

May 3, 1938.

T. L. SHEPHERD

2,116,289

FABRIC, PAPER, LEATHER, OR THE LIKE

Filed March 29, 1935

2 Sheets-Sheet 1.

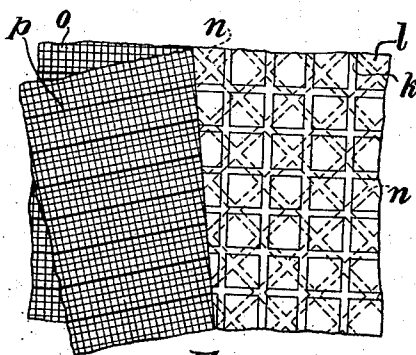
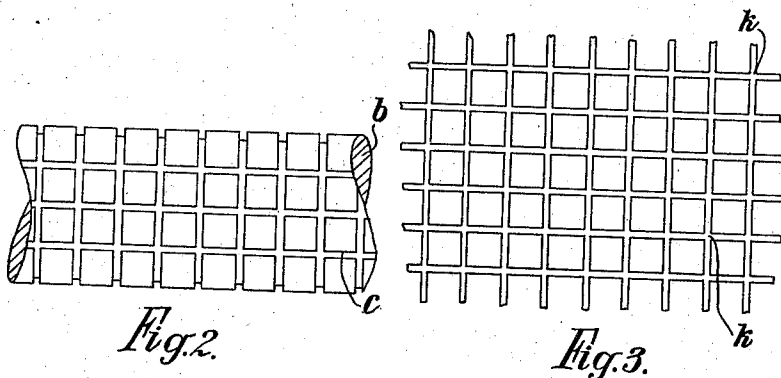
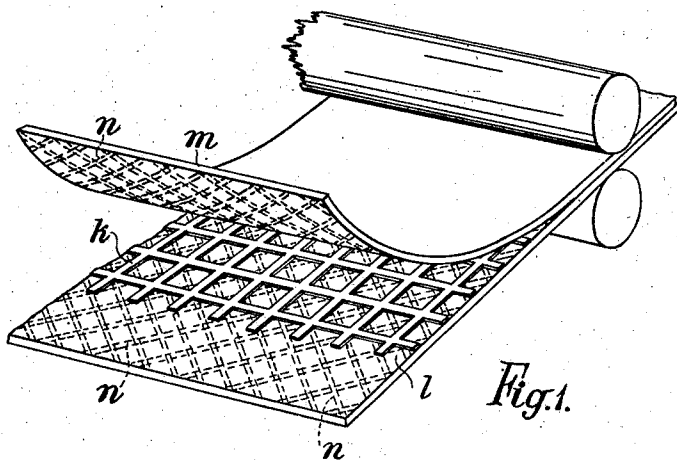


Fig. 10.

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2 Sheets-Sheet 2

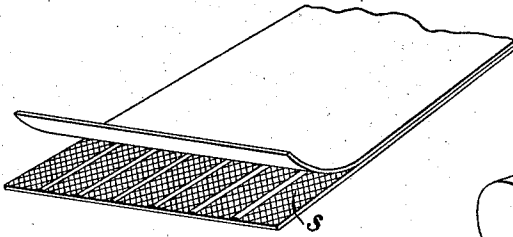


Fig. 4.

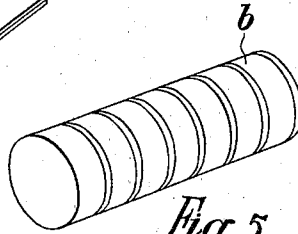


Fig. 5.

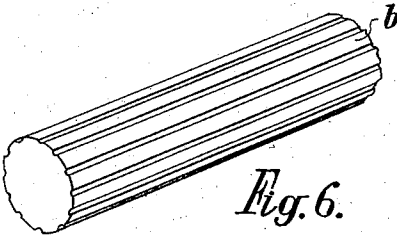


Fig. 6.

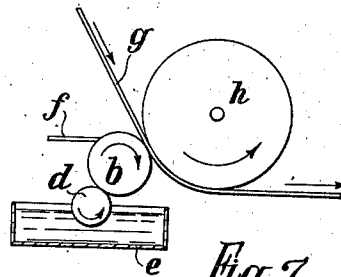


Fig. 7.

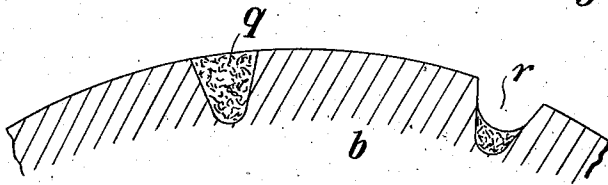


Fig. 8.

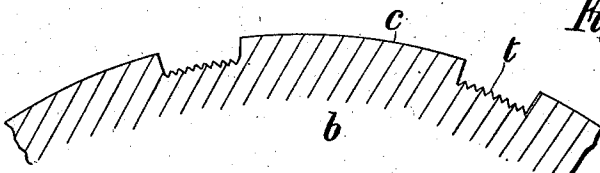


Fig. 9.

