

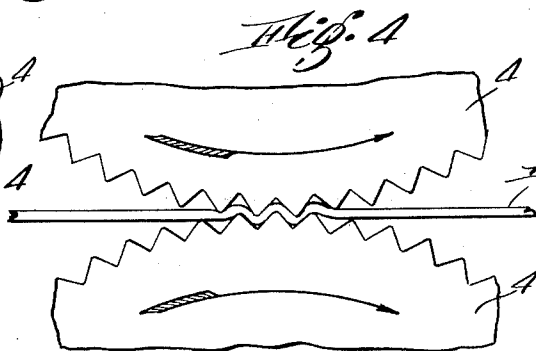
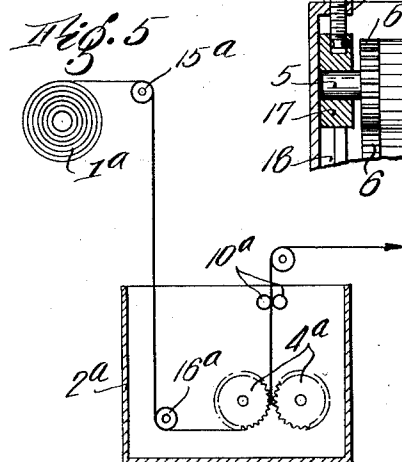
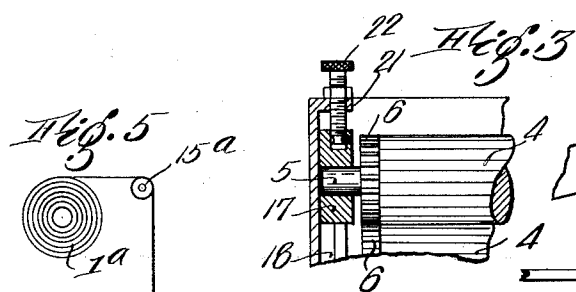
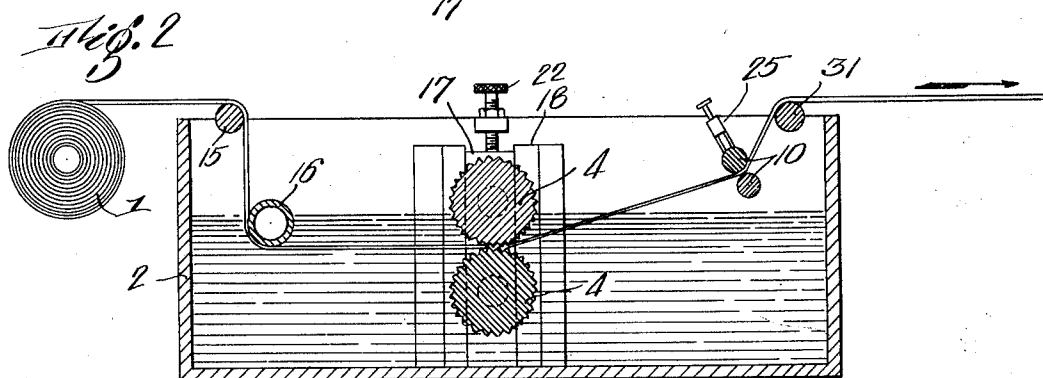
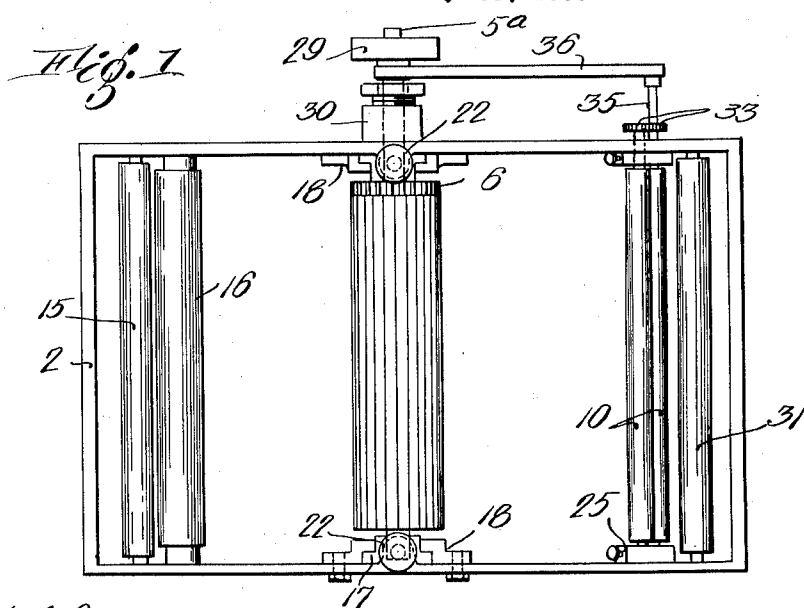
April 3, 1934.

