

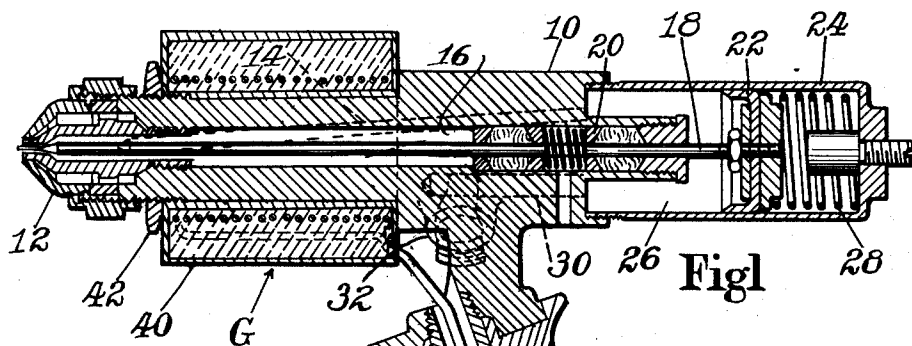
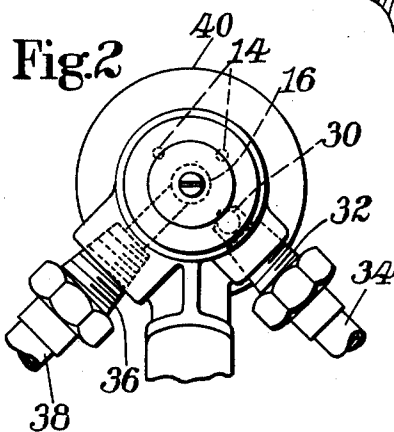
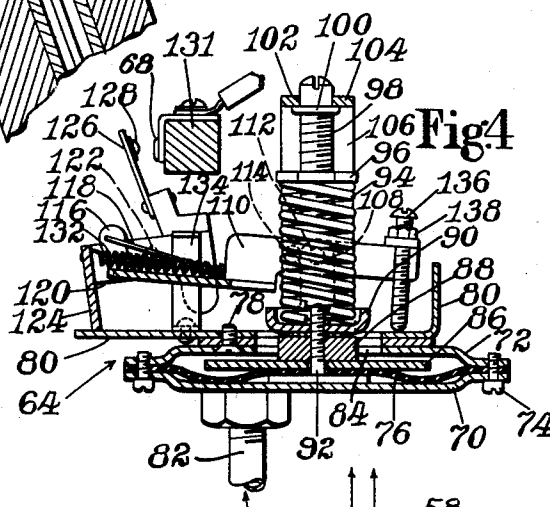
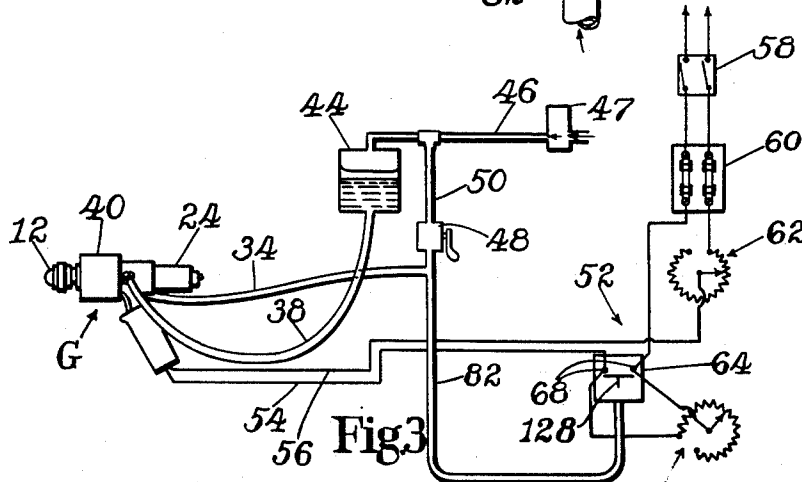
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2,362,634

SPRAYING APPARATUS

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SPRAYING APPARATUS

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4 Claims. (Cl. 299-140)

This invention pertains to apparatus for applying a coating to articles and more especially to means for spraying shoe parts with coating material.

The apparatus illustrated herein for spraying coating material comprises, in part, a conventional spray gun upon the barrel of which is placed a heating coil for heating the coating material as it passes through the spray gun. Under normal conditions the spray gun is used intermittently. That is, between each spraying operation there may be a considerable period of time and consequently if the same amount of heat is supplied to the spray gun when it is idle as is supplied to it when it is in operation to liquefy the coating material during its passage through the spray gun the temperature will build up to such an extent that during the succeeding spraying operation the coating material may be overheated and thus spoiled, or, the gun may be damaged.