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UNITED STATES PATENT OFFICE

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FABRIC, PAPER, LEATHER, OR THE LIKE

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Application March 29, 1935, Serial No. 13,756

In Great Britain June 11, 1934

3 Claims. (Cl. 91-50)

This invention relates to fabrics, paper, leather or the like and the manufacture thereof, such fabrics being of the known type in which an extensible fabric has imprinted thereon a line or other open pattern of rubber, preferably an aqueous dispersion of latex. This pattern is then dried and vulcanized and it will be found, when the fabric is stretched in any direction, that it will always return to normal shape and size. The same result will be obtained when a multi-layer fabric is made. In that case after the open work pattern is imprinted on one layer of fabric, a second layer is pressed on to the still tacky pattern, thus forming a two layer fabric. A further modified form of multifabric may be formed by placing between two sheets of fabric each bearing an open work pattern, an intermediate solidified open work layer of coagulated material formed from an aqueous dispersion of latex, converted rubber or the like.

Whilst such fabrics are quite successful in practice, there is a tendency that when the open work pattern is being printed, the lines of the pattern may be blurred and uneven this being due partly to an excess of rubber solution being used and partly to the different absorbent qualities of the sheets of fabric.

The object of the invention to be hereinafter described is to overcome these disadvantages.

To this end the invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of a known form of multifabric, i. e. in which an open solidified network is arranged between two fabric layers each being imprinted on their adjacent faces with an open work pattern.

Figure 2 is a side elevation of an engraved printing roller used in preparing the multifabric in Figure 1.

Figure 3 is a plan view of a network forming a part of the fabric in Figure 1.

Figure 4 is a perspective view of an improved form of two-ply fabric made according to the invention;

Figures 5 and 6 are perspective views of two kinds of printing rollers that may be used;

Figure 7 is a diagrammatic view of an apparatus whereby the invention may be carried into effect;

Figure 8 is a transverse section of Figure 6 showing a portion of the roller drawn to an enlarged scale; and

Figure 9 is a view similar to Figure 8 but in

which the recesses in the roller are modified in shape.

Figure 10 is plan view of a modified form of fabric with one of the layers turned back.

In the manufacture of a fabric shown in Figure 1, and referring also to Figures 2 and 3, a network *k* as shown is prepared from coagulable material and for this purpose a suitable solution such as an aqueous dispersion of latex, converted rubber or the like is fed to an engraved printing roller *b* shown in Figure 2. The roller *b* is formed with a series of cross grooves or recesses *c* extending both longitudinally and circumferentially, helically or otherwise so as to form a network. With a printing roller *b* arranged as shown in Figure 7, it is fed by means of a transfer roller *d* which dips into a bath *e* containing the latex. After the roller *b* has picked up the solution a doctor blade *f* wipes over the surface of the printing roller *b* and leaves the solution in the grooves *c*. A moving blanket *g* passes round the roller *h*, and the printing roller rotates in contact with the moving blanket and prints thereon the network lines of solution contained in the grooves. The blanket passes on and means are provided whereby the printed network *k* (Figure 3) is subsequently dried and vulcanized in any usual way. After this the finished network is separated from the blanket and it is now inserted as shown in Figure 1 between two layers of extensible fabric *l*, *m*, for instance stockinette which have each been previously treated by a printing process by a printing roller similar to *b*, Figure 2, but in which the grooves are obliquely arranged, by which a pattern *n* as shown by the dotted diagonal crossing lines, of adhesive solution is applied to the adjacent surfaces of the two layers *l*, *m* of stockinette. A sort of sandwich construction is thus obtained comprising two layers of stockinette for example and the interposed solid network *k*. The whole is then subjected to pressure by means of rollers, a press or the like so as to cause the three layers to adhere to each other very intimately and tightly by means of the adhesive solution pattern *n*. The resultant fabric is then suitably dried and/or cured or vulcanized with the result that a strong composite fabric is obtained which, after being extended or stretched, will always contract back to normal size.

It has been found in practice, with such a known fabric, that in regard to the printing process described both for the solidified network *k* as well as adhesive solution pattern *n* Fig. 1 that in order to prevent air bubbles being formed and

to obtain a smooth and uniform line, regard must be had to the viscosity of the aqueous dispersion of latex or similar solution as well as the dimensions of the grooves or recesses *c* of the engraved printing roller *b*. For this purpose the latex or rubber solution which is used is much more liquid in character than is usual with solutions of this kind, i. e., it possesses a fluidity approaching that of milk and the following is a typical example of a suitable mix which will yield good results:—

Parts by weight	
Latex	130
Sulphur	2.25
Zinc oxide	3.0
Accelerator	0.75
Anti-oxidant	0.5
Casein solution 10%	5.0

Such a fluid possesses an advantage over the comparatively thick paste or cream that is often used, because it will not result in the presence of air bubbles during the printing operation owing to its low viscosity value and again the lines or patterns printed on the fabric will be uniform and possess sharply defined edges.

