

UNITED STATES PATENT OFFICE

2,040,320

MANUFACTURE OF SHOE STIFFENERS

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No Drawing. Application March 11, 1933,
Serial No. 660,436

6 Claims. (Cl. 36-77)

This invention relates broadly to shoe stiffeners made up of a fibrous foundation carrying therein as the impregnating or stiffening charge various stiffening agents such as heretofore used but in combination with synthetic resins. The stiffening agents embraced by this invention are preferably of the cellulose ester type soluble in organic solvents and the synthetic resins are preferably those prepared as chemical condensation products from various starting chemicals and preferably possessing such qualities as ability to bond well both with the fibrous foundation and with the cellulose ester or other stiffening agent, non-shatterability, and ability to condense or oxidize to a further degree after entering in combination with the stiffening agent into the fibrous foundation.

This invention relates more particularly to that type of shoe stiffener in which finely divided or pulverulent colloidal stiffening compound is carried as an impregnating charge in a fibrous foundation, the stiffening compound being designed subsequently to be treated with, and be plasticized by, an organic solvent, so that the stiffener can be rendered limp and moldable by such solvent for assembly with a shoe upper and then conformed to the shape of the last during the pulling-over and bed-lasting operations to which the assembled upper is subjected.

It is to be observed that a stiffening compound reduced to particles of small unit size will not be suitable for the foregoing purpose unless the particles are bonded to the fibrous foundation and to one another by some third element or compound. Various attempts to manufacture the desired article have been made. Thus, I am aware of a process wherein rosin size and/or rubber latex have been specifically employed as the binding agent, but this expedient gives rise to certain difficulties, some of which will hereinafter be mentioned.

I have made a very great number of experiments in an endeavor to compound or mix a finely divided stiffening compound with a suitable binder to form a composition which, upon drying or setting, will adequately hold or grip the fibrous foundation and yet be sufficiently porous to allow the influx of organic solvent into and throughout the foundation with proper coalescing or colloidizing of the particles of stiffening compound.

I have found that grave difficulties may arise in skiving the edge portions of shoe stiffeners so made, since too plastic a binder will fuse and become gummy under the intense friction of

skiving, whereas a shatterable binder may be released into the atmosphere in large quantity as finely divided, inflammable dust. Again, I have found that certain binders which respond or dissolve nicely in the organic solvents of the stiffener compound may yield in combination with the stiffening compound a mass which is so plastic or fluent that it exudes under lasting pressure or wiping from the shoe stiffener foundation in which it is initially carried to other parts of the shoe upper. In such case, the stiffener blank is also apt to be messy in the sense that it is difficult for the operator to handle it and assemble it with the shoe upper without smudging his fingers and the shoe upper.

I have discovered that when finely divided stiffening compound is mixed in an aqueous medium with synthetic resins, the mixture then charged into a fibrous foundation, and the charged foundation dried, the resulting product is practically without any of the aforementioned defects and is eminently serviceable for use in making box toe stiffeners and other shoe stiffener parts. The type of synthetic resin employed may vary within wide limits, and be, for example:—

(1) The so-called vinyl resins prepared by combining vinyl alcohol and an organic acid, as typified by vinyl acetate;

(2) The resins made from polybasic acids, polyhydric alcohols, and if desired, modifying agents, as typified by glycerol phthalate;

(3) The "plioform" resins, made from terpene derivatives, such as rubber;

(4) The "glyptal" resins.

While any of the above types of resins may be employed, I prefer a phthalate resin, having secured the best results to date by using a resin produced as the reaction product of colophony and maleic acid and combined with tung oil and tung fatty acids in the presence of certain metallic salts or so-called driers.

As a specific example of my invention, I cite the following formula for charging the fibrous foundation, which will be understood as typical and not limiting:—

	Parts
Pulverulent stiffening compound.....	100
Synthetic resin.....	35
Inert dispersion liquid.....	250