It is an object of the present invention to provide means for maintaining the spraying apparatus at a substantially constant predetermined temperature irrespective of whether it is in operation or is idle.

In the illustrated apparatus, coating material is forced through a heating chamber to a spray nozzle by a fluid under pressure and is heated during its passage through the chamber by heating means associated with the chamber. A valve is provided for controlling the flow of the coating material and, in accordance with a feature of the invention, the valve is operable to cause the heating means to maintain a substantially uniform temperature in the chamber irrespective of whether the valve is open or closed.

The details of the apparatus will now be described with reference to the accompanying drawing, in which

Fig. 1 shows the spray gun, in section;

Fig. 2 shows an end elevation of the spray gun as seen from the right side of Fig. 1;

Fig. 3 shows a diagrammatic view of the spray gun, the air conduits connected thereto, and the heating circuit; and

Fig. 4 shows the details of the pressure-operated switch.

Most coating materials are quite viscous at room temperature and, accordingly, when applied to articles by a spray gun, means must be provided for heating the material before it reaches the spray gun or during its passage through the spray gun to make it liquid enough to be atomized. In the present apparatus a heat-

ing coil is placed about the barrel of the spray gun to heat the coating material which is forced therethrough, as will appear hereinafter.

In shoe manufacturing, the application of the coating material to shoe parts is not a continuous operation. That is, after each part is coated there is an appreciable interval before the next part is coated, and between one rack of shoe parts and the next there may be a considerable period of time. During the intervals when the spray gun is not being used and when no coating material is passing through it, the temperature builds up and, consequently, when the next coating operation is performed the coating material may be overheated to such an extent as to spoil its properties as a covering agent. Furthermore, there is also the danger of overheating the spray gun itself. To prevent this, the motivating means for driving the coating material through the spray gun and a pressure-operated switch controlling the electric circuit for heating the spray gun are interconnected in a manner to maintain the spray gun at a substantially uniform temperature regardless of whether the coating material is or is not passing through it.

Referring to Fig. 1, the spray gun G is shown as comprising a barrel 10 having a nozzle 12 at one end, interior passages 14, 14 for delivering air and 16 for delivering coating material to the nozzle, and a needle valve 18 in the passage 16 for controlling the passage of the coating material through the nozzle. The needle valve 18 passes through a packing gland 20 at the rear of the barrel 10 and has fixed thereto at its end a piston 22. A cylinder 24 closed at one end is threaded on the rear end of the barrel and provides a chamber 26 for the piston 22. A compression spring 28 is interposed between the piston 22 and the closed end of the cylinder 24 to urge the needle valve toward a position to close the fluid passage 16 near the nozzle 12. A passage 30 in the body of the spray gun permits access of air under pressure to the chamber 26 and thus to the front side of the piston 22, thereby providing means to open the needle valve 18 against the opposition of the compression spring 28. A part of the air which gains access to the chamber 26 passes through the passages 14 to the nozzle 12 of the spray gun, thereby providing means for atomizing the coating material delivered to the nozzle through the passage 16. A nipple 32 (Fig. 2) is threaded into the barrel 10 of the spray gun and provides a connection between the barrel of the spray gun and an air conduit 34 (Fig. 3) by which air under pressure

is delivered through the passage 30 to the chamber 26. A second nipple 38 provides a connection between the fluid passage 16 in the barrel of the spray gun and a conduit 38 by which the coating material is delivered to that passage. To heat the spray gun, a heating coil 40 in the form of a sleeve is slipped over the barrel of the spray gun and held in place by a nut 42.

The coating material in a liquid or semisolid state is contained in a closed receptacle 44 (Fig. 3) which may be remote from the spray gun and may be of any desired capacity, preferably such that an operator may operate the spray gun for an entire day without refilling the receptacle. The coating material is conducted from the receptacle 44 to the spray gun through the conduit 38 which is connected to the bottom of the receptacle. An air conduit 46 is connected to the top of the receptacle and is connected to a source of air pressure, indicated generally by the reference character 47, whereby air under pressure may be delivered to the receptacle to force the coating material from the receptacle through the conduit 38 to the spray gun. The conduit 34 through which air is delivered to the chamber 26 of the spray gun is connected to the air conduit 46 by way of a valve 48 and a branch conduit 50. Thus, by manipulation of the valve 48, air may be permitted to enter the chamber 26 through the conduit 34 and passage 30, thereby opening the needle valve 18 and admitting the coating material to the nozzle. As soon as the valve 48 is closed, the air under pressure will be cut off and the spring 28 in the cylinder 24 will close the needle valve 18.

