

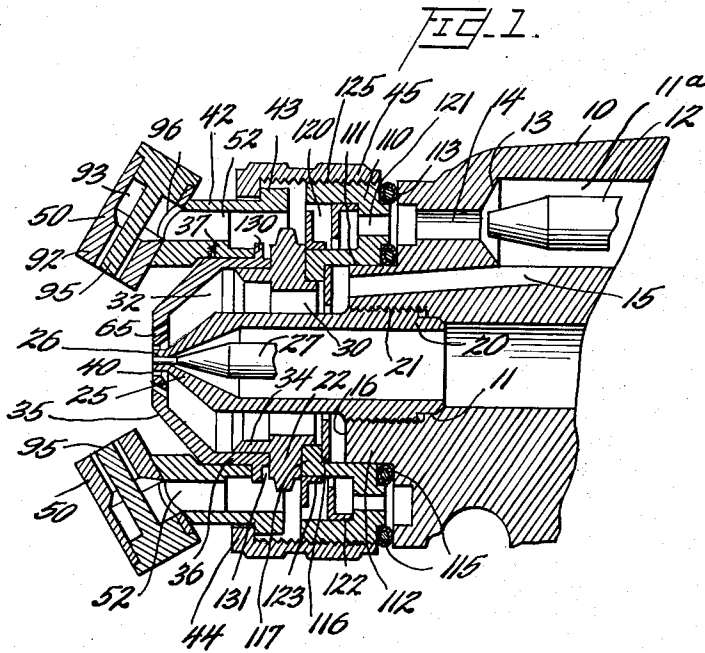
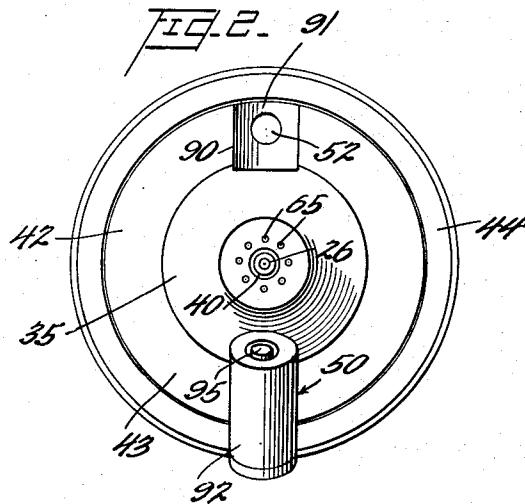
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SPRAYING DEVICE

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SPRAYING DEVICE

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8 Claims. (Cl. 299-140.1)

This invention relates to spraying devices or the like, and more particularly to the nozzle assemblies of spray guns of the type which are employed in atomizing and spraying liquids, such as coating materials or the like.

This application is a division of my copending application Serial No. 184,301, filed January 10, 1938.

The general object of the invention is the provision of novel and improved nozzle constructions of the class described, which are easy and economical to manufacture and at the same time are capable of being readily assembled so as to produce a spray jet of great accuracy and fineness of atomization; and one which is susceptible of a wide range of adjustability.

A further object of the invention is the provision of a novel construction of side wing jets for flattening the spray. The use of this novel structure and method of manufacture enables the ready application of the clamping ring which is usually employed to secure the nozzle air cap to the body portion of the gun and also permits variations in assembly of the nozzle to attain certain sizes and configurations of the spray pattern, and also facilitates the manufacture of the spray gun.

Another object is the provision of a novel front end construction for spray guns, particularly applicable to guns the body portions of which may be made of integral forgings or die castings, especially of aluminum. This features includes the provision of a separate element made of some easily machinable material such as brass, this element carrying the threads to which the clamping ring is screwed and also embodying baffle means for the better distribution of the air.

Other objects and features of novelty will become apparent from the following specification when read in connection with the accompanying drawing in which several embodiments of the invention are illustrated by way of example.

