

United States Patent

Harwood et al.

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[54] SPRAY DISCHARGE NOZZLE

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 1,355, Jan. 8, 1970, abandoned.

[52] U.S. Cl. 239/597, 239/421, 239/545

[51] Int. Cl. B05b 1/26

[58] Field of Search 239/398, 419.5, 421, 428.5, 239/433, 523, 545, 598

[56] References Cited

UNITED STATES PATENTS

2,864,652 12/1958 O'Brien et al. 239/523

3,073,533 1/1963 Weinbrenner et al. 239/433 X
3,082,961 3/1963 Hruby, Jr. 239/523 UX
3,322,352 5/1967 Alcantara 239/428.5

FOREIGN PATENTS OR APPLICATIONS

17,369 9/1892 Great Britain 239/545

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[57]

ABSTRACT

A side discharge liquid spray nozzle is shown having an air passage and a liquid passage entering from opposing sides thereof and meeting and impinging one on the other in the bottom of a groove, the groove being an external plain groove extending across the body of the nozzle portion.

6 Claims, 8 Drawing Figures

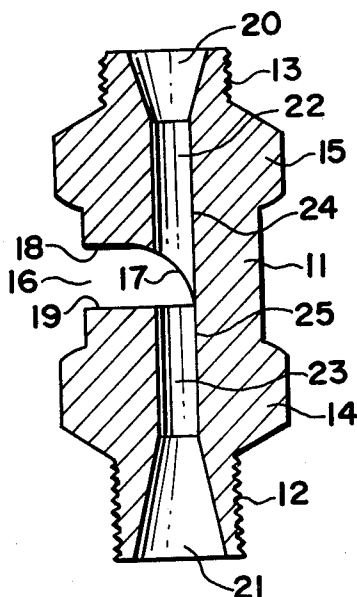


FIG. 1

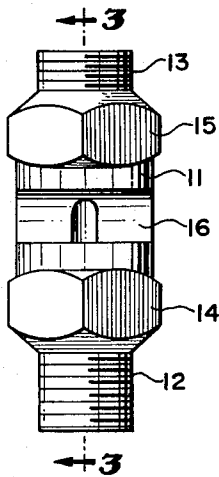


FIG. 2

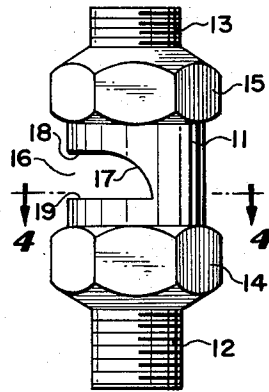


FIG. 3

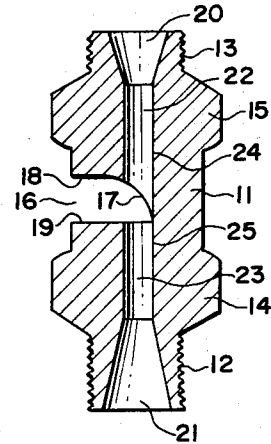


FIG. 4

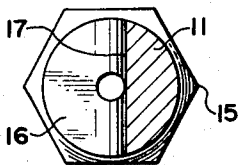


FIG. 5

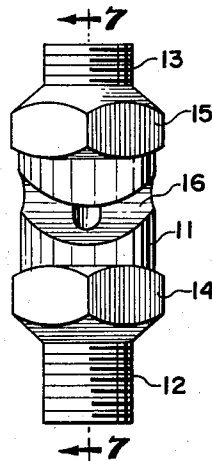


FIG. 6

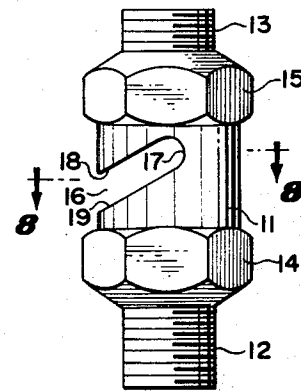


FIG. 7

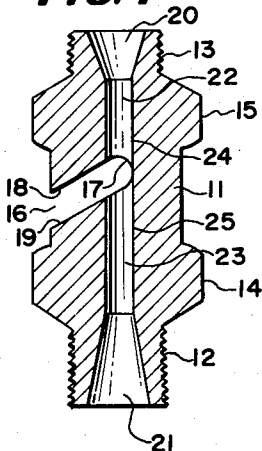
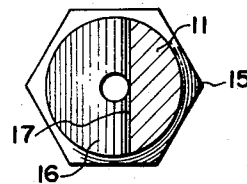


FIG. 8



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SPRAY DISCHARGE NOZZLE

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of application, Ser. No. 1,355 filed Jan. 8, 1970 now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to spray nozzles for producing a spray of widespread flat fan shape wherein the opposite limit of the spray may or may not be discharged in substantially opposite directions.