The heating coil 40 surrounding the barrel of the spray gun is connected in an electric circuit 52 by leads 54 and 56. The circuit consists of two variable resistances 62 and 66 connected in series to an outside power line by a knife switch 58. As illustrated, current from the knife switch 58 passes through a cut-out 60, the variable resistance 62, the variable resistance 66, and via the leads 54 and 56 to the coil 40. It is to be observed that the second resistance 66 is connected across the terminals 68 of a pressure switch 64 and may be short-circuited by it when fluid under pressure is admitted to operate it.

In Fig. 3 the pressure switch 64 is shown in a purely diagrammatic fashion, thereby to illustrate clearly the electric circuit. The pressure switch 64 is of a commercial type and is shown in detail in Fig. 4. The switch comprises a pair of dished disks 70 and 72 fastened together face to face by screws 74 threaded through the peripheral portions thereof, and between the disks is clamped a flexible diaphragm 76. The upper disk 72 is fastened by screws 78 to the base plate of a box 80 forming the body of the switch. A conduit 82 is connected at one end to the lower disk 70 and at its opposite end to the valve 48. Thus, air under pressure may be delivered through the conduit 82 to the underside of the flexible diaphragm 76 to cause it to expand. The expansion of the diaphragm is employed to close the terminals of the switch. To this end, a central aperture 84 is provided in the upper disk 72 and a plate 86 is attached by a screw 92 to the upper side of the flexible diaphragm 76 and rises with it into contact with the lower side of the disk 72, which thus limits the expansion of the diaphragm. Rising with the plate is a block 88 and cup 90 which are retained on the top of the plate 86 by the aforesaid screw 92. A finger

108 projects upwardly from one side of the cup 90, and an arm 110 is pivotally attached thereto at 112, the arm also being pivotally attached at 114 to one of a pair of upstanding legs 106 fastened at their lower ends to the base 80. Accordingly, upward movement of the cup causes the arm 110 to tilt counterclockwise about the pivot 114. At one end of the arm 110 there is formed a projection 116, to the end of which is pivotally attached a rod 118. A bar 120 is pivoted at 122 upon one wall of the box 80, one end of the bar having a depending leg 124 which is adapted to rest upon the base of the box 80 and the other end of which carries an upright 126 having a contact 128 thereon operable to bridge the terminals 68. The terminals 68 are mounted on a strut 131 extending between and fastened to the opposite sides of the box 80. The contact 128 is snapped into and out of engagement with the terminals 68 by a spring 132 which is fastened at one end to the rod 118 and at its other end to the leg 124. As illustrated, when the arm 110 is caused to tilt about the pivot 114 in a counterclockwise direction, the end of the rod 118 fastened to the projection 116 is brought down below the pivot point 122, and the spring 132, which is now exerting an upward pull, causes the bar 120 to tilt in a clockwise direction about its pivot 122, thereby to snap the contact 128 into engagement with the terminals 68. Thus, the resistance 66 is short-circuited. When the air pressure is cut off, the diaphragm 76 is collapsed, that is, returned to its lowermost position by a spring 94. To this end, the spring 94 is seated at one end in the cup 90 and is held under compression by an adjustable nut 96 threaded on a screw 98, thereby urging the diaphragm downwardly. The upper end of the screw is provided with a flanged head 100 which projects through an aperture 102 formed in a horizontal plate 104 joining the upper ends of the upstanding legs 106. Clockwise movement of the arm 110 causes the rod 118 to rise above the pivot 122, as shown in Fig. 4. The spring 132 thus exerts a downward pull and causes the bar 120 to tilt in a counterclockwise direction to break engagement between the contact and terminals, thereby to cause the current to pass through the resistances 62 and 66 in series. A strap 134 fastened to the base 80 limits the upward movement of the rod 118. The clockwise movement of the arm 110 is limited by a screw 136 threaded through the end of the arm 110 and adjustably secured therein by a lock nut 138. The conduit 82 leading to the pressure switch 64 is connected to the main air conduits 46 and 50 through the valve 48 so that when air is admitted to the spray gun, air is also admitted to the pressure-operated switch 64 and, consequently, when the coating material is being forced through the spray gun, the contacts of the pressure-operated switch remain closed. As a result, a maximum of current passes through the heating coil 40 because of the fact that the second resistance 66 is shunted or short-circuited out of the circuit. When the valve 48 is turned to a position to cut off the flow of air to the spray gun, air is also cut off from the pressure-operated switch so that the contacts are separated, thus cutting the second resistance 66 back into the circuit in series with the resistance 62. As a result, a minimum of current passes through the circuit and the amount of heat generated at the spray gun is reduced. It is to be observed that both the resistances 62 and 66 are variable

and by properly adjusting them the amount of current delivered to the heating coil 40 of the spray gun while it is in operation and the coating material is passing therethrough and the amount of current delivered to the heating coil 40 of the spray gun when no coating material is passing therethrough can be so balanced that the temperature of the spray gun will be uniform whether the gun is or is not in operation.

