Feb. 1, 1944. R. P. HOFFERBERT 2,340,591

STIFFENING PORTIONS OF THE UPPERS OF SHOES

Filed July 1, 1942

Fig1

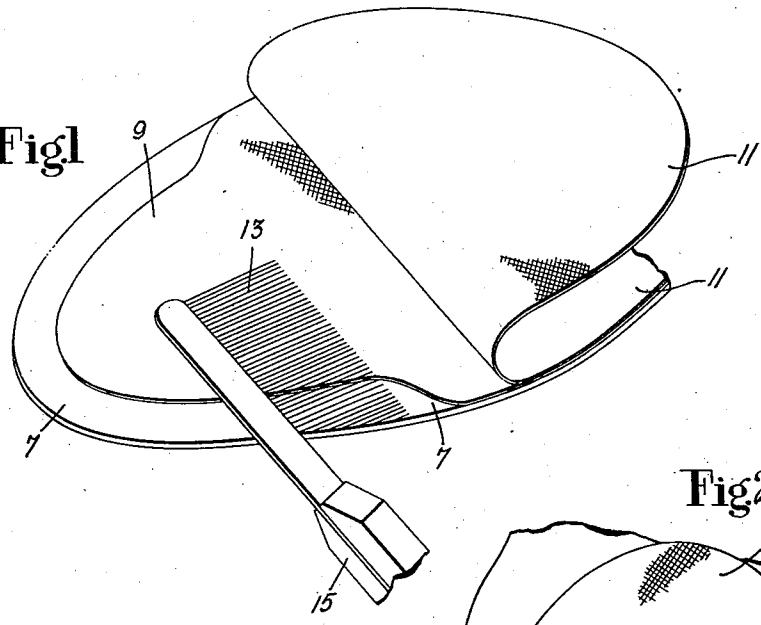


Fig2

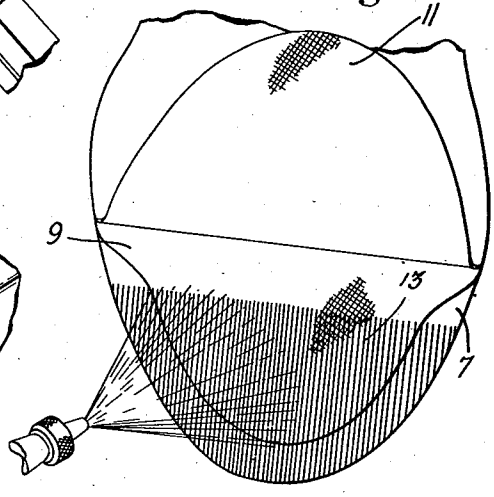
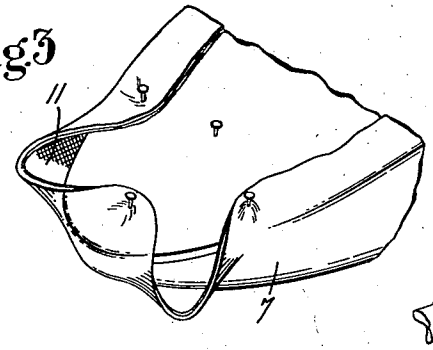


Fig3



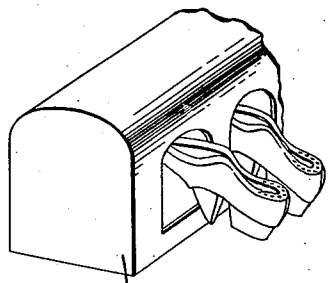


Fig4

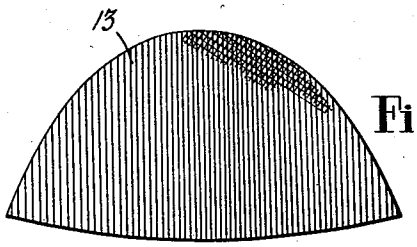


Fig5

INVENTOR

Raymond P. Hofferbert

By his attorney

Merritt Cadbury

Patented Feb. 1, 1944 2,340,591

UNITED STATES PATENT OFFICE

2,340,591

STIFFENING PORTIONS OF THE UPPERS OF SHOES

Raymond P. Hofferbert, Cambridge, Mass., assignor to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Application July 1, 1942, Serial No. 449,227

12 Claims. (Cl. 12—146)

This invention relates to the stiffening of parts of the uppers of shoes, and is in general an improvement upon the invention set forth in application Serial No. 388,398, filed April 14, 1941, in the name of Walter H. Wedger.

