

April 27, 1943.

C. T. GRAHAM

2,317,375

METHOD OF TREATING FABRIC AND FABRIC

Filed Jan. 27, 1938

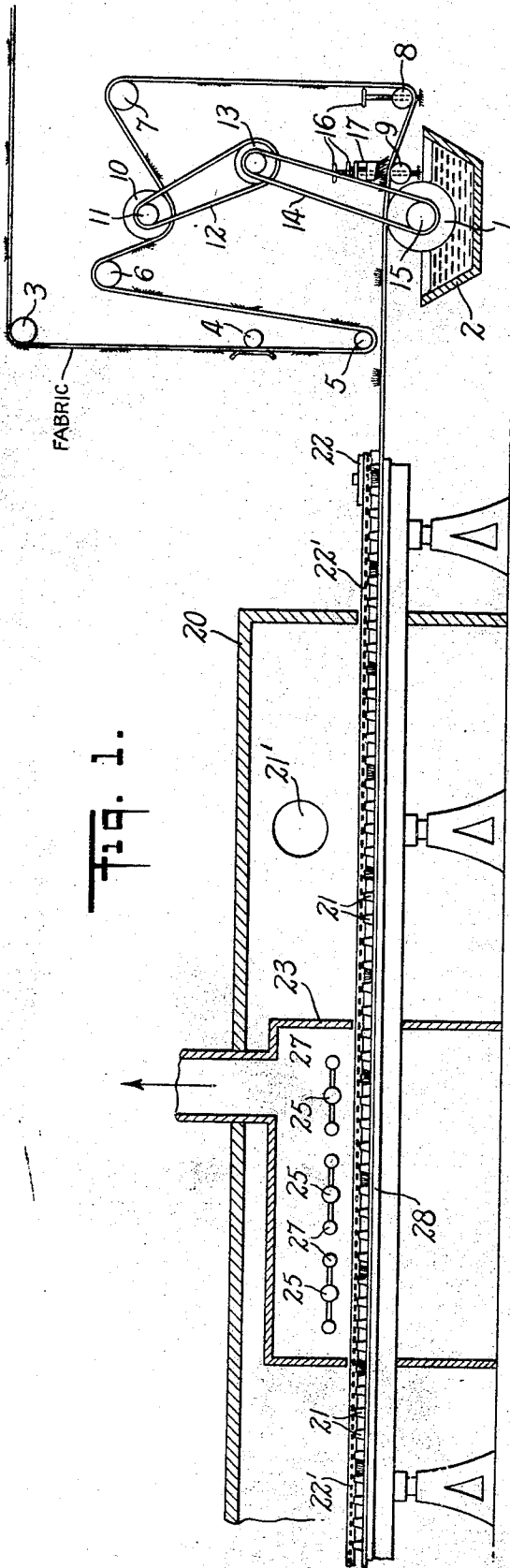


Fig. 1.

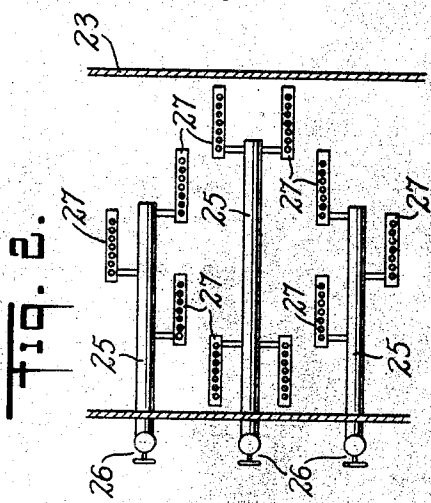
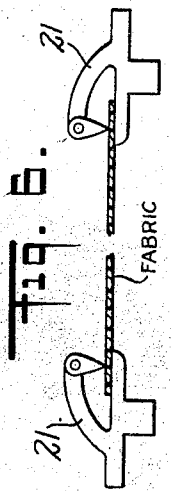
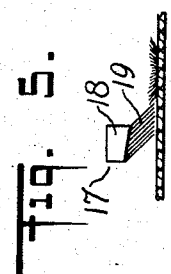


Fig. 2.

