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METHOD OF COMPLETELY IMPREGNATING TEXTILE FABRIC WITH FILLING MATERIAL.

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1,281,728. Patented Oct. 15, 1918.

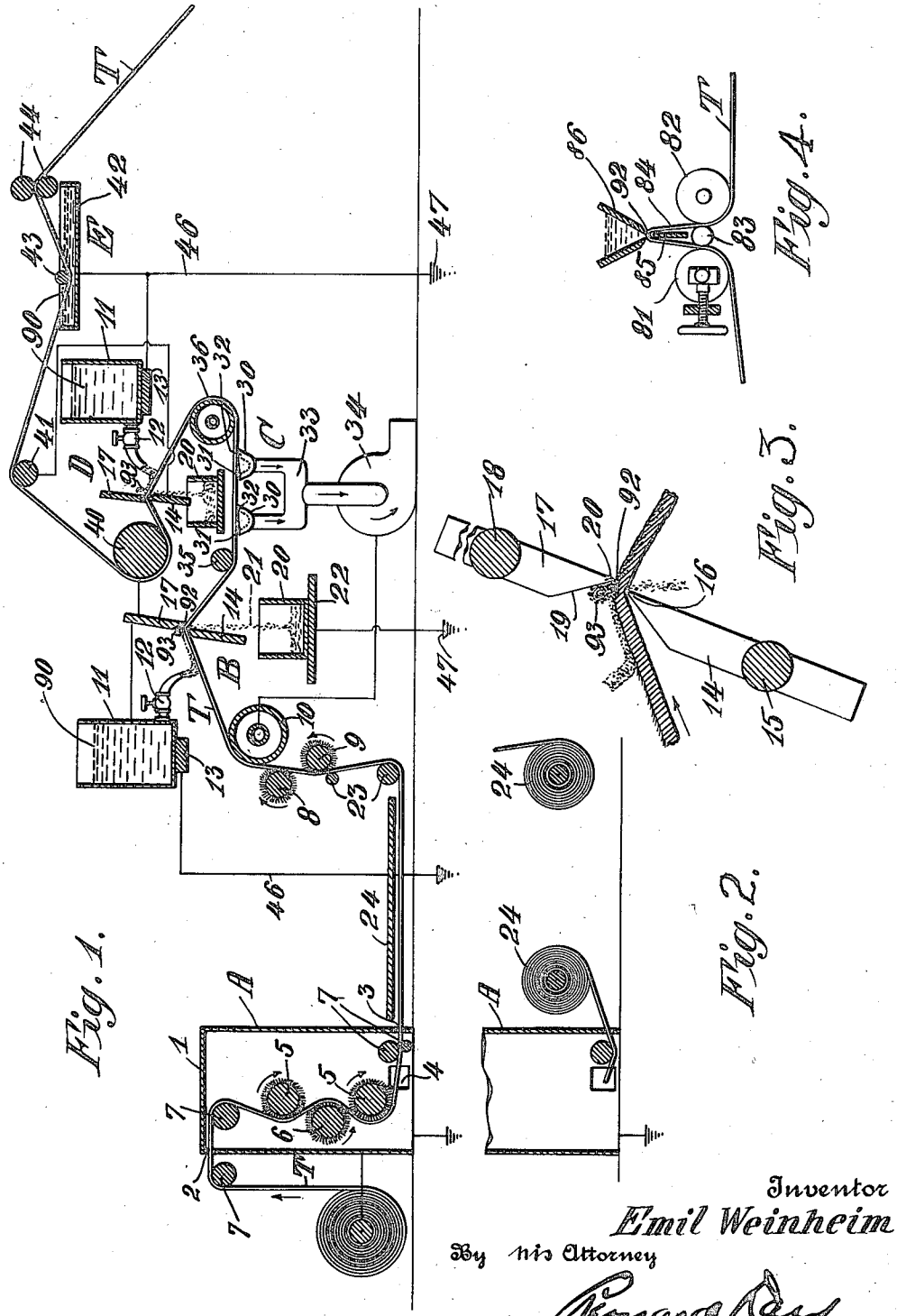


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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METHOD OF COMPLETELY IMPREGNATING TEXTILE FABRIC WITH FILLING MATERIAL.

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To all whom it may concern:

Be it known that I, EMIL WEINHEIM, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Methods of Completely Impregnating Textile Fabric with Filling Material, set forth in the following specification.

This invention relates to the converting of a textile fabric into substitute leather and, more generally, to the impregnation of textile fabrics with filling materials of a character intended to improve the fabric for special use.

