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METHOD FOR FORMING REMOVABLE PROTECTIVE COVERINGS

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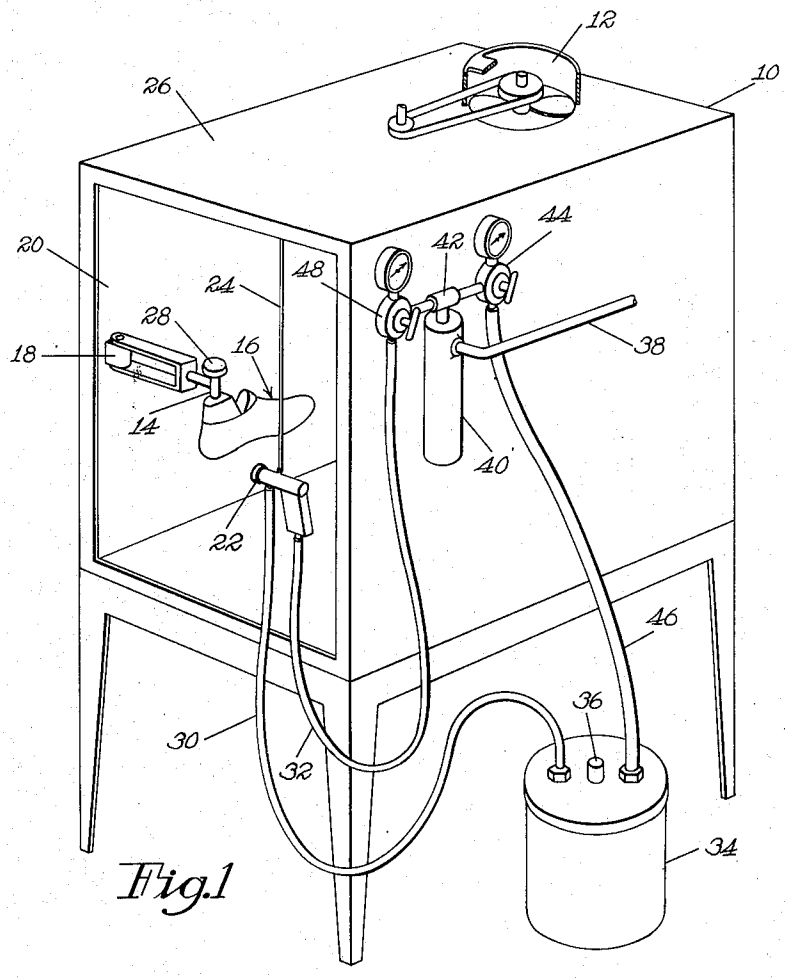


Fig.1

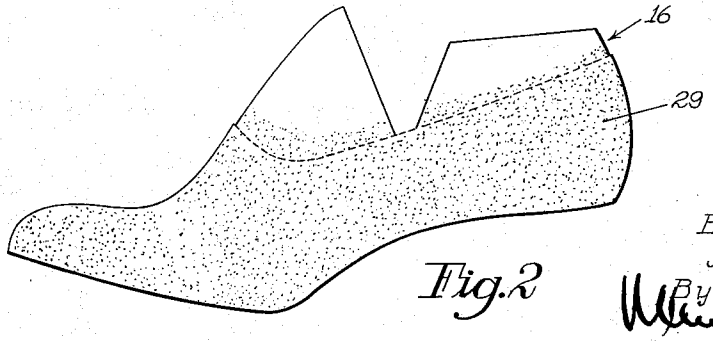


Fig.2

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METHOD FOR FORMING REMOVABLE PROTECTIVE COVERINGS

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2 Claims. (Cl. 117—6)

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This invention relates to an improvement in methods for forming temporary protective coverings on articles, particularly shoes.

In the manufacture of shoes, the display surfaces of certain parts, such as those which make up the upper and commonly consist of leather and/or fabric, may become stained or soiled during various shoemaking operations.

Extensive efforts have been made to provide temporary protective covers on shoes by spraying thereon solutions of various materials. Many different solutions possessing characteristics generally regarded as fitting them for spray application were tried, but in every case difficulties were encountered which prevented their use for covering shoes. The difficulties were due in part to the wide variety of shoe materials to be covered, such as suede, polished calf, kidskin, fabric, plastic decorated shoes, and many others, and in part to the exacting requirements made of shoe covers in the treatment to which the covered shoes must be subjected. Solutions of which sprayed droplets cohered sufficiently to give covers of sufficient toughness to withstand the stresses of shoemaking operations adhered so strongly to certain shoe materials that the cover could not be easily removed. Other spray compositions would not dry satisfactorily to permit handling of the covered shoe or gave papery, fragile covers. Another major difficulty was the action of the various spray materials on the finish of the shoe. A large proportion of the spray materials, including some which might otherwise have been satisfactory, destroyed the finish of the shoe or dissolved color from the shoe surface so that the shoe, after removal of the cover, presented an uneven spotty or streaky appearance.

