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2,431,684

METHOD OF SPRAYING A TEMPORARY PROTECTIVE COATING

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2 Sheets-Sheet 1

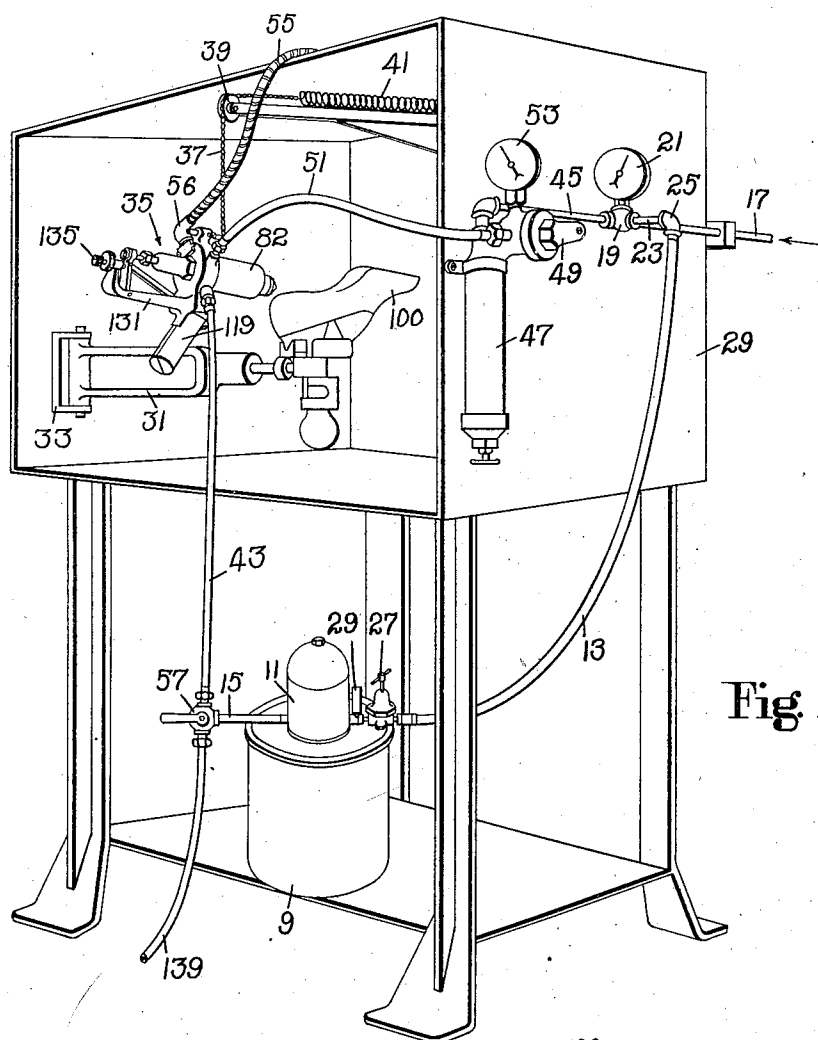


Fig. 1.

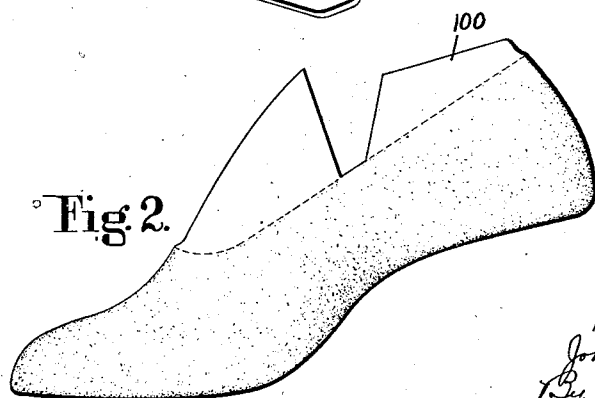


Fig. 2.

