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SHOE UPPER PROVIDED WITH PROTECTIVE SPRAY
COVER AND METHOD FOR FORMING SAME
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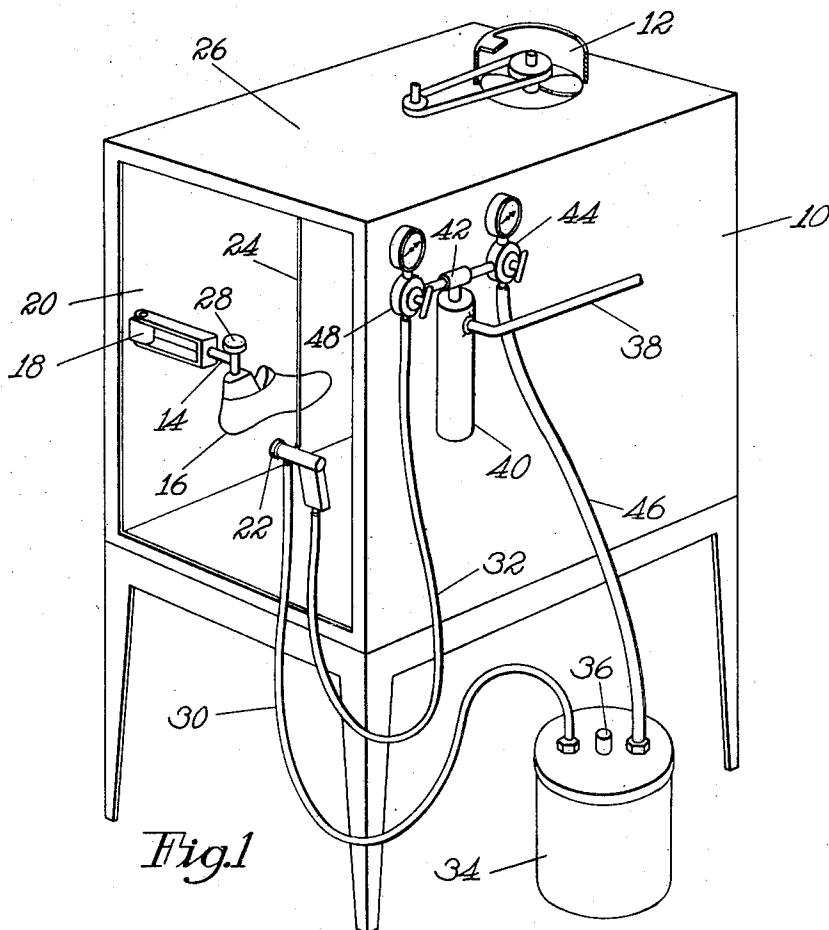


Fig. 1

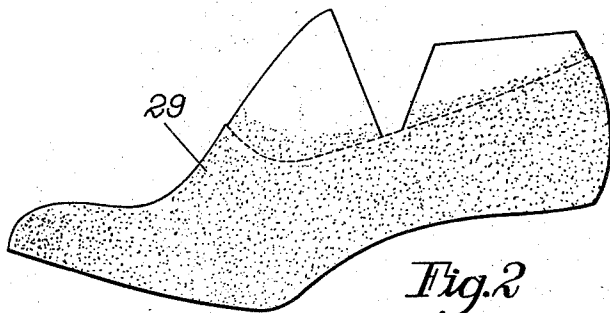


Fig. 2

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UNITED STATES PATENT OFFICE

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SHOE UPPER PROVIDED WITH PROTECTIVE
SPRAY COVER AND METHOD FOR FORM-
ING SAMECharles G. Newton, Jr., Newburyport, Mass., as-
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10 Claims. (Cl. 36-72)

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This invention relates to temporary protective covering of articles and particularly to a temporarily covered shoe and method of forming such cover for the prevention of injury to the shoe during shoemaking.

In the manufacture of shoes, the display surfaces of parts of the shoe upper, which may be of fabric and/or leather, may become soiled or stained during the shoemaking operations. The practice of providing temporary protective covers over the shoe upper has been employed in many instances, particularly with light colored or white shoe uppers. These covers have been of two types, namely preformed covers such as paper and covers formed by spraying a coating of a substance such as rubber latex on the upper.

