Feb. 17, 1953 E. ROGERS 2,628,864

AEROSOL PAINT SPRAYING DEVICE

Filed Nov. 7, 1949

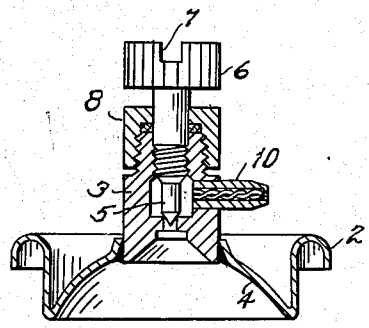

FIG. 2

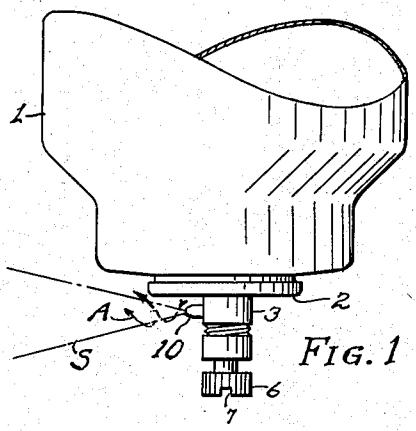

FIG. 1

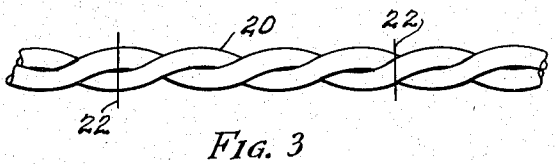

FIG. 3

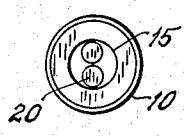

FIG. 5

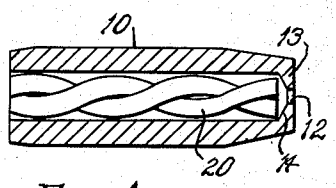

FIG. 4

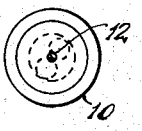

FIG. 6

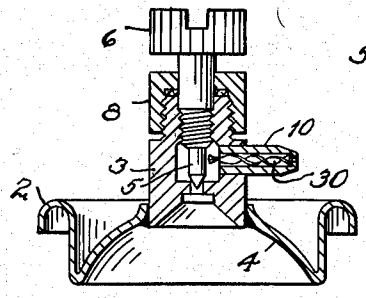

FIG. 8

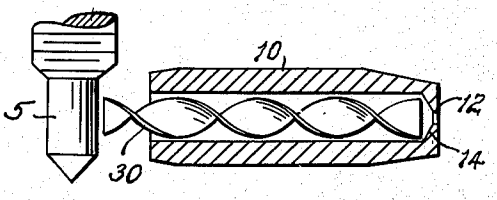

FIG. 7

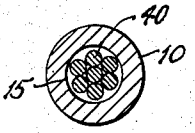

FIG. 9

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Patented Feb. 17, 1953

2,628,864

UNITED STATES PATENT OFFICE

2,628,864

AEROSOL PAINT SPRAYING DEVICE

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Application November 7, 1949, Serial No. 125,917

3 Claims. (Cl. 299—95)

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This invention relates to a nozzle construction for creating a whirling spray of liquid and for use when using the aerosol method of applying liquid coatings on surfaces.

The invention relates particularly to overcoming certain difficulties encountered when applying paints, varnishes, lacquers, insecticides, and the like, by spraying the same from a can or container under pressure of a gas forming liquid by the well-known aerosol method. "Gas liquid" or "liquid gas" as hereinafter used is intended to mean a suitable gas-forming liquid propellant.

One of the problems in the use of an aerosol spray nozzle for applying surface coatings, such as paints, varnishes, and the like, is that of securing a spray of uniform nature and which will permit uniform distribution of the coating, preventing running or dripping on vertical surfaces, and also which will prevent the gas liquid from the formation of drops or bubbles in the surface being coated, whether such surfaces are horizontal or upright.

It is recognized that the causing of a whirling stream to deliver a uniform spray from spray nozzles has long been practiced with lawn sprayers, insecticide spray nozzle equipment, and the like. Also, it is well known that due to the extremely small nozzle opening used with containers for liquid to be delivered by gas pressure by the aerosol method, and due to the fact that the propelling gas continues to expand with the liquid delivered from the nozzle orifice, a spray of sufficient fineness for many purposes, and with some liquids, has been attained without the necessity for extremely minute machine work which would be required to make nozzles after the fashion of larger devices such as lawn sprayers, or otherwise improve the spray by mechanical means.