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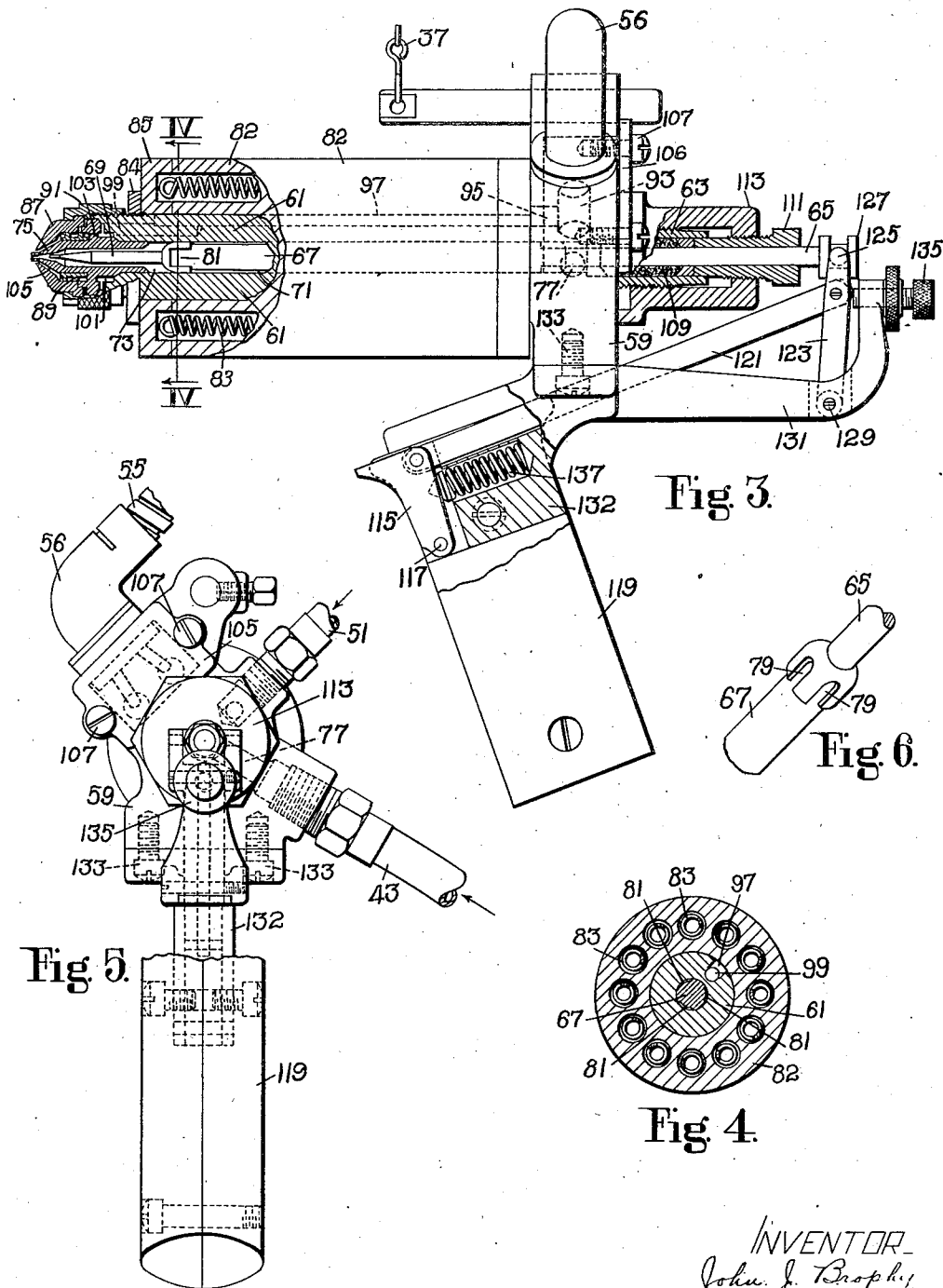
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METHOD OF SPRAYING A TEMPORARY PROTECTIVE COATING

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2 Sheets-Sheet 2



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METHOD OF SPRAYING A TEMPORARY
PROTECTIVE COATING

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5 Claims. (Cl. 117-6)

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This invention relates to a method of spraying an article to provide upon it a protective coating, and is herein set forth as a method of providing an upper of a shoe with a temporary coating which may readily be peeled off when it has served its purpose.

In the manufacture of shoes it is customary to spray upon the display side of the upper material, either before or after the upper material is conformed to a last, a material which will form a temporary coating to protect the upper material from being soiled or stained during certain shoe-making operations, this coating being adapted to be peeled off when it has served its purpose.