An improved form of coating for shoe uppers, disclosed in the patent to John J. Brophy 2,396,313, dated March 12, 1946, involves the spraying on a shoe upper of a solution of a vinyl resin and plasticizer to form a shoe cover. In many cases thoroughly satisfactory protective coatings are formed. However, extreme care must be observed with certain types of shoe upper materials to prevent harm to the shoe upper from the material sprayed thereon.

It is required of protective shoe covers that they have toughness to withstand the stresses of shoemaking operations and that they adhere lightly to the materials of the shoe upper but not so strongly that the cover is difficult to remove. Notwithstanding care taken in the control of conditions of spraying, it has been found that, with certain of the shoe materials covered, previous coating compositions have harmed the finish of the shoe or dissolved color from the shoe surface so that the shoe, after removal of the cover, has presented an uneven spotty or streaky appearance. To a considerable extent this effect on the color of the shoe surface has been due to the presence of plasticizer, which has been required to give the desired physical characteristics to the shoe cover, and to the action of the solvents. These solvents which are satisfactory solvents for vinyl resins are relatively polar and as such display an affinity for like substances such as dyestuffs and certain of the finishes normally employed. It has also been observed with certain shoe materials, that the migration of the plasticizer from the coating to the surface of the shoe upper when the cover is left on the shoe upper for extended periods of time will cause an undesirable increase in the strength of the bond between the shoe upper in the shoe cover which has made it difficult to remove such covers from the shoes.

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It is a feature of the present invention to provide a temporary protective covering on shoes which does not attack the finish of the shoe upper and does not tend to develop excessive bond strength to the surface of the shoe upper upon standing.

Referring to the accompanying drawings,

Fig. 1 is a perspective of an apparatus which may be employed in practicing the method of the present invention; and

Fig. 2 is an elevation of a lasted shoe, to the upper of which there has been applied a protective coating according to the present invention.

I have made the surprising discovery that a readily removable, tough and strong layer or sheet of fibrous character, serving as a temporary protective covering for articles such as shoes, may be formed on the surface of such articles by spraying an unplasticized copolymer of styrene with isobutylene or butadiene on said surfaces. The coating does not attack the color or finish of the surface nor does it tend to develop an objectionably high bond to the surface upon long standing. This result is considered most unusual since, according to all prior developments, it has been important to employ as a base, a resin of high strength and to impart to such base the necessary flexibility and extensibility by addition of a plasticizer thereto. Hence, it was not expected that a spray covering could be formed of a material possessing in unmodified state the necessary physical characteristics needed to give protection to the shoe upper and at the same time provide a lightly adhering film readily removable as a unitary sheet from substantially all of the variety of shoe upper materials encountered. It is further observed that spray compositions of these copolymers exhibit on spraying a strong webbing effect. That is, the material as sprayed forms webs or fibers which are deposited in criss-cross relation on the surface to be protected and form a layer of partially coalesced fibers lightly adhering to the surface. This effect permits a given amount of spray material to be used to cover a greater area than would be the case with compositions not forming webs. Also gaps and irregularities in a surface to be covered are readily bridged.

The copolymer materials possessing properties which give them the unique ability to form novel and highly satisfactory unplasticized temporary coatings on articles such as shoe uppers are obtained by the copolymerization of styrene with an olefin or diolefin such as isobutylene or butadiene. Copolymers containing from 40% to 75%

of styrene have been found useful. Preferred styrene, isobutylene copolymers comprise from 50 to 60% of styrene; and preferred styrene, butadiene copolymers comprise from 50 to 70% of styrene. A copolymer which is particularly satisfactory consists of 60% styrene and 40% isobutylene and has an intrinsic viscosity of from 0.7 to 0.9, a durometer hardness (Shore) of from 80 to 90, and a Williams plasticity and recovery (70° C.—5 kg. load) of 380–20. It has an ultimate elongation percentage of from 250 to 300, and a tensile strength of 1500 to 2500 lbs. per square inch. A similar material which is very satisfactory consists of a copolymer of 50% styrene and 50% isobutylene which has an intrinsic viscosity of 0.7 to 0.8, a durometer hardness (Shore) of 50 to 63, a Williams plasticity and recovery (70° C.—5 kg. load) of 159–7, a tensile strength of from 1000 to 1500 lbs. per square inch, and an ultimate elongation in percentage of from 450 to 500. Other materials which can be used include a copolymer comprising 70% styrene and 30% butadiene which has a specific gravity of 1.03.