In the drawing:

Figure 1 is a vertical longitudinal sectional view of a nozzle embodying the principles of the present invention, and also showing a portion of the body of the spray gun to which the nozzle assembly is applied; and

Figure 2 is a view in front elevation of the nozzle illustrated in Figure 1.

In Figure 1 a portion of the forward end of the body of a spray gun is indicated at 10 and is provided with a liquid chamber or passageway 11 and a main air passageway 11a. The air passageway is divided adjacent the valve seat 13 to

provide a forwardly directed passageway 14 leading to the supplemental flattening jets of the air cap and the diverging passageway 15 leading to the central aspirating air orifices. A reciprocating valve member 12 cooperates with the valve seat 13 to control the passage of air through the passage 14. The forward face 16 of the body portion of the gun is ordinarily formed in a single plane, although within the scope of the invention the construction of the body portion of the gun may vary widely.

The inner liquid nozzle portion is indicated generally by the reference numeral 20 and comprises the central rearwardly projecting nipple which is threaded as at 21 into the recess 11 formed in the forward portion 10 of the main body of the gun, which in this embodiment may be made of a forging or die casting of aluminum or other light soft metal. The central portion of the liquid nozzle 20 is provided with a flange 22, the periphery of which may be squared for the application of a wrench or other suitable tool for removing and applying this portion of the nozzle to the spray gun. The forward end of the liquid nozzle proper is of a general conical configuration as indicated at 25 and is provided centrally at the tip thereof with a liquid orifice 26, the flow of liquid through this orifice being controlled by means of the needle valve 27 which projects rearwardly and is operatively connected with the trigger of the gun which is not shown herein, but may be of any usual or conventional construction or may be arranged as shown in my Patents Nos. 2,082,060 and 2,082,061. The intermediate flange 22 is provided with an annular series of passageways 30 which constitute a portion of the communicating means between the air passageway 15 in the body of the gun and the forward air chamber 32 formed between the conical tip 25 of the liquid nozzle and the walls of the supplemental air cap 35.

This supplemental air cap 35 is provided with the annular rearwardly extending flange 36 which fits around the annular flange 34 which extends forwardly from the portion 22 of the liquid nozzle. The flange 36 extends rearwardly to abut the intermediate flange 22 of the liquid nozzle and is provided with a radially outwardly directed flange 130 which is spaced from the flange 22 so as to leave an annular space 131 into which a screw-driver or other suitable tool may be inserted in order to remove the cap or tip 35 from the liquid nozzle. The flange 130 also provides an abutment element for the surrounding inner portion of the air cap 42. Preferably the

inner wall 34 of the liquid nozzle 20 is shaped as shown in Figure 1 and terminates short of the converging front walls of the cap 35 so as to provide as much of an enlargement within the air chamber 32 as possible.

The inner air tip 35 in this embodiment is provided with an annular series of openings 65 which surround the annular aspirating air orifice 40 of the nozzle. Any number of these openings 65 may be provided and they may be arranged as shown in Figure 1 of the drawing, with diagonally opposite pairs of openings on opposite sides of the central liquid orifice.

The tip 35 converges forwardly to the plane of the face of the liquid nozzle and the inner margin of the opening therein is spaced from the liquid nozzle tip 25 at a predetermined distance to provide the annular aspirating air orifice 40. It will thus be seen that there is thereby formed a relatively permanent arrangement for defining the orifice 40 which is adapted to be carried by the inner liquid nozzle portion of the nozzle assembly; which is of a relatively small diameter as compared with the air cap of the usual arrangement; and which is secured to the rigidly supported liquid nozzle at a point well forwardly thereon and adjacent the front face of the nozzle assembly. Thus no reliance need be placed upon the accuracy of fit of the usual air cap with relation to the inner liquid nozzle to provide the aspirating jet of air.