Such a method of spraying the upper of a lasted shoe, using a compound containing a resinous substance, specifically, a vinyl resin, and a liquid which, when hot, is a solvent for the resinous substance, is disclosed and claimed in my prior application, Serial No. 447,116, filed June 15, 1942, now United States Patent No. 2,396,313, dated March 12, 1946, which is a division of application Serial No. 348,096, filed July 29, 1940. In said patent there is set forth a method in which a resin is treated for several hours under heat with a liquid which is a solvent for the resin only at elevated temperatures. The spray material, thus prepared, is placed in the reservoir of a spray apparatus; and from this reservoir leads a conduit through which the material is forced to the spray gun of the apparatus. In practicing such a method the preparation of the spray material requires a comparatively long time and the use of a comparatively large amount of heat. After the material has cooled, it is placed in the reservoir of the spray apparatus, and the reservoir is heated to render the material viscous, the conduit leading to the spray gun being also heated to maintain the material in a state of viscosity such that it will flow readily to the spray gun. The compressed air, which is supplied to the spray gun, is also heated to convert the spray material into a thin liquid so that the compressed air may break it into a spray.

According to the present invention, the spray material is prepared in the cold by mixing a powdered colloidal macromolecular substance with a liquid, which is a solvent for the substance only at elevated temperatures, to produce a cold, paste-like, non-sticky spray material which is placed in the reservoir or receptacle of a spray apparatus and is forced cold in a moving column through a cold conduit which leads from the

reservoir to the spray gun. In order to convert the spray material into a thin solution so that compressed air, which is also supplied to the spray gun, may break the solution into a spray, means are provided for heating the spray material as it passes through the spray gun. The method thus comprises treating a colloidal macromolecular substance in finely divided form with an unheated liquid which is a solvent for said substance only at elevated temperatures to produce a pasty, non-sticky material which is not suited to be broken into a spray, forming a moving column of said unheated material, heating the leading end only of the column to convert the leading end into a free-flowing solution, causing a blast of gas to break the solution into a spray, and directing the spray upon the article which is to be coated.

Referring now to the accompanying drawings, Fig. 1 is a perspective of an apparatus by the use of which the paste-like, non-sticky spray material may be used.

Fig. 2 is a perspective of a lasted shoe, the upper of which has been coated by use of the apparatus shown in Fig. 1;

Fig. 3 is a view partly in side elevation and partly in longitudinal section of the spray gun and certain conduits which lead into it;

Fig. 4 is a section on the line IV-IV of Fig. 3;

Fig. 5 is a rear elevation of a spray gun and certain conduits which lead into it; and

Fig. 6 is a detailed perspective of the rear portion of the valve member.

The spray material may be prepared by stirring a colloidal macromolecular substance in powdered form into an unheated liquid which is a solvent for the substance only at elevated temperatures. There results a pasty, non-sticky mass which consists essentially of the colloidal substance dispersed in the liquid and can be forced cold through a conduit of comparatively small cross section. Below are various examples.

Example I

	Parts by weight
Polyvinyl alcohol	16
Glycerine	9
Ivory Soap Flakes	3
Water	72

The polyvinyl alcohol is of a grade which is insoluble (although it may swell slightly) in cold water. A suitable polyvinyl alcohol is that put out by the du Pont Company under the designation "B 391 High Viscosity." The principal pur-

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pose of the glycerine is to serve as a plasticizer, and other hygroscopic substances, such as other polyhydric alcohols, may be used with or in place of it. The principal purpose of the Ivory Soap Flakes is to control stickiness of the resulting film or coating. It may be noted that an excess of glycerine may be used in place of the soap flakes.

The glycerine, Ivory Soap Flakes and water are mixed to form a solution, and into this cold solution powdered polyvinyl alcohol is stirred. The effect of this procedure is to wet each particle of the polyvinyl alcohol; and, at the end of an hour or so, there results a dispersion of the resin, the product resembling a thick paste or wet clay. Apparently each particle of the polyvinyl alcohol carries on its surface a film of the solution which consists principally of water. It may be that each particle is somewhat swollen by water which it has absorbed, but there is no dissolving of the polyvinyl alcohol such as would occur if hot water were used. What results is a slippery paste having a fairly large polyvinyl alcohol content which may readily be forced cold through a conduit of comparatively small cross section, for example by means of a grease gun. In order to avoid the expense involved in shipping to shoe factories a material which contains a large percent of water, a composition may be made by mixing the polyvinyl alcohol, the glycerine and the soap, and shipping this composition, in which case the shoe manufacturer has only to mix this composition with the proper amount of water.