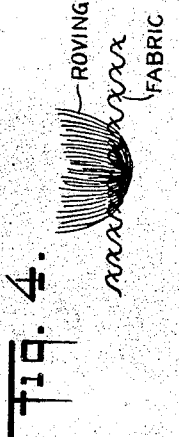


Fig. 4.

Fig. 3.

Fig. 5.

Fig. 6.

ROVING
FABRIC

ROVING
FABRIC

INVENTOR
 Clarence T. Graham
 BY
 Blair, Curtis, Dumas & Hayward
 ATTORNEYS

Patented Apr. 27, 1943

2,317,375

UNITED STATES PATENT OFFICE

2,317,375

METHOD OF TREATING FABRIC, AND FABRIC

Clarence T. Graham, North Attleboro, Mass., assignor, by mesne assignments, to Defiance Manufacturing Company, Barrowsville, Mass., a corporation of Massachusetts

Application January 27, 1938, Serial No. 187,136

3 Claims. (Cl. 28—74)

This application is a continuation in part of my application, Serial No. 4,643, filed February 2, 1935, for Fabric and method and apparatus for its manufacture, the subject matter of which application is now claimed in Letters Patent 2,128,516, dated August 30, 1938, and 2,155,127, dated April 18, 1939.

This invention relates to the method of and apparatus for applying a finishing material, such as starch, dye, or the like, to a fabric and to the fabric that results therefrom.

It is common practice for the textile mills that weave fabrics to have the finishing of these fabrics accomplished in a separate finishing mill. In such a finishing mill, the fabrics are either bleached, or have applied thereto, finishes such as dye, starch, or the like.

One type of the fabrics that are received by the finishing mill consists of a base fabric, that is, one consisting of warp and weft threads alone. Another type consists of such a base fabric and a raised design which in certain instances is produced in the textile mill by interengaging rovings with the base fabric. In some instances these design rovings are clipped or sheared to form a raised figure of any desired or overall design. As this fabric is received by the finishing mill, usually in bales, the design rovings are unfluffed. I have illustrated, in the drawing, one form of such fabric that is received by the finishing mill for the application of a finish such as starch, dye, or the like. In this form the base fabric, as I have said, consists of the usual warp and weft threads and of design rovings that are arranged to form what I shall term "fluff dots." In the textile mill these fluff dots are formed by interengaging the rovings from which the fluff dots are to be formed with the threads of the base fabric at spaced points and looping these rovings back and forth between these points, and then passing on to the next dot. The rovings that are thus looped back and forth are then cut away between the points at which these rovings are engaged with the base fabric. This operation produces the fluff dots, with the free ends of the rovings extending somewhat away from the obverse side of the base fabric, the rovings being in somewhat of a U-form; but these fluff dots are, at this time, unfluffed, and lie more or less flat against the base fabric. When it is desired to apply the finish to the fabric, as by starching or dyeing, for instance, without applying the finish to the rovings, or fluff dots, or other raised portion, the treatment must be carried on to the exclusion of such raised portions and yet must be so effectively applied to the base fabric as to impart to it the desired finish. Moreover, the fluff dots or other raised figures must be handled in such a manner that they will be out of the zone of the finishing treatment.

My present invention seeks to accomplish the

results that are indicated above as desirable and to accomplish related results that are not above pointed out, but that will appear as the description progresses.

5 In the drawing I have illustrated in more or less conventional representation, a mechanism for carrying out my process, but it is to be understood that the process may be carried out by other instrumentalities or by hand and that the details of the steps of the process may be varied. I therefore am not to be limited to the specific disclosure of either the process or the apparatus, but only insofar as is made necessary by the claims.

15 In the drawing:

Figure 1 is a diagrammatic view of an apparatus for carrying out the method that forms one part of this invention,

20 Figure 2 is a fragmentary view of the mechanism for projecting the pressure fluid onto the fabric after the finish has been applied and dried,

Figure 3 is a diagrammatic view showing the condition of the rovings prior to the "roughing" treatment.