The main air cap of this type of nozzle assembly is indicated generally by the reference numeral 42 and is provided with a central annular surface 37 which fits around the flange 36 of the supplemental air tip 35. The air cap is provided rearwardly with an outwardly extending annular flange 43 which forms a shoulder about which the inwardly directed flange 44 of the clamping ring 45 may engage. The clamping ring 45 is threaded to the outer periphery of an intervening annular thread carrying element 110 which is disposed between the flange 22 of the liquid nozzle and the forward face of the body of the gun. The inner annular surface 111 of the insert 110 fits around the central projecting portion 112 of the front end of the gun and is sealed against the rearward stepped face 113 of the body portion 10 as by means of the gaskets 115.

An inwardly disposed ring or washer 116 is held by the flange 117 of the member 110 so as to baffle and equalize the distribution of the central air supply passing through the passageway 15 before it enters the passageways 30. The annular intermediate member 110 is also provided with the annular recess or forward annular chamber 120 which is placed in communication with the air supply passing through the passageway 14 in the body of the gun by means of the series of holes 121. An inwardly projecting flanged baffle ring 122 and an outwardly projecting ring 123 are fitted within the chamber 120 in order to equalize the distribution of the auxiliary jet air supply upon opposite sides of the air cap.

The intermediate annular member 110 is preferably made of brass or some other durable readily machinable metal and is provided around its outer periphery with the screw threads 125 upon which may be screwed the clamping ring 45 which is provided with the flange or shoulder 44 surrounding the shoulder 43 of the air cap. This arrangement not only provides a convenient disposition of the equalizing air baffles but also enables the placing of the screw threads for the at-

tachment for the air cap on the member made of renewable bar stock and eliminating the alternative of providing threads upon the front end of the body portion which would be subject to wear and deterioration.

It is very often convenient to provide nozzles with varying angles of convergence of the side wing or spray flattening jets, and the method of construction illustrated in the drawing provides an optional way of producing a nozzle whereby this object may be attained. This method of manufacture and assembly also facilitates the application of a locking retaining ring of conventional type and comprises a distinct improvement in the production of spray gun nozzles. The air cap 42 instead of being provided with integral side wing jets may be furnished with built-up soldered jet assemblies which are designated generally by the reference numeral 50, and having supplemental air passageways 52 leading therefrom to the baffled air chambers in the insert 110. In order to support the side jet members 50 there are formed upon diametrically opposite sides of the forward face of the air cap 42, the projecting bosses 90 in the outer ends of which are formed the inclined substantially semi-circular grooves 91. The bosses 90 are provided with the passageways 52 which provide communication with the source of air for the auxiliary jets. To form the side wings of the nozzle there are provided cylindrical members 92 which are drilled forwardly and rearwardly to provide the proper passageways of air therein indicated generally by the numeral 93, and to receive the plug member 95 which provides a rear closure for the wing and a centering stem for the annular jet. The sidewall of the member 92 is also drilled as at 96 to provide communication with the passageways 52. In assembling this type of nozzle air cap the members 92 may be disposed at varying distances from the axis of the nozzle and may be secured in the desired position within the groove 91 by soldering or any other suitable method. The angle of convergence of the members 92 may also be altered by machining the groove 90 at a different slope. In assembling the nozzle in this manner not only can the width and angularity of the side wings be varied, but the clamping ring 45 may be applied to the air cap 42 against the shoulder 43 before the wing members 92 are applied and thus the clamping ring may be permanently attached to the air cap. Also the parts of the air cap may be drilled and machined more readily from standard bar stock, instead of having to employ forgings in constructing the cap. It will also be noted that the bosses or pedestals 90 may be made somewhat narrower than the cylindrical wing nozzle members 92 and thus provide less obstruction for the eddy currents of air which move inwardly across the face of the central nozzle from the periphery toward the axial main jet during the spraying operations. Thus an added "streamlining" effect is secured by means of this construction which increases the efficiency of the nozzle.

