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SOLVENT SOFTENING SHOE STIFFENER

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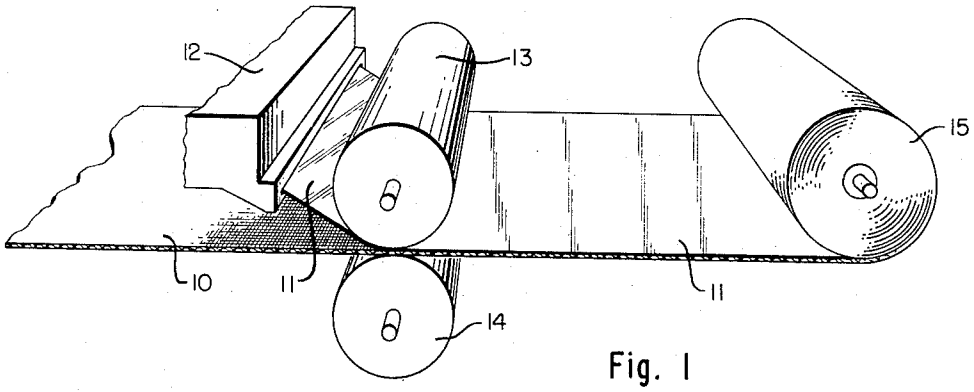

Fig. 1

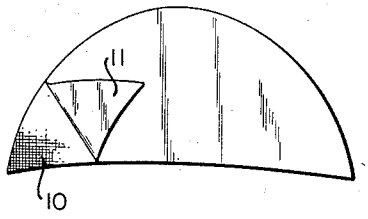

Fig. 2

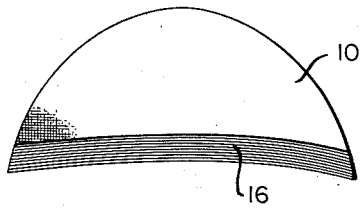

Fig. 3

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SOLVENT SOFTENING SHOE STIFFENER

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3 Claims. (Cl. 154—46)

This invention comprises a new and improved shoe stiffener of the solvent softening type having novel characteristics which particularly adapt it for use in unlined shoes.

Solvent softening box toes have been used with entire success for many years in the manufacture of lined shoes where the box is located between the outer integument of the upper and the lining and the lining is therefore interposed between the box and the last during many of the shoemaking operations to which the shoe is subjected. The solvent softening compounds with which such box toes are impregnated are very highly adhesive and necessarily so because it is important that the box should be firmly bonded to the lining in order to prevent the lining from sagging and dropping during the life of the shoe.

There is now, however, an insistent demand for a solvent softening box toe which may be used in unlined shoes where the box toe must come in direct contact with the last. The industry has for a long period struggled with the problem of providing a solvent softening box toe adapted for unlined shoes and so constructed and arranged as to prevent adhesive contact between the box and the last during those operations in which the box is conditioned or activated, that is to say, while the box has been rendered soft, pliable and adhesive by solvent treatment. If any trace of the stiffening compound of the box reaches the surface of the last while in this condition, the box sticks to the last so that it is almost impossible to remove the shoe without tearing it to pieces. The present invention prevents that objectionable occurrence.

Many attempts have been made to solve the problem by coating the inner face of the box toe with a non-adhesive shield of rubber or wax or a composite layer of such materials, but these attempts have not been successful because the non-adhesive coating is likely to split or rupture when the temporarily softened box toe is strained in the pulling over or lasting operations and when this occurs the stiffening compound seeps through the crack and adheres to the last with disastrous results.

