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METHODS OF SHOE END STIFFENING EMPLOYING SOLVENT ACTIVATABLE STIFFENER PLY WITH ANTI-STAIN SOLVENT ACTIVATING SOLUTION

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Fig. 1

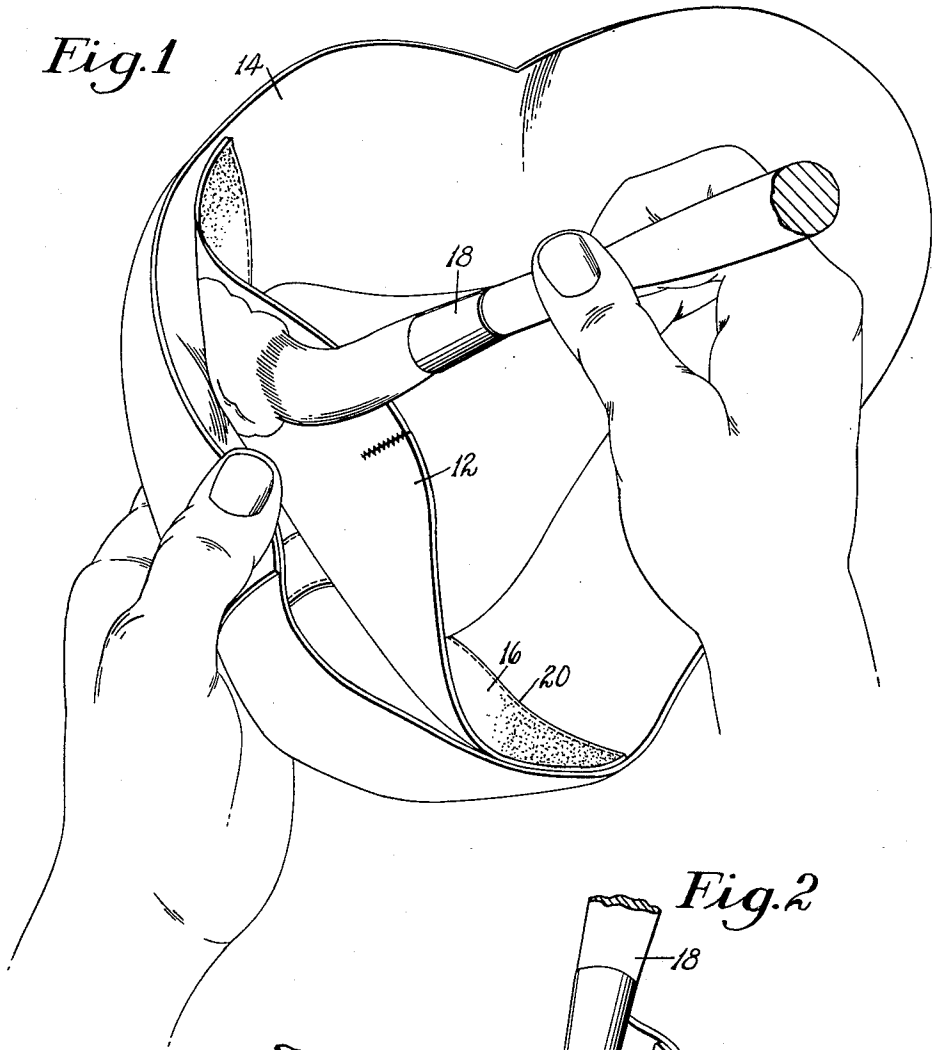
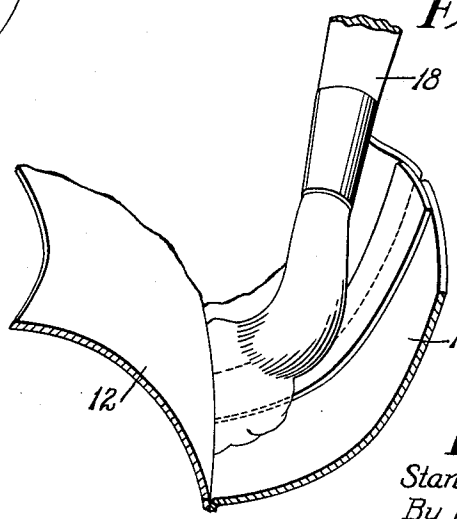


Fig. 2



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METHODS OF SHOE END STIFFENING EMPLOYING SOLVENT ACTIVATABLE STIFFENER PLY WITH ANTI-STAIN SOLVENT ACTIVATING SOLUTION

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1 Claim. (Cl. 12—146)

This invention relates to shoemaking and more particularly to improvements in methods of stiffening portions of shoe uppers, particularly heel end portions.