According to that application there is incorporated in a selected locality of the upper of a shoe an aminoplast stiffening substance in uncured form, such, for example, as an aqueous solution of a urea-formaldehyde resin, a curing agent capable of causing the stiffening substance to be converted into a form which, when dry, is hard and water-resistant, and a toughening substance. After the selected locality of the upper, for example the toe portion, has had incorporated in it the stiffening substance, either by incorporating the substance directly in a lining member such as the doubler or the lining proper or by incorporating in the upper a separate stiffener blank containing the substance, the upper is conformed to a last; and, when the stiffening substance has dried, the toe portion of the upper of the shoe becomes hard and resilient.

I have found that the use of a lubricating oil as a toughening substance produces a stronger and at the same time more resilient stiffened portion in the finished shoe than do the toughening substances of the prior application.

Referring to the accompanying drawing, which is like that of the application,

Fig. 1 is a perspective of a portion of the toe end of the upper of a shoe, the stiffening material being in process of being applied to the toe portion of the doubler by means of a spatula;

Fig. 2 is a plan of the same portion of the upper showing the application of the curing agent in the form of a spray;

Fig. 3 is a perspective of the toe portion of the upper after it has been pulled over;

Fig. 4 is a perspective of a toe heater showing two lasted shoes in process of having their toe portions heated to hasten the drying of the stiffening material; and

Fig. 5 is a plan of a toe stiffener blank to which the stiffening material and the curing agent have been applied, said blank being ready to be incorporated in the toe portion of the upper of a shoe.

The term "aminoplast stiffening substance," as used herein, denotes a water-soluble product which results from the partial reaction of a substance containing an NH_2 group linked to carbon, such as urea, thiourea, melamine, dicyandiamide and derivatives of these substances, with an aldehyde, the product upon having its pH value changed being capable of curing to a water-resistant resin. In the preparation of such aminoplast stiffening substances, the partial reaction is one of addition or addition plus partial polymerization. After the addition reaction, the products may be stabilized and used as such. Alternatively, the addition products may be partially polymerized and then stabilized. In the final cure the addition products, or the partially polymerized products, are polymerized to a water-resistant resin. The aminoplast stiffening substances may be any one of such partial reaction products or a mixture of any of them.

An aminoplast stiffening substance which is put out by the American Cyanamid Company under the trade name of "Beetle Syrup No. 250 conc.," and is an aqueous solution of the partial reaction production of urea and formaldehyde containing 70% solids and having a pH value of about 7, is in a convenient form to be used; and other partial reaction products may be made into a solution or suspension or a combination of the two having the same solid content. In the description which follows, such a solution or suspension will be referred to as "resin syrup."

A formula for the stiffening material, as given in the application identified above, is:

	Parts by weight
Resin syrup (70% solids)	200
Triethanol amine	4
Nitrocellulose emulsion	120
Ground horse hair	35

The stiffening material of this formula is a pasty mass. The ground horse hair is a filler. The triethanol amine is a stabilizer and neutralizes to the desired degree the acidity of the ground horse hair. The nitrocellulose is a toughening agent which increases the flexibility or resilience of the cured resin. Various toughening substances may be employed such as polyvinyl acetate and asphalt, as well as various fillers such as leather dust and ground slate, as listed in the said application. The pH value of the solution or pasty mass is about 7.

Referring now to the drawing, one manner of using this stiffening material will be briefly described. Assuming that the assembled upper comprises a vamp 7 and lining members including a doubler 9 and a lining proper 11, the stiffening material may be incorporated in a desired locality by placing the toe portion of the assembled upper upon a flat support, with the vamp down and the lining pulled back as shown in Figure 1, and forcing the pasty stiffening material

