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C. E. REYNOLDS

2,127,783

SHOE STIFFENER

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Fig. 1

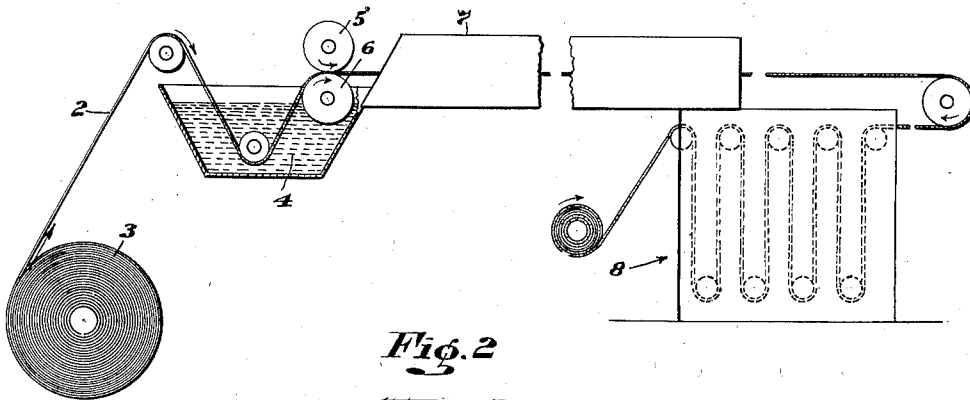


Fig. 2

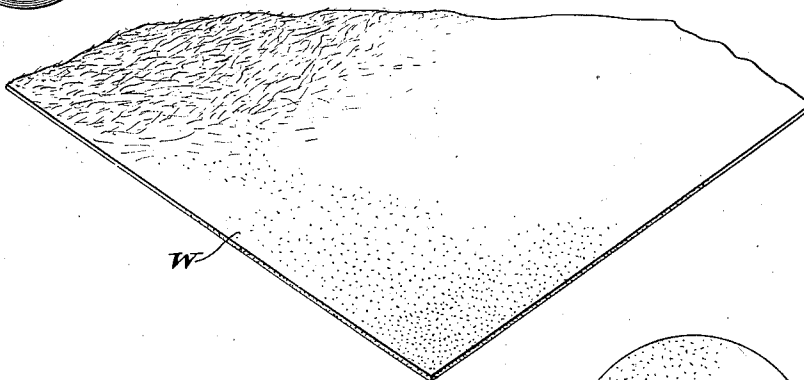


Fig. 3

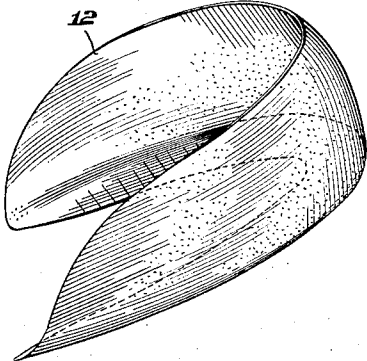
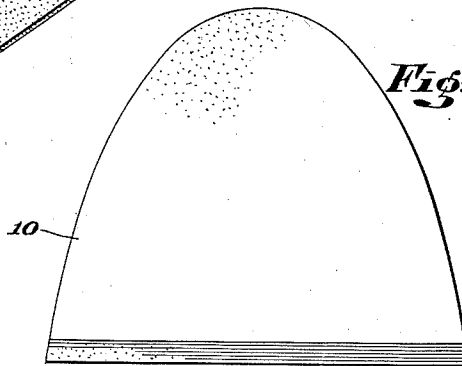


Fig. 4



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SHOE STIFFENER

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10 Claims. (Cl. 12-146)

This invention relates to shoe counters, box toe stiffeners, and other parts of footwear which act as stiffeners. Such elements are customarily used in a shoe chiefly at the toe and counter portions in order to hold these parts in the desired shape and to enable them to maintain a contour conforming to that of the last on which the shoe is made. It is desirable that such stiffeners have the degree of rigidity or firmness necessary for this purpose, but it is also preferable to have them possess a considerable degree of resilience, both because of considerations of comfort, and also in order to avoid too abrupt a break in the contour of the shoe upper between the stiffened area and adjacent portions of the upper which are not so supported.