In all such aerosol container equipment, including the valve and the nozzle, the usual merchandising involves the provision of the container with its valve and nozzle without intent for reuse. In other words, the "package" including the valve and spray nozzle is normally treated as a "throw-away" or single use container. It follows that the expense of manufacture must be kept to a minimum. The parts comprising the valve and nozzle must be capable of being manufactured by extremely simple high-production methods, and likewise must be capable of very convenient and quick assembly.

The need for the uniform spray and for a satisfactory valve and nozzle construction for paint spraying has heretofore not been supplied.

The present invention avoids the foregoing difficulties and attains the highly desirable objective of a simple efficient construction of a spray nozzle adapted to be used with a needle valve or other cheap and convenient controlling valve, and which normally prevents clogging of the minute exit orifice, while setting up in the passage within the nozzle a rapid whirling motion of the fluid being expelled from the container through the spray orifice.

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More specific objects attained are the provision of a simple whirl-creating unit, which may be set into a straight drilled hole leading to the smaller exit orifice of the nozzle, and which when assembled with the valve remains in position without likelihood of displacement, and which may function effectively throughout the discharge of the entire contents of the can.

Various modifications of the device may be made without departing from the spirit of my invention as defined in the appended claims.

The following description relates to the accompanying drawings, illustrating preferred embodiments of my invention.

In the drawings,

Fig. 1 is an elevation of the lower portion of an aerosol can inverted for paint spraying and showing the valve and nozzle;

Fig. 2 is a vertical axial section somewhat enlarged through the valve, nozzle and can cover;

Fig. 3 is a view on a further enlarged scale showing twisted wires which may be cut to short lengths for use in the nozzle;

Fig. 4 is a longitudinal section through the nozzle showing the twisted wires in position therein;

Fig. 5 is an end elevation of the same;

Fig. 6 is a view of the delivery end of the nozzle;

Fig. 7 is a view showing a modified form of twisted single piece insert and showing the relative position of the nozzle and needle valve tip;

Fig. 8 is a sectional view showing the valve, nozzle and can cover in which the modified form of Fig. 7 is used;

Fig. 9 is an enlarged transverse section of the nozzle showing the use of a larger number of twisted wires; Figs. 3 to 7 and Fig. 9, being on the same scale, and Fig. 8 corresponding to the scale of Fig. 2.

In my copending application, Serial No. 125,916, filed November 7, 1949, I disclosed and claimed a "Method and Means for Mixing and Spraying Paint," by which successful spraying of pigment paints has been accomplished while holding the container with the valve and spray nozzle at the

bottom. This is the position indicated in Fig. 1 and in which the aerosol can 1 is shown as provided with a cap 2, carrying the valve body and nozzle 10 from which a spray is projected at the desired wide angle and is emitted while rapidly whirling, as indicated by the arrows A in Fig. 1.

A preferred form of valve comprises a body portion 3 suitably secured to the can top 2 and fitted into an opening in a dome portion 4 thereof, and having a central passage closed by the tapered point of the valve 5, threaded into the valve body and provided with a head 6, preferably having a slot 7 adapted to receive the edge of a coin to facilitate turning after the manner of a screw driver.

A packing-gland cap 8 is removably secured to a threaded portion of the upper end of the body 3. Tightly fitted and secured into a transverse opening in the valve body communicating with the pasage leading from the interior is the nozzle proper 10 which in actual size has a bore of about three-sixty-fourths to one-sixteenth of an inch in diameter, and is of a length of about three-eighths of an inch, or more, if desired.

The valve and nozzle are so constructed that they may be made of a minimum amount of material and by the simplest possible screw machine manufacturing operations.

The nozzle exit or spray orifice 12 may be as small as ten to fifteen one-thousandths of an inch and is drilled through a thin forward end wall portion 13 of the nozzle, the bore of which has been drilled down to that wall and terminates in a tapered surface 14 which may form a space beyond the ends of twisted wires 20, as shown in Fig. 4. This space may act as a chamber in which the liquid paint or the like may whirl in an inwinding path at increasing speed before being emitted from the minute orifice 12.