It will be seen that by the various provisions of the present invention, a novel and improved spray gun nozzle has been attained which will ensure an accurately formed, finely atomized, and readily controllable spray. Furthermore, in certain embodiments of the invention, the accuracy of the formation of the spray is not dependent upon the positioning of the air cap, but this cap may be subject to distortion or displacement without impairing the configuration of the

fluid spray. Other attendant advantageous features have also been provided and these include the provision of novel means for attaching the air cap of the nozzle to the body of the spray gun and also means and methods of manufacturing the various parts of the nozzle to more efficiently attain the other objects which have been described.

It will be understood that various changes and modifications in the embodiments illustrated and described herein may be made without departing from the scope of the invention as defined by the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A spray gun of the class described comprising, in combination, a body member having liquid and air passageways therein and a nozzle assembly at the forward end thereof, said nozzle assembly comprising an inner liquid nozzle element threaded axially into the forward end of said body member and provided with a liquid passageway communicating with the liquid passageway in the body member, an outer air cap element surrounding said inner liquid nozzle element and provided with air passageways leading to oppositely disposed spray flattening jet orifices, a radial flange extending from said liquid nozzle element at a point spaced forwardly of the front face of the body member, an annular element disposed between said radial flange and the front face of said body member and adapted to be clamped in position when said liquid nozzle element is screwed into the body member, threads on the outer periphery of said annular element, a threaded clamping ring attached to said air cap member and adapted to be screwed onto said annular member, passageways formed in and leading through said annular member for providing communication between the air passageway in said body member and said air cap, and flanged overlapping baffle rings in the passageways of said annular element for equalizing the flow of air to opposite orifices in said air cap.

2. In a spray gun for coating materials or the like, a nozzle assembly at the forward end thereof for the projection of an atomized spray of material therefrom, said nozzle assembly comprising an inner centrally disposed nozzle element having a substantially conical tip, an axial liquid passageway therein terminating forwardly in a central liquid discharge orifice in the front end of the tip, an annular air chamber within said nozzle element and surrounding said central liquid passageway, a radially extending flange formed upon said nozzle element and having a forwardly extending annular flange formed thereon, spaced from the outer periphery thereof, and enclosing said annular air chamber, a cap element having a rearwardly directed annular flange fitted snugly upon the outer surface of said first named annular flange and a forward wall provided with an orifice communicating with said air chamber for the projection of a jet of aspirating and atomizing air adjacent the liquid orifice, a transverse external annular shoulder formed on the annular flange of the cap and spaced forwardly of said radial flange on the inner liquid nozzle element, whereby a space is provided for the insertion of a tool for prying said cap from said element, an outer annular air cap provided with means for projecting auxiliary spray flattening air jets and adapted to

be secured to the gun body, said outer air cap fitting snugly around the outer surface of the rearwardly directed flange of the inner cap.

3. An air cap element for a spray gun nozzle of the type described comprising, in combination, a substantially circular base member adapted to be attached to the forward end of the spray gun and provided centrally with an opening for the central spray jet, grooves formed in said base member upon diametrically opposite sides thereof and inclined forwardly and axially inwardly at a predetermined angle, side jet members soldered respectively in said grooves and disposed at a predetermined distance apart, communicating passageways in said base member and in said jet members for the supply of compressed air a radial flange formed on the rear portion of said base member, a clamping ring of an internal diameter which is smaller than said flange but larger than the diameter of said base member without the side jet members, said clamping ring being applied to said annular flange and provided with means for attachment to said nozzle.

4. In the manufacture of spray gun nozzles having an air cap member provided with a shouldered base element, a cooperating clamping ring surrounding the same and side wing jet elements at the forward end thereof projecting radially outwardly beyond said clamping ring, the method of assembly of said air cap member which comprises the steps of applying said ring over the forward end of said base element, moving it rearwardly until it abuts the shoulder on the base element, and then soldering the side wing jet elements in place at the forward end of said base element.