25 Figure 4 is a similar view showing the condition of the rovings after the "roughing" has been accomplished, and

30 Figure 5 is a detail of the "rouger," and Figure 6 is a detail of the fabric advancing clamps.

The method includes advancing a fabric in the direction of either its length or breadth while maintaining the same under tension, raising the rovings so that the portions thereof that are visible on the obverse side of the fabric extend away from the fabric, applying a finish to the reverse side of the fabric, arresting the penetration of the finish before it encounters that portion of the rovings that are visible from the obverse side of the fabric, and thereafter subjecting the fabric to such action that the all-over effect of the fabric and rovings such as fluff dots will be uniform, as well as certain other related steps which will appear as the description progresses.

45 The apparatus that I have chosen to illustrate the application of the method includes an applicator roll 1 that is rotatably mounted within a reservoir 2 adapted to contain the finishing material such as the starch or dye material, which material may be heated, when desired, by any suitable means.

50 In order that the fabric to be finished may be passed across and in contact with the surface of the applicator roll 1, I have provided a series of guide rollers 3, 4, 5, 6, 7, 8 and 9 which include the usual commercial type of cloth guider that is used in the finishing art.

55 In order that the applicator roll 1 may be driven by the advancing fabric and at variable speeds, I have provided the following mechanism:

A drive roller 10 freely rests upon the reach of the fabric which lies between the guide rollers 6 and 7 and is provided with a pulley 11 over which a belt 12 passes. This belt 12 passes over a variable speed pulley 13, which is suitably supported for rotation on its axis. A second belt 14 passes over this pulley 13 and around a pulley 15 on the applicator roll 1. Thus the advancing fabric rotates the driving roller 10 which, through belt 12, rotates pulley 13 and in turn, the applicator roll 1, through the belt 14 and the pulley 15. It is obvious that the speed of rotation of the applicator roll 1 may be varied by means of the variable speed pulley 13 and that in any event, and regardless of its particular speed of rotation, this speed bears a definite ratio to the speed of travel of the cloth over the surface of the applicator roll 1. The purpose of this variation of speed of the applicator roll 1 is so that variable quantities of the finishing liquid may be applied to the cloth as the cloth travels over and in contact with the face of the roll as will later more fully be described.

The guide rollers 8 and 9 are mounted for vertical adjustment by means of adjusting members 16 so that the arc of contact between the advancing fabric and the surface of the applicator roll 1 may be varied or in other words, so that the fabric may have a greater or lesser surface contact with the roll.

In order that the design rovings that form the fluff dots may be arranged to extend away from the obverse side of the fabric so that they may be free from application of the finishing material or so that the extent of penetration of the finishing material into the rovings or fluff dots may be controlled, I have provided what I shall term a rougher 17, which is arranged above the adjustable roller 9 in the construction as I have shown it, but which may be arranged above the adjustable roller 8. In fact, whether or not it is arranged above one or the other is of little importance. One or the other of these rollers 8 and 9 may be dispensed with and in that event, the rougher will be mounted above the remaining roller. This rougher is adapted to engage with the design rovings as the fabric advances, with the result that the rovings which later become the fluff dots or other raised design are loosened, softened and fluffed, and the matted condition of the rovings is relieved. At the same time the rovings are raised so that they extend away from the obverse side of the fabric and out of contact therewith save for the portion of the rovings that are actually interengaged with the threads of the base fabric.

In the drawing, I have illustrated this "rougher" as being what may be termed a brush form consisting of a transverse backing 18 that extends longitudinally above the roller 9. The brush member 19 may be made up of a series of elements such as wires, bristles or the like. These elements extend, preferably, in acute angular relation to the advancing fabric and in the direction opposite to that in which the fabric is moving. This arrangement of the brush elements causes them to engage beneath the design rovings, which, as has heretofore been stated, lie more or less flat on the obverse side of the fabric and in a matted condition, and raises them so that they extend away from the base fabric, at the same time, loosening, softening, fluffing, and destroying the matted condition of the rovings. As will be seen, this operation on the rovings, such as the fluff dots, or other raised

design, takes place before the fabric passes over the applicator roll 1.