A particular object of the invention is to improve the method of effecting the impregnation of the fabric. A distinguishing characteristic of my improved method and an objective feature thereof is the combining of steps to effect a deep impregnation of the textile fabric in a manner suitable for commercial manufacture, in contradistinction to small-scale, experimental production.

Heretofore fabrics have been surface-coated and partially impregnated with various materials and more or less claim has been made by others that they have impregnated textile fabrics throughout their entire thickness with filling materials in solution in a volatile solvent. For example, I am aware of the attempts to impregnate fabrics, as evidenced by the following patents:

Louis Gebaert Naert, 719,787,
Albert H. Henderson, 1,020,499, 601,325,
Bayne *et al.*, 885,219.
Wilson A. Strickler, 1,048,912.

For the most part, manufacturers have, up to the present time, been able, by a commercial process, to apply only a surface coating to a textile fabric which would peel off from the body of the fabric with all too great a degree of readiness.

One objective part of my invention to accomplish the ready impregnation on a commercial scale of a textile fabric is the kinking of or the forming of an angular bend in the fabric by drawing it over the edge of a blade, so that the opposite side of the fabric is stretched and so that the threads, especially the filler threads, are separated; and the application of a suitable dope at the edge of the angular bend so that, under the action of a suitable force as, for example, gravity, the dope readily penetrates the body of the fabric rather than forming a mere surface coating.

Another objective step in my process is the employment of a suction device, operating continuously upon the moving fabric against the face opposite that to which the dope has been applied, so as to force the dope more deeply or, in fact, very nearly through the fabric by atmospheric pressure. Another part of my process is the application of a dope formed of a solution, in a volatile solvent, of suitable filling material and the application of the same to a heated moving textile fabric in the open air.

Another part of my process is the preparation of the textile fabric for the reception of the dope by subjecting the same to suitable manipulation to remove all sizing from it by a dry manipulation and to fluff up the surface fibers and card them so that they will lie horizontally along the face of the fabric.

I desire it to be understood that many of the aforementioned objective parts of my process I understand to be individually new, although they are all subject to combination one, two or more with another to produce co-operating progressive results tending toward perfection in the finished product.

The above and further objects of my invention will better be understood by reference to the accompanying claims and to the illustrative embodiments of my invention, which are described in the following specification in connection with the accompanying drawings which form a part hereof.

In the drawings Figure 1 is a diagrammatic representation of apparatus for practising the process, the apparatus for the most part being shown in longitudinal section; Fig. 2 is a similar diagrammatic representation showing a modification; Fig. 3 is an enlarged longitudinal section, parts being shown in elevation, of apparatus for effecting the angular bend in the fabric; and Fig. 4 is a diagrammatic longitudinal section, parts being shown in elevation, of a modified apparatus for effecting an angular bend.

Apparatus.

A is a brushing machine comprising a suitable inclosure 1, having an entrance slot 2 and an exit slot 3 for the fabric. The inclosure 1 is provided with an exhaust duct 4 operated by any well-known exhaust

means for removing undesired material such as lint and dust from the inclosure 1. Suitably arranged brushes 5 and 6 are suitably power driven in the direction of the arrows, opposite to the direction of travel of the strip of textile fabric T. It is to be understood that the mechanism A may comprise the necessary and convenient idlers and guiding devices such as those indicated by 7. B is a dope-applying mechanism in which 8 and 9 are brushing rolls or carding rolls, suitably power driven in an opposite direction to the travel of the fabric T. 10 is a steam-heated roll preferably heated to the neighborhood of 220° and preferably located under the strip of fabric T, so that the heating effect of the roll may be increased by the upward convection of the heat. A replenishable dope-containing vessel 11, with a controllable spout 12, is preferably located above the heating roll 10 upon any suitable support such as the beam 13. 14 is a plate of a length at right-angles to the drawing, slightly greater than the width of the strip of fabric T, which may be mounted upon trunnions 15 to have both a vertical, longitudinal and rotary adjustment. The fabric-engaging edge 16 of the plate 14 is preferably moderately sharp and similar to a chisel in shape. 17 is a doctor bar or plate which may be the usual doctor bar known in the art for spreading dope on the surface of a fabric. Its transverse extent should be slightly greater than the width of the strip of fabric T. It is preferable that the same be mounted upon trunnions 18, so that the bar may have a vertical, rotary and longitudinal adjustment. It is preferred that the dope-engaging edge 19 of the doctor 17 be beveled or chisel-shaped, as indicated, and that it be located with its extreme edge 20 in Fig. 3 slightly beyond and above the engaging edge of the kinking bar 14. 20 in Fig. 1 indicates a suitable receptacle or receptacles for catching the excess 21 of dope and may be suitably supported as upon a ledge 22. Suitable idle rolls are indicated by 23, and 24 is a platform for protecting the strip T.