13 into and through the doubler 9 by means of a spatula 15. The curing agent may be applied, as shown in Figure 2, by spraying a solution of a substance such as ammonium chloride upon the doubler or upon the doubler and the exposed margin of the vamp, if the margin of the doubler has been cut away as shown in the drawing. The ammonium chloride, which is a curing agent, reduces the pH value of the partial reaction product to a range of from 2 to 5. The toe portion of the doubler, treated with the resinous pasty mass and with the curing agent as described above, will remain workable during the time which elapses in common shoe-factory practice until the shoe is lasted, the rapidity of the cure depending upon the pH value. The assembled upper is conformed to the last and maintained in the shape thus imparted to it until the stiffening material has dried, whereupon there results a stiffened toe portion of the upper which is hard and resilient. Instead of making use of a lining member such as the doubler as described above, the stiffening material and the curing agent may be applied to a separate stiffener as indicated in Figure 5, which may be inserted in the assembled upper, the manner in which the stiffening substance and the curing agent are incorporated in the upper being immaterial. It will be understood that the stiffening substance, before being treated with the curing agent to change its pH value, is water-soluble and that the impregnated lining member or the separate stiffener may be allowed to dry if desired and then wet with an aqueous solution of the curing agent, the water serving to soften the stiffening substance and the curing agent changing its pH value. If desired, the toe portion of the lasted shoe may be heated, for example as shown in Figure 5, to hasten the drying.

The stiffened portion of the upper of a shoe, for example the toe portion, should be strong and hard so as to offer as great a resistance as possible to a force tending to deform it, and at the same time should be of a flexibility or resilience such that, if it is deformed, it will immediately resume its original shape. In other words, the stiffened portion should be as strong and hard as possible without being brittle. The aminoplast stiffening substances, of which the partial reaction product of urea and formaldehyde is a typical example, are, when cured, very hard and strong but also very brittle, the problem being to detract as little as possible from the strength of these substances and at the same time to increase their resilience. When such an aminoplast stiffening substance is used as an impregnant for a fabric base, particularly when a filler is present, the impregnated fabric possesses much more flexibility and resilience than does a film of the stiffening substance alone. It is desirable, however, that the stiffened portion while still retaining as much as possible of its hardness and strength, that is, of its capability to resist deformation, should be still more resilient, and hence the use of a toughening substance.

I have found that lubricating oils used as toughening substances give improved results. Various oils such as fixed vegetable oils of the non-drying or the drying type, examples of the former being castor oil and olive oil, and of the latter linseed oil and tung oil; animal oils of which neat's-foot oil and sperm oil are examples; and mineral oils such as "D. T. E. oil heavy medium" of the Standard Oil Company of New York and "Mineral oil," an oil of the same general nature as the D. T. E. oil but of lower viscosity, may be used, the oil in each case being emulsified in the resin syrup. In the case of the drying oils, the stiffening material should be used within a short time since the emulsion of such oils will thicken noticeably upon standing.

Below is an illustrative example of the stiffening material of the present invention.

	Parts by weight
Resin syrup (70% solids)	200
Triethanol amine	4
Castor oil	20–80
Water	40
Ground horse hair	70

Preferably about 40 parts by weight of oil are used.

A uniform dispersion is obtained by mixing the resin syrup, the triethanol amine and the castor oil. A homogeneous emulsion is obtained by mixing the water with the dispersion. A smooth paste is formed by mixing the emulsion with the filler of ground horse hair which is preferably of a fineness to pass through a 100-mesh sieve. It will be understood that other lubricating oils, such as those mentioned above, and mixtures of oils may be used in place of castor oil, and that the particular alkali and filler used is immaterial so far as the present invention is concerned. As to the use of water, there may be mixed with the water, if desired, a considerable amount of a water-miscible liquid, such for example as alcohol, which is more volatile than water and which will shorten the drying time.

It should be noted that the aminoplast stiffening substances are water-soluble products, by which is meant products which are completely soluble in cold water and also products which, while only a portion completely dissolves, yet retain a sufficient degree of solubility in the remainder so that the whole material may be used in an aqueous medium without requiring a protective colloid to prevent incompletely dissolved fractions settling out and destroying the uniform, homogeneous character of the fluid material. For instance, products are characterized as water-soluble which, in the form of a fine powder and without the addition of a protective colloid, may be mixed with water to form a syrupy liquid which may be applied to a fibrous base and when dried will provide an adherent substance of a homogeneous character.

I am unable to explain exactly how the oil acts, but a possible explanation may be that it acts both to increase the flexibility and toughness of the resin by lubricating the molecules thereof and also to lubricate the fibers of the fabric. In any event the stiffened portion of the upper of the shoe is more resistant to deformation and at the same time more resilient than has been the case hitherto.

