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(54) Nozzle and atomizer head suitable for paint spray guns

(57) A nozzle and atomizer head suitable for use with a paint spray gun has a centrally located spray orifice 13 with a substantially elliptical cross-section and a pair of compressed air output orifices 17, 17′ offset from the paint spray orifice. The output air forms a screen, with an elliptical cross-section, that prevents the paint spray from breaking up.

FIG. 2

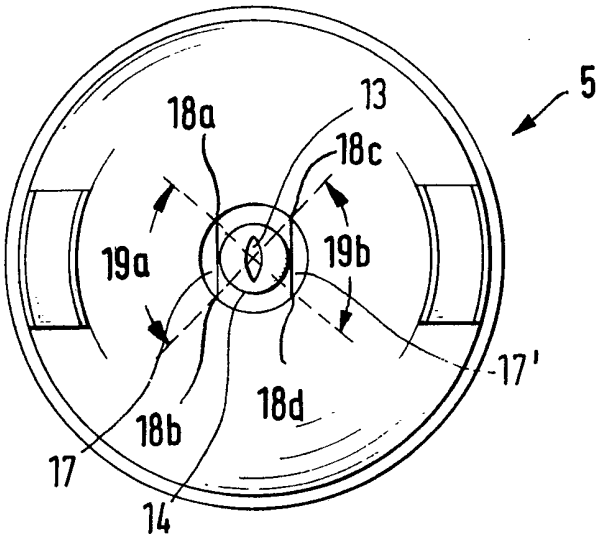

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FIG.1

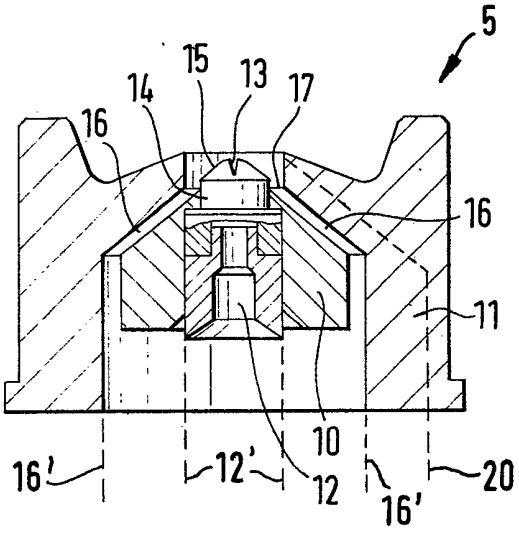
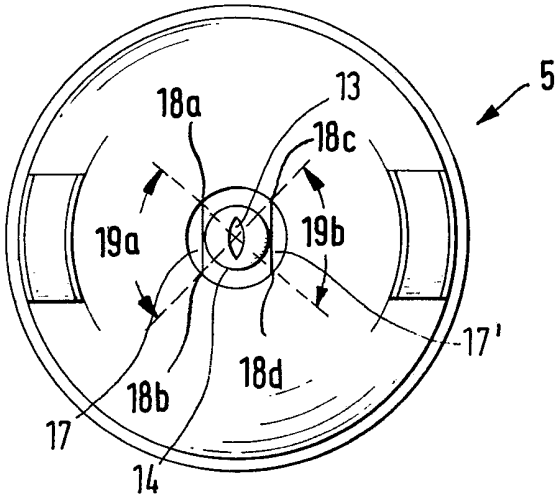


FIG. 2



SPECIFICATION

Nozzle and atomizer head suitable for paint spray guns

The invention relates to nozzles and atomizers for paint spray guns.

Two basic kinds of atomizer heads are known for paint spray guns. In air-type spraying, the paint is fed to the exit nozzle almost without pressure and the atomizing as well as the transport to the workpiece is brought about by compressed air. In airless spraying the paint is brought to the nozzle under a high pressure of, for example, 200 bar, so that the paint atomizes by itself when exiting from the nozzle. The paint reaches the workpiece without needing additional compressed air as a result of its kinetic energy. Recently, a third kind of atomizer head has become known. This is a combined air-airless spray head. The paint is maintained under high pressure but not as high pressure as in the case of purely airless paint sprayers. Compressed air is additionally used in lesser quantities of flow than in the case of purely compressed air paint sprayers.

In the combined method, pressures between 30 and 100 bar are used and the additional compressed air serves both to provide the atomization and to transport the paint to the workpiece. An atomizer head of this sort is taught by German OS 2,422,597. One disadvantage of this known atomizer head is its complexity. Separate compressed air borings and orifices are necessary to produce atomization and to transport the paint to the article. A second disadvantage lies in the performance of the known atomizer head. At the edges of a fan-type paint spray, paint particles break away from the spray and are not directed to the workpiece.

