. Therefore, importance attaches to the relation in the separate impregnation steps of the guided lengths of material extending between a squeezing point, a guide roller in the impregnation
 25 trough and the next following squeezing point.

For example, the material is conducted over a roller arrangement so that the said material follows an up and down zig-zag or serrated course, the amount of surface of the
 30 material in contact with the pressing rollers being made as small as possible due to the ascending flights of such material being finally directed more or less horizontally into the bites of the presser rollers.

The lateral stretching or width-maintaining devices comprise rollers adapted for the treatment of wide materials and other rollers adapted for the treatment of narrow materials, adjustable mountings being provided
 40 whereby either set of rollers may, at will, be brought into operation in a very simple manner. Such an arrangement permits either one wide length, or two parallel narrow
 45 lengths, of material to be treated, and if each of the two parallel lengths comprises two superposed lengths it is possible to treat four lengths simultaneously in the apparatus.

In order to enable the invention to be readily understood, reference is made to the accompanying drawings illustrating suitable arrangements for carrying the invention into practice, in which drawings:—

Figure 1 is a diagrammatic longitudinal section of a complete installation for the elastic mercerization of materials in accordance with the improvements.

Figure 2 is a plan of Figure 1.

Figure 3 is a more or less diagrammatic longitudinal section of width-maintaining devices working in a heated chamber, these devices being somewhat similar to those illustrated in Figure 1.

Figure 4 is a plan of Figure 3.

Referring to Figure 1, it will be seen that

one or more lengths or webs of material to be elastically mercerized are passed from rolls *b* to an impregnating trough *o* and pressing rollers *a* or foulards. The latter are somewhat massive and comprise a number of pairs of sets, five being shown in the drawings.
 70 The rollers *a* are loaded as diagrammatically indicated by the means *h*, the loading of the last pair of the series being greatest as indicated by the greater dimensions of the final loading means. In front of the first pair of rollers *a*, and between any two neighbouring pairs, there is disposed a lower guide roller *i* and an upper guide roller *k*. The material
 75 passes down under the rollers *i* and upwards over the rollers *k* the latter being disposed so that a short length of the material makes a practically horizontal flight into the bite of the presser rollers into which it is next passing. It will be seen that by causing the material to ascend right up to the level of the bites of the presser rollers, the amount of surface of the material in contact with the
 80 presser rollers prior to being squeezed in the bite is very small. The material upon emerging from a bite passes somewhat obliquely down to the next guide roller *i* in the mercerizing trough *o* so that guidance of the material by contact thereof upon the presser rollers only takes place after leaving the bite. By this arrangement, the liquor has the fullest opportunity for impregnating the material during each interval between the presser rollers in spite of the small distances between each pair of such rollers and its
 85 neighbours.

When the material leaves the final and heavily loaded presser rollers *h*, the fibres have experienced a maximum of impregnation which is important when considering the attainment of subsequent effects. Experiments quickly show whether or not the appropriate degree of impregnation has been attained, for test patches may be sewn to the web and such patches may be tested individually for their contraction before being subjected to steaming.

These improvements provide for the most suitable tension to be attained automatically. If the material were put on stretching devices immediately after leaving the presser rollers, the effort would be very slight. It is known that boiling liquors do not cause any appreciable shrinkage. Therefore, after the material has left the last presser rollers with a materially less loss of width than has heretofore been possible, due to the arrangement and operation of the impregnation devices as above described, the said material is conducted between two rollers *b*¹ and *b*² running in ball bearings and situated in a chamber, containing steam pipes *m* or a steam chamber. After this, the material is neutralized in a manner now to be described.

The neutralization is carried out continu-

ously and without any further washing vessels, acid treatments or the like. The said neutralization is performed in a single vessel or chamber *p*, the entry part of which contains a particular arrangement of width-maintaining rollers *z* whilst the main part is a large hot water or steam chamber working on the counter-current principle.

Contrary to known practice, the width-maintaining rollers are not driven but they are entrained by the moving web of material. This is possible because the material enters this part of the installation in a comparatively wide and hot condition.