2. Description of the Prior Art

In many spraying operations, as for example, in field spraying and the like, it is desirable to project the spray as uniformly as possible throughout as wide a range as possible. Uniformity of spray deposit does not depend on uniformity of volume of discharge throughout the fan shaped extent of the discharging spray, because the portions of the spray which are projected sidewise to the greater distances cover a greater length of the range of the spray deposit and accordingly require proportionately greater volume of spray than the portions of the spray which are discharged downwardly or more nearly downwardly from the origin of the spray discharge. It is, therefore, customary that the volume of spray discharge throughout the length of the discharging spray be varied in order to achieve uniformity in the discharge pattern.

Prior art includes spraying operations which project the spray in opposite directions from the nozzle location by utilizing two nozzles which are paired together and one of which discharges at one side of the nozzle location and the other of which discharges at the other side of the nozzle location so that the total extent of spray range is the combined fanwise extent of spray discharge of the two nozzles, the orifices of which are shaped and arranged so as to produce corresponding fan shaped sprays which are positioned to meet or overlap at their inner limits of individual spray range and have the spray volume suitably proportioned throughout the fanwise range of each so that the spray deposit is substantially uniform throughout the range from the outer limit of the projection of the spray from one nozzle to the outer limit of the projection of spray from the other nozzle. This prior art has the obvious defect of requiring two nozzles instead of one and thus multiplies any problems that may occur.

One prior art attempt to overcome these problems has been suggested in U.S. Pat. No. 2,864,652. This type of nozzle utilizes a groove overlapping a single supply channel in the body of a nozzle. While this nozzle overcomes some of the problems left unsolved by the art prior to it, it is still unacceptable for certain operations. It may be desired to handle a higher volume of material than the prior art nozzles are capable of handling, or it may be desired to spray a small volume of a large particle size material, a feat the prior nozzles have not accomplished. It may also be desired to have a mixing of two or more streams at the nozzle itself. Also in certain type operations, it is desirable to prevent air contact with a material as long as possible and is therefore desirable to effectuate air contact with the material at the nozzle itself. The present invention solves the many problems that have been unanswered by the prior art.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a side discharge spray nozzle which can be used to spray a relatively high volume of material in substantially a fan shaped spray discharge.

It is another object of this invention to provide a spray discharge nozzle which provides for mixing of a liquid material and a gaseous material in the nozzle itself and emits the mixture in a spray pattern.

It is still another object of this invention to provide a spray nozzle which will spray a relatively small volume of a relatively large particle size material.

The objects of this invention are accomplished by a side discharge liquid spray nozzle comprising a body with a rear end and a front end and having an external plain groove extending across the body from side to side thereof, the body having an air supply passage therein which leads forwardly from the rear end of the body toward the front end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, the body also having a liquid supply passage therein which leads rearwardly from the front end of the body toward the rear end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, the groove having the bottom thereof extending transversely of the air supply passage and liquid supply passage and at right angles thereto and of uniform cross-section from end to end of the groove, the groove having at least one side which curves outward from the supply passages, said air supply passage and said liquid supply passage terminating at a point opposing one another at the bottom of the groove causing air and liquid discharged from the passages into the groove to impinge one on the other and emerge in a spray pattern.

In relation to the prior art as expressed by U.S. Pat. No. 2,864,652, our present invention may be said to be an improvement over prior art nozzles wherein the improvement as defined as in a side discharge liquid spray nozzle comprising a body with a rear end and a front end and having an external plain groove extending across the body from side to side thereof, the body having liquid supply passage therein which leads rearwardly from the front end of the body toward the rear end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, the groove having the bottom thereof extending transversely of the air supply passage and liquid supply passage and at right angles thereto and of uniform cross-section from end to end of the groove, the improvement comprising an air supply passage therein which leads forwardly from the rear end of the body to the front end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, the groove having at least one side which curves outward from the supply passages, said air supply passage and said liquid supply passage terminating at a point opposing one another at the bottom of the groove causing air and liquid discharged from the passages into the groove to impinge one on the other and emerge in a spray pattern.

It is to be understood that the air supply passage and the liquid supply passage must respectively be connected to means for supplying a gaseous medium under positive pressure thereto and means for supplying a liquid medium under positive pressure thereto. In other words, in operation a gaseous medium must be forced into the air supply passage and a liquid must be forced into the liquid supply passage. Neither can, in operation, be left open to the atmosphere. Both must have a pressure greater than the pressure where the nozzle exits. While we claim an apparatus having means to supply a gaseous medium to the apparatus under positive pressure, we intend to limit this only to an attachment on the nozzle which allows it to be pneumatically attached to a means for supplying a gaseous medium under positive pressure thereto.

The objects of this invention and how we have accomplished them are more fully explained by the description hereinafter presented.

BRIEF DESCRIPTION OF THE DRAWING

The objects of this invention are accomplished and more fully explained by the accompanying drawings in which:

FIG. 1 is a side view of a nozzle made in accordance of our invention and looking at the open side thereof from which the spray is discharged.

FIG. 2 is a view looking at the right side of the nozzle of FIG. 1.