As a modification, the fabric T, after leaving the brushing mechanism A, may be formed into a reel 24, which may be transported to take the place of one of the idlers 23, whereby the brushing mechanism A may be separated at a distance from the remainder of the apparatus and the platform 24 eliminated.

C is a suction apparatus comprising one or more nozzles 30, the front lips 31 of which are slightly lower than the rear lips 32. These nozzles are exhausted by a suitable system of ducts 33, operated by an exhaust blower 34. The guiding roll 35 and the heating drum 36 serve the purpose of guiding the fabric coöperatively across the nozzles 30, although it should be understood that for this purpose the heated drum 36 is not necessarily heated but forms the double function of a guide and heating means for the fabric before entering the mechanism D. The mechanism D is substantially similar to the dope-applying mechanism B and comprises the kinking plate 14 and the doctor bar 17 and the dope-container 11, but, in addition, differently positioned guiding rolls 40 and 41, as indicated.

A dope-saturating device is indicated by E and comprises a suitable vat 42, an immersion roller 43, and squeegee rolls 44.

A modification of the dope-applying mechanism is shown in Fig. 4, in which two suitably mounted rollers 81 and 82 are arranged to be pinched against the suitably pivoted intermediate roller 83, so that a bite of fabric 84 on opposite sides of the guide-strip 85 may be progressively passed in and out and directly under the open mouth of a dope-containing trough 86. Every part of the apparatus especially all of the pieces of mechanism likely to generate static electricity, is suitably connected by suitable connections indicated by 46 to ground 47. In this manner danger from static sparks through all the mechanism is eliminated.

Operation.

Any suitable commercial fabric, preferably of a strong character and usually such as cotton drill, and provided in the form of rolls of five-hundred yards, more or less in length, is the stock preferable for the employment of this process. Such a textile fabric is extremely tough and durable, but offers considerable resistance to the penetration of a texture converting dope. It has been found that many of the irregularities in the finished product, such as substitute leather made from a base of textile fabric of this character, may be attributed to the sizing inherent in the commercial fabric or to the glazed surface not wholly attributable to sizing on the threads throughout the fabric and especially on the exposed threads. To remove these defects and the better to prepare such a textile fabric for the reception of suitable dope, I first subject the fabric to a carding, brushing and bending action between and about the idlers and brushes in suitable brushing and carding apparatus such as that indicated by A. If desired, I may operate this step of my process as a separate step drawing the fabric through by means of a separate apron and reeling it up for storage preparatory to the finishing process in reels 24 or, as indicated in Fig. 1, this brushing stage may be the first step in my process, in which case the apron should be threaded about and through the mechanism A to the commencing end of the strip of textile fabric T. After passing from the brush-

ing mechanism A the fabric is carried across a suitable number of brushing rolls 89, located preferably as nearly as practicable to the locality for the application of the dope 90. These rolls insure that the fluff of surface fibers which have been brought out by the brushing mechanism A all lie uniformly in a direction away from the movement of the strip of fabric and they also insure the removal of any dust or foreign particles which might have adhered to the strip.

A dope suitable for the practice of my process may comprise a solution of a soluble cellulose derivative, partly oxidized oils, gum, rubber and so forth, one or any combination of the same in any suitable volatile solvent, examples of which are alcohols, derivatives from the distillation of coal-tar, wood oils and the like. Pigments and coloring matter may be added to such a solution, as desired, and without interfering with the process. The solution may, to some extent, be formed into an emulsion with substances in a pulverized state which do not actually form a solution. The chief characteristic of the preferred form of dope to be employed is that it be thinned with a volatile solvent. It is also preferred that the normally semi-solid portion of the dope be subjected to heat to effect the completion of the dissolving action in the volatile solvent. The entire process is practised in well ventilated rooms but no attempt is made to provide hoods for the reclaiming or confining of the volatilized solvent as it escapes from the fabric out of the applied dope. The grounding of all parts of the apparatus employed in the process is important, to the end that all static electricity is removed to the earth without the danger of the creation of sparks.