To obtain the fullest utility of the machine and to enable either wide or narrow webs to be treated with equally and uniformly good results, two sets of width-maintaining rollers are mounted in such a manner that either one of such sets can be brought into operation. For example, one set is adapted for operating on full-width webs and the other set is adapted for operating upon half-width webs. As the spacing of the width-maintaining rollers *z* from one another must not be excessive, rollers adapted for dealing with different widths are mounted in revoluble discs *n*, so that a circular adjustment of such discs through 180° will bring a different set of such rollers into operation. In Figure 1, the rollers *z* are mounted with their ends in bearings in discs *n* of alternately large and small diameter. However, the arrangement and operation will be better understood from Figure 3 which differs from Figure 1 in that all such rollers are mounted in similar revoluble carriers.

Referring to Figures 3 and 4, it will be seen that there are rollers *z*¹ adapted for dealing with full-width materials and rollers *z*² for dealing with half-width materials. There are several sets, and the revoluble carrier *n* of each set supports a full-width roller and a half-width roller at diametrically opposite points. Figure 4 illustrates diagrammatically and by the shading lines, the known spreader character of these rollers. Assume that the full-width rollers *z*¹ are in the operative position in Figure 3, then by adjusting the carriers *n* through 180° the half-width rollers *z*² will be brought into the operative position in place of the full-width rollers *z*¹.

The discs or carriers *n*, in turn, may be mounted in slidable bearings which can be adjusted in the general direction of travel of the web, for the purpose of altering the spacing of the width-maintaining rollers. Also, this adjustment may be necessary for enabling the rollers of one set to clear the rollers of neighbouring sets when the carriers are revolvably adjusted by any suitable means for exchanging half-width rollers for full-width or vice versa.

In Figure 1, two superposed webs of material are drawn from two rolls *b* and are con-

veyed through the apparatus for simultaneous treatment. In a wide apparatus adapted for treating two webs side by side, superposed webs also may be treated which would enable four webs in all to be treated simultaneously.

The method and apparatus hereinbefore described with reference to the drawings embody materially novel features enabling definite technical progress to be accomplished. It is to be understood, however, that the invention is not limited to the precise constructions and arrangements described and illustrated but that it is possible to adopt such changes and modifications as fall within the scope of the invention defined by the claims herein-after set forth.

I claim:—

1. In elastic mercerization apparatus and in combination, impregnation and squeezing mechanism comprising a set of pairs of heavy rollers with guide rollers between the pairs and adapted for giving an up and down zig-zag course to the fabric to be mercerized and a short straight approach of such fabric into the bites of the said rollers, and means for thereafter heating and stretching the fabric, rollers in a heated chamber to which the fabric is passed from such impregnation and squeezing mechanism, these rollers being adapted for entrainment by the moving fabric, and widthwise treatment rollers also adapted for being entrained by the moving fabric substantially as set forth.

2. A method of obtaining elastic mercerization of woven material comprising the alternate and successive steps of impregnating the material with a mercerizing solution, and applying pressure thereto without impairing the swelling thereof, and thereafter heating the impregnated material to the boiling point of the entrained solution and stretching the heated material.

3. A method of mercerizing fabrics which comprises the alternate and successive steps of impregnating the fabric with a mercerizing solution and applying pressure to the fabric to counteract shrinking to some extent without thereby preventing maximum-steepage of the fibers, treating the fabric with steam to bring the entrained solution to the boiling point, stretching the heated fabric, and again treating the fabric with steam.

4. In apparatus for elastic mercerization of fabric, the combination with a trough containing mercerizing liquid, of a plurality of pairs of pressure rollers located above said trough, upper and lower guide rollers disposed between adjacent pairs of pressure rollers, said lower guide rollers being entirely submerged in the liquid in the trough, and said upper rollers being so arranged that the fabric is fed directly into the bite between the cooperating pressure rollers.

5. In apparatus for elastic mercerization of fabric, the combination with a trough con-

taining mercerizing liquid, of a plurality of pairs of pressure rollers located above said trough, upper and lower guide rollers disposed between adjacent pairs of pressure rollers, said lower guide rollers being entirely
5 submerged in the liquid in the trough, and said upper rollers being so arranged that the fabric is fed directly into the bite between the cooperating pressure rollers, and means
10 whereby greater pressure is exerted between the last pair of pressure rollers in the train than between the preceding pairs of pressure rollers.

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