A further and important requirement for such a stiffener is that it be sufficiently waterproof to hold its shape when wet. This property, however, involves serious disadvantages during the lasting, molding, or other operations which shape the stiffener. That is, it is necessary in order to perform these operations satisfactorily that the stiffener be in temper, or, in other words, moistened to such a degree that it will conform readily to the surfaces of the last, molds, or the other devices used in shaping it. Consequently, this requirement is distinctly antagonistic to the desired quality of waterproofness in a stiffener.

The present invention deals with this problem and aims to devise a thoroughly practical solution for it. It provides a novel stiffener, a new stiffener material, and novel improvements in the method of making shoes in which a stiffener is incorporated.

Attempts have been made heretofore to solve this problem by impregnating the stiffeners with some substance which is thermo-plastic but is hard at normal temperatures so that the stiffeners can be softened or tempered preparatory to molding or lasting by the application of a controlled degree of heat. It has also been proposed to impregnate the stiffeners with some substance that can be softened by the application of a volatile solvent. Both these expedients, however, involve complications which increase the expense of the shoe manufacturing process and which the present invention aims to avoid.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawing, and the novel features will be particularly pointed out in the appended claims.

In the drawing,

Figure 1 is a diagrammatic view illustrating a

step in a typical method of making a stiffening material in accordance with this invention;

Fig. 2 is a perspective view of a portion of a stiffener material to be treated in accordance with the method of this invention;

Fig. 3 is a perspective view of a molded counter made of this material; and

Fig. 4 is a plan view of a toe stiffener made of the same material.

The present invention avoids the necessity for using volatile solvents and steam, or other heating agents, by impregnating the sheet material from which the stiffeners are to be made with a limited quantity of a waterproofing and stiffening substance or preparation, such quantity being so restricted that while the strength, toughness, and waterproofness of the original material is substantially increased, nevertheless the stock will still take up sufficient moisture for tempering purposes. At any suitable point in connection with the incorporation of the stiffener in the shoe, or the molding or shaping of it, the stiffener is subjected to an impregnating operation in which a sufficient quantity of waterproofing material is added to it so that when it has dried out, it will thereafter remain substantially waterproof permanently. According to the preferred practice, this second impregnation and the tempering operation may be combined in a single step.

According to the practice at present preferred, a web of sheet material suitable for the manufacture of these stiffeners is first prepared. Subsequently the stiffeners are cut from it, skived, if necessary or desirable, and later are molded or not, as suits the requirements of the shoes being manufactured. As a body material, I prefer to use a sheet or web of felted fiber, preferably a cotton felt, although other materials such as cotton flannel can be used. The felt is comparatively inexpensive, is of very uniform composition, and makes a stiffener suitable for use in a wide variety of shoes. According to the preferred method, a web 2, Fig. 1, of this material is unwound from a supply roll 3, and is fed through a bath 4 of impregnating material, thence between upper and lower squeeze rolls 5 and 6, through a drying tunnel 7, and through a can dryer 8. A particularly satisfactory impregnating medium consists of vulcanized rubber latex either alone, or, more preferably, compounded with constituents adapted to improve the final product. The weight of dry latex rubber that will be taken out by the felt in passing through the impregnating bath may be controlled to a very substantial degree by the concentration of the bath. Another

method of control, however, which I prefer to use, consists in sizing the web lightly with starch, or some equivalent material, and drying the web before running it through the bath 4.

