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SPRAY NOZZLE

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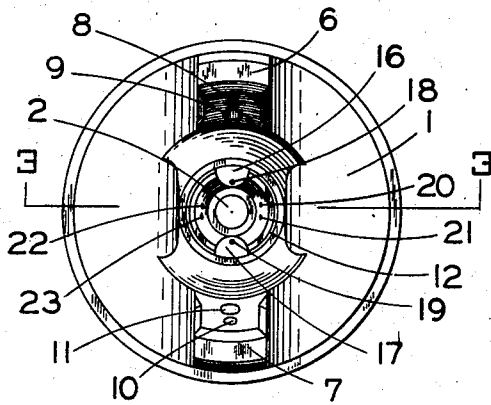


Fig. 1

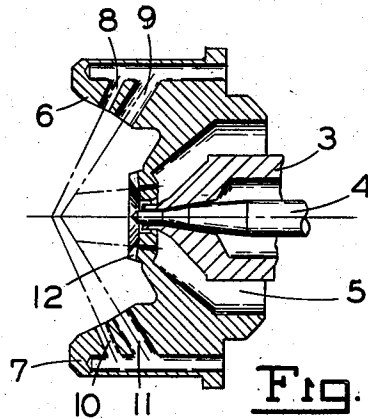


Fig. 2

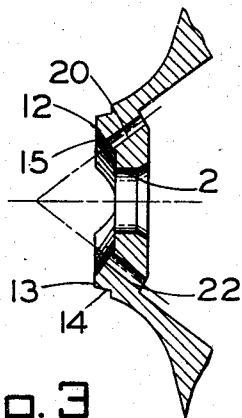


Fig. 3

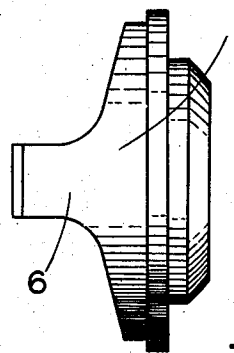


Fig. 4

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SPRAY NOZZLE

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4 Claims. (Cl. 299—140.1)

1

This invention relates to spray nozzles utilizing air for atomization and particularly to such nozzles in which a plurality of air jets are directed toward the stream of discharged material to atomize it and to form it into a desired pattern.

In the conventional spray nozzle of this type, as used for spray coating furniture, automobile bodies and the like, there is an annular air outlet opening around a circular spray material outlet. The purpose of the air from this annular opening is the primary atomization of the material. It also serves as a protective shield around the atomized material and prevents an uncontrolled dispersion of the material by the impingement of supplemental air jets. Prior to being subjected to the action of supplemental air jets the sprayed material has a forwardly flaring conical form.

To shape the spray discharge into a more effective fan pattern, it has long been customary to have a pair of forwardly converging air jets strike the central air and material stream upon opposite sides.

Various other air jets are used at the sides of the center stream 90° about its axis from the sides against which the flattening jets strike. These auxiliary jets have been utilized for two principal purposes. As disclosed in Gustafsson Patents 1,990,824 and 2,029,423 one of these purposes is to provide a stream of air parallel to the axis of the central stream of atomized material to restrict its lateral spread.

The other principal purpose of such side jets is to improve atomization by directly impinging the atomized material stream at its center and strongly indenting it. The usual effect from this action is to form the stream into a cross section of a rather dumbbell outline elongated in the plane of the main flattening jets. It is not believed that the use of such auxiliary side jets has extended beyond these two arrangements.

To a person not experienced in the art it may appear a simple maneuver to add and arrange variously angled air jets upon a spray nozzle. The contrary is actually the case. The size and position of each of the jets now commonly utilized are most critical. Any disarrangement ordinarily has a most harmful effect upon the atomization, the distribution of the atomized particles or upon the undesirable deposit of stray particles upon the face of the spray nozzle. Attempts at variations are accordingly made with great caution and the creations of new forms are very infrequent.

Instead of center piercing and partial division

2

of the main spray material stream, the subject invention undertakes an entirely new action through the use of an opposed pair of two side-by-side auxiliary jets directed in parallel paths and striking the central stream at an acute angle and at off center spaced points. A flattening as well as a compound indenting action is thus secured.

Contrary to previous concepts the use of such cooperating jets contributes to the final formation of a particularly well atomized and distributed spray pattern and at the same time does not cause an objectionable accumulation of stray spray particles upon the face of the spray nozzle.

The contour of the surface in which the auxiliary air jet ports are located as incorporated in the subject spray nozzle is also considered novel and a factor in its improved performance. The ports of the side atomizing jets are positioned in an inwardly angled annular surface, while other auxiliary jet ports between the ports of the main flattening jets and the center orifice are disposed in arcuate outlined flat surfaces perpendicular to the axis of the center orifice. Such auxiliary jets have been referred to as clean-up jets.