These copolymers are dissolved in a highly volatile organic solvent to form compositions which may be sprayed according to the method of the present invention to form highly satisfactory temporary protective covers. It is desired although not always necessary that the boiling point range of the solvent or solvent blend be such that at least 50% will be evaporated at temperatures below 50° C. Suitable solvents include chlorinated hydrocarbons such as methylene chloride and carbon tetrachloride, aliphatic hydrocarbons such as n-pentane and the amylenes, and aromatic hydrocarbons such as benzene.

These solvents may be employed either alone or in combination with others of the above solvents which are miscible. For example, a highly satisfactory solvent blend for the isobutylene-styrene copolymer will comprise a mixture of n-pentane and carbon tetrachloride containing 50 to 90% of n-pentane.

The coating compositions may comprise from 15% to 40% of the copolymer in the volatile organic solvent. It is preferred to use coating compositions in the higher range of concentrations of copolymer and a particularly satisfactory coating composition comprises a solution of 35% of the copolymer of 60% styrene and 40% isobutylene in a mixed solvent comprising equal quantities by weight of n-pentane and carbon tetrachloride.

The coating compositions may be sprayed on articles such as shoe uppers by any convenient spray apparatus. The apparatus shown in Fig. 1, which may be used in forming a temporary protective covering on shoes is similar to commercially available spray coating apparatus and comprises a generally rectangular compartment 10 open at one side and an exhaust vent 12 in the top, adjacent to the back side for withdrawal of solvent vapors. A support 14 for a lasted shoe upper 16 which is to be coated is pivotally carried by a bracket 18 which is secured to a wall 20 of the compartment 10, said support being so constructed that the shoe may be swung and turned in various paths so as to permit all localities on the upper of the shoe to be exposed to a spray which emerges from the spray gun 22. As shown, the gun 22 is suspended by means of a spring loaded pulley attachment 24 from the top side 26 of the compartment. In coating the upper of a shoe 16 the operator holds the spray gun

22 in one hand while with the other he manipulates the support 14 by means of a handle 28 and causes the spray to travel over the upper. Depending upon the nature of the upper of the shoe and of the material of which the spray is formed, the spray may be caused, if desired, to travel a plurality of times over the upper so as to build up a thin but uniform protective coating 29 (see Fig. 2). It has been found desirable to form coatings which have a thickness of from 0.005 to 0.020 when dry.

Leading into the spray gun 22 are two flexible pipes 30 and 32 which conduct, respectively, the viscous spray composition and the compressed air to the gun 22.

There is provided a container 34 from which the resinous material is supplied to the flexible pipe 30. A safety valve 36 is provided at the top of the container 34.

Compressed air from a source of supply (not shown) passes through a pipe 38, and then through an air purifier 40. From the purifier the air passes to a T 42 where it divides, and part passes through a pressure reducer 44 and thence through a flexible pipe 46 to the top of the container 34, while another part passes through a second pressure reducer 48 to the flexible pipe 32 and thence to the spray gun 22. In the operation of the apparatus the air is ordinarily supplied to the spray gun 22 at a pressure of from 20 to 120 pounds per square inch and to the container 34 at from 20 to 80 pounds per square inch.

The apparatus which has been thus briefly described forms no part of the present invention and any suitable apparatus may be employed.

The following examples of spray compositions which may be employed according to the present invention to form temporary protective covers on articles such as shoes are given to aid in understanding the invention. It is to be understood that the invention is not limited to the particular ingredients or proportions employed in the examples:

Example I

Parts by weight

Copolymer of 60% styrene and 40% of isobutylene	146.6
n-Pentane	135
Carbon tetrachloride	135

The copolymer material was dissolved in the mixture of n-pentane and carbon tetrachloride and the solution introduced into the coating material container of a spray apparatus such as that shown in Fig. 1. A lasted shoe upper was mounted on the support 14 of the apparatus and was sprayed with the above coating composition using a pressure of about 40 lbs. in the air line 32 and a pressure of about 20 lbs. on the material in the container 34. A covering was rapidly formed on the shoe and this cover was strong, flexible, and lightly adherent to the shoe upper and readily stripped off from the shoe after completion of shoemaking operations.