- 5 A typical formula which has proved satisfactory in this process consists of the following constituents:

Vulcanized latex containing one hundred pounds of dry rubber solids;

- 10 Ten pounds casein made up in a 20% solution in water;

Five pounds paraffin wax emulsified in a 50% solution by some such emulsifying agent as triethylamine-oleate;

- 15 Twenty pounds manila copal gum dissolved in sufficient ethyl alcohol to produce about a 66% solution.

The foregoing constituents are mixed together after the individual solutions or emulsions have been produced. Usually it is necessary to use a small proportion of ammonia, or some equivalent substance, in dissolving the casein. Also, the copal gum solution should be filtered, about twenty pounds of aqueous ammonia added to it, and approximately one hundred twenty pounds of water added to dilute the solution.

After the foregoing solutions and emulsions have all been mixed together, a relatively high proportion, say one hundred pounds of some inert filler, such as kaolin, aluminum flake, barytes, or the like, should be added to the mixture, this filler being first dispersed in approximately its own weight of water. The nature of these inorganic filling or loading agents used may be varied widely and may consist of, or contain high proportions of, pigments, if desired. All of them should be wet out in a small proportion of some suitable wetting agent, such as sodium oleate, before mixing with water.

- 40 The final composition will have a total solid concentration of approximately 40%, will show little or no tendency to separate, and will be of good viscosity.

After the web 2 has been run through a bath of this vulcanized latex composition and has dried, it will be found that its tensile strength has been greatly increased, that it is relatively stiff while yet having a considerable degree of resilience and pliability, and it is much heavier, firmer, and a far more substantial piece of goods than the original web. Also, it possesses a very substantial degree of water resistance or waterproofness. Nevertheless, if it is dipped in water it will readily absorb sufficient water for tempering purposes.

55 Preferably the material is sold to the shoe manufacturer, or the stiffener manufacturer, in this condition. Such a material is suitable, without further treatment, for the manufacture of toe boxes, counters, insoles, and the like. This material is indicated at W, Fig. 2. In making a toe stiffener, such as that shown at 10 in Fig. 4, the stiffener blanks are cut out of the sheet material W and usually, also, their edges are skived. In making counters this same operation is performed, but subsequently the counter usually is molded to approximately the shape indicated at 12, Fig. 3. In the case of very thin counter stiffeners a molding operation may not be necessary, sufficient shaping of the stiffener being produced in lasting. It is far more common, however, to mold the counter stiffener prior to assembling it on a last with the other parts of the shoe. Before molding, lasting, or performing any other operation on the stiffener for the purpose of radi-

cally changing its shape and making it conform to the contour of the last, the molds, or any other shaping member, it is tempered or "mulled". As above indicated, this may be done simply by dipping it in water. According to the preferred method, however, this tempering operation is performed by dipping the stiffener in a bath of latex, either vulcanized or unvulcanized. Ordinary commercial latex of either form contains approximately 30% of solids dispersed in a serum composed chiefly of water. Consequently, such a dipping operation produces two important effects; first, the absorption of water by the stiffener with a consequent tempering or mulling; and second, the coating of the stiffener with rubber solids contained in the latex. The stiffener is allowed to dry sufficiently to remove the excess water but it is assembled in the shoe while its outer surface is still tacky, thus causing it to adhere to the lining of the shoe and to the upper leather or other material composing the outer surface or ply of the upper. If desired, a counter may be mulled in water, then molded, and may not receive its second impregnation with latex until immediately preceding its assembly into the shoe. The lasting operation should be performed while both the counter stiffeners, or toe stiffeners, if both are used, remain in temper.

