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SPRAY NOZZLE

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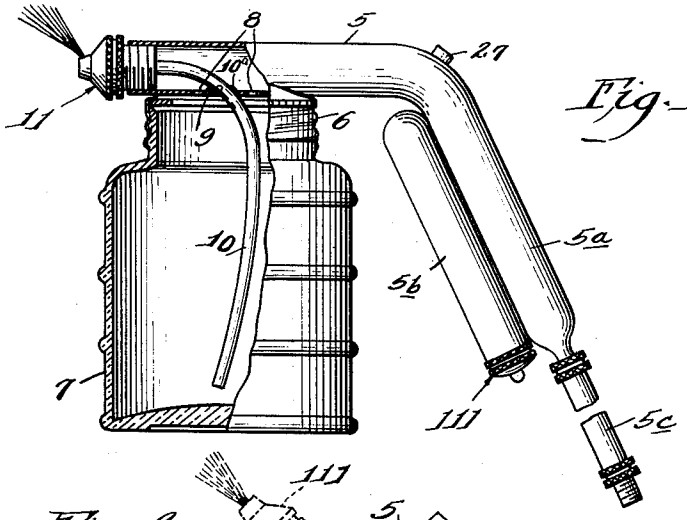


Fig. 1.

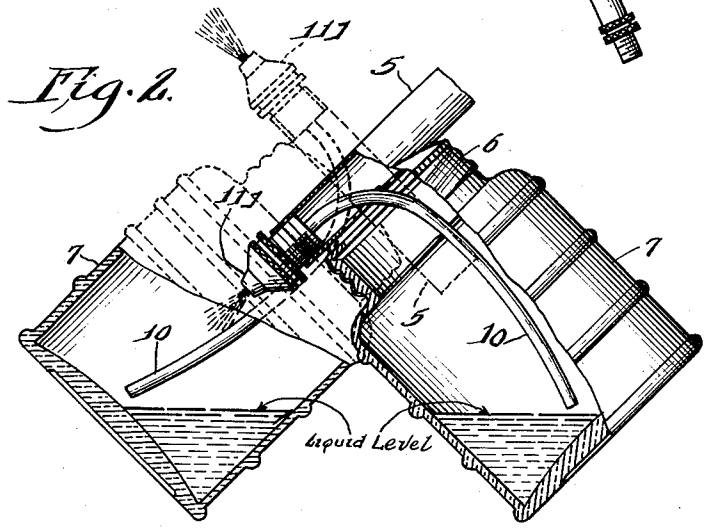


Fig. 2.

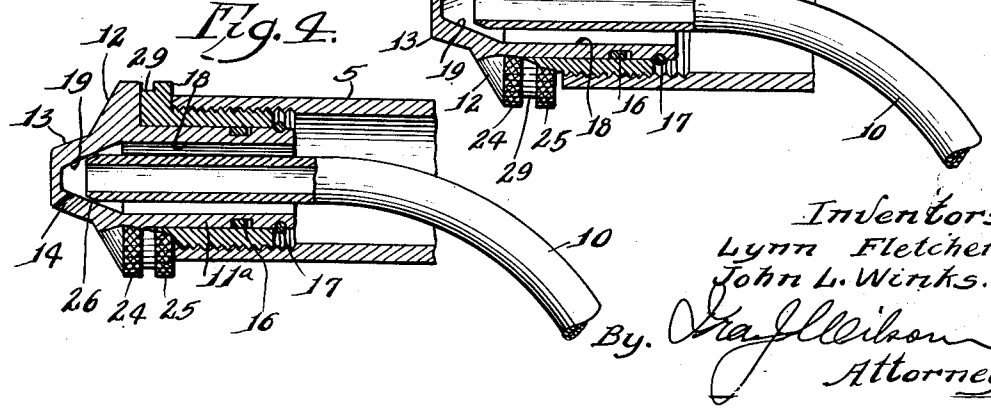


Fig. 4.

Fig. 3.

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SPRAY NOZZLE

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5 Claims. (Cl. 299—89)

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This invention relates to sprayers, primarily those of the utility type having various uses, and, more particularly to a special nozzle for ejecting the paint, enamel and other liquids in a number of different spray patterns and degrees of "richness" and in a tangential direction (other than straight forward from the operator) while the spray barrel and reservoir are held in a position by which the best results may be obtained.

One of the primary objects of the invention is to provide a nozzle which may be adapted to use with various types of paint, enamel or other liquid spray "guns" and one which the operator may adjust with ease to vary the proportions of paint or other liquid and air and the shape or character of the spray patterns.