The present invention is based on our discovery that the difficulties heretofore encountered are obviated by incorporating upon the inner face of the box toe a thin preformed layer of polyethylene. This material is highly non-adherent and has a very high factor of elongation besides being exceptionally tough in texture. Consequently the polyethylene layer is capable of stretching without danger of rupture even when the box toe is severely strained and distorted while incorporated in the upper and being drawn under pressure against the surface of the last. The polyethylene layer, moreover, is strictly non-toxic and antiseptic when in contact with the wearer's foot. It is in itself highly flexible and elastic and so does not interfere in the slightest degree with the flexibility of the moistened and conditioned box toe

as it is presented for the pulling over or lasting operations. It also retains its elastic characteristics when the box becomes stiffened in the completed upper.

In successfully completing our invention it was necessary to solve a second problem, viz. the permanent bonding of the polyethylene film or ply to the body of the box toe. Polyethylene, as already noted, is highly non-adhesive but after extensive research it was found that it could be successfully bonded to a felt or textile base by extruding it in thin sheet or film shape at a high temperature, laying it hot upon the fibrous body material, and then immediately subjecting it to pressure and cooling. This procedure results in a secure and permanent bond entirely satisfactory for the purposes of box toe manufacture.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment of the box toe and of the process of its production as illustrated in the accompanying drawings in which:

Fig. 1 is a view in perspective suggesting the steps of manufacturing the box toe material in sheet form,

Fig. 2 is a view in perspective of a box toe blank showing the polyethylene ply detached at one corner, and

Fig. 3 is a corresponding view of the blank as seen from its fibrous side.

For purposes of illustration the invention is shown in its application to a solvent softening box toe of the character described in U. S. Letters Patent No. 2,036,588 granted April 7, 1936, on an application of S. P. Lovell. The fibrous base material **10** comprises a porous felt, or a waterlaid felt, or a woven or knitted fabric of single or double ply. For example, in making box toe blanks for typical women's shoes it is appropriate to use as a fibrous base a true felt composed of 20% wool, 80% cotton, and weighing about 4½ ozs. per square yard. The base material is impregnated with a solvent softening stiffening compound which, for example, may comprise a mixture of nitrocellulose and boric acid as a substantially uniform dispersion which is porous and receptive of nitrocellulose solvents such as acetone, ethyl alcohol, diacetone alcohol or the like, or mixtures thereof. Using such impregnating composition with the felt above identified, we produce a dried impregnated sheet weighing about 15½ ozs. per square yard, that is, a finished sheet containing about 11 ozs. of impregnating solids of which slightly more than one-half is nitrocellulose and slightly less than one-half is boric acid. The effect of the boric acid is to increase the porosity of the compound, render it substantially fireproof, and improve its capability of being skived. In some cases it may be desirable to add a small percentage of camphor to the stiffening compound to serve as a plasticizing agent.

In Fig. 1 the polyethylene is represented as being extruded as a thin continuous sheet from the outlet nozzle **12** of an extruding machine provided with a die slit of the proper dimensions to extrude a sheet from 0.001 to 0.002" in thickness at a temperature of 500–600° F. Polyethylene may be supplied to the extruding machine in the granular form in which it is available commercially and if desired a coloring ingredient may be added so that the extruded sheet **11** will be tinted or colored and so indicate at once to the operator which side of the box toe is to be located in contact with the last.

As already noted it is important to extrude the polyethylene sheet **11** at a fairly high temperature in order to form a permanent bond with the fibrous base **10**. At 500° F. the polyethylene issues as a preformed semi-solid sheet from the die slit. The polyethylene sheet is led from the die slit immediately into contact with the base sheet **10** and then passed between a pair of pressure

rollers **13** and **14** which press the two sheets firmly and progressively into contact and at the same time cool the polyethylene. A very firm and permanent bond is formed in this manner and the composite box toe material in sheet form may with little or no delay be wound into a coil **15**.

In Fig. 2 is shown a box toe blank as it is died out from the sheet material produced in accordance with the process of Fig. 1. The blanks are died out in the proper shape and size for the unlined shoes in which they are to be incorporated. In Fig. 2 the polyethylene ply **11** is shown as separated from the fibrous base at one corner of the blank. This may be done with the exercise of sufficient force and care, and in stripping the polyethylene layer in this manner it will be found to carry with it the surface layer of fibres from the base **10**. This is because the bond between the polyethylene and the fibre base is stronger than the bond between the components of the base itself.

