ABSTRACT

A remotely controlled spray gun in which a nozzle 42 and orifice plate 40 are held in precise axial alignment by alignment member 54, in turn held in alignment with the general outlet 33 of the spray gun by insert 36. By this arrangement, precise repeatability of spray patterns is insured.
THE INVENTION

TECHNICAL FIELD

This invention relates generally to devices for spraying fluid materials and particularly to portable devices such as spray guns which are directable by robotic control for precise automated spraying.

BACKGROUND OF THE INVENTION

Certain spray guns or sprayers, including Models 43P and 43PA manufactured by Binks Manufacturing Company of Chicago, Ill., are adapted to spray low viscosity materials and include means for internally mixing components of material to be sprayed. The listed ones are of the airless, or hydraulically atomization, type, the Model 43P being a hand-held model, and the Model 43PA being adapted to be machine held as by a robotic arm. The latter model is particularly useful when it is desired to not only effect automatic positioning of the gun, but also where precise control over a spray pattern is particularly desirable or necessary. For example, the Model 43PA has been used to spray polyurethane, or polysiocyanurate foam, is supplied from mixing chamber 16 outward through an opening 31 of annular outlet 33. Annular outlet 33 has an exterior threaded region 34 adapted to enable the mounting of particular nozzle-orifice assemblies by collar nut 35.

As stated above, the present invention specifically encompasses a nozzle-orifice assembly, and it is illustrated by the exploded portion of the drawing.

First, a cylindrical insert 36 made of Teflon™, or other plastic material adapted to have little affinity for the mixture employed, would have an exterior diameter of approximately the diameter of opening 31 of annular outlet 33 and would be precisely dimensioned to effect a frictional fit within opening 31. Typically, the outer diameter of insert 36 would be from 0.277 to 0.280 inch and its inner diameter would be from 0.200 to 0.205 inch. Typically, insert 36 would be on the order of 0.815 plus or minus 0.020 inch long, and it has a tapered end region 38, being tapered toward the spray body wherein the inner and outer diameters merge as shown in FIG. 2.

Normally, and in accordance with the prior art, the fluid outlet of annular outlet 33 would be directly fed to an orifice plate 40 which meters flow to a nozzle 42, the nozzle being particularly configured to effect a selected pattern of spray as, for example, a fan-shaped pattern. A gasket 44 is placed between orifice plate 40 and annular outlet 33, and the two are compressed together in final assembly by collar nut 35. Collar nut 35 has an inwardly extending flange 46 which fits around an annular extension 48 of nozzle 42 and then, via its internal threads, 42, orifices are fed by orifice plate 40 which meters a component through one of metering tubes 18 and 20. The metering valves include adjustably positioned orifices (not shown) installable and removable via installation nuts 22 and 24. The forward portion of the body is generally shaped as shown. The outer case includes a forward, generally oblong region 26 and rear region 27 which extends above the front region. It also includes a mounting bolt 28 adapted to secure the sprayer to a grippable member, for example, a handgripping member or, as shown, a cylinder 30 which may be gripped by a mechanical or robotic arm, diagrammatically illustrated by dashed line 32 connected to a conventional robotic arm control 34. Thus, body 10 of the sprayer is remotely controllable to direct a spray pattern over a particularly configured object.

By means of the conventional structure thus far described, a fluid mixture, such as forming polyurethane, or polysiocyanurate foam, is supplied from mixing chamber 16 outward through an opening 31 of annular outlet 33. Annular outlet 33 has an exterior threaded region 34 adapted to enable the mounting of particular nozzle-orifice assemblies by collar nut 35.

As stated above, the present invention specifically encompasses a nozzle-orifice assembly, and it is illustrated by the exploded portion of the drawing.

First, a cylindrical insert 36 made of Teflon™, or other plastic material adapted to have little affinity for the mixture employed, would have an exterior diameter of approximately the diameter of opening 31 of annular outlet 33 and would be precisely dimensioned to effect a frictional fit within opening 31. Typically, the outer diameter of insert 36 would be from 0.277 to 0.280 inch and its inner diameter would be from 0.200 to 0.205 inch. Typically, insert 36 would be on the order of 0.815 plus or minus 0.020 inch long, and it has a tapered end region 38, being tapered toward the spray body wherein the inner and outer diameters merge as shown in FIG. 2.

Normally, and in accordance with the prior art, the fluid outlet of annular outlet 33 would be directly fed to an orifice plate 40 which meters flow to a nozzle 42, the nozzle being particularly configured to effect a selected pattern of spray as, for example, a fan-shaped pattern. A gasket 44 is placed between orifice plate 40 and annular outlet 33, and the two are compressed together in final assembly by collar nut 35. Collar nut 35 has an inwardly extending flange 46 which fits around an annular extension 48 of nozzle 42 and then, via its internal threads, 42, orifices are fed by orifice plate 40 which meters a component through one of metering tubes 18 and 20. The metering valves include adjustably positioned orifices (not shown) installable and removable via installation nuts 22 and 24. The forward portion of the body is generally shaped as shown. The outer case includes a forward, generally oblong region 26 and rear region 27 which extends above the front region. It also includes a mounting bolt 28 adapted to secure the sprayer to a grippable member, for example, a handgripping member or, as shown, a cylinder 30 which may be gripped by a mechanical or robotic arm, diagrammatically illustrated by dashed line 32 connected to a conventional robotic arm control 34. Thus, body 10 of the sprayer is remotely controllable to direct a spray pattern over a particularly configured object.

By means of the conventional structure thus far described, a fluid mixture, such as forming polyurethane, or polysiocyanurate foam, is supplied from mixing chamber 16 outward through an opening 31 of annular outlet 33. Annular outlet 33 has an exterior threaded region 34 adapted to enable the mounting of particular nozzle-orifice assemblies by collar nut 35.

As stated above, the present invention