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NOZZLE STRUCTURE FOR SPRAY GUNS

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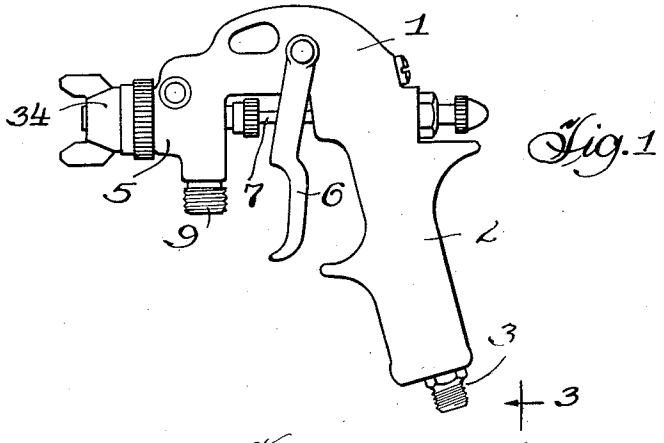
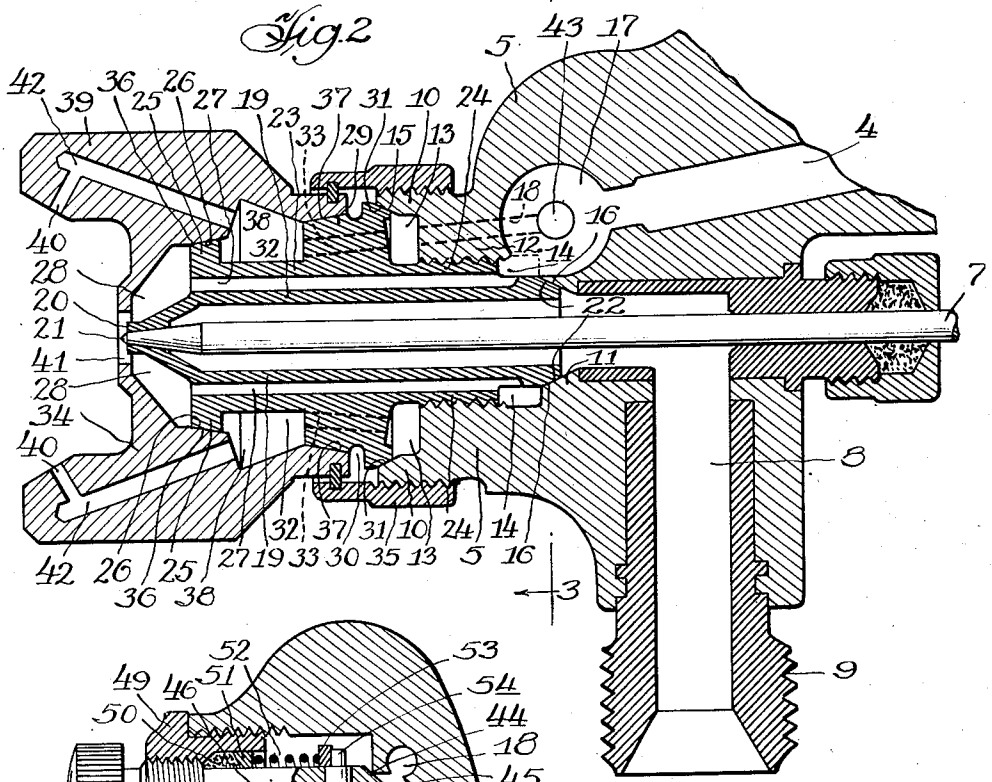


Fig. 1

Fig. 2



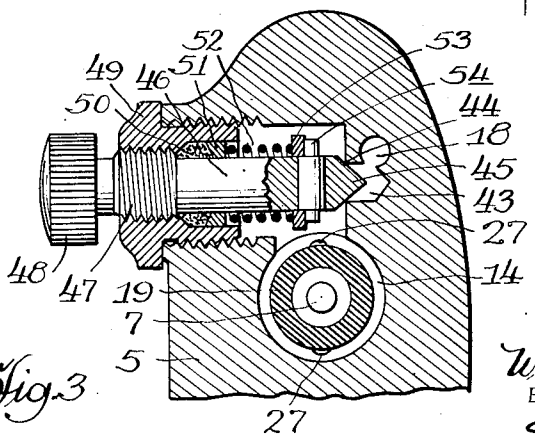


Fig. 3

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NOZZLE STRUCTURE FOR SPRAY GUNS

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7 Claims. (Cl. 299—140.1)

The present invention relates to nozzle structures for spray guns, and more particularly to the type having a nozzle unit secured to the front end of the gun body and which is located between said front end of the gun body and the air nozzle cap coupled to the front end portion of the body of the gun.