FIG. 3 is a central, longitudinal, sectional view of the nozzle taken along the line 3—3 of FIG. 1.

FIG. 4 is a cross-sectional view of the nozzle taken on line 4—4 of FIG. 2.

FIG. 5 is an alternate embodiment of our invention and is a side view of a nozzle looking at the open side thereof from which the spray is discharged.

FIG. 6 is a view looking at the right side of the nozzle of FIG. 5.

FIG. 7 is a central, longitudinal, sectional view of the nozzle taken on the line 7—7 of FIG. 5.

FIG. 8 is a cross-sectional view of the nozzle taken on line 8—8 of FIG. 6.

In the drawings the nozzle comprises an elongated body portion 11 which is cylindrical in shape. The body portion has a first threaded end 12 and a second threaded end 13 for attaching it to air supply means and liquid supply means respectively. The body is also provided with hexagonal enlargements 14 and 15 for wrench engagement to facilitate connection to the supply means. The body has groove 16 which extends across the body approximately midway of the length of the body. The groove has a grooved bottom 17 at least one side of which is preferred to be curved in shape. The sides of the groove 18 and 19 are straight in at least one portion thereof to provide a deflector surface. Within the body are liquid supply entrance 20 and air supply entrance 21 wherein the liquid and air respectively are passed into the liquid supply passage 22 and the air supply passage 23 respectively. The liquid supply passage and air supply passage terminate in the bottom of the groove opposing one another in a manner which will cause the fluids conveyed in the passages to impinge one on the other in the bottom of the groove. The liquid supply passage and the air supply passage have side extremities 24 and 25 respectively which meet and form the bottom portion of the groove.

It is preferred that the width of the bottom of the groove be greater than the diameter of the supply passages, although it is not absolutely necessary that the width of the bottom of the groove be substantially greater than the diameter of the supply passages. It is necessary, however, that the groove be cut in such a manner that an expanse of deflector surface is provided to impart the desired spray pattern effect. As is hereinbefore mentioned, the groove may consist of two substantially straight sides tangentially connected to a grooved bottom such as is shown in FIG. 6. The groove may also consist, however, of one straight side and one other side being straight for a small distance and then being curved inward to meet the other side.

As is illustrated by FIGS. 1 through 3, the groove may be perpendicular throughout to the supply passage. However, as is described by FIGS. 5 through 7, the groove may be curved at its outer extremity to provide a wider spray pattern.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiment of this invention is illustrated in FIGS. 1 through 4 of the drawings. In this embodiment, the groove is substantially perpendicular to the supply passages and has one side which lies in substantially the same plane for a short distance and then curves inward to meet the other side and form the bottom of the groove.

Having shown a new and unique spray discharge nozzle, we claim:

1. A side discharge liquid spray nozzle comprising a body

with a rear end and a front end and having an external plain groove extending across the body from side to side thereof, the body having an air supply passage therein which leads forwardly from the rear end of the body toward the front end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, said air supply passage having means to supply thereto a gaseous medium under positive pressure, the body also having a liquid supply passage therein which leads rearwardly from the front end of the body toward the rear end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite sides thereof, the groove having the bottom thereof extending transversely of the air supply passage and liquid supply passage and at right angles thereto and of uniform cross-section from end to end of the groove, the groove having at least one side which curves outward from the supply passages, said air supply passage and said liquid supply passage terminating at a point opposing one another at the bottom of the groove causing air and liquid discharged from the passages into the groove to impinge one on the other and emerge in a spray pattern.

2. A side discharge liquid spray nozzle as in claim 1 wherein the external plain groove is of substantially uniform cross-section and is in substantially a straight line which is substantially perpendicular to said supply passages.

3. A side discharge liquid spray nozzle as in claim 1 wherein the external plain groove is of substantially uniform cross-section and wherein the ends of the groove curve toward one end of the nozzle.

4. In a side discharge liquid spray nozzle comprising a body with a rear end and a front end and having an external plain groove extending across the body from side to side thereof, the body having liquid supply passage therein which leads rearwardly from the front end of the body toward the rear end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, the groove having the bottom thereof extending transversely of the liquid supply passage and at right angles thereto and of uniform cross-section from end to end of the groove, the improvement comprising an air supply passage therein which leads forwardly from the rear end of the body to the front end thereof to one side of the bottom of the groove and discharges across the bottom of the groove to the opposite side thereof, the groove having at least one side which curves outward from the supply passages, said air supply passage having means to supply thereto a gaseous medium under positive pressure, said air supply passage and said liquid supply passage terminating at a point opposing one another at the bottom of the groove causing air and liquid discharged from the passages into the groove to impinge one on the other and emerge in a spray pattern.

5. A side discharge liquid spray nozzle as in claim 4 wherein the external plain groove is of substantially uniform cross-section and is in substantially a straight line which is substantially perpendicular to said supply passages.

6. A side discharge liquid spray nozzle as in claim 4 wherein the external plain groove is of substantially uniform cross-section and wherein the ends of the groove curve toward one end of the nozzle.

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