This form of roughing element 17 is adjustably mounted so that it may be adjusted with and in relation to the roller with which it cooperates.

It is to be understood that this roughing action may be accomplished by various means other than that illustrated. For instance, the rougher may include a device with a rotary motion in one direction or the other, or in both, or with a lateral motion combined with any or all of the above motions so that the figure can be roughed in any desired direction to create the desired shapes, such as, oblong, round, high, low, flat, etc.

Arranged in spaced relation to the mechanism that applies the finishing material is a dryer 20 which may be either of the conventional open, or contact, constructions, and includes a suitable housing which may be supplied with a heating medium, such as hot air, through a duct 21. It is a part of the method to regulate the temperature within this dryer.

The dryer includes a series of clamps 21 arranged to grip, automatically, each selvage of the fabric as illustrated in Figure 6. These clamps are moved in a direction away from the applicator roll 1 at a given and controllable speed by operating mechanism which is conventionally represented by sprockets 22 and chains 22'.

The function of this dryer is to dry the finishing material whether it be starch, dye, or some other finishing material, after the finishing material has penetrated the fabric to the desired and predetermined extent. This, of course, means a control of the rapidity of movement of the fabric to and through the dryer as well as a temperature control within the dryer or, in other words, a control of the time element intervening between the application of the finishing material and the drying of that material.

From the dryer, the fabric is drawn through a housing 23, that is located within the dryer 20, by means of the advancing mechanism 22'. Arranged within the housing 23, preferably, in a horizontal plane are a plurality of manifolds 25 which are provided with control valves 26 and are connected to a source of supply of fluid under pressure. From these manifolds, perforated pipes or nozzles 27 extend, also, preferably, in the same horizontal plane. The perforations in these pipes or nozzles 27 open downwardly over a platen 28 above which the fabric passes. It will be noted that the arrangement of these pipes or nozzles 27 is such that as the fluid under pressure is ejected from the openings or jets therein, the entire surface of the fabric will be subjected to a uniform treatment which will result in the complete fluffing of the rovings such as the fluff dots or other raised design.

I have found that steam or air under pressure are admirably adapted as a fluid for accomplishing the results that I have above pointed out.

When the fabric issues from the housing 23 it will have had the finishing material applied thereto so that the base fabric is completely treated by that material and the rovings such as the fluff dots or other raised design lack such treatment, either to the full extent, or to any desired extent, and will be in an unmatted, fluffy, condition, which is the condition that it is desired to attain.

Following now the movement of the fabric through the various mechanisms that I have described, after passing over the guide rollers, it

passes over the applicator roll 1, so that its reverse side, that is to say, the side opposite to that which carries the rovings engages with the surface of the applicator roll 1. The rotation of this roll caused by the driving of the roller 10 by the movement of the fabric, picks up the finishing material and applies it to the lower surface of the fabric. By convection, the finishing material penetrates the fibers of the fabric and moves toward the obverse side. It is to be here noted that the increasing of the speed of rotation or the decreasing of the speed of rotation of the applicator roll controls the amount of finishing material that is applied to the fabric, or otherwise stated, the faster the rotation of the applicator roll, the greater the application of the material, and conversely, the lesser the speed of rotation of the applicator roll, the less the application of the finishing material. It is also to be noted that the surface contact of the fabric with the roll 1 may be varied by raising or lowering the rollers 8 and 9, or if only one of these is used by raising and lowering that one. Thus the extent of contact and consequently the time of contact of the fabric with the surface of the roller may be varied, which varies the period of pressure between the applicator roll and the fabric, and consequently, the rapidity of penetration of the finishing material into the fabric.