H. M. EATON

1,953,799

FABRIC IMPREGNATING PROCESS AND APPARATUS

Filed May 31, 1930



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UNITED STATES PATENT OFFICE

1,953,799

FABRIC IMPREGNATING PROCESS AND APPARATUS

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Application May 31, 1930, Serial No. 457,913

3 Claims. (Cl. 91—68)

This invention relates to a method and corresponding apparatus for impregnating sheet material, and more particularly involves the employment of a relatively heavy or viscous impregnating compound, which is desirable in many instances, generally permitting, for example, economies in the use of solvent. In a more specific aspect the present invention relates to the employment of a viscous cellulosic compound to provide stiffened or reinforced fabric which is suitable for making shoe stiffeners, e. g. counters, box toes and the like, although the invention is broadly applicable to the employment of other viscous compounds such as rubber compositions.

Heretofore in the impregnation of suitable fabric for the manufacture of stiffeners for shoes, such as box toes or counters, the flannel, felt or the like has been passed through a bath of cellulosic solution which was in the form of a liquid that was relatively thin in order to permit the solution to penetrate the fabric. This has required the employment of a relatively large amount of solvent and has involved the loss of considerable solvent. Furthermore, the resulting impregnated material was commonly characterized by a glazed surface or cellulosic deposit upon one or both sides of the sheet material, while the interior of the fabric was but lightly impregnated. Apparently this was caused by the relatively large amount of solvent passing to the surface of the material during drying which carried a substantial quantity of the cellulosic material to the surface. Accordingly material impregnated in the manner heretofore employed has not been uniformly impregnated with the cellulosic material but has had relatively smooth or heavy surface coatings or shells which made the material difficult to skive and to soften for use in shoes for either box toes or for counters.

The present invention affords a method of impregnating fabric, either woven or felted, with a cellulosic or other solution which may be relatively viscous and which in fact preferably may be in the form of an unctuous or plastic mass having, for example, substantially the consistency of ordinary petroleum jelly. Accordingly the amount of solvent which need be used with this process is much lower than that heretofore employed, and the quantity of solvent which is lost, either through direct drying or drying in suitable reclamation apparatus, is much lower than that heretofore necessary with the drying of a comparable quantity of impregnated fabric under similar conditions. Furthermore, this process permits the effective and uniform impregnation of the fabric

throughout its thickness, and avoids the formation of a heavy coating upon the fabric surface. Thus the shoe stiffeners which are formed of this type of impregnated fabric may be more heavily and yet uniformly impregnated, and may be more readily skived and softened for use than the stiffeners formed by the fabric impregnated in a liquid bath.

To permit these desirable results the fabric is preferably passed through a mass of relatively viscous, preferably pasty or plastic cellulosic material, for example the amount of solid material mixed with a given quantity of solvent may be as much as 50% greater than was possible with the impregnating methods heretofore employed. In order to cause the penetration of the porous sheet material by the cellulosic paste or compound, I employ means to force the same into the pores of the fabric, preferably, for example, fluted or tooth rollers between which the fabric passes. These rollers are positively driven at equal peripheral speeds and are so spaced that the registering protuberant and recessed portions thereof are at a distance apart less than the normal thickness of the fabric so that the same is firmly compressed and the viscous solution or paste is forced into its pores, while undesirably tight gripping or pinching of the fabric which would break down its structure is avoided. From the fluted rollers the fabric may pass to any suitable means for removing an excess of the compound, for example, passing between a pair of closely spaced rollers, which may be rotated at a speed somewhat higher than that of the fabric movement. The sheet material then passes to a suitable drying chamber.