The box toe blank is completed by skiving its transverse edge in an area **16** upon the fibrous base surface of the blank. In the skiving operation the polyethylene ply is not disturbed while the blank is reduced to a feather edge so that is will not show a transverse line across the tip of the finished shoe.

When the improved box toe of our invention is to be incorporated in a shoe upper, it is conditioned by the application of a suitable solvent such as acetone, ethyl alcohol or the like, and in this operation the blank is rendered soft, pliable and limp so that it may be readily and perfectly moulded in the upper to the last. It is also rendered moist and adhesive but nevertheless the polyethylene layer adheres permanently to the moist and softened fibrous base throughout any distortion to which the conditioned blank is subjected in the pulling over or lasting operations. In these operations the polyethylene layer is not only brought into severe frictional engagement with the wood of the last, but very severely stretched and strained. However, throughout all of such treatment the polyethylene layer maintains its integrity and acts as a complete and continuous shield between the body of the box toe and the wood of the last. The result is that while the fibrous surface of the box toe becomes permanently and adhesively bonded to the upper, there is no tendency whatever on the part of the polyethylene layer to stick to the wood of the last.

Our invention is useful also in its application to box toes which are distributed by the manufacturer in sealed containers while in a state of full or partial condition, that is to say, dampened and softened to some extent by solvent and therefore usable more immediately than blanks distributed in a fully dried state. The polyethylene layer applied as above explained remains intact and without impairment to its bond in such conditioned box toe blanks.

While we have referred specifically to one illustrative stiffening compound and to polyethylene as a material for the protective non-adherent ply, it would be within the scope of the invention to employ any equivalent compounds or materials.

A process of lasting the toes of unlined shoes in which is employed the stiffener herein disclosed is claimed in our co-pending application Ser. No. 488,384, filed February 15, 1955, now Patent No. 2,714,734 dated August 9, 1955.

Having thus disclosed our invention and described in detail an illustrative embodiment thereof and a preferred manner of producing it, we claim as new and desire to secure by Letters Patent:

1. A box toe stiffener of box toe configuration for use in an unlined shoe, consisting of a fibrous base impregnated throughout with a dry solvent-softening stiffening compound having latent adhesive characteristics, the compound being exposed on one face of the stiffener for adhesive attachment to an outer integument of an upper, and a thin tough elastic and integral ply of polyethylene of 0.001 to 0.002 inch thickness permanently united to the other face of the base and being highly elastic whereby it will stretch without rupturing when the impregnated fibrous base is strained while in softened condition during the lasting operation and will retain its elastic characteristics when the fibrous base is stiffened.

2. A box stiffener of box toe configuration for use in an unlined shoe, consisting of a base of fibrous sheet material impregnated throughout with a compound of dry nitrocellulose and boric acid having latent adhesive characteristics and being exposed on one surface of the base for bonding it to an outer integument of an upper, and a thin tough and elastic ply of polyethylene of 0.001 to 0.002 inch thickness permanently united to the other face of the base and having the property of stretching without rupturing when the impregnated fibrous base, incorporated in softened condition in a shoe upper, is strained during the lasting operation and of retaining its elastic characteristics when the compound is stiffened in the base in the toe portion of the upper.

3. A box toe stiffener of box toe configuration for use in an unlined shoe, consisting of a fibrous base impregnated throughout with a dry solvent-softening stiffening compound having latent adhesive characteristics, the compound being exposed on one face of the stiffener for adhesive attachment to an outer integument of an upper, and a thin tough elastic and integral ply of polyethylene permanently united to the other face of the base and being highly elastic whereby it will stretch without rupturing when the impregnated fibrous base is strained while in softened condition during the lasting operation and will retain its elastic characteristics when the fibrous base is stiffened.

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