Such unit is of generally double cone form with the rear cone portion in seating engagement with the front end of the gun body and the forward cone portion in seating engagement with the nozzle cap, and being provided with a central passage for the passage of the material to be sprayed from the gun body to the material tip of the nozzle and concentrically located air passages for the passage of atomizing air from the gun body to the air orifice in the nozzle cap. Heretofore, the passage of the auxiliary air for the horn or side jet ports has extended from the gun body to the horns carried by the nozzle cap by way of a chamber located outside the unit and within the coupling connecting the cap to the gun body, such chamber being provided between the rear end of the cap and the front end of the gun body, whereby the auxiliary air will leak out by the coupling, thus rendering the control of the pressure and amount of air at the horn ports uncertain and difficult.

An object of the present invention is to provide a passage in the unit itself for the flow of the auxiliary air from the gun body to the horns which passage is independent from the air chamber in the coupling and also is sealed off from such air chamber whereby there will be no possibility of the auxiliary air leaking out as in previous structures.

In units of the type mentioned, the rear cone portion of the unit comprises axially and radially spaced frusto-conical parts which seat against counterpart frusto-conical surface portions at the front end of the gun body, and a threaded part between the frusto-conical parts of the unit engageable with a threaded part between the frusto-conical parts of the gun body. The threaded parts are close to and of but very slightly greater diameter than the rear frusto-conical parts so that the proper seating of the frusto-conical parts depends upon the accuracy of fit of the threads of the threaded parts. If the threaded parts are not exactly coaxial with the frusto-conical parts, the latter will not seat properly when the threaded parts are screwed home. Under such conditions, the frusto-conical parts will engage more or less eccentrically and the desired sealing of the parts is not effected. Because both of the forward and rear frusto-conical parts mentioned are machined to lie in the same cone surface, the eccentric engagement will apply to both.

The present invention has as another object the provision of means for avoiding such disadvantage by more greatly spacing the frusto-conical parts both radially and axially so that the threaded parts may vary from coaxiality within a fairly wide tolerance much greater than usually allowed in the manufacture of devices of this kind. The forward of the frusto-conical parts is of much greater diameter than the rear one thereof, and preferably at least twice the diameter. When the unit is being screwed into place, the frusto-conical parts self-center as they engage or seat before the threads of the threaded parts are tightened. This is possible because of the threaded parts being remote from the frusto-conical parts, both radially and axially, and also because the threads extend for the full length of the threaded parts, there being no bottom to limit the threading movement.

Other objects, advantages, capabilities, features and the like are comprehended by the invention as will later appear and as are inherently possessed by the invention.

This is a division of the copending application of John Harrison and myself, Serial No. 260,040, filed March 6, 1939.

Referring to the drawing:

Fig. 1 is a side view in elevation of a spray gun embodying the invention;

Fig. 2 is a fragmentary longitudinal sectional view on an enlarged scale of the nozzle structure and the forward part of the gun body; and

Fig. 3 is a transverse sectional view taken in planes represented by line 3—3 in Fig. 2 of the drawing.

Referring more in detail to the drawing, the embodiment selected to illustrate the invention is shown with a spray gun comprising a body 1 having a handle 2 provided at its lower end with a connection 3 for the connecting of an air duct (not shown) which supplies air under pressure to the gun by way of a suitable duct (not shown) in the gun handle and leading to a valve controlled air passage 4 in the body of the gun, the air passage 4 leading to the forward end portion 5 of the gun body. To the body 1 is pivotally connected a trigger 6 operatively associated with a needle valve 7 which controls the flow of material to be sprayed through the material nozzle tip and the incidental flow of the material through a material passage 8 provided in the

forward end portion 5 of the gun body. The passage 8 has an inlet comprising a connection 9 for the connecting thereto of a material duct (not shown).