The stiffening of toe end portions of shoe uppers has for some time been accomplished by inserting into the upper of a shoe, prior to pulling over, a solvent activated box toe blank comprising a base of porous fabric impregnated with a stiffening agent in such discontinuous form that, prior to drying after activation, the blank is limp. Upon activation of the material by treatment with a solvent, the stiffening agent coalesces and, after drying out of the solvent, renders the blank stiff.

Recently such material has been developed in a form having a layer of flock bonded to one surface and this has been found suitable for a heel end lining and stiffening material providing a non-slip surface tending to avoid relative movement of the shoe on the wearer's foot as well as affording a pleasing appearance.

In a typical construction, a lining element in the form of a counter is died out of such flocked sheet material and sewed, flock side out, to a quarter, the seam extending along the top of the heel and down the sides of the counter. Before forming the heel end of the shoe to a last, the counter is activated by pulling it away from the quarter at the bottom and applying solvent with a brush. I employ the term "quarter" herein to designate any outer ply of the back portion of a shoe upper.

However, difficulties have presented themselves in activating such stiffener materials when so assembled since the solvent if allowed to come in contact with the stitching, or with a quarter of leather or other porous material, rapidly penetrated through the material and occasionally caused staining of the outer surface of the shoe. Further, uppers of glove-type leather, particularly sensitive to staining, have become more prominent in the trade. The care required to avoid touching such areas with a solvent filled brush, particularly adjacent to the seam by which the parts are assembled, is so great as to be impractical from a manufacturing standpoint.

It is accordingly an object of the present invention to provide an improved method of stiffening the heel end of a shoe in which method a ply of solvent activatable stiffener material of the aforementioned type is assembled to a quarter and activated with minimized danger of staining visible surfaces of the quarter or a lining element if used.

To this end and in accordance with a feature of the invention, a method of stiffening the heel end of a shoe upper comprises the steps of assembling a quarter and a porous ply of sheet material impregnated with a stiffening agent in discontinuous form capable of being coalesced by treatment with an organic aliphatic solvent and, after drying out, rendering the material stiff, applying to a surface of said porous ply a composition comprising a resin, water, and a solvent for the resin, pressing the porous ply against the quarter, and allowing the assembly to dry.

I prefer to employ polyvinyl acetate as the resin, because it has excellent adhesive and stiffening qualities while being quite economical.

The solvent may be substantially any aliphatic solvent or mixture of solvents having a suitable boiling point, but because it is to be employed with water, it should have the power of dissolving a certain amount of water, preferably at least about 3% of its weight. Suitable solvents include methyl ethyl ketone, ethyl acetate, methyl acetate, and acetone; but other available solvents for the polymers may be used. Such solvents as those named are "readily volatile" as contrasted with organic plasticizers.

For most practical purposes, the water of the composition will be provided by employing the resin in the form of an aqueous emulsion. Such emulsions are not ordinarily available over above 55% solids with the possibility of obtaining 60% solids. Accordingly, the composition will comprise at least ⅔ part of water for one part of resin. On the other hand, the proportion of water may exceed the amount present in the resin emulsions. Where the composition is to be used only to activate the stiffening material, there may be used three parts of water to one part of resin (corresponding to a latex having 25% solids), but where it is desired that the composition have also an adhesive action, the ratio should not be more than about two parts of water to one part of resin. Accordingly, then, the practical range of proportions of resin to water in my composition will be from one part of resin to ⅔ part of water, to one part of resin to three parts of water where the composition is used simply as an activator.

The chosen solvent is added to the resin and water, which is generally in the form of an emulsion, until the viscosity of the composition becomes low enough to penetrate porous material, including any porous upper material with which the composition is to be used, without staining the outside of the upper material. The amount of solvent may differ somewhat with different materials, but the practical range will be from about one part of solvent to about three parts of solvent by weight of the combined resin and water.