Example II

	Parts by weight
Vinylite XYSG-----	8
Plasticizer 3GH-----	4
Acetone-----	88

Vinylite XYSG and Plasticizer 3GH are products of the Carbide and Carbon Chemicals Corp. of New York, the former being a vinyl acetal which results from the interaction of polyvinyl alcohol and butyraldehyde; and the latter (triethylene glycol di-2-ethylbutyrate) is a plasticizer particularly adapted for use with the so-called "X" resins, of which Vinylite XYSG is one.

Example III

	Parts by weight
Ethyl cellulose (50 centipoises)-----	6.00
Dibutyl phthalate-----	.09
Hi-flash naphtha-----	84.52
Isopropyl alcohol-----	9.39

The method of preparing the spray materials from the ingredients of Examples II and III may be the same as that which has been described with respect to the ingredients of Example I; and, if desired, as in Example I, the resin and the plasticizer may be mixed and shipped to the shoe manufacturer who may supply the liquid.

Referring now to Fig. 1, the cold, pasty, non-sticky material is placed in the reservoir or receptacle 9 of a force-feed device which, as herein shown, is a Service chassis dispenser put out by the Service Manufacturing Company of Erie, Pennsylvania. This device is designed particularly for use in automobile service stations to force grease into the various bearings of automobiles and consists of the receptacle 9 and a force-feed unit 11 into which leads a conduit 13 for compressed air, an outlet conduit 15 being provided for the material which is forced out. The dispenser is a commercial piece of appara-

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tus, the details of the construction of which form no part of the present invention. It will be sufficient to explain that the pressure exerted to force the contents of the receptacle out through the conduit 15 is many times greater, for example it may be 45 times greater, than the pressure of the compressed air which enters the unit through the conduit 13 to operate it, and that the construction is such that the pressure exerted to force the contents of the receptacle out through the outlet 15 is maintained constant regardless of whether or not material is permitted to flow through the conduit 15. There is thus exerted a pressure which is uniform at all times.

Compressed air is supplied to the conduit 13 from any suitable source. In the illustrated apparatus this air is led in through a conduit 17, passes through a T 19 having a pressure gage 21 mounted upon it, and thence through a conduit 23 and elbow 25 into the conduit 13. The air, as it reaches the gage 21, may have a pressure of say 100 pounds per square inch. In the conduit 13, just before said conduit enters the force-feed unit, there are a valve 27 and a pressure gage 29. The pressure of the air which enters the force-feed unit may be regulated by turning the valve and is indicated on the gage. Ordinarily the pressure of the air entering the unit is reduced to about twenty pounds per square inch.

The spraying apparatus, except for the dispensing device described above and the construction of the spray gun, which will be described later, is in general similar to that of the apparatus of my prior patent referred to above; but in the present apparatus neither the compressed air nor the spray material is heated before they are delivered to the spray gun. The apparatus comprises a generally rectangular compartment 29, open at one side, in which the spraying is done. A support 31 for a lasted shoe 100, the upper of which is to be coated, is pivotally carried by a bracket 33 which is fast to a wall of the compartment 29, 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 reached readily by the spray which emerges from the nozzle of the spray gun, indicated as a whole at 35. The gun is suspended by a chain 37 which runs over a small pulley 39 and is attached to one end of a light tension spring 41, the far end of which is fastened to a wall of the spray compartment. This manner of suspension permits the operator to grasp the handle of the gun and manipulate the gun freely.

The pasty spray material, which is forced out of the dispensing device through the conduit 15, flows up through a flexible conduit 43 into the rear end of the spray gun. Compressed air, as has been explained, is supplied to the apparatus through the conduit 17, and part of this compressed air flows through the conduit 13 to operate the dispensing device. The other part of the compressed air flows through a conduit 45, an air filter 47 and a pressure-control valve 49 into a flexible conduit 51 which also leads into the rear end of the spray gun. The pressure of the air which enters the gun is indicated on a gage 53 and is ordinarily about eighty pounds per square inch. The spray material, as it enters the rear end of the spray gun in its cold pasty state, is not suited to being broken into a spray; and, in order to convert it as needed into a thin solution which the compressed air may break into a spray, the forward end of the spray gun is heated by an electrical unit connected through an elbow 56

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with a two-wire, flexible, armored cable 55, a rheostat (not shown) being provided for controlling the amount of the current. The outlet conduit 15 of the dispensing unit is connected to the flexible conduit 43 by a three-way valve 57 for a purpose which will be described later.