In the first impregnating bath above mentioned, various equivalents may be substituted for the constituents named. Under some conditions, as for example when the stiffener is to be used in a shoe that is to be vulcanized, unvulcanized latex or a suitable aqueous dispersion of rubber, may be substituted for the vulcanized latex. The casein acts as a stabilizer, adds somewhat to the stiffening characteristics of the material, and increases its adhesive properties. Other protective colloids, such as glue or gelatin, could be substituted for this constituent. The copal gum is an effective stiffening agent and is much more valuable for this purpose than any of the other constituents. It is acted upon by the ammonia in the solution to suspend it in a colloidal form and this is a desirable property. Other resinous constituents, however, could be substituted for it, such as ester gum and certain of the varnish resins as, for example, shellac. A further function performed by the copal gum and the paraffin wax is that they serve as waterproofing agents. In addition, the paraffin acts as a plasticizer, modifies the feel of the final product, and gives it a non-tacky surface, or at least reduces the natural tackiness of the surface. It is also an aid in performing the molding operation. Other waxes may be substituted for it provided they have the characteristic possessed by paraffin of being insoluble in rubber.

The quantity of rubber added in the first bath naturally will vary somewhat with the requirements of different grades of shoes. A typical rubber concentration is in the neighborhood of ten to twelve ounces (dry weight) per square yard in a felt weighing eight ounces to the square yard. This, of course, means that the rubber is not present in a continuous phase, but that much of the fiber is not coated with rubber. As above explained, this is desirable in order to facilitate the tempering or mulling step. If the fibers were completely coated with rubber in a continuous phase it would be practically impossible to temper the stiffener in the manner above described. In some cases where a greater concentration of rubber or waterproofing solids is desired, it is preferable to run the goods through the bath a

second time, drying the web between dipping or impregnating operations. In this connection it may be pointed out, however, that for some purposes it is generally preferable not to have the felt loaded with rubber to such a degree that it is impermeable to water vapor. It is entirely possible and, in fact, usually desirable, to have the stiffener sufficiently porous to permit the evaporation of moisture from the feet, and the degree of porosity necessary for this purpose is entirely consistent with an impregnation which makes the stiffener substantially waterproof. As above indicated, the total quantity of rubber and waterproofing solids added to the fiber can be controlled by properly regulating the concentration of the impregnating and tempering baths.

The thickness of the stiffener necessarily will vary somewhat with the nature and weight of the shoe in which it is incorporated. A typical thickness of the cotton felt web prior to impregnation is from one thirty-second to one-sixteenth of an inch, and this thickness is not changed much by the treatments above described.

Stiffeners made in accordance with this invention have been found in practice to possess that balance between stiffness and flexibility which is desirable in order to enable them to hold their shape and still to yield sufficiently for the purposes above described. They are easily worked in the shoe manufacturing processes and maintain their shape well when wet.

While I have herein shown and described a typical embodiment of my invention, it will be evident that the invention is not limited to the precise details described.

Having thus described my invention, what I desire to claim as new is:

1. That improvement in methods of making shoes in which a stiffener is incorporated, which consists in providing a fibrous stiffener impregnated with a quantity of rubber sufficient to bind the fibers of the stiffener, but insufficient to water proof the stiffener and prevent a ready absorption of sufficient water for tempering purposes, tempering said stiffener with an aqueous dispersion of rubber, incorporating the tempered stiffener in a shoe assembly while the coating applied in the tempering operation is still in a tacky condition, and during said tempering operation applying such a quantity of rubber to the stiffener that, combined with the original rubber content of the stiffener, it will make the stiffener substantially waterproof.

2. That improvement in methods of making shoes in which a waterproof stiffener is incorporated, which consists in impregnating the stiffener with a substantial percentage of the material required to give it the desired degree of waterproofness in the finished shoe, but so restricting the quantity of said material applied in said impregnating operation that the stiffener so treated will have insufficient quantity to water proof said body, and prevent a ready absorption of sufficient water for tempering purposes, tempering said stiffener with an aqueous medium, assembling the tempered stiffener with other shoe parts in a shoe assembly, shaping the stiffener at any convenient point in the process but while it is in temper, and simultaneously with said tempering step subjecting the stiffener to a second impregnating operation in which a sufficient quantity of waterproofing material is added to the stiffener to make it substantially waterproof.