While the condition of the solvent and resin emulsion during mixing is not completely clear, it appears important that the resin and water exist in an emulsion which is stable enough to keep the resin suspended until the solvent has an opportunity to act on the resin component of the emulsion.

I have found that the incorporation of water and polyvinyl acetate resin with a solvent for activating a solvent activatable stiffener element of the type described above greatly reduces the danger of staining the outside of an adjacent ply of porous material such as a leather quarter while causing relatively little reduction of the activating action of the solvent on a solvent activatable stiffener element. Within relatively wide limits of proportion of solvent to the combined resin and water, the composition will penetrate into a porous ply such as a quarter without showing through and staining the outer surface, and when dried after application to an assembly of plies produces a stiffening action through the impregnation of porous plies and the bonding of the plies.

In attempting to explain why the liquid composition of the present invention exhibits the behavior of penetrating into porous material, especially leather, without penetrating through the material and staining its other surface, I have made tests using the same proportions of solvent and resin but leaving out the water in which this waterless mixture was applied to soft leather. It was found that this mixture penetrated through and stained the other side of the leather while the same mixture with the addition of an amount of water equal in weight to the resin did not penetrate through and stain the other side of the same leather. While I do not wish to be held to any specific theory of operation, I believe that the

non-staining properties of the water-containing mixture are due to precipitation of resin in the water during penetration into the leather because of the relatively rapid evaporation of the solvent and that the so precipitated resin checks penetration of the composition beyond a certain depth.

Because of the penetrating but non-staining properties of my composition, it has been found useful for a variety of uses not originally contemplated including heel end stiffening with porous sheet material other than the solvent activatable type.

Additional features and advantages of the invention will best be understood from the following detailed description taken in connection with the following drawings, in which—

FIG. 1 is an angular view of a shoe upper assembly and illustrates a step in the method provided by the present invention; and

FIG. 2 is a partial section of the upper assembly shown in FIG. 1.

In providing the composition of the present invention, it is perfectly possible to start with the solid resin, dissolve it in the selected solvent, and add water, or for that matter, initially to polymerize the resin in solvent solution and then add water thereto. The former method of making the composition results in an unstable mixture in which some of the water tends to separate out after a time unless a small amount of emulsifier is added, suitably, for example, about 1% based on the weight of the resin of a suitable surface active agent such as Tergitol NPX, made by Carbide and Carbon Chemicals Co., 30 East 42nd Street, New York 17, New York.

However, inasmuch as resins are usually made and are available commercially in the form of resin emulsions or lattices, usually of approximately 40–60% solids content, with the balance having water as its major constituent, I have found it convenient to use resin emulsions as the means of providing the resin and water components of my composition. Further, since emulsions contain emulsifiers, an emulsion affords a stable mixture with suitable solvents and provides a very convenient form in which to provide these ingredients.

The choice of solvent is dictated by a number of considerations most of which are quite obvious. The solvent should be sufficiently miscible with water to form a homogeneous stable composition when mixed with a resin latex in such proportions as to provide suitable viscosity with sufficient solids content to minimize staining by penetration through the quarter or lining material with which it is to be used and to provide a certain amount of stiffening action through impregnation of porous material. I have found suitable as solvents acetone, methyl ethyl ketone, methyl acetate and ethyl acetate. These are all readily volatile aliphatic solvents which will dissolve more than 3% of their weight of water and all are suitable solvents for nitrocellulose or polystyrene impregnated stiffener material. An amount of solvent chosen from at least one of this group in the amount of from about one to about three parts by weight blended with one part by weight of resin latex provides a composition having marked reduction over the pure solvent in penetrating through and staining leather or other porous material such as might be employed for quarters or shoe lining elements. The extent of solvent dilution to be employed will depend of course upon the type of such material with which it is to be employed. Suitably greater solvent dilution may be employed on a relatively firm upper leather than on a soft upper leather quarter.

Solvents which do not dissolve water to any appreciable extent, such as methyl isobutyl ketone (solubility of "water in": 1.8%) and butyl acetate ("water in": 1.2%), fail to form homogeneous mixtures with polyvinyl acetate resin emulsion and the same is generally true of the aromatic and straight chain hydrocarbon solvents such as naphtha.