Referring now more particularly to Figs. 3 to 6, the construction of the spray gun will be described. In order to convert the pasty spray material, which enters the rear end of the spray gun in a moving solid column, into a form in which a blast of air may break it into a suitable spray, this moving column is forced through an elongated annular chamber of such dimensions that there is formed a moving annular column, the wall of which is very thin; and to this thin-walled annular column of spray material heat is applied. Before the leading end of this annular column reaches the nozzle of the spray gun it is a thin solution. In this form it encounters the blast of air which breaks it into a spray.

The spray gun comprises a base 59 having projecting horizontally from one side at right angles to it a hollow cylindrical member 61; and, aligned with this member 61 and projecting from the opposite side of the base, is a hollow member 63 which serves as part of a stuffing box, presently to be described, for the stem 65 of a valve member which comprises the stem 65, a rod 67 and a needle valve 69, these three portions of the valve member being integral. The rod throughout all of its length, except at the opposite ends thereof, is of a diameter slightly less than the diameter of the bore in the hollow cylindrical member 61, so as to provide a passageway 71 annular in cross section and of a width of about .020 of an inch into and through which the spray material is forced. The pasty spray material is forced into the right-hand end of this annular passage and is heated as it flows through the passage to convert it into a thin solution, in which form it issues from the left-hand end of the passage 71 into a chamber 73, from whence it flows to the left in a passage around the needle valve 69 through an inner nozzle 75 where it encounters a spirally flowing blast of air which breaks it into a spray. The spray material is forced from the receptacle 9 through the conduit 43 and a bore 77 into an annular chamber in the base 59 around the stem 65. In order to permit the material to be forced to the left and thus to enter the elongated annular chamber or passageway 71, the enlarged rear end of the rod 67, which fits slidably in the bore in the cylindrical projection 61, has cut in it three spaced channels or slots 79, two being shown in Fig. 6. In order to permit the spray material to flow from the left-hand end of the annular passageway 71 into the chamber 73, three similar channels 81 (Fig. 4) are cut in the enlargement at the left-hand end of the rod 61.

In order to heat the spray material as it passes through the passageway 71, a heating element surrounds the cylindrical projection 61, said element comprising a hollow cylindrical porcelain base 82 having a plurality of longitudinal holes through which passes back and forth a spiral of wire 83, the ends of which are fastened to the ends of the line wires which are brought in through the elbow 56 and the armored cable 55. The heating unit is held in place by having its right-hand end clamped against the base 59 by means of a collar 84 threaded on the left-hand end of the cylindrical projection 61 and engaging a cap 85 of the heating unit.

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The nozzle of the gun really comprises two nozzles, the inner one 75 for the liquid spray material and an outer one 87 for the compressed air. These two nozzles 75 and 87, as well as a small triple-threaded helix 89, the purpose of which is to cause the compressed air to whirl properly, are held in place by a nut 91, the left-hand end of which has an internal shoulder to contact with an external shoulder on the air nozzle 87, and the right-hand end of which is screwed on the threaded end of the cylindrical projection 61.

The compressed air, as has been stated, is forced through the conduit 51. It enters a tapped hole 93 in the base 59 from which leads a small hole 95 which in turn leads into a long passageway 97. The passageway 97 is a slot cut in the projection 61, the top of the slot being closed by the adjacent portion of the wall of the bore in the heating unit 82. The left-hand end of the passageway 97 is open through its bottom into the upper portion of the right-hand end of a small bore 99 which connects with a small annular chamber 101. The compressed air thus passes into this chamber. From this chamber three small passageways, one of which is shown at 103, lead into the chamber which contains the triple-threaded helix 89. The threads of the helix together with the walls across their peripheries form spiral channels, all three of which lead into a generally conical chamber 105 annular in cross section, formed between the inner nozzle 75 through which the liquid spray material is delivered and the outer nozzle 87 through which heated compressed air is delivered in a whirl produced by the triple-threaded helix 89. The spray material, which is forced up to the gun in a cold moving column of paste-like consistency, is thus liquified as it passes through the gun and is delivered from the gun in the form of a hot spray.

The opening in the rear of the base 59, which gives access to the junction box where the wires in the armored cable 55 are connected to the ends of the spiral wire of the heating unit, is closed by a plate 106 fastened to the base 59 by screws 107. In order to prevent spray material which is forced into the base 59 from escaping to the right from said base, the stem 65 of the valve member passes through a stuffing box. To this end the stem passes through packing 109 which may be compressed by turning a thumb screw 111, the stem of said screw being threaded through a hole in the right-hand end of a cap 113 which is threaded on exterior threads on the hollow member 63.