3. That improvement in methods of making shoes in which a waterproof stiffener is incor-

porated, which consists in impregnating the stiffener body with a substantial percentage of the rubber required to give the stiffener the desired degree of ultimate waterproofness, associating with said rubber additional stiffening and filling material serving to improve the character of the stiffener, so proportioning the quantity of dry rubber thus introduced into the stiffener and said added materials associated with the rubber impregnating medium that the rubber will not be present in a continuous phase but will be introduced in sufficient quantity to bind the fibers of said body together into a tough flexible product, but insufficient in quantity to waterproof said stiffener and prevent a ready absorption of sufficient water for tempering purposes, tempering the stiffener with an aqueous dispersion of rubber, assembling the tempered stiffener with other parts of a shoe, shaping the stiffener at any convenient point in the process but while it is in temper, and in said tempering operation introducing a sufficient quantity of rubber into the stiffener to cooperate with that added in the first impregnating operation to make the stiffener substantially waterproof.

4. A shoe stiffener stock comprising a relatively thick sheeted fibrous body impregnated with latex rubber associated with substantial proportions of finely divided water insoluble resinous and filling materials and with an adhesive serving to increase the bond of the rubber to the fibers of said body, said rubber and the materials associated therewith being dispersed substantially throughout said body and the rubber being present in a quantity insufficient to form a continuous film which would prevent the ready absorption of sufficient moisture to temper the stiffener but the quantity of rubber in the stiffener being sufficient to bind the fibers of said body together into a tough flexible product.

5. A shoe stiffener stock comprising a relatively thick sheeted fibrous body impregnated with latex rubber associated with substantial proportions of water insoluble resinous and finely divided inert filling constituents, together with a glue and a plasticizer therefor, the rubber and said finely divided constituents associated with it being dispersed approximately uniform throughout said body, and the quantity of rubber in the stiffener being sufficient to bind the fibers of said body together into a tough, flexible product, but being insufficient to form a continuous film which would prevent the ready absorption of sufficient moisture to temper the stiffener.

6. That improvement in methods according to previous claim 3, in which the shaping operation is performed while the surfaces of the stiffener are sufficiently tacky to unite with the portions of the lining and outer material with which they are in contact.

7. A shoe stiffener stock comprising a relatively thick fibrous sheet impregnated throughout the body thereof with rubber in a dispersed condition and associated with substantial proportions of glue, wax, and water insoluble resinous and filling materials, the quantity of the rubber in the stiffener being sufficient to bind the fibres of said body together into a tough flexible product but being insufficient to prevent the ready absorption by the fibers of said body of sufficient moisture to temper the stiffener.

8. A shoe stiffener stock comprising a relatively thick sheet of felted fiber impregnated throughout the body thereof with rubber in a dispersed condition, the quantity of rubber being sufficient to

bind the fibers of said body together into a tough flexible sheet but being insufficient to waterproof said sheet to such a degree as to prevent its ready absorption of sufficient water to temper the sheet, said stock also including a substantial percentage of a waterproof resinous constituent dispersed substantially uniformly throughout said rubber impregnating medium.

9. A shoe stiffener stock comprising a relatively thick sheet of felted fiber impregnated throughout the body thereof with rubber in a dispersed condition, the quantity of rubber being sufficient to bind the fibers of said body together into a tough flexible sheet but being insufficient to waterproof said sheet to such a degree as to prevent its ready absorption of sufficient water to temper the sheet, said stock also including a substantial percentage of a waxy constituent that is insoluble

in the rubber and is dispersed substantially uniformly throughout said rubber impregnating medium.

10. A shoe stiffener stock comprising a relatively thick sheet of felted fiber impregnated throughout the body thereof with rubber in a dispersed condition, the quantity of rubber being sufficient to bind the fibers of said body together into a tough flexible sheet but being insufficient to waterproof said sheet to such a degree as to prevent its ready absorption of sufficient water to temper the sheet, said stock also including substantial proportions of resinous and waxy constituents dispersed substantially uniformly throughout said rubber impregnating medium.

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