To avoid these difficulties according to methods previously proposed, the coating material, for example a resin solution, was heated, and the air blast used to spray the resin solution was also heated so that the solvent would evaporate more rapidly in passing from the spray gun to the article to be coated and the resin would be softened somewhat by the heat so that it would adhere to the article and would cohere to adjacent resin particles to form the readily removable cover. However, while the heat aided in obtaining a satisfactory cover from a mechanical standpoint, the residual heat in the resin on the surface of the article increased the tendency of the coating composition to pull color from the surface of the article.

It is a feature of the present invention to provide a method and composition for protective

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covering of shoes or like articles which form a strong, tough, lightly adherent, readily removable cover and which does not harm the finish of articles such as shoe uppers to which the covering is applied.

Referring to the accompanying drawing,

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

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

In accordance with the present invention, a highly viscous solution of a film-forming resin, preferably a vinyl copolymer resin, in a mixture of a highly volatile organic solvent and a highly volatile organic non-solvent in certain ranges of proportions, is sprayed, preferably at room temperature, on a shoe or like article by a high pressure, high air-velocity spray gun whereby the highly viscous material is broken into fine droplets which are deposited upon the article to be coated.

The viscous solution employs a high ratio of resin to active solvent such that the resin solution would be a gel but for the presence of the non-solvent. The ratio of resin to solvent may be 1 part of resin to from 2½ to 4 parts of volatile organic solvent. Because of the high ratio, the amount of active solvent which must be evaporated to precipitate or gel the resin is small. The non-solvent may be employed in the ratio of from 1 to 3 parts of non-solvent to 1 part of solvent. The non-solvent appears to aid in breaking up the spray composition to form smaller droplets than would be the case in the spraying of a composition not comprising a mixture of active solvent and non-solvent liquid. The high velocity jets of air in the spray apparatus cause rapid evaporation of the solvent from the droplets at a greater rate than the non-solvent so that the initially viscous spray material reaches a gel stage in passing from the spray apparatus to the surface of a shoe. The gelled droplets unite with other droplets on the surface being coated to form a strong film but will adhere only lightly to the article being coated. The residual liquid in the material deposited on the surface of the shoe is largely non-solvent and does not pull color or otherwise harm the finish.

A preferred spray composition may comprise from 8% to 22%, preferably about 16%, of a copolymer of vinyl chloride and vinyl acetate containing from 85% to 91% of vinyl chloride. The resin is dissolved in a mixture of from 25% to 50%

by weight of a highly volatile, polar organic solvent, preferably propylene oxide and up to 75% of a non-inflammable, volatile, non-polar organic liquid miscible with the solvent but non-solvent for the resin, such as carbon tetrachloride. Other solvents for the resin which may be used are polar liquids boiling below about 100° C., such as the ketones, methyl ethyl ketone, acetone, and methyl isopropyl ketone, ethyl acetate, and methylene chloride. Suitable non-solvent liquids are trichlorethylene, chloroform, isopentane, and benzene.

There may also be included in the composition a minor proportion in the order of ½% of methyl isobutyl ketone. The methyl isobutyl ketone apparently functions to promote drying of the sprayed material by keeping the film open to permit escape of solvent.

A limited amount of plasticizer, for example, 5%, based on the total weight of the composition, may be employed. It is preferred to use relatively high molecular weight plasticizers such as Flexol 3-GH obtained from the Carbide and Carbon Chemical Corp., and which is understood to be triethylene glycol di-2-ethyl butyrate.

It is important that spray compositions for forming the improved protective coating have a viscosity from about 1000 to 3000 centipoises. This viscosity, in combination with the other factors above noted, insures that the material will form a coherent film which does not adhere excessively to the shoe or other article to be coated and which does not harm the finish on the shoe or other article.

To effect spraying of the viscous composition, there may be employed a commercial spray gun constructed to spray at pressures somewhat above pressures normally used in spray applications.

The illustrated apparatus (see Fig. 1) 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 80 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.