The forward end portion of the gun body is provided with a forwardly widening socket having a mouth portion 10, a base portion 11 of smaller diameter, and an intermediate threaded portion 12 of intermediate diameter. Between the mouth portion 10 and the threaded portion 12 is an annular air channel 13, and between the base portion 11 and the threaded portion 12 is an annular air channel 14. Both the mouth portion 10 and the base portion 11 are provided respectively with flaring annular or frusto-conical seats 15 and 16 disposed in the same conical surface and forming spaced parts thereof, with the channels 13 and 14 and the threaded portion 12 cut into said conical surface and located between said seats 15 and 16. The air channel 14 communicates with the air passage 4 by way of a valve chamber 17 to be later described. In the body portion 5 is also provided an air passage 18 connecting with valve chamber 43 for establishing communication between the valve chamber 17 and passage 4, and the air channel 13.

Fitted to the socketed forward end portion of the gun body is a nozzle unit comprising a material nozzle portion and an air nozzle portion, and having the general form of a double cone. The material nozzle portion comprises a central tubular part 19, the rear end of which communicates with the material passage 8 and the forward end of which tapers into a material tip 20 for the passage of material to be sprayed therethrough, such passage being controlled by the valve tip 21 of the needle valve 7. The rear end of the tubular part 19 has a tapering annular or frusto-conical seat 22 which seats upon and seals with the seat 16 in the socket base portion 11.

The tubular part 19 has a concentric portion 23 which is provided at its rear end with a threaded portion 24 for securement with the threaded portion 12 of the forward portion 5 of the gun body, and which is provided at its forward end with an annular part 25 provided with a forwardly tapering annular or frusto-conical seat 26. Extending longitudinally through the concentric part 23 is a series of air passages 27 for establishing communication between air channel 14 and an annular air chamber 28 provided at the front end of the unit parts 19 and 23. Intermediately of the length of the concentric portion 23 is integrally provided an annular part 29 which has a forwardly tapering annular or frusto-conical seat 30 and which further has rearwardly of the seat 30 a rearwardly tapering annular or frusto-conical seat 31 of larger diameter than the seat 30 and which seats upon and seals with the seat 15 at the mouth 10 of the socket portion of the gun body. The seats 26 and 30 are disposed in the same conical surface and form spaced parts thereof, there being an annular air channel 32 cut into the unit between the seats 26 and 30. Within the annular part 29 is provided a series of forwardly converging air passages 33 which establish communication between the air channels 13 and 32.

An air nozzle cap 34 is applied to the forward end of the unit and is held tightly in place by means of a coupling ring 35 screwed to the threaded forward end portion 10 of the gun body. The cap 34 has interiorly thereof spaced forwardly tapering annular or frusto-conical seats 36 and 37 which seat upon and seal with the seats 26 and 30 respectively, there being provided in the cap between the seats 36 and 37 an annular air channel 38 which registers with the air channel 32. The cap 34 has a pair of horns 39 having ports 40 from which are projected side jets of air to flatten the atomized stream of material and air projected from the material tip 20 and the air orifice 41, respectively, the ports 40 communicating with the annular air channels 32—38 by way of passages 42 provided in the horns 39.

It will thus be seen that the unit referred to is generally of double cone form with a pair of rear cone seats 22 and 31 seating upon the cone seats 16 and 15 respectively of the gun body, and with a pair of forward cone seats 26 and 30 seating upon the cone seats 36 and 37 of the air nozzle cap, whereby the auxiliary air for the horn ports will pass through the part 29 by way of the passages 33 and not pass through the space within the coupling ring 35 and between the rear end of the nozzle cap and the front end of the gun body whereby leakage would occur, the seats 15—31 and 30—37 acting to seal off and prevent the air entering into such space within the coupling ring. Because of the manner of connecting the air nozzle cap to the gun body by a coupling ring between the rear end of the cap and the forward end of the gun body, there is an annular space between the cap and the gun body which is not sufficiently sealed off by the threads of the coupling and the ring connection with the cap to prevent leakage of air. In previous structures, the air for the horn ports passed through such space and because of the leakage of air from such space by the coupling the proper pressure of air at the horn ports could not be as well maintained as desired. By the present invention, the air is by-passed about such space and sealing means is provided between such space and the passage for the air.