After being thoroughly brushed, the fabric passes over the heated roll 10, which serves the double purpose of heating the fabric, which tends to render the dope 90 more fluid as it spreads across the surface of the fabric, and, in addition thereto, changing into steam or vapor the small amount of moisture which every textile fabric inherently contains, probably in a condition similar to what is known as water of crystallization. The arrangement of the heating roll 10 and the degree of heat is preferably such as to remove as much as possible of the moisture inherent in the textile fabric. Thus, when the textile fabric reaches the locality for the application of the dope, its section is filled with the remainder of the slightly superheated steam. Upon reaching the kinking mechanism and doctor bar, there is a tendency for a cooling effect below the critical temperature for steam and a condensation which creates locally a vacuum within the body of the fabric itself, tending to draw in the applied dope. It is to be understood, however, that the process, for its satisfactory practice, does not depend upon this drawing in of the dope by the condensation of inherent moisture first turned into steam, but it is believed that such a step in the process is advantageous. The first most important step in the process is the formation of an angular bend 92, extending transversely across the entire width of the progressing strip of fabric. This is accomplished by causing the strip of fabric to be bent over a sharp blade 14, at the edge 16 of which the angular bend is created. It is preferred to arrange the doctor blade 17 so that the reverse roll 93 of dope which is being scraped off by the doctor blade will be wedged into the bent and separated portion of the fabric at the convexity of the angular bend 92. Fig. 3 illustrates this action. The surplus dope flows over and down across the two lateral edges of the fabric strip. Another advantage of applying the dope to the convexity of the angular bend 92 is that, when the strip regains a horizontal direction, the dope, which has penetrated deeply into the fabric, is compressed by the straightening of the fabric itself, so as to completely saturate all of the fibers and threads in the fabric. It has been found that the penetration caused in this manner is very deep into the fabric, in contradistinction to a surface-coating, as results from the practice of old processes. After passing through the first stage of dope-application, it is preferred that the fabric pass over suction nozzles 30, which, while the dope is still hot, tend to draw the dope further through the fabric toward the side opposite that to which dope was initially applied. The fabric is then preferably reheated by suitable means, such as the steam heated roll 36 and its direction of movement is reversed so as to bring what was first the under-side uppermost, as indicated in Fig. 1, and to this now uppermost side is applied an additional layer of dope in the same manner as was applied the first layer, the same forming of an angular bend and wedging action taking place. The fabric is then drawn back into its original direction of movement and passed through a saturating vat 42, containing a charge of the same dope or, if desired, dope containing a little more of the volatile solvent so as to make its consistency less viscous. The excess of dope applied in the saturating vat 42 may be removed by suitable squeegee rolls common in the art.

The completion of the thus deeply impregnated fabric may be accomplished in any suitable manner, which should include a curing process.

I am aware of the fact that many of the steps in the complete process which I have described are individually novel and effective, although I regard all of the steps,

practised in the sequence described, to be preferable for the production of the best product. I also understand that the mechanism for practising my process is not necessarily that indicated diagrammatically, and that many changes may be made therein. For example, the formation of the progressive angular bend 92 in the fabric T is not necessarily the blade 14, but may be in the form of pinching rolls 81 and 82, as shown in Fig. 4. I am also aware that the drawing of the fabric over the terminal edge of a table would be, in effect, the same as drawing the fabric over the edge of an angular bending blade. It is my understanding that the edge of such a table would, in effect, be the edge of such a blade, as contemplated by my invention.

What I claim and what I desire to secure by United States Letters Patent is:

1. The method of deeply impregnating a textile fabric with a texture converting filling comprising, locally forming an angular bend in the textile fabric to stretch and open the fabric threads from one side to a considerable depth inwardly; and applying a dope comprising material dissolved in a volatile-solvent at the edge of said angular bend on the opened side of the said fabric and subjecting said dope to a force tending to cause it to enter the said fabric.

2. The method of deeply impregnating a textile fabric with a texture converting filling comprising, heating said fabric; locally forming an angular bend in the textile fabric to stretch and open the fabric threads from one side to a considerable depth inwardly; and applying a dope comprising material dissolved in a volatile-solvent at the opened side of said angular bend and subjecting said dope to a force tending to cause it to enter the said fabric.

3. The method of deeply impregnating a textile fabric with a dope comprising, forming a progressive angular bend in a strip of moving fabric to open the mesh of said fabric on the convexity of said angular bend; and applying a dope continuously to the convexity of said angular bend on one side of said strip.

4. The method of deeply impregnating a textile fabric with a dope, comprising forming a progressive angular bend in a strip of moving fabric to open the mesh of said fabric on the convexity of said angular bend; applying a dope continuously to the convexity of said angular bend on one side of said strip; forming a second progressive angular bend in said strip with the convexity of said angular bend on the opposite side of said strip; and applying dope to the convexity of said second angular bend.

5. The method of deeply impregnating a textile fabric with a dope comprising, forming a progressive angular bend in a strip of moving fabric to open the mesh of said fabric on the convexity of said angular bend; and wedging said dope into said strip at the convexity of said angular bend.

In witness whereof I have signed my name to this specification, this 10th day of November, 1916.

EMIL WEINHEIM.