Another primary object is to provide a nozzle so constructed and arranged in connection with the usual spray gun barrel and reservoir that the spray may be directed tangentially, i. e., at a predetermined angle, to the axis of the gun and the position of the eduction tube with respect to the liquid body in the reservoir whereby, for instance, the gun may be held in a horizontal position or in such position as will maintain the inlet end of the eduction tube within the body of liquid in the reservoir while the axis of the spray stream is directed into places which otherwise would require tilting or other manipulation displacing or tending to displace the inlet end of the eduction tube from within the liquid body.

Other objects include the provision of a nozzle of simple and inexpensive construction and one which will be easily and readily manipulated or adjusted, cleaned and maintained, all as will be understood and appreciated after reading the following description and claims and after viewing the drawings, in which:

Fig. 1 is a view in side elevation of a paint sprayer with a nozzle of the invention applied thereto and illustrating the position in which the sprayer may be held to spray upwardly at an angle of 45° toward a ceiling or overhead area;

Fig. 2 illustrates, diagrammatically, the positions in which the usual or conventional type of paint spray gun would have to be held or tilted to direct a spray discharge in the same direction and also in a downward direction at approximately 90° to the first direction;

Fig. 3 is an enlarged view, in longitudinal section, of the preferred form of the improved nozzle and an adjacent portion of the sprayer air supply barrel, illustrating the position of the nozzle outlet orifice to spray "upward"; and

Fig. 4 is a view similar to that of Fig. 3, illustrating the parts as adjusted to spray "downward" and with a "richer" proportion of paint to air.

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The sprayer shown in Fig. 1 has a relatively rigid air supply conduit or barrel 5 of cylindrical shape integral with a hand grip conduit portion 5^a to which a cylindrical barrel 5^b is attached as by welding, soldering or otherwise for purposes to be described. A flexible conduit 5^c supplies compressed air from any suitable source. Attached to conduit 5, as by soldering, welding or otherwise, is a screw cap 6 for engagement with the threaded neck of a glass or other reservoir 7 within which is placed the liquid to be sprayed. The conduit portion or barrel 5 is provided with three apertures, two of which, designated 8, serve to supply air through the cap 6 to the interior of the reservoir 7, and the third of which, designated 9, provides a passageway for passage of an eduction or discharge tube 10. Preferably the eduction tube is secured in proper position and sealed to the conduit portion or barrel 5 by solder or the like 10^a, so that it is rigid with the conduit and cap. Air supplied from a suitable source passes through the conduit directly to the nozzle generally designated 11 and also into reservoir 7 to effect displacement of the liquid therefrom through eduction tube 10 to nozzle 11.

Ordinarily a sprayer of this type is not well adapted to spraying ceilings and floors or any other place where a straight nozzle spray, as indicated in Fig. 2, is used, as, in such arrangement, the sprayer must be inclined to the horizontal to direct the spray upward or downward. This is true because, unless the liquid reservoir contains a substantial volume of liquid, the tilting or inclining of the reservoir will cause the liquid to flow to a position where the inlet end of the eduction tube is exposed or extends out of the liquid, whereupon emission of liquid spray ceases. This situation or condition is graphically illustrated in Fig. 2, wherein the lower or inlet end of the eduction or liquid supply tube is illustrated as brought out of the liquid when the liquid level is low and the sprayer is tilted either up or down. Furthermore, in case the ordinary sprayer is tilted upwardly to spray a ceiling or the like, spray liquid, if at a high level in the reservoir, may run through the air openings 8 and enter the conduit 5 and flow backwardly therein. If, on the other hand, the sprayer is so inclined as to direct spray in a downward direction, the liquid may also flow out of the air inlets 8 into the conduit 5, but this time into the

air channel about the eduction tube outlet and thence flow from the nozzle in a solid stream.

In order to overcome these undesirable results, the nozzle 11 of the invention is provided. This nozzle comprises a member having a hollow cylindrical stem 11a terminating at its outer end in an annular head 12 having a protruding nipple or nose 13 through which an outlet orifice 14 is drilled or otherwise formed at an angle less than a straight angle to the axis of the stem, in this case at an angle of 45°. Intermediate of its ends the stem is provided with an annular channel or groove 15 for the reception of a rubber or other material ring packing 16 to prevent leakages between this part and a retainer to be described, and at its inner end (the end remote from head 12) there is a shallow annular groove for the reception of a spring-ring retainer 17 the purpose of which will appear. Internally, the bore 18 is cylindrical throughout the length of the stem but within the head it tapers down conically, as indicated at 19.