There is thus a need for a simple, combined air-airless spray head, with improved paint deposition where fan-type sprays are being used.

According to one aspect of the present invention, there is provided a paint spray nozzle having an outer housing, a centrally located cylindrical member having an upper conical surface on which is located a paint spray orifice having a substantially elliptical cross-section which in use is operable to form a fan-shaped paint spray, a paint input port connected to the spray orifice, and a compressed air input port, the nozzle further comprising means affixed to the nozzle for forming an air screen fully surrounding the fan-shaped paint spray when the nozzle is in use, said air screen having a substantially elliptical cross-section.

According to a second aspect of the present invention there is provided a paint spray nozzle having an outer housing, a centrally located cylindrical member having an upper conical surface on which is located a paint spray orifice having a substantially elliptical cross-section which in use is operable to form a fan-shaped paint spray; a paint input port connected to the spray orifice; a compressed air input port; and a first and a second compressed air output orifice each of which is connected to the compressed air input port, wherein (a) said two compressed air output orifices are disposed in spaced apart relationship on opposite sides of the cylindrical member supporting the spray orifice and are located at a predetermined distance below an outer edge of the upper conical surface and at an acute angle with respect to a center of rotation of the cylindrical member; and (b) said two air output orifices are shaped so that, in use, they cooperate with the cylindrical member and the upper conical surface to form a screen of air, having a substantially elliptical cross-section fully enclosing the fan-shaped spray.

According to a third aspect of the invention, there is provided a method of spraying a fluid, for example paint, which comprises supplying the fluid to a substantially elliptical nozzle under a pressure of from 30 to 100 bar, while forming a substantially elliptical air screen around the fluid which issues from the nozzle by causing compressed air to issue from outlets adjacent to said nozzle.

The nozzle or atomizer of this invention has a body with a centrally located boring through which paint can be transported to a spray orifice. The orifice, centrally located, has an elliptical cross-section. In preferred embodiments, compressed air orifices are provided on each side of the paint spray orifice, both of the compressed air orifices being fed from a single compressed air boring. Each compressed air orifice preferably has a cross-section corresponding in shape to a section of a circle.

The length of each of the compressed air orifices is preferably somewhat longer than the length of the paint spray orifice. The compressed air orifices can be shaped so that an air flow having an elliptical cross-section is set up when the nozzle is in use. This air flow can fully enclose the paint spray. The two air sprays intersect at their edges, due to the length of the air orifices, thus minimizing the break away of paint drops from the edge of the fan-shaped spray.

In addition to assisting in the atomization of the spray, the air screen produces a very high degree of paint deposition on the article being painted.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a schematic representation of an atomizer head in longitudinal section; and

Figure 2 is a schematic representation of an end view of the atomizer head of Fig. 1.

An atomizer head 5 has a nozzle body 10 and an air cap 11 which surrounds the body 10 concentrically. The nozzle body 10 possesses an interior boring 12, which is connected to a paint feed conduit 12′ shown in dashed lines. The boring 12 terminates at a slot-shaped nozzle opening 13. The nozzle or orifice 13 has an essentially elliptical cross-section. Orifices such as the orifice 13 produce a fan-shaped spray pattern and are, in general, designated as fan spray nozzles. The orifice 13 is supported by a cylindrical body portion 14 which terminates at a conical surface 15. Surface 15 tapers to the nozzle opening 13. The air cap 11 includes two groove-like recesses which are covered by the nozzle body 10 and thus form air channels 16. The air channels 16 are connected to a compressed air feed 16′ shown in dashed lines. Each of the channels 16 terminates in a circular segment-like air outlet 17 or 17′. The air orifices 17 and 17′ are adjacent the cylindrical surface 14 and on opposite sides thereof.

As can be seen from Fig. 1, the air outlets 17 and 17′ are arranged opposite the nozzle body 10 and are directed towards the cylindrical part 14 of the nozzle body 10. Opposite the surface of the cylinder part 14, the orifices 17 and 17′, or the respective feed channels 16, are oriented at an angle of approximately 45° with respect to an axis of rotation of the body member 10.

As shown in Fig. 2, the orifices 17 and 17′ are elongate and their ends are indicated by references 18a–d. The orifices 17 and 17′ extend parallel to the major axis of the nozzle slot 13 and finally, which is of particular importance, they have a length which exceeds the diameter of the cylinder 14 such that the end sections 18a, b and 18c, d, respectively, of the orifices 17, 17′ are located opposite one another directly without there being any part of the cylindrical surface 14 in between. Expressed differently, the arc length 19a, b of each of the air orifices 17 and 17′ is advantageously from 30° to 80° when measured with respect to the center of the housing 11.