In the accompanying drawing:

Fig. 1 is a top view of the improved apparatus for impregnating sheet material;

Fig. 2 is a cross section through the same, showing related parts;

Fig. 3 is a sectional detail of the adjustable roll mounting;

Fig. 4 is an enlarged detail view of a portion of the fluted rollers showing the same with a sheet passing therebetween; and

Fig. 5 is a diagrammatic view of an optional arrangement of the apparatus.

In accordance with the present invention, a suitable porous fabric such as flannel or felt may be drawn from a roll 1, thence passing into a vat 2 which may contain a cellulosic mass, comprising, for example, a compound of cellulose ester or cellulose ether with alcohol and/or acetone, or any other suitable solvent or solvents. If de-

sired other material may be included in the compound or pasty mass for example, finely ground or discrete substances such as powdered plaster of Paris or asbestos. In any case, the mass contained in the vat is preferably relatively poor in solvent so that it is substantially plastic or unctuous. From the roll 1, the fabric may pass over and under idler rolls 15 and 16, respectively, and thence pass between a pair of fluted rollers 4. These rollers are mounted on parallel axial supports 5 and are provided with meshed gears 6. It is evident that the rollers 4 and the gears 6, respectively, may be of equal size and have equal numbers of teeth so that the rolls rotate at the same peripheral speed.

Preferably the rollers 4 are so shaped and disposed that their teeth or fluted portions are disposed in closely spaced relation to each other, but remain out of contact, the spacing of these elements being less than the normal thickness of the fabric which passes therebetween so that the viscous material is firmly pressed into the fabric. Furthermore the rollers rotating in this manner have a pumping or impeller action which tends to draw the compound to the bite of the rolls and thus to the region where it is forced into the pores of the fabric; in fact, the teeth cooperate with the fabric in providing a plurality of pockets in which the compound is trapped; the capacity of these pockets decreases as they approach the bite of the rolls and the compound accordingly thoroughly penetrates the fabric. The flexing and stretching of the fabric between the teeth of the rollers tends to open the pores of the fabric and also aids in the impregnation of the fabric even with the relatively viscous compound.

In order to permit the accurate and proper spacing of the rollers in relation to each other and to suit the exact type and thickness of fabric to be treated, the upper roller has its axial extensions mounted in bearing blocks 17 that slide in vertical guideways 18 at the sides of vat 2. As shown in Fig. 3, an adjusting screw 22 depending from lug 21 upon the wall of the casing rotatably engages each bearing block 17 to permit accurate adjustment of the height of the upper roller and accordingly its spacing from the lower roller. An axial extension 5^a of the lower roller 4 provides a drive shaft carrying a pulley 29 which may be driven in any suitable manner, while a suitable stuffing box 30 is arranged to prevent leakage about the shaft 5^a.

From the rolls 4, the fabric may pass upwardly to the bite of a pair of driven rolls 10 which are effective in aiding the movement of the fabric, and which are so spaced that any excess of the material which has coated the surface of the fabric may be removed so that the same is substantially uniformly impregnated as it passes over the roller 31 to the drying chamber or racks. The upper roller 10 may be adjustably mounted and supported in relation to the lower roller 25 by an arrangement similar to that fully described in conjunction with the fluted rolls 4. The lower roll 10 is provided with a shaft 35 carrying a pulley that is driven by a belt 36 extending from a pulley on the shaft 5^a. The axial extensions of rollers 10 are provided with similar meshed gears 33, whereby these rollers rotate at the same peripheral speeds. The belt 36 and associated pulleys are so arranged in relation to the diameters of the rolls 10 and 4 and the corresponding gears that the rolls 10 may rotate at a speed

slightly higher than the speed of the fabric passing between the rollers 4.