5. A spray gun of the class described comprising, in combination, a body member having liquid and air passageways therein and a nozzle assembly at the forward end thereof, said nozzle assembly comprising an inner liquid nozzle element threaded axially into the forward end of said body member and provided with a liquid passageway communicating with the liquid passageway in the body member, an outer air cap element surrounding said inner liquid nozzle element and provided with air passageways leading to oppositely disposed spray flattening jet orifices, a radial flange extending from said liquid nozzle element at a point spaced forwardly of the front face of the body member, a unitary self-contained annular element disposed between said radial flange and the front face of said body member and adapted to be clamped in position when said liquid nozzle element is screwed into the body member, threads on the outer periphery of said annular element, a threaded clamping ring attached to said air cap member and adapted to be screwed onto said annular member, openings formed in and leading through said annular member for providing communication between the air passageway in said body member and the passageways leading to the spray flattening orifices in said air cap.

6. A spray gun of the class described comprising, in combination, a body member having liquid and air passageways therein and a nozzle assembly at the forward end thereof, said nozzle assembly comprising an inner liquid nozzle element threaded axially into the forward end of said body member and provided with a liquid passageway communicating with the liquid passageway in the body member, an outer air cap element surrounding said inner liquid nozzle element and provided with air passageways leading

to oppositely disposed spray flattening jet orifices, a radial flange extending from said liquid nozzle element at a point spaced forwardly of the front face of the body member, a unitary self-contained annular element disposed between said radial flange and the front face of said body member and adapted to be clamped in position when said liquid nozzle element is screwed into the body member, threads on the outer periphery of said annular element, a threaded clamping ring attached to said air cap member and adapted to be screwed onto said annular member, openings formed in and leading through said annular member for providing communication between the air passageway in said body member and the passageways leading to the spray flattening orifices in said air cap, an annular forwardly facing recess in said element with which said openings communicate, annular baffle rings disposed in said recess and having overlapping radial flanges.

7. A spray gun of the class described comprising, in combination, a body member having liquid and air passageways therein and a nozzle assembly at the forward end thereof, said nozzle assembly comprising an inner liquid nozzle element threaded axially into the forward end of said body member and provided with a liquid passageway communicating with the liquid passageway in the body member, an outer air cap element surrounding said inner liquid nozzle element and provided with air passageways leading to oppositely disposed spray flattening jet orifices, a radial flange extending from said liquid nozzle element at a point spaced forwardly of the front face of the body member, a unitary self-contained annular element disposed between said radial flange and the front face of said body member and adapted to be clamped in position when said liquid nozzle element is screwed into the body member, threads on the outer periphery of said annular element, a threaded clamping ring attached to said air cap member and adapted to be screwed onto said annular member,

openings formed in and leading through said annular member for providing communication between the air passageway in said body member and the passageways leading to the spray flattening orifices in said air cap, said body member being formed of a relatively soft and light material, and said annular interposed threaded element being made of a relatively hard material, said annular element being relatively permanently secured to the body member, all whereby repeated connection and disconnection of the air cap member from the gun will not cause wear or damage to the relatively soft material of the gun body.

8. An air cap element for a spray gun nozzle of the type described comprising, in combination, a substantially circular base member adapted to be attached to the forward end of the spray gun and provided centrally with an opening for the central spray jet, a radially outwardly projecting flange on said member providing a forwardly facing shoulder at the rear portion thereof, a clamping ring adapted to seat about said shoulder and be threaded to other portions of the nozzle to retain said air cap element thereon, a pair of forwardly projecting bosses formed on diametrically opposite sides of said base member and provided with air passageways therein and grooves of cylindrical contour and predetermined angularity with respect to the axis of the nozzle formed in the outer faces thereof, a cylindrical side jet member soldered in each of said grooves and drilled to provide air passageways therein communicating with the passageway of the boss and opening through an end of said member to provide an orifice for the discharge of the spray flattening side jets, the internal diameter of said clamping ring being somewhat larger than the air cap element before the side jet members are soldered thereto, but smaller than the diameter of the air cap element including said side jet members.

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