The primary object of this invention is the provision of a spray nozzle of superior atomizing power.

A further object is the provision of a spray nozzle which may be constructed with less need of close tolerances.

Other objects and features of novelty will become apparent from the following specification with reference to the accompanying drawing in which:

Fig. 1 is a front view of a spray nozzle embodying my invention;

Fig. 2 is a central vertical section thereof;

Fig. 3 is an enlarged fragmentary horizontal section taken on line 3—3 of Fig. 1; and

Fig. 4 is a side elevation of the spray nozzle turned 90° about its axis from its position in Fig. 2.

Referring to the drawing, my invention is shown as applied to a spray nozzle 1 with a central orifice 2.

Into this orifice extends a spray material tip 3, as shown in Figure 2. A needle valve 4 is the conventional member for controlling the discharge of spray material from tip 3.

The primary atomizing air travels through space 5 surrounding tip 3 and issues from the spray nozzle through the annular opening formed by the peripheral portion of orifice 2 bordering

3

the forward end of the tip 3. This air atomizes the discharged spray material and in commingled relation therewith travels forwardly in a gradually expanding conical stream.

From horns 6 and 7 pairs of converging flattening jets are discharged from ports 8, 9, 10 and 11 against the atomized material stream to shape the stream into its final fan pattern.

Encircling the central orifice 2 is an annular ridge 12 approximately .042 inch in height and having a narrow forwardly facing flat top 13. Its outer wall 14 is substantially parallel with the axis of the central orifice 2 while its inner wall surface 15 is tapered at about 53 degrees toward the axis.

In front of each horn the ridge 12 is intercepted by an arcuate shaped cut-out section (16 and 17). These are flat bottomed and in each is an air port (18 and 19) for discharging a clean-up jet in a path parallel to or inclined slightly toward the axis of the center orifice.

On opposite sides of the center orifice 2 and on the inner sloping side 15 of the ridge 12, at points 90 degrees around the center orifice from the cut-out sections 16 and 17, are pairs of side-by-side ports 20, 21, 22 and 23. These are positioned to project air jets in parallel paths against the central atomized material stream at an angle and in straddling relation to the center line of the stream.

Having the surfaces from which these jets are emitted elevated in relation to the center orifice is particularly advantageous. The emission point of each jet is thereby brought closer to the stream of atomized material and the concentration and power of the jet is less dissipated through expansion before striking the stream. Further, because the surface surrounding each of the ports of these jets is substantially perpendicular to the port axis, the contour of the port remains fully circular and one side of the air jet is not confined by the port wall longer than is the other side. It may be readily understood that when the port axis is angled to the surface surrounding the port, the outline of the latter is elliptical instead of circular and the air jet becomes asymmetrical due to expansion of that side portion first reaching the atmosphere.

In one form of my invention with which excellent results may be obtained the more forward port in each horn (8 and 10) is .0465 of an inch in diameter and is directed at an angle of 65 degrees toward the axis of the center stream; and the rearward horn ports (9 and 11) are .070 of an inch in diameter and are directed at an angle of 53 degrees toward the center stream. The clean-up jets from ports 18 and 19 are .024 in diameter and are directed in paths inclined at an angle of 5 degrees toward the axis of the center stream. The side atomizing jets from ports 20, 21, 22 and 23 are .021 in diameter and

4

are angled toward the center stream axis at 37 degrees. The ports of each pair of atomizing jets are .050 of an inch apart from center to center.

My copending application Ser. No. 190,952, filed October 19, 1950, similarly entitled Spray Nozzle relates to a different form of the basic feature of striking the central stream near its source on opposite sides with a plurality of non-merging jets. Instead of having the jets directed along parallel paths as in this application the jets of this copending application are directed along converging paths. The jets however separately impinge against the central stream before their paths intersect.

While a certain embodiment of the invention has been described in detail modification in respect to the size and angle of air ports may be made therein without departing from the essence of the invention.

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

1. A spray nozzle having a central port for the discharge of an expanding conical stream of material and air, pairs of atomizing air ports on opposite sides of but adjacent to the central port symmetrically arranged for directing against the stream of material and air near its source from each side a pair of jets along parallel paths which are in straddling relation to the axis of the central orifice, and two sets of larger ports, farther from the central port and on opposite sides 90° about the axis of the central port from the position of the atomizing air ports, for discharging opposed sets of converging air jets to strike the stream simultaneously from opposite sides to form it into its final fan shape.

2. A spray nozzle as set forth in claim 1 in which the atomizing air ports are equidistant from the central port.

3. A spray nozzle as set forth in claim 1 in which the jets from the atomizing air ports are directed against the stream at an angle of approximately 37° thereto.

4. A spray nozzle as set forth in claim 1 in which the combined diameters of the pair of atomizing air ports on one side of the central port is greater than the distance between said ports.

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