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[54] **PROCESS FOR LASTING SHOE PARTS**

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[52] **U.S. Cl.** ..... **12/145,** 12/146 D, 36/68

[51] **Int. Cl.** **A43d 21/00,** A43d 13/42

[58] **Field of Search** ..... 12/146 R, 146 D, 145; 36/77 R, 68; 161/64, 67, 175, 151 T

[56] **References Cited**

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[57] **ABSTRACT**

This invention provides a shoe stiffener such as a box toe or counter stiffener which retains its stiffness when contacted with leather tanning oils. The stiffener comprises a textile base containing between 67 and 80 weight percent of a styrene-acrylonitrile copolymer which copolymer contains between 20 and 40 weight percent acrylonitrile.

8 Claims, No Drawings

PROCESS FOR LASTING SHOE PARTS

BACKGROUND OF THE INVENTION

This invention relates to a process for manufacturing stiffening materials for shoes and to the stiffening material produced.

In the manufacture of shoes, the upper portion at either the toe or the heel is stretched on a last and held there in order to impart the desired shape to the upper, conforming to the last shape. To maintain the desired upper shape after the lasting step, it is common practice to employ a stiffening material such as a box toe or a counter stiffener which is adhered to the inside surface of the upper. The box toe is formed by cutting a blank from a sheet of woven or nonwoven textile material impregnated with an unplasticized or plasticized polymeric latex to the desired shape conforming to the end of the shoe. The latex can be solvated under the conditions of the heat and pressure encountered during the lasting process thereby effecting adhesion to the upper and the shoe lining. Solvation generally is effected by immersing the polymer-impregnated material in a solvent which is evaporated subsequently during the lasting step.

Prior to the present invention, a wide variety of resin polymers were employed as adhesives in the box toe including styrene, carboxylated styrene, styrene-butadiene copolymers, styrene-acrylate copolymer and carboxylated styrene-acrylate copolymer, either plasticized or unplasticized. While these polymers provide substantial cost advantages over the previously employed nitrocellulose and pyroxylin resins, they are undesirable particularly in certain types of footwear especially boots and shoes formed from uppers of oil-tanned leathers. When these leathers are adhered to the box toe containing these adhesives, the tanning oils will migrate from the leather into the box toe and cause the resin to become plasticized. Eventually, the stiffening effect provided by the box toe is lost entirely due to this plasticization and the toe will collapse during wear.

As used herein, the term "styrene-acrylonitrile copolymer" is intended to include copolymers and terpolymers of styrene and acrylonitrile.

SUMMARY OF THE INVENTION

The present invention is based upon the discovery that box toes and counter stiffeners having desired stiffness, which is retained even after contact with oils employed in leather tanning, can be obtained by incorporating a styrene-acrylonitrile copolymer containing between 20 and 40 weight percent acrylonitrile into a textile material normally employed in forming box toes and counter stiffeners. Accordingly, the present invention provides a shoe stiffener comprising a woven or non-woven textile base having a thickness suitable for use in shoes and impregnated with a styrene-acrylonitrile copolymer containing between about 20 and 40 weight percent acrylonitrile. The stiffener is prepared by impregnating a textile base with a latex of the copolymer and thereafter drying the impregnated stiffener to remove water therefrom. The dried stiffener then can be incorporated into a shoe construction under conditions to plasticize the copolymer so that the stiffener is adhered to the shoe upper and shoe lining.

DESCRIPTION OF SPECIFIC EMBODIMENTS

The shoe stiffener of this invention comprises a textile base of suitable thickness and is shaped in the form of a conventional box toe or counter stiffener which base is impregnated with a styrene-acrylonitrile copolymer and which copolymer contains between about 20 and 40 weight percent, preferably between 23 and 35 weight percent acrylonitrile. The impregnated base contains between about 67 and 80 weight percent of the copolymer, based upon the weight of the impregnated base.

Exemplary suitable textile materials that can be employed as shoe stiffeners include napped cotton flannel, needled rayon flannel, wool or synthetic polymer felts, stitch bonded rayon viscose or the like.

Suitable styrene-acrylonitrile copolymers include styrene-acrylonitrile, acrylonitrile-butadience-styrene terpolymer, styrene-acrylonitrile-acrylate terpolymer wherein the acrylate can be methyl methacrylate, ethyl acrylate or the like.