The atomizer head 5 functions in the following way In operation, when affixed to a spray gun, paint is fed to the nozzle 13 via the boring 12 and paint supply conduit 12′. The paint is under a pressure of from 30 to 100 bar. The paint then exits from the nozzle orifice 13 in the form of a fan spray, which consists of atomized paint particles. At the same time, via the channels and air conduit 16′, 16, compressed air under pressure of for example 2 bar, is fed to the two segment openings 17 and 17′. The compressed air which is exiting from the middle region of the air orifices 17 and 17′ strikes the cylindrical surface 14 and is deflected toward the front surface 15 whereby it then assists in atomization of the paint. Additionally, the compressed air surrounds the two fan sides of the paint fan spray in a screening manner. The compressed air exiting at the outer ends 18a and b of the orifice 17 is directed toward compressed air exiting at outer edges 18c and d, respectively, of orifice 17′. The air streams from the end points 18a, b intersect the streams from end points 18c, d, thereby providing a closed air screen having an essentially elliptical cross-section with the paint fan-spray centrally located therein. In other words, the paint fan-spray is completely surrounded by a screening air envelope having an oblong elliptical cross-section. As a result, individual paint drops are inhibited from breaking away from the fan spray. Besides this, the atomization is improved and additionally, kinetic energy is imparted to the spray to convey it to the article being painted.

Of course, the atomizer head 5 is also suitable for electrostatic paint spraying, in which case, the atomizer head 5 itself is designed with an electrode 20 shown in dashed lines in Fig. 1. All standard electrode arrangements can be used with the spray head 5. The atomizer head can have various embodiments. The two air feed channels 16 could be brought together into a connected ring channel formed by an interior plane of the air cap 11 and an outer surface of the nozzle body 10. Also, the cross-sectional form of the air exit openings 17 and 17′ need not necessarily be circular segment-shaped. Nevertheless, it is essential that orifices 17 and 17′ be of such a length that the compressed air streams which flow out of the end regions 18a–d intersect one another such that the air shield surrounding the paint fan-spray is closed at the edges.

The method of the invention, although particularly suited to the spraying of paint, may also be used for the spraying of other fluids.

CLAIMS

1. A paint spray nozzle having an outer housing, a centrally located cylindrical member having an upper conical surface on which is located a paint spray orifice having a substantially elliptical cross-section which in use is operable to form a fan-shaped paint spray, a paint input port connected to the spray orifice, and a compressed air input port, the nozzle further comprising means affixed to the nozzle for forming an air screen fully surrounding the fan-shaped paint spray when the nozzle is in use, said air screen having a substantially elliptical cross-section.

2. A nozzle as claimed in claim 1, wherein said means comprises a first and a second compressed air output orifice each of predetermined shape and size and each located in spaced relationship to the paint spray orifice, and at a selected angle with respect to a

center of rotation of the cylindrical member.

3. A paint spray nozzle having an outer housing, a centrally located cylindrical member having an upper conical surface on which is located a paint spray orifice having a substantially elliptical cross-section which in use is operable to form a fan-shaped paint spray; a paint input port connected to the spray orifice; a compressed air input port; and a first and a second compressed air output orifice each of which is connected to the compressed air input port, wherein (a) said two compressed air output orifices are disposed in spaced-apart relationship on opposite sides of the cylindrical member supporting the spray orifice and are located at a predetermined distance below an outer edge of the upper conical surface and at an acute angle with respect to a center of rotation of the cylindrical member; and (b) said two air output orifices are shaped so that, in use, they cooperate with the cylindrical member and the upper conical surface to form a screen of air, having a substantially elliptical cross-section fully enclosing the fan-shaped spray.

4. A nozzle as claimed in claim 2 or 3, wherein: (a) each of said air output orifices has a first elongate straight edge joined at a first and a second end by an arc of a circle; and (b) each of said straight edges is located adjacent the cylindrical member and parallel to a major axis of the substantially elliptical paint spray orifice.

5. A nozzle as claimed in claim 4, wherein each of said straight edges has a length which exceeds that of the major axis of the substantially elliptical paint spray orifice by a predetermined amount.

6. A nozzle as claimed in claim 2, 3, 4 or 5, wherein said acute angle is substantially a forty-five degree angle.

7. A nozzle as claimed in claim 4 or 5, wherein each of said straight edges is located adjacent the cylindrical member, at a predetermined distance from the major axis of the paint spray orifice.

8. A nozzle substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

9. An atomizer head incorporating a nozzle as claimed in any preceding claim.

10. A method of spraying a fluid, for example paint which comprises supplying the fluid to a substantially elliptical nozzle under a pressure of from 30 to 100 bar, while forming a substantially elliptical air screen around the fluid which issues from the nozzle by causing compressed air to issue from outlets adjacent to said nozzle.

11. A method of spraying paint substantially as hereinbefore described with reference to the accompanying drawings.

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