The pressure of the air to the horn ports and its passage thereto from the air passage 4 are controlled by a side valve shown in Fig. 3. This valve device comprises a cross-bore in the gun body providing a chamber 17, and a valve chamber 43 with a valve seat 44 between them. The air passage 18 leads from the chamber 43 to the annular air channel 13. The port of the valve seat 44 is controlled by a valve 45 carried at the end of a stem having a smooth stem portion 46, a threaded portion 47, and a knob 48, the threaded portion 47 being operative in packing nut 49 secured into the outer end of the chamber 17 at a side of the gun body. At the inside of the nut 49 is a packing 50 compressed by a pressure plate 51 acted upon by a spring 52 for maintaining the packing leak-tight about the smooth portion of the stem, the spring 52 reacting against washer 53 on the stem portion 46 and backed by a cross pin 54 provided in the stem 46. By turning the knob 48 the valve 44—45 may be adjusted to control the amount and the pressure of the air to the horn ports, and hence the desired flattening of the material stream from the tip 20.

In assembling the unit, which is of generally double cone form, it is connected to the forward end portion of the gun body by screwing the threaded portion 24 of the unit into the threaded portion 12 of the socketed portion 5 of the gun body. As the cone seats 31 and 15 at the mouth of the socket and the cone seats 22 and 16 at the base of the socket engage and self-center the unit, further turning of the unit effects a wedging action between the threads of the threaded parts 24 and 12 without further axial movement of the unit, thus tightly securing the unit with all cone seats exactly coaxial and sealed. If the

threads are not coaxial they will be engaged or wedged together with sufficient eccentricity so that all the cone seats will be precisely coaxial. The thread of the threaded part **12** is longer than the thread of the threaded part **24** so that there is no possibility of the rear end of the part **24** seating before the seating of the cone seat parts **16** and **22**, and **15** and **31**, as would be the case if the part **12** had the usual socket base against which the rear end of the part **24** would seat. The seating home of the unit is controlled and made exact by the cone seats, which, as above stated, are in the same or a common cone surface.

The air cap **34** is then coupled to the front end portion of the gun by screwing the coupling ring **35** into place, thus bringing the cone seats **36** and **37** of the cap respectively into sealing engagement with the cone seats **26** and **30**. With the parts so assembled, the space within the coupling and between the rear end of the cap and the front end of the gun body is sealed off from the auxiliary air passage comprising the components **18**, **13**, **33**, **32**, **38**, **42** and **40**.

In operation, when the trigger is pressed to open the air and needle valves, the air passes through the passage **4**, thence through the chamber **17** always in communication with the annular channel **14**, from the channel **14** through the passages **27** to the chamber **28**, and out through the annular orifice **41**. The needle valve opens later and the material projected through the tip **20** is atomized by the air issuing from the orifice **41**. With the side valve **44—45** adjusted as desired, the air passes from the chamber **17** through the valve **44—45**, chamber **43**, passage **18**, channel **13**, passages **33**, channel **32—38**, passages **42** and side ports **40** to project side jets to flatten the material and air stream proceeding from the tip **20** and orifice **41**. The passage of the auxiliary air through the passages **33** is within a nozzle part, as **29**, which is sealed from the space within the coupling ring and between the nozzle cap and the forward end of the gun body so that there is no chance of leakage of air to such space.

While I have herein described and upon the drawing shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but comprehends other constructions, arrangements of parts, details, features, or the like, without departing from the spirit of the invention.

Having thus disclosed the invention, I claim:

1. In nozzle structure for a spray gun having a body provided with material and air passages leading to the forward end of the body, an air nozzle part connected to the forward end of the body by a coupling means, and a material and air nozzle unit connected between the air nozzle part and the forward end of the body and having material and air passages communicating with the material and air passages in the body, the combination of said forward end of said body being provided with a socket of general cone form with cone seats at the mouth and the base of the socket and with a threaded part between said seats, and an end of said unit being of generally cone form to fit in said socket and having cone seats to form mouth and base seals with said cone seats of the body and also having a threaded part between the seats of the unit to join with the threaded part of the body, said joined threaded parts being spaced from said seals to provide a rear air channel between said threaded parts and the base seal and a forward air channel between said threaded parts and the mouth seal whereby said channels are separated by said threaded parts, said rear channel being in communication with the air passage in the body and the air passage in the unit being in communication with said rear channel, said body having an auxiliary air passage communicating with the air passage in the body and with said forward channel, said unit having an auxiliary air passage therein communicating with said forward channel and with said air nozzle part.