The valve member is slidable longitudinally of the spray gun and is normally held to the left with the needle valve 69 in closed position by a compression spring 137 later to be described. In order to promote clearness of illustration the valve member has been shown in its extreme right-hand position with the needle valve 69 open, a position which it may occupy only when the operator is grasping the handle 119 of the gun and pressing with his forefinger against a trigger 115 to swing it, against the force of the spring 137, about a pivot 117 carried by a casting 132 to which the two parts of the handle are fastened. To the upper end of the trigger is pivoted one end of a link 121, the other end of which is pivoted at a point between the ends of a substantially upright arm 123. The upper end of this arm is forked and carries rolls 125 which are received in an annular groove in a spool 127, said spool being fast to the

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end of the stem 65. The lower end of the link 123 is pivoted at 129 to an arm 131 which projects from the casting 132 and is fastened to the bottom of the base 59 by screws 133. This arm 131 has an upwardly extending rear end through which is threaded a stop screw 135, the right-hand end of the link 121 being urged at all times away from this screw by the compression spring 137 which is located in a bore in the casting 132 and bears against the trigger 115. The needle valve 69 is thus normally closed, and no spray material can flow through the nozzle of the gun. The operator, who grasps the handle, can manipulate the gun and can control the amount of spray material delivered by pressing upon the trigger 115 to swing it about the point 117. At the end of a day's run, it is desirable to clean out the spray gun by removing from it all of the spray material. To this end, while the needle valve 69 is held open, the three-way valve 57 (Fig. 1) is turned to close the outlet conduit 15 from the receptacle 9 and to put into communication with the conduit 43 a conduit 139. Water is then forced through this conduit 139, the conduit 43 and the spray gun, whereby spray material is cleaned out of the conduit 43 and the spray gun.

All the subject matter common to the present application and my prior patent identified above, is claimed in said prior patent, the present application being concerned only with the preparation and use of a cold, paste-like spray material, the conversion of such a material into a solution and the breaking of the solution into a spray.

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 of providing on a fabricated article a temporary protective coating, said method comprising treating a finely divided macromolecular film-forming colloidal substance with an unheated liquid which is a solvent for the substance only at an elevated temperature to produce a pasty, non-sticky material, forming a moving column of said unheated non-sprayable material, heating the leading end only of the column to convert it into a free-flowing solution, causing a blast of gas to break the solution into a spray, and directing the spray upon the article.

2. A method of providing on a fabricated article a temporary protective coating, said method comprising treating a finely divided resinous film-forming substance with an unheated liquid which is a solvent for the substance only at an elevated temperature to produce a pasty, non-sticky material, forming a moving column of said unheated non-sprayable material, heating the leading end only of the column to convert it into a free-flowing solution causing a blast of gas to break the solu-

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tion into a spray, and directing the spray upon the article.

3. A method of providing on a fabricated article a temporary protective coating, said method comprising treating finely divided polyvinyl alcohol, which is insoluble in unheated water, with unheated water to produce a pasty, non-sticky dispersion of the polyvinyl alcohol, forming a moving column of the unheated non-sprayable dispersion, heating the leading end only of the column to convert it into a free-flowing solution, causing a blast of gas to break the solution into a spray, and directing the spray upon the article.

4. A method of providing on a fabricated article a temporary protective coating, said method comprising treating finely divided polyvinyl alcohol, which is insoluble in unheated water, with a plasticiser and unheated water to produce a pasty, non-sticky dispersion of the polyvinyl alcohol, forming a moving column of the unheated non-sprayable dispersion, heating the leading end only of the column to convert it into a free-flowing solution, causing a blast of gas to break the solution into a spray, and directing the spray upon the article.

5. A method of providing on a shoe part a temporary protective coating, said method comprising dispersing finely divided polyvinyl alcohol which is insoluble in cold water in a solution in cold water of a plasticizer for the polyvinyl alcohol to produce a paste-like mass which contains a comparatively large proportion of polyvinyl alcohol, forming a moving column of the cold non-sprayable dispersion, heating the leading end only of the column to convert said leading end into a free-flowing solution, causing a blast of gas to break the solution into a spray, and directing the spray upon the shoe part.

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