As appears in Figs. 3 and 4, the twisted wires 20, whose diameter is about one-half of the diameter of the bore 15 in the nozzle, are cut as indicated by lines 22 in Fig. 3 to a length approximately that of the bore, and these short sections of twisted wire are inserted as a unit in the bore before placing the nozzle in its assembled position in the valve body.

A modified form is shown in Figs. 7 and 8 in which the member 30 is a single, small, flat twisted wire or like metal strip presenting helicoidal surfaces, one end of which may rest against the sloping outer portion of the bore in the nozzle, thus providing a space in which the paint streams from along the wires may converge in an inwinding whirl before passing through the exit orifice.

This strip 30, or the twisted wire section 20, may be the same length as the bore of the nozzle, or less, but any such unit causing the whirling may be made slightly longer than the bore and project inwardly toward the needle valve member 5, as shown in Figs. 7 and 8.

A further illustration of a convenient form of whirl-creating unit is that shown in section in Fig. 9 where the nozzle insert 40 comprises several twisted wires (in that case seven wires), which may be cut from a length of small cable having an outside diameter permitting it to approximately fit within the bore 15 of the nozzle 10. The aggregate space around the wires for the passage of the paint is sufficient for creating the spray stream, but likewise each passage is small which further assures preventing particles of foreign matter, hardened paint, pellets, or the like, from passing through the nozzle bore and clogging the spray orifice 12.

Obviously the twisted wire elements 20 or the element 30 will likewise tend to prevent the entry of large particles likely to clog the nozzle orifice, and under most circumstances are entirely satisfactory, but the form shown in Fig. 9 may in certain instances be more desirable.

From the foregoing description it will be seen that, with the can inverted, the liquid paint under the gas liquid pressure will forcibly pass the needle valve, when opened, and flow rapidly along the spiral pathways at the sides of the twisted wires, or the element 30, and upon reaching the chamber beyond the end of the spiral elements, the streams will unite in a whirling action converging in an inwinding, increasingly rapidly spinning whirl at the exit orifice 12. Experience has shown that a very uniform, fine, whirling, mist-like spray stream is emitted from the orifice 12 in the form of a hollow cone, the minute globules of which spread at a suitable angle, such as illustrated at S in Fig. 1, and thus coating liquids may be applied to the surfaces to be covered with great uniformity. The likelihood of drops, bubbles, and the like, is eliminated, and heavily pigmented paints, metallic paints, lacquers, and the like, may be rapidly applied to the desired uniform even thickness.

Having thus described my invention, what I claim is:

1. A paint spraying device adapted for attachment to a hand portable container arranged to be inverted to place the valve at the lower portion thereof during spraying, the contents of the container including a mixture of paint and a gas-forming liquid, the device comprising a valve having an axial passage communicating with the interior of the container, a needle valve element extending through and closing said passage, an enlargement of the passage around the needle valve element, a nozzle member rigid with the valve body and having a cylindrical bore communicating with the enlargement of the passage and having a spray tip portion, the inner surface of which is conical tapering toward a central spray orifice smaller than the bore, a helical wire element closely fitted into said bore comprising a plurality of mutually supporting twisted wires and so cut at the outer end as to rest against the base of the conical surface and leave a space between the end of the wire and the spray orifice whereby fluid paint passing through the nozzle is caused to whirl along the wire and to increase the whirling beyond the end of the same against the conical surface.

2. The device described in claim 1, in which the twisted wire element is co-extensive with the cylindrical bore and extends toward and is thus prevented from displacement by reason of the inner end of the element being adjacent to the needle valve stem arranged in alignment with the bore.

3. An aerosol paint spraying valve and nozzle for attachment to an aerosol can having a dome-shaped top and adapted to be inverted during the spraying, the valve comprising a body fitted into the top of the can and having a conical surface substantially continuing the dome-shaped top and having a central passage leading from the cone-shaped surface, a needle valve member and a seat therefor in the valve body, an enlargement of the passage beyond the valve seat away from the container and through which the needle valve member extends, a radial opening in the valve body, a tubular nozzle tightly fitted into the radial

opening and having a bore opening into the passage enlargement and having its outer end provided with an inner tapered surface and a reduced spray orifice, a twisted wire element closely fitted into the nozzle bore and cut to a length such as to extend the length of the bore and be retained in position by the needle valve stem within the passage enlargement.

EDMUND ROGERS.

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