Snugly but rotatably counted on the exterior cylindrical surface of stem 11 is a collar or nozzle holder member 20 which, at its forward end, has an outwardly projecting circumferential flange 21 adapted to abut (at its forward face) against the rear face of head 12 and which at its rear or inner end, engages the spring snap ring or retainer 17 and thereby is retained on the stem 11a. Spaced from the flange 21 are a plurality of turns of a thread 22, preferably of a fine gauge or pitch, by which the nozzle assembly is adjustably secured in the correspondingly threaded bore 23 of the terminal end of the conduit or barrel 5. In order to avoid leakage along the threads 22 and 23 it is desirable that a machine thread be used and that the fit between the threads be close without such friction as would prevent rotation for adjustment. Both the head 12 around its external circumference as at 24, and the circumferential flange 21 as at 25, may be knurled so that a grip may be had upon either or both for relative or simultaneous rotation for adjustment purposes.

The construction described above permits either adjustment of the angle of the axis of spray emergence or the density or richness and other characteristics of the spray pattern, or both. The liquid supply or eduction tube 10 projects from the reservoir through the barrel 5 to a fixed point or place with respect to the terminal end of the latter and is rounded or beveled at its forward end, as will be noted at 26, for cooperation (after the manner of a valve) with conical surface 19, the beveled surface and the conical surface being cut at substantially the same angle. The liquid supply tube is normally held in fixed position relative to the sprayer conduit or barrel 5, the reservoir and the cap 6, as previously stated, and the nozzle, conduit and cap are removable from the reservoir as a unit, as will be understood.

The diameter of the eduction or liquid supply tube 10 is substantially less than the internal diameter of the cylindrical bore 18 in the stem of the nozzle within which it is concentrically disposed, but its least diameter preferably is greater than the greatest diameter of the conical part 19 of the stem bore at the intersection thereof with the bore of the outlet orifice 14. Consequently, if the nozzle holder or collar 20 is rotated relative to the conduit or barrel 5 (whether or not the nozzle member is rotated therewith) the conical surface 19 of the nozzle member will be adjusted relatively toward or from the outer beveled end 26 of the supply or eduction tube 10, thereby to decrease or increase, respectively, the amount of air flowing about the tube 10 from the air supply to the orifice 14. In this manner the richness and other characteristics of the spray stream and its pattern may be controlled.

As indicated above, the adjustment of the spray quality is independent of the position of the axis of the orifice 14 with respect to the position of the sprayer as a whole. But, the axis of orifice 14 may be rotated to any position within the limits of its circular orbit of 360° about the axis of its stem so as to direct the spray up or down or sidewise or in any intermediate direction without changing the position or level of the sprayer itself. This is accomplished by effecting relative rotation between the nozzle member and the nozzle holder, as by holding the knurled part 25 of the nozzle holder still while turning the nozzle by gripping the knurled portion 24 thereof. It will be observed that the knurled surface portion 25 of the nozzle holder flange is set back from the forward end thereof by forming a circular shoulder 29, thereby conveniently to space the two knurled rings from one another. Leakage of air or liquid between the nozzle stem and the nozzle holder is prevented by the packing 16.

The advantages of the construction described above are manifold. The user need not have any substantial amount of spray liquid in the reservoir, as heretofore necessary, in order to spray in an upward or downward direction for, utilizing a spayer nozzle of the invention type, the nozzle may be adjusted to direct the spray at the place or area to be sprayed while the sprayer is held in a horizontal position. Again, so long as the sprayer is held in a horizontal or substantially horizontal position, there is little chance for the liquid spray to enter the conduit or barrel to run down the barrel into the air supply conduit or to pass through the air channel around the outlet end of the supply or eduction tube 10 and pass from the nozzle orifice in a solid stream. When it is desired to change the direction of the spray stream axis the nozzle may be rotated while holding the nozzle holder against rotation so that the character of the spray stream will not be changed by varying the setting between the beveled end 26 of the tube 10 and the tapered bore 19; yet, on the other hand, the nozzle holder 21 may be adjusted relative to the conduit or barrel 5 and supply tube 10 to vary the setting between the tube end 26 and bore 19, thereby to change the ratio of air to liquid in turn to change the spray character without changing the relative positions of the axes of the outlet orifice or sprayer. By adjustment of the nozzle outlet orifice and/or the ratio of air to liquid, it becomes an easy matter to gain access to otherwise inaccessible places.

The cylindrical barrel 5b not only serves (with conduit portion 5a) as a hand grip but, if hollow, conveniently may serve to hold nozzle cleaning tools, and at one end may be threaded to receive the threaded end of a replacement nozzle assembly 111 which may have a straight outlet orifice of the type indicated in Fig. 2, the nozzle assembly, when screwed into the end of barrel 5b, serving to close the barrel to retain its contents in place. A thumb or finger operated control button 27 on the conduit 5 serves to open a spring and air closing air control valve (not

shown) within the conduit. The nozzle 111 may be constructed and operated after the manner of nozzle 11, except that its outlet orifice (not shown) will be coaxial with the axes of the conduit or barrel 5 and the straight outer end portion of the supply or eduction tube 10.