In the drying chamber loops of the fabric may be exposed to drying air and the excess solvent removed. However, when a relatively viscous solution is employed, as is possible with the present invention, the amount of solvent which must be removed is relatively low. The resulting sheet material is uniformly impregnated throughout its thickness and is free of the objectionable glaze that characterizes fabrics impregnated in a liquid bath. Despite the absence of this glaze or surface coating, the amount of compound with which each square yard of fabric is impregnated may be greater than heretofore. Although the fabric is thus heavily impregnated, the resulting shoe stiffeners, whether employed for counters or box toes, may be more readily skived and softened than the former lightly impregnated stiffeners with their glazed surfaces.

While the invention has been described with particular reference to a cellulosic compound, the principles of this invention may be employed with a wide variety of viscous unctuous impregnating compounds in which particles may be suspended or in solution and is not limited to the employment of any particular solid or soluble ingredients or solvent.

Fig. 5 shows an optional arrangement of the apparatus, the fabric passing from a roll 1^a over an idler 15^a and under an idler 16^a located in the vat 2^a and there being immersed in the solution. From the idler 16^a the fabric extends into engagement with the lower surface of one of a pair of fluted rolls 4^a which may be disposed with their axes substantially in a horizontal plane, thence passing upwardly between the rolls and between a pair of cleaner rolls 10^a to an idler 31^a. The rolls 4^a in this form of the invention may be arranged in the same general manner as has been described to grip but not excessively to squeeze the fabric passing therebetween.

From the foregoing, it is evident that I have provided a method and means permitting the effective impregnation of fabric with a relatively viscous cellulosic or other compound, and that the material as thus treated may be thoroughly and uniformly impregnated and free from an excess of material at its surface, thus affording a superior product, while the process is more economical due to the small amount of solvent required.

I claim:

1. Method of thoroughly impregnating an elongate sheet with a compound having a viscosity so high that substantial impregnation of the sheet will not occur by mere surface contact which involves the employment of a pair of fluted rollers in a vat with the protuberant and recessed portions of said rollers in mutually registering juxtaposition, said method comprising the immersion of the registering portions of said rollers in a bath of the compound and the passing of the sheet between said portions of the rollers while rotating the latter at the same peripheral speed, thereby affording pockets between successive flutes and the sheet as the flutes approach the region of registration, and thus causing the pockets to contract to force the compound into the sheet as the same is being flexed between the fluted portions of the rollers.

2. Method of thoroughly impregnating a continuous elongate sheet with a compound having a viscosity so high that substantial impregnation does not occur by surface contact, comprising

progressively passing the sheet through a region of impregnation within a body of the compound, forming pockets filled with the compound upon each side of the sheet, while initially pressing inwardly upon opposite faces of alternate transversely extending areas of the sheet to afford closely successive transverse undulations in the sheet as it passes to said region, continuing and increasing the application of pressure upon opposite sides of the sheet to accentuate the undulations while contracting the volume of the successive pocketed bodies of the compound to force the compound into the sheet from both faces thereof, and thereafter drawing the sheet taut to remove the undulations.

3. Method of thoroughly impregnating a sheet with a compound having a viscosity so high that substantial impregnation does not occur by surface contact, comprising progressively passing the sheet through a region of impregnation within a body of the compound, forming pockets filled with the compound upon each side of the sheet, while initially pressing inwardly upon opposite faces of alternate transversely extending areas of the sheet to afford closely successive transverse undulations in the sheet as it passes to said region, continuing and increasing the application of pressure upon opposite sides of the sheet to accentuate the undulations while contracting the volume of each successive pocketed body of the compound to a minor fraction of its original volume and thus squeezing and forcing the compound into the sheet from both faces thereof, and thereafter drawing the sheet taut to remove the undulations.

HORACE M. EATON.

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75	150