The stiffening compound used in the foregoing formula may be any suitable one soluble or gelatinizable in an organic solvent, but I prefer to use cellulose esters, such as celluloid, cellulose

acetate, etc., or mixtures of the esters. The synthetic resin may be any one of those named, but I prefer to use one which progressively condenses or oxidizes in the foundation under atmospheric influences. The dispersion liquid or carrier for the mixture, making possible its introduction as an impregnating into and throughout the fibrous foundation, is preferably water. The mixture produced according to the formula is preferably passed through a colloid mill, homogenizer, or other dispersing machine, which delivers a smooth, substantially homogeneous mixture of paste-like consistency. This paste is incorporated into the fibrous foundation, for instance, by passing cotton flannel, felt, or other woven or felted fabric through calender or squeeze rolls in front of which a bank of the paste is maintained for forcing into and throughout the fabric in desired amount. Upon drying or evaporation of the liquid from the charged foundation, the powdered stiffening compound is found to be bonded particle to particle and particle to fiber by the binder, but, as already indicated the mixture of stiffening compound and binder exists in a porous state in the foundation. The dried fabric is then cut or dried out into box toe blanks or other shoe stiffeners, which can readily be skived without liberating dust and from which stiffening compound does not ooze to any material extent when conditioned with solvent for the stiffening compound and put through customary shoe-making operations.

When my shoe stiffeners made as hereinbefore described are subjected to organic solvents and incorporation into shoe uppers, the resultant qualities realized in the stiffeners are neither those of the stiffening compound alone nor of the synthetic resin alone, but a combination of the desirable physical qualities of both. Thus, the hardness and shock-resistance of the condensation product or synthetic resin are realized together with the stiffness and resilience of the stiffening compound.

Since further condensation or oxidation of the synthetic resin may take place slowly and progressively, the desired end results may be realized only after the stiffener has remained for some time in the finished shoe, during which time the condensation or oxidation proceeds to an equilibrium.

It might be observed that when the pulverulent stiffening compound is a cellulose ester, such as cellulose acetate and/or cellulose nitrate, and the synthetic resin serving as the binder is a polyvinyl ester resin, such as polyvinyl acetate, the shoe stiffener of the present invention comprising a porous fibrous foundation carrying as an impregnating charge a combination of the cellulose ester and the polyvinyl ester resin may be rendered limp and moldable by the colloidizing or gelatinizing action of an organic solvent on both of the components of the impregnating charge. Thus, there are some organic solvents that are solvents of both cellulose esters and polyvinyl ester resins so that when the shoe stiffener of the present invention is treated with such organic

solvents, not only do such solvents penetrate into and throughout the fibrous foundation of the stiffener, by reason of the porosity of the foundation and the porosity of the impregnating charge therein, but function to gelatinize both the cellulose ester and the polyvinyl ester to effect an intimate blending of the two esters and thus to develop in the set, molded stiffener in the shoe a combination of the desirable physical qualities of both esters, as hereinbefore described.

I claim:—

1. A shoe stiffener comprising a porous fibrous foundation containing incorporated therein a mixture of finely divided cellulose ester and a synthetic resin selected from a class consisting of the phthalate resins, the vinyl resins, the "glyptal" resins, and the "piloform" resins in bonded relationship to each other and to the foundation, said mixture existing in a porous state in said foundation and permitting solvent of said ester to penetrate into and throughout said foundation with colloidizing action on said ester.

2. A shoe stiffener comprising a porous fibrous foundation containing incorporated therein a mixture of finely divided cellulose ester and a phthalate resin in bonded relationship to each other and to the foundation, said mixture existing in a porous state in said foundation and permitting solvent of said ester to penetrate into and throughout said foundation with colloidizing action on said ester.

3. A shoe stiffener comprising a porous fibrous foundation containing incorporated therein a mixture of finely divided cellulose ester soluble in organic solvents and polymerized phthalate resin in bonded relationship to each other and to the foundation, said mixture existing in a porous state in said foundation and permitting solvent of said cellulose ester to penetrate into and throughout said foundation with colloidizing action on said cellulose ester.

4. A shoe stiffener comprising a porous fibrous foundation containing incorporated therein a mixture of a preponderant proportion of finely divided cellulose ester soluble in organic solvents and a subordinate proportion of polymerized phthalate resin in bonded relationship to each other and to the foundation, said mixture existing in a porous state in said foundation and permitting solvent of said cellulose ester to penetrate into and throughout said foundation with colloidizing action on said cellulose ester.

5. A shoe stiffener comprising a porous fibrous foundation stiffened by a finely divided mixture of different agents, said agents including a cellulose ester soluble in an organic solvent and a vinyl ester resin and being bonded to said foundation and to each other.

6. A shoe stiffener comprising a porous fibrous foundation stiffened by a finely divided mixture of different agents, said agents including a preponderant proportion of a cellulose ester soluble in an organic solvent and a subordinate proportion of a vinyl ester resin and being bonded to said foundation and to each other.

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