As the fabric passes from the roller 1 to the dryer 20, the finishing material continues to penetrate and does so until it is dried within the dryer 20. Therefore, the period intervening between the application of the finishing material and the drying of that material controls the amount of penetration of the finishing material into the fabric. This degree of penetration may therefore be controlled by means of the advancing clamps 21, that is to say, they may be speeded up in their movement or slowed down in their movement to cause the quicker or slower entry and passage through of the fabric in the dryer. This, of course, makes it possible to nicely control the penetration of the finishing material. It may be possible to dry it within such a period after the application of the finishing material that the one side of the fabric will have the finishing material applied thereto, or this period may be varied so that the finishing material may be permitted to penetrate all of the fibers of the base fabric without penetrating the fluff dots, so that the result is a finished fabric with no finishing material applied to the raised designs. Then again, the period may be so nicely controlled that the finishing material may be permitted to penetrate partially into the raised design and to any degree desired, so that in the case of dye, for instance, the raised design may have two different hues. It is to be noted that after the rovings such as the fluff dots or other raised designs have been fluffed by the rougher, the entire operations are carried on without the rovings again having positive contact with any element or mechanism that would tend to crush or "unfluff" the rovings. Thus the integrity of the raised design, having once been established, is preserved.

The projection of fluid under pressure onto the obverse face of the fabric completes the fluffing of the raised design and results in an overall, uniform, effect.

It is of course to be understood that certain changes in the details of the method and apparatus used in carrying out the same may be made within the scope of the claims. For in-

stance, the applicator roll 18 may be dispensed with and a pressure spray form of applicator used instead, in which event the amount of finishing material applied to the fabric will be controlled by the adjustment of the spray.

It is here pointed out that certain phases of the invention are applicable to fabric that carries fluff dots, or raised designs that are formed of yarn as distinguished from rovings.

I claim:

1. The method of finishing a woven textile fabric that includes an unfinished, plain, relatively open mesh ground, spaced raised pattern or figure forming portions on the obverse side of said ground constituted by roving or yarn fibers having bight portions interengaged with threads of said ground and end portions lying substantially flat on the obverse side of said ground, to form a fabric having a finished ground, and unfinished, substantially upstanding and artificially fluffed, spaced, raised pattern or figure forming portions on the obverse side of said ground, including the steps of: applying a liquid finishing material to the reverse side only of said fabric ground; drying said finishing material before it substantially penetrates the said end portions of the fibers; and fluffing the pattern or figure forming portions by substantially separating the fiber ends and causing them to assume an upstanding attitude away from the fabric ground.

2. The method of finishing a woven textile fabric that includes an unfinished, plain, relatively open mesh ground, spaced raised pattern or figure forming portions on the obverse side of said ground constituted by roving or yarn fibers having bight portions interengaged with threads of said ground and end portions lying substantially flat on the obverse side of said ground, to form a fabric having a finished ground, and unfinished, substantially upstanding and artificially fluffed, spaced, raised pattern or figure forming portions on the obverse side of said ground, including the steps of: fluffing the pattern or figure forming portions by substantially separating the fiber ends and causing them to assume an upstanding attitude away from the fabric ground; moving the fabric in sheet form through a liquid applying and drying zone; applying a liquid finishing material to the reverse side of said fabric as said fabric enters said zone; at a time interval thereafter drying said fabric to produce the desired penetration of said finishing material into said fabric ground; and controlling the depth of penetration of said liquid finishing material into said raised portions by regulating the amount of liquid applied to a unit area of said fabric and the time interval between the application of the finishing material and the drying of said fabric with respect to each other, whereby said fabric is finished without substantially affecting the raised pattern forming or figure portions thereof.

3. A treated fabric including a base of warp and weft threads, raised spaced pattern or figure forming portions formed of rovings extending through and engaged with several threads of the base, the free ends of said rovings having an upstanding attitude away from the base, fluffed up and in substantial separation from each other, the base of the fabric and the portions of the rovings engaged therewith being starched and the fluffiness of the pattern or figure forming portions being substantially unaffected by the starch.

CLARENCE T. GRAHAM.