Example II

Parts by weight

Copolymer of 50% styrene and 50% of isobutylene	118.4
n-Amylene	140
Carbon tetrachloride	140

This material was employed to form a protective spray covering on shoe uppers in accordance with the procedure outlined in Example I. A very satisfactory, strong, lightly adherent, readily removable cover was obtained.

Example III

Parts by weight	
Copolymer of 70% styrene and 30% of butadiene	100
Benzene	200
Carbon tetrachloride	200

This material was sprayed on a shoe upper according to the procedure outlined in Fig. 1 and formed a satisfactory cover which possessed strength requisite to avoid rupture during further shoemaking operations and which was readily removable from the shoe after completion.

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

1. A method for forming on the surface of an article a tough, strong, lightly adherent film serving as a removable temporary protective cover which comprises injecting a coating solution into a high pressure, high velocity air blast to form a spray of fine droplets of the coating solution, and directing said spray of coating solution at the surface of the article, the coating solution comprising a film forming component and a solvent therefor, said film forming component consisting of an unplasticized copolymer of from 40% to 75% by weight of styrene with from 60% to 25% by weight of a member selected from the group consisting of isobutylene and butadiene, and said solvent comprising a highly volatile nonpolar organic solvent medium for the copolymer having a boiling range such that at least 50% of the solvent will boil below 50° C., the copolymer being present to the extent of from 15% to 40% by weight of the solution.

2. A method for forming on the surface of an article a tough, strong, lightly adherent film serving as a removable temporary protective cover which comprises injecting a coating solution into a high pressure, high velocity air blast to form a spray of fine droplets of the coating solution, and directing said spray of coating solution at the surface of the article, the coating solution comprising a film forming component and a solvent therefor, said film forming component consisting of an unplasticized copolymer of from 50% to 60% by weight of styrene with from 50% to 40% by weight of isobutylene, and said solvent comprising a highly volatile nonpolar organic solvent medium for the copolymer having a boiling range such that at least 50% of the solvent will boil below 50° C., the copolymer being present to the extent of from 15% to 40% by weight of the solution.

3. A method for forming on the surface of an article a tough, strong, lightly adherent film serving as a removable temporary protective cover which comprises injecting a coating solution into a high pressure, high velocity air blast to form a spray of fine droplets of the coating solution, and directing said spray of coating solu-

tion at the surface of the article, the coating solution comprising a film forming component and a solvent therefor, said film forming component consisting of an unplasticized copolymer of from 50% to 70% by weight of styrene with from 50% to 30% by weight of butadiene, and said solvent comprising a highly volatile nonpolar organic solvent medium for the copolymer having a boiling range such that at least 50% of the solvent will boil below 50° C., the copolymer being present to the extent of from 15% to 40% by weight of the solution.

4. The combination of a shoe upper and a tough, strong, temporary protective covering lightly adhering to said upper, said covering being formed by the process of claim 1 from a coating solution and being composed of partially coalesced fibers, said fibers cohering so strongly that the covering may be readily stripped from the upper as a sheet.

5. The method as claimed in claim 2 wherein the highly volatile organic liquid solvent for the copolymer comprises from 50 to 90% n-pentane and from 10% to 50% carbon tetrachloride.

6. The method as claimed in claim 3 wherein the highly volatile organic liquid solvent for the copolymer comprises a solvent blend including at least 50% benzene.

7. The combination of a shoe upper and a tough, strong, temporary protective covering lightly adhering to said upper, said covering being formed by the process of claim 2 from a coating solution and being composed of partially coalesced fibers, said fibers cohering so strongly that the covering may be readily stripped from the upper as a sheet.

8. The combination of a shoe upper and a tough, strong, temporary protective covering lightly adhering to said upper, said covering being formed by the process of claim 3 from a coating solution and being composed of partially coalesced fibers, said fibers cohering so strongly that the cover may be readily stripped from the upper as a sheet.

9. The method as claimed in claim 2 wherein the highly volatile organic liquid solvent for the copolymer comprises a solvent blend including at least 50% n-pentane.

10. The method as claimed in claim 2 wherein the highly volatile organic liquid solvent for the copolymer comprises a solvent blend including at least 50% n-amylene.

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