In order to operate effectively in spraying the viscous composition, high spraying pressures are employed. The pressure on the air supplied to the air jets of the spray head may be from 80 to 120 pounds per square inch, and the pressure on the material within the receptacle to force the material to the nozzle of the spray gun may be from 20 to 80 pounds per square inch. The air jets of the spray gun when operated at this pressure break up the spray material into fine particles. The ratio of air to material sprayed is quite high so that a substantial portion of the solvent is evaporated prior to the droplets of material reaching the shoe. For most efficient operation it is desirable that the ratio of air to material be sufficiently high that at least 50% of the true solvent be evaporated within six inches of the spray nozzle. By way of illustration, very satisfactory results have been obtained employing spray gun equipped with a nozzle having an orifice for the spray material of from 0.015 to 0.050 inch in diameter and having a number, e. g., from 8 to 16 of air jet orifices from 0.005 to 0.065 inch in diameter. (A suitable nozzle is De Vilbiss nozzle #763.) Employing this spray gun under the conditions noted above the ratio of volume of air to the volume of solution may be one cubic foot of air to from four to forty grams of solution. Using this high ratio of air to material sprayed and the high pressure, high velocity air jets in the spray gun, satisfactory reduction in the solvent content of the droplets of the novel spray composition, has been achieved to form a satisfactory protective cover where the spray gun nozzle is held a distance as low as 2 to 3 inches from the shoe being sprayed. This ability to spray with the gun operated only a short distance from the article is of substantial importance in reducing the quantity of material and the time required to coat a shoe.

With the coating so applied using a highly viscous solution of resin in the defined mixture of solvent and non-solvent, and using the high air pressure spray, it is found that the coating is sufficiently dry and tough to permit handling of a shoe as soon as the coating is applied without special means for supporting the coated shoe out of contact with other articles and without forced drying.

The following example is illustrative of the use of the spray method in providing a protective covering on a suede leather shoe. It is to be understood that the method is applicable to the protection of other materials such as smooth leather or fabric, and that the details of the process may be varied within the ranges noted above.

A solution was prepared comprising the following ingredients in the following proportions.

16% Vinylite VYNS
39.5% carbon tetrachloride
39% propylene oxide
5% plasticizer Flexol 3–GH
½% methyl-isobutyl-ketone

Vinylite VYNS, a product of the Carbide & Carbon Chemicals Corporation of New York, is a copolymer comprising from 88.5 to 90.5% of vinyl chloride. Plasticizer Flexol 3–GH is a product of the same corporation and is understood to be triethylene glycol di-2-ethyl-butyrate.

The above solution was disposed within the spray material container of a suitable spray apparatus such as that shown in Fig. 1. A pressure of forty pounds was applied to the top of the material container to force the spray composition to the spray nozzle. An air pressure of 100 pounds was supplied to the air jets of the spray gun.

A suede leather shoe on a last was mounted on the bracket of the spray apparatus and was sprayed holding the spray gun nozzle at a distance of from 4 to 6 inches from the surface of the shoe. A coating was built up on the shoe of a thickness such that after drying it was about 0.01 inch in thickness. The major portion of the propylene oxide evaporated in passing from the spray gun nozzle to the surface of the shoe, and the resulting film was sufficiently firm immediately after spraying of the shoe so that the shoe could be handled and placed in a rack. After carrying out the usual shoe manufacturing operations on the protected shoe cover, the cover was slit along the crevice between the upper and the sole by a heated blade and the cover was readily stripped off in a single piece.

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

1. A method for forming on a shoe upper a tough, strong, lightly adherent film serving as a removable temporary protective cover which comprises injecting a highly viscous solution of a vinyl resin into a high pressure, high velocity air blast to form a spray of fine droplets of the resin solution, the resin solution having a viscosity of from 1000 to 3000 centipoises and comprising 1 part by weight of resin, from 2½ to 4 parts by weight of a highly volatile polar organic solvent liquid for the resin and a highly volatile non-polar organic liquid non-solvent for the resin in the ratio of from 3 to 1 parts to 1 part by weight of the organic solvent, the organic solvent and non-solvent liquids having a boiling point of not over 100° C, the ratio of the volume of air to the volume of solution being such that at least 50% of the volatile organic solvent is evaporated within 6 inches of the point of formation of the spray, holding a shoe upper within the spray to form a coating of the resin thereon, discontinuing application of spray material and evaporating the remainder of the organic liquids.

2. A method for forming on a shoe upper a tough, strong lightly adherent film serving as a removable temporary protective cover which comprises injecting a highly viscous solution of a vinyl resin in an organic liquid into a high-pressure, high-velocity air blast to form a spray of fine droplets of the resin solution, the solution comprising from 8 to 22% by weight of a copolymer of vinyl chloride and vinyl acetate containing from 85 to 91% of vinyl chloride in a volatile organic liquid comprising carbon tetrachloride and from 25 to 50% by weight based on the weight of the organic liquid of propylene oxide, the resin solution having a viscosity of from 1000 to 3000 centipoises, the ratio of the volume of air to the volume of solution being such that at least 50% of the propylene oxide is evaporated within 6 inches of the point of formation of the spray, holding a shoe upper within the spray to form a coating of the resin thereon, discontinuing application of spray material and evaporating the remainder of the organic liquid.

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