After the textile base has been impregnated with the copolymer latex, it is heated to evaporate the water by using any conventional drying means. Thereafter, the dried stiffener is immersed in a solvent which solvates the copolymer. While the copolymer is plasticized, the stiffener is lasted together with an upper and a lining at a temperature between normal room temperature and about 120° C until substantially all of the solvent has been evaporated and the copolymer has fused to the upper and to the lining.

Any solvent which plasticizes the styrene-acrylonitrile copolymer without damaging any of the lining, upper or textile base in the box toe can be employed in the process of this invention. Particularly suitable solvents are ketones, including acetone, methyl ethyl ketone, mixtures of acetone and methyl ethyl ketone, ethyl acetate, butyl acetate, mixtures of the acetate, or the like.

The following example illustrates the present invention and is not intended to limit the same.

EXAMPLE I

Six Blanks comprising 30 percent by weight cotton flannel textile were cut to form one-half inch by 3 inch samples. Three samples were immersed in a styrene-acrylonitrile latex having a solid content of 52–54 weight percent, a pH of 9 to 10, an average particle size of 13 microns and a viscosity of 250 centipoises. The acrylonitrile comprises about 23 weight percent of the co-polymer. The samples were immersed for 10 seconds. The copolymer comrpised approximately 70 percent dry weight percent based upon the weight of the impregnated textile. The impregnated cotton textile samples then were heated to remove substantially all of the water. The dry samples were immersed in an acetone-methyl ethyl ketone solvent and then heated at a temperature between room temperature and 100° C to solvate the copolymer and thereafter evaporate the solvent. Thereafter, the samples were cooled to stiffen the impregnated textile.

The above procedure was followed with the only difference that a styrene latex was employed comprising 49 to 52 weight percent solids and having a pH of 10.5 to 10.8. Rather than employing acetone-methyl ethyl ketone as the activating solvent, toluene was employed.

Three of the styrene-impregnated flannel samples, and three of the styrene-acrylonitrile impregnated sample were immersed in a leather tanning oil for 24 hours at 10° C.

Each stiffened sample was tested for flexural modulus of elasticity by employing a Tinuis Olsen Stiffness apparatus.

The following table shows that stiffness for the flannel containing the styrene-acrylonitrile copolymer was far superior to the flannel containing the styrene. The reduced stiffness of the styrene-impregnated flannel is due to the migration of the tanning oils into the flannel which plasticized the styrene polymer. On the other hand, the tanning oils do not plasticize the styrene-acrylonitrile copolymer.

TABLE I

Sample Tested	Flexural Modulus of Elasticity — average of three samples
Styrene-impregnated sample	69,782 lbs/in²
Styrene-acrylonitrile impregnated sample	65,622 lbs/in²
Styrene-impregnated sample-oil immersed	33,282 lbs/in²
Styrene-acrylonitrile impregnated sample-oil immersed	81,883 lbs/in²

We claim:

1. A process for lasting an end portion of a shoe which comprises applying to the inside surface of a shoe upper a textile base shaped in the form of a shoe stiffener and impregnated with a styrene-acrylonitrile copolymer, said copolymer containing between about 20 and 40 weight percent acrylonitrile, said base containing between about 67 and 80 weight percent of said copolymer, adding a solvent to said impregnated base to solvate the copolymer and shaping said upper and stiffener on a last while heating said stiffener under lasting pressure to evaporate the solvent and adhere the stiffener and upper.

2. The process of claim **1** wherein the solvent is a ketone.

3. The process of claim **1** wherein the solvent is a mixture of acetone and methyl ethyl ketone.

4. The process of claim **1** wherein the copolymer contains between about 23 and 35 weight percent acrylonitrile.

5. The process of claim **1** wherein said copolymer consists essentially of styrene and acrylonitrile.

6. A composition suitable as a shoe stiffener comprising a textile base impregnated with a styrene-acrylonitrile co-polymer containing between about 20 and 40 weight percent acrylonitrile, said base containing between about 67 and 80 weight percent of said copolymer.

7. The composition of claim **6** wherein the copolymer contains between about 23 and 35 weight percent acrylonitrile.

8. The composition of claim **6** wherein the copolymer consists essentially of styrene and acrylonitrile.

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