To obtain such an improved printing result, a machine may be used similar to that already described and shown in Figure 7 in which *g* represents a travelling blanket or a length of fabric to be printed.

In the enlarged sectional view in Figure 8, two grooves are shown in the surface of the printing roller *b*, such grooves being noted by *q* and *r* respectively.

It is to be noted that the grooves are shown as V shape, the depth of which is substantially equal to the width at the mouth so that when the printing roller *b* is in contact with the sheet of material *g*, capillary attraction will have an influence so as to regulate the amount of solution which will be taken out of the grooves during the printing contact. Whilst any suitable dimensions of depth and width may be used, it has been found in practice that a groove having a depth and width both 1/25th of an inch has given good results. The groove *q* shown in Figure 8 is intended to illustrate it being full of solution before the printing operation whilst the groove *r* shows the condition of the same groove after printing has occurred and it will be noticed that in the latter groove *r* about one third of the quantity or charge of solution is left remaining in the groove after the printing operation; that is to say, by the printing contact only a predetermined quantity of solution is transmitted to the fabric whereby only just enough will be supplied for the purpose and there will be no excess which would result in the lines printed upon the fabric being somewhat uneven and non-uniform.

By therefore carefully determining the size of the grooves beforehand in relation to the degree of viscosity of the solution, the exact amount of mixture is transferred to the fabric during the printing operation and no more. Thus, there will be no excess transferred and in order to still further control the printing operation it is preferred to soak the fabric before the printing with a very weak acid solution to prevent the rubber print from too much penetration and to cause it to lie upon the surface rather than soak into it. A suitable solution for this purpose may be one half to two per cent. of acetic acid and the cloth or fabric so soaked is semi-dried and then printed. In the two-ply fabric illustrated in Figure 4

such acid solution is indicated by the hatched lines *s*.

In Figure 9 is shown a modified form of groove in the printing cylinder and in this case the grooves are somewhat rectangular in shape and have a width about three times greater than the depth of 1/25th of an inch. In this case the bottom of the groove is serrated as shown at *t*, whereby the same feature of retaining a part of the solution in the groove will be maintained as the serrations will form extended surface contact by which capillary attraction is increased to keep back the desired amount of solution. Such serrations are useful in the case illustrated where the grooves are substantially rectangular in shape. It is to be noted however that the above dimensions are given by way of example only.

Although in Figures 5 and 6 two examples are shown of printing rollers, one in which the grooves are circumferential and the other in Figure 6 where the grooves are longitudinal, it is to be understood that any other shape of groove or arrangement or design may be used, the cross section of the grooves shown in such rollers being of the character shown in Figure 8 or 9 or such other section as will produce the result desired of keeping back a certain part of the solution.

It is also to be understood that for printing the solidified network *k* grooves will be used of a capacity relatively greater than those employed to print the adhesive line pattern *n*.

From the foregoing it will be understood that an extensible fabric of the kind referred to may be obtained by the means described and illustrated, such fabric being permeable both to moisture and air so that adequate ventilation is ensured. Such a fabric may be also improved by replacing the solidified network *k* by a flexible and elastic or non-elastic fabric consisting of a woven, knitted, braided or lace network of rubber or contractile threads and with or without ordinary textile threads such as cotton, silk, artificial silk or linen combined therewith, such textile threads being suitably treated (as by twisting) to allow for the stretching movements.

A compound fabric of this kind (see Figure 10) may be easily made by applying upon an extensible or non-extensible fabric *l* a layer formed of solidified network *k*. Upon this network there is laid a textile fabric *o* already interwoven with elastic threads *p*, the adjacent surfaces of the layers having applied thereon a pattern *n* of adhesive solution.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In apparatus for use in manufacturing elastic fabric, a reservoir for liquid coagulable material, a feed roll partly immersed therein, a printing roll contacting said feed roll, a pressure roll mounted adjacent said printing roll in such a manner as to permit a fabric sheet to pass therebetween, said printing roll having grooves in the periphery thereof, said grooves being substantially V-shaped and the depth of each being substantially equal to the width thereof at the mouth whereby said grooves hold approximately one-third of the liquid material therein by capillary attraction when the exposed surface of the liquid within the grooves engages the fabric sheet.

2. Apparatus as claimed in claim 1 wherein the depth of the grooves and the width thereof at the mouth are approximately 1/25th of an inch.

3. In apparatus for use in manufacturing elastic fabric, a reservoir for liquid coagulable ma-

terial, a feed roll partly immersed therein, a printing roll contacting said feed roll, a pressure roll rotatably mounted adjacent said printing roll so as to permit a fabric sheet to pass therebetween, said printing roll having grooves in the peripheral surface thereof, said grooves having

rounded conical cross-sections whereby the grooves hold a portion of a liquid material by capillary attraction within the grooves when the exposed surface of the liquid is contacted by the fabric sheet.

THOMAS LEWIS SHEPHERD.