Since the invention is susceptible of application to sprayers of insecticides and other liquids and of incorporation or adaptation to other embodiments, as well as capable of functioning in various modifications, we desire to be limited only by the invention spirit and the scope of the appended claims.

We claim:

1. In a spray device having an air conduit including a cylinder, a liquid reservoir attached to and depending from the cylinder and adapted to be held in a predetermined position, a relatively fixed eduction tube having its inlet end disposed within and adjacent to the bottom thereof when the reservoir is in said position and having its outlet end projecting forwardly of the cylinder discharge end, comprising a nozzle member surrounding said outlet end of said tube and defining with the outlet end of the tube a passageway for air to flow from the cylinder to the nozzle, said nozzle member being rotatable about and movable longitudinally of a forward part of the axis of said tube, said nozzle member having a discharge orifice the axis of which is disposed at an angle less than a straight angle to said tube axis part, and means rotatable with and relative to said nozzle member for moving the nozzle member to adjust the relative quantity of air flowing to said nozzle orifice through said passageway irrespective of the angular rotative position of the orifice axis.

2. In a spray device of the character described including a source of supply of air under pressure, a discharge tube a liquid reservoir in which the liquid is subjected to air pressure for discharge therefrom through the discharge tube the inlet end of which is disposed in relatively fixed position in the lower portion of the reservoir with respect to the position of a body of liquid therein and an air passage from the air supply source past the outlet end of the discharge tube, comprising a nozzle having a hollow cylindrical stem portion disposed in rotatable and longitudinally adjustable relation to the outlet end of the discharge tube and surrounding same with said outlet end of the tube on an axis substantially parallel to the axis of said stem portion, a single outlet orifice in the nozzle having its axis of discharge disposed at an angle less than a straight angle to the axis of said stem portion, said nozzle and tube outlet end providing a valve for the control of air flowing past the said tube outlet end, and means rotatable about said nozzle stem portion for moving said nozzle relative to said tube outlet end whereby to vary the air flow past said tube outlet end.

3. In a spray device of the character described having a source of supply of air under pressure, a discharge tube, a liquid reservoir in which the liquid is subjected to air pressure for discharge therefrom through the discharge tube the inlet end of which is disposed in relatively fixed position in the lower portion of the reservoir with respect to the position of a body of liquid therein and an air passage from the air supply source past the outlet end of the discharge tube, comprising a nozzle having a hollow cylindrical stem portion disposed in rotatable and longitudinally adjustable relation to the outlet end of the discharge tube and surrounding same with said outlet end of the tube on an axis substantially parallel to the axis of said stem portion, said nozzle and tube outlet end providing a valve for the control of air flowing past the said tube outlet end, and means rotatable about said nozzle stem portion for moving said nozzle relative to said tube outlet end whereby to vary the air flow past said tube outlet end.

4. In a sprayer of the character described having a liquid discharge tube, nozzle supporting means associated with said discharge tube, and means securing the outlet end of the discharge tube relative to said supporting means, a nozzle retaining member having threaded engagement with said supporting means and adjustable longitudinally thereof relative thereto and having a bore, a nozzle member having a hollow stem rotatably disposed in said bore and surrounding said tube end in circumferentially spaced relation thereto, said nozzle member having a head at one end of the stem closed except for an outlet orifice therethrough, the axis of said orifice being disposed at an angle less than a straight angle to the axis of said bore, said stem having an internally constricted portion between said orifice and its end opposite to said head for cooperative association with said tube end to control the size of the passageway between the stem and tube end, and means for retaining said nozzle member against movements longitudinally of said retaining member.

5. In a sprayer of the character described having a liquid discharge tube, nozzle supporting means associated with said discharge tube, and means securing the outlet end of the discharge tube relative to said supporting means, a nozzle retaining member having threaded engagement with said supporting means and adjustable longitudinally thereof relative thereto and having a bore, a nozzle member having a hollow stem rotatably disposed in said bore and substantially concentrically surrounding said tube end in circumferentially spaced relation thereto, said nozzle member having a head at one end of the stem and having an outlet orifice therethrough, said stem having an internally constricted portion between said orifice and its end opposite to said head for cooperative association with said tube end to control the size of the passageway between the stem and tube end, and means for retaining said nozzle member against movements longitudinally of said retaining member.

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