The following examples will serve further to illustrate the invention:

Example I

	Parts
Polyvinyl acetate emulsion 55% solids	1
Methyl ethyl ketone ("water in": 11.8%)	1

The polyvinyl acetate emulsion employed in this and the following examples is a commercial preparation made by the Borden Company, Madison Avenue, New York, and designated Polyco 117–SS Polyvinyl Acetate Emulsion. Methyl ethyl ketone dissolves water 11.8% of its weight. This emulsion and the solvent were thoroughly mixed in the above proportions. The product was a heavy homogeneous mixture of milky appearance having a relatively low penetration of soft leather and somewhat low activating and stiffening qualities. It was judged to be at the low end of the dilution range for solvent activating though of excellent stiffening properties on porous material.

Example II

	Parts
Polyvinyl acetate emulsion	1
Methyl ethyl ketone	2

These materials when thoroughly mixed produced a cloudy oyster white composition of approximately 150 centipoises viscosity. It provided satisfactory penetration of soft leather without staining the reverse side and fair to good activation on solvent activatable stiffener sheet material of the cellulose nitrate type. It was judged to be a suitable dilution for general use with such material.

Example III

	Parts
Polyvinyl acetate emulsion	1
Methyl ethyl ketone	3

The mixture produced a cloudy homogeneous composition of 47 centipoises viscosity. Penetration without staining was satisfactory on firm upper leather but tended to penetrate completely through soft leather with some staining. It had good activating properties on cellulose nitrate impregnated solvent activatable sheet material. It was judged to be about at the upper end of dilution range with this solvent so far as staining leather is concerned.

Example IV

	Parts
Polyvinyl acetate emulsion	1
Acetone ("water in": complete)	2

The mixture provided a cloudy homogeneous composition of 94.5 centipoises viscosity having satisfactory penetration without staining on soft leather and good activating properties on the aforesaid stiffener material.

Example V

	Parts
Polyvinyl acetate emulsion 55% solids	1
Ethyl acetate ("water in": 3.3%)	2

These materials when thoroughly mixed produced a cloudy mixture of 972 centipoises viscosity. This was judged to be about at the lower end of useful dilution with this solvent.

Example VI

	Parts
Polyvinyl acetate emulsion	1
Methyl acetate ("water in": 8.2%)	2

The mixture provided a pearl gray composition of 109 centipoises viscosity having satisfactory penetration without straining on soft leather and good activating properties on cellulose nitrate stiffener material. This was judged a suitable dilution for general purposes but circumstances may dictate the choice of more or less solvent.

I prefer the odor of this composition to that of Example II.

In employing the composition of the present invention in providing a stiffened shoe heel portion, a stiffening element such as the counter **12** shown in FIG. 1 is died out of a sheet preferably of solvent activatable stiffener sheet material such as the material known to the trade as "Celastic" cellulose nitrate impregnated stiffener material. In the illustrative example shown in FIG. 1, the counter **12** is sewed to a quarter **14** by stitching extending along the top of the heel of the upper and down the sides of the counter leaving the bottom free to open as shown in the manner of a pocket. Before the shoe end forming operations including the pulling over and lasting operations, the counter is pulled out from the quarter as shown and the composition of the present invention is applied generously to a surface of the counter, which is shown as having a layer of flock **16** on its exposed surface and preferably also to the quarter. The composition may conveniently be applied by a brush **18** or a fountain brush applicator, and unlike the situation existing with pure solvents, the composition may be applied liberally to the inner surface of the quarter as shown in FIG. 2 without fear of the composition bleeding through and staining the upper.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

The method of stiffening the heel end portion of a shoe comprising the steps of assembling to a quarter a porous ply of sheet material impregnated with a stiffening agent in discontinuous form capable of being coalesced by treatment with an organic aliphatic solvent and after drying out, rendering the material stiff, applying to a surface of said ply a liquid composition comprising one part by weight of polyvinyl acetate resin aqueous emulsion of approximately 25–60% solids content and from one to three parts by weight of a readily volatile organic aliphatic solvent capable of coalescing said stiffening agent and capable of forming with said emulsion a stable homogeneous liquid composition, pressing the ply and quarter together and allowing them to dry.

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