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

1. The method of stiffening a portion of the upper of a shoe, said method comprising incorporating in a selected locality of the upper an aminoplast stiffening substance in uncured form in a liquid vehicle, a curing agent capable of causing the substance to be converted into a form which, when dry, is hard and water-resistant and a toughening substance in the form of an emulsified lubricating oil, imparting to the selected locality of the upper the desired shape, and main-

taining said shape while the stiffening substance hardens, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

2. The method of stiffening a portion of the upper of a shoe, said method comprising incorporating in a selected locality of the upper an aminoplast stiffening substance in uncured form in a liquid vehicle, a curing agent capable of causing the substance to be converted into a form which, when dry, is hard and water-resistant, a toughening substance in the form of an emulsified lubricating oil and a filler, imparting to the selected locality of the upper the desired shape, and maintaining said shape while the stiffening substance hardens, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

3. The method of stiffening a portion of the upper of a shoe, said method comprising incorporating in a selected locality of the upper an aminoplast stiffening substance in uncured form, a curing agent capable of causing the substance to be converted into a form which, when dry, is hard and water-resistant, a toughening substance in the form of an emulsified vegetable lubricating oil and a filler, imparting to the selected locality of the upper the desired shape, and maintaining said shape while the stiffening substance hardens, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

4. The method of stiffening a portion of the upper of a shoe, said method comprising incorporating in a selected locality of the upper an aminoplast stiffening substance in uncured form, a curing agent capable of causing the substance to be converted into a form which, when dry, is hard and water-resistant, a toughening substance in the form of emulsified castor oil and a filler, imparting to the selected locality of the upper the desired shape, and maintaining said shape while the stiffening substance hardens, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

5. The method of stiffening a selected portion of the upper of a shoe, said method comprising incorporating in a fabric lining member of an upper an aqueous solution of an aminoplast stiffening substance in uncured form, a curing agent capable of causing the substance to be converted into a form which, when dry, is hard and water-resistant and an emulsified lubricating oil, imparting to the selected portion of the upper the desired shape, and maintaining said shape while the stiffening substance hardens, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

6. The method of stiffening a selected portion of the upper of a shoe, said method comprising incorporating in a fabric lining member of an upper an aqueous solution of an aminoplast stiffening substance in uncured form, a curing agent capable of causing the substance to be converted into a form which, when dry, is hard and water-resistant, a filler and an emulsified lubricating oil, imparting to the selected portion of the upper the desired shape, and maintaining said shape while the stiffening substance hardens, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

7. The method of stiffening a portion of the upper of a shoe, said method comprising incorporating in a selected locality of the upper a stiffening substance in incompletely polymerized condition in an aqueous vehicle, a curing agent adapted to cause the polymerization to proceed and an emulsified lubricating oil, said stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances, with an aldehyde, imparting to the selected locality of the upper the desired shape, and maintaining said shape while the stiffening substance hardens, and said oil being at least 20% by weight of the solid stiffening substance.

8. A shoe upper ready to be conformed to a last, there being incorporated in a selected locality thereof a stiffening material comprising an aminoplast stiffening substance in uncured form in a liquid vehicle, a toughening substance in the form of an emulsified lubricating oil, and a curing agent, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

9. A shoe upper ready to be conformed to a last, there being incorporated in a selected locality thereof a stiffening material comprising an aminoplast stiffening substance in uncured form in a liquid vehicle, a toughening substance in the form of an emulsified lubricating oil, and a curing agent, the lubricating oil being at least 25% by weight of the solid stiffening substance, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde.

10. A shoe having a stiffened toe portion containing a cured aminoplast stiffening substance, a lubricating oil, and a filler, said aminoplast stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances with an aldehyde, and said oil being at least 20% by weight of the solid stiffening substance.

11. A shoe part comprising a fabric base carrying a stiffening substance stabilized in incompletely polymerized form and a lubricating oil, said stiffening substance being chosen from a

class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances, with an aldehyde, said oil being at least 20% by weight of the solid stiffening substance.

12. A shoe part comprising a fabric base carrying a stiffening substance stabilized in incompletely polymerized form and a lubricating oil, said stiffening substance being chosen from a class consisting of the partial reaction products of urea, thiourea, melamine, dicyandiamide and derivatives of these substances, with an aldehyde, the lubricating oil being at least 25% by weight of the stiffening substance.

RAYMOND P. HOFFERBERT.