In using the apparatus, the operator throws on the main switch 58 which heats the coil 40 of the spray gun. When it is desirable to coat an article such as a shoe part, the operator directs the spray gun at the shoe part or holds the shoe part in front of the spray gun and turns the valve 48 which admits air under pressure to the piston-operated needle valve 18, thereby causing it to open and to permit the coating material to pass into the nozzle. Simultaneously, air is admitted to the underside of the diaphragm 76, and the contact 128 and terminals 68 are closed, thereby to short-circuit the variable resistance 66, which increases the current in the circuit so that the quantity of heat at the spray gun increases with the flow of the coating material through the spray gun. When the valve 48 is manipulated to cut off the air, the piston-operated needle valve 18 is closed by the spring 28. The diaphragm 76 is returned to its lowermost position by the spring 94, and the contact 128 and terminals 68 are separated so that the current again passes through both resistances 62 and 66, thus reducing the current in the circuit and consequently the amount of heat at the spray gun. By setting the variable resistances beforehand, a balance may be established so that the temperature of the spray gun may be maintained substantially constant. Thus the spray gun may be operated without overheating, whether it is used continuously or intermittently.

The method of forcing an unheated spray material to a spray gun and there heating it to liquefy it forms no part of the present invention but forms the subject matter of application Serial No. 461,435, filed October 9, 1942, in the name of John J. Brophy.

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

1. Apparatus for applying a spray coating to an object, said apparatus being used in connection with a source of fluid pressure and a source of electric power, said apparatus comprising a spray gun, a source of coating material, means for normally closing the nozzle of the spray gun, electrical means for heating the spray gun, said electrical heating means including a resistance and a switch operable to short circuit a part of the resistance when the nozzle is open, means whereby said fluid under pressure effects delivery of the coating material from said source to said spray gun and simultaneously opens said first-named means and operates said switch, and means for cutting off the flow of fluid under pressure to said first-named means and switch without affecting delivery of the coating material to the spray gun.

2. Apparatus for applying a spray coating to

an object, said apparatus being used in connection with a source of fluid pressure and a source of electric power, said apparatus comprising a spray gun, a source of coating material, means for normally closing the nozzle of the spray gun, electrical means for heating the spray gun, said electrical means including an electric circuit connecting said heating means to a source of electric power, a resistance and a switch operable to short circuit a part of the resistance when the nozzle is open, means whereby said fluid under pressure effects delivery of the coating material from said source to the spray gun and simultaneously opens said first-named means and operates said switch and atomizes the coating material as it is discharged from the nozzle, and means for cutting off the flow of fluid under pressure to said first-named means and switch without affecting delivery of the coating material to the spray gun.

3. Apparatus for applying a spray coating to an object, comprising a spray gun having material and air passages therein, a source of coating material, a conduit connecting said source to the material passage of the gun, a valve in said material passage for controlling the passage of coating material therethrough, a conduit connecting the air passage to a source of compressed air, means in said air passage to actuate said valve, heating means surrounding the spray gun, an electric circuit connecting the heating means to a source of electric power, resistance means in the circuit, a pressure-operated switch to short-circuit a part of the resistance, a conduit connecting the pressure-operated switch to said source of compressed air, and a valve between said source of compressed air and said second- and third-named conduits operable to admit compressed air simultaneously to the means for actuating said first-named valve and the pressure-operated switch.

4. Apparatus for applying a spray coating to an object, comprising a spray gun having material and air passages therein, a container for coating material, a conduit connecting said container to the material passage of the spray gun, a conduit connecting the container to a source of compressed air to force the coating material through the first-named conduit to the material passage of the spray gun, a valve in the material passage for controlling the passage of the coating material therethrough, a conduit connecting the air passage to the source of compressed air, pneumatically operated means in the air passage to actuate said valve, heating means surrounding the spray gun, an electric circuit connecting the heating means to a source of electric power, resistance means in the circuit, a pneumatically operated switch to short-circuit a part of the resistance, a conduit connecting the pneumatically operated switch to the source of compressed air, and a valve between the source of compressed air and the third- and fourth-named conduits operable to admit air simultaneously to the pneumatically operated means and switch.

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