2. In nozzle structure for a spray gun having a body provided with material and air passages leading to the forward end of the body, an air nozzle part connected to the forward end of the body by a coupling means, and a material and air nozzle unit connected between the air nozzle part and the forward end of the body and having material and air passages communicating with the material and air passages in the body, said body and unit having spaced annular seats which form outer and inner seals of different diameters, and also having spacedly intermediate said seals threaded parts of an intermediate diameter, said threaded parts when joined providing outer and inner air channels which are separated by said joined threaded parts and which are respectively between said joined threaded parts and said outer and inner seals, said inner channel being connected to the air passage in said body and the air passage in said unit, said body having an auxiliary air passage connected to the air passage in the body and said outer channel, and said unit having an auxiliary air passage therein connected to said outer channel and said air nozzle part.

3. In nozzle structure for a spray gun having a body provided with material and air passages leading to the forward end of the body, an air nozzle part connected to the forward end of the body by a coupling means, and a material and air nozzle unit connected between the air nozzle part and the forward end of the body and having material and air passages communicating with the material and air passages in the body, said body and unit having axially and radially spaced seats which fit together to form forward and rear seals, and also having spacedly between said seals threaded parts which when united form a joint, said joint being so located as to provide between it and said seals forward and rear annular air channels, said rear channel being connected to the air passage in the body and to the air passage in the unit at a point between said joint and rear seal, said body having an auxiliary air passage between said passage in said body and said forward channel, and said unit having an auxiliary air passage therein between said forward channel and said air nozzle part.

4. In a spray gun structure provided with passages for material and for main and auxiliary air and having a body, a nozzle unit and an air nozzle cap; a sealing means comprising spaced seating means between the rear end of the unit and the forward end of the body, and securing means intermediate said spaced seating means for securing the unit to the body and being spaced from said seating means to provide main and auxiliary air channels which respectively form parts of said main and auxiliary air passages, said cap being seated on the forward end of the unit.

5. In a spray gun structure of the character disclosed and which comprises a body provided

with material and main and auxiliary air passage portions therein, a nozzle unit provided with material and main and auxiliary air passage portions therein, and an air nozzle cap on the unit and provided with an auxiliary air passage portion; a securing and sealing means comprising spaced seating means each having counterpart seats on the unit and the body, and securing means spacedly between said seating means for securing and sealing the unit to the body and for providing main and auxiliary air channels between said securing means and said seating means, which main and auxiliary air channels communicate respectively with the main and auxiliary air passage portions in said body and said unit, said auxiliary air passage portion in said unit communicating with said auxiliary air passage portion in said cap.

6. In a spray gun structure of the character disclosed and which comprises a body provided with material and main and auxiliary air passage portions therein, a nozzle unit provided with material and main and auxiliary air passage portions therein, and an air nozzle cap on the unit and provided with an auxiliary air passage portion; a securing and sealing means comprising spaced seating means each having counterpart seats on the unit and the body, and securing means spacedly between said seating means for securing and sealing the unit to the body and for providing main and auxiliary air channels between said securing means and said seating means which main and auxiliary air channels communicate respectively with the main and auxiliary air passage portions in said body and said unit, said securing means comprising threaded portions of said unit and said body of which the threaded portion of said body extends for the full distance between said main and auxiliary air channels for affording full and exact seating of said seating means, said auxiliary air passage portion in said unit communicating with said auxiliary air passage portion in said cap.

7. In a spray gun structure of the character disclosed and which comprises a body provided with material and main and auxiliary air passage portions therein, a nozzle unit provided with material and main and auxiliary air passage portions therein, and an air nozzle cap on the unit and provided with an auxiliary air passage portion, a securing and sealing means comprising spaced seating means each having counterpart seats on the unit and the body, and securing means spacedly between said seating means for securing and sealing the unit to the body and for providing main and auxiliary air channels between said securing means and said seating means, which main and auxiliary air channels communicate respectively with the main and auxiliary air passage portions in said body and said unit, said securing means comprising threaded portions of said unit and said body of which the threaded portion of said body is longer than the threaded portion of said unit for effecting exact seating of said seating means, said auxiliary air passage portion in said unit communicating with said auxiliary air passage portion in said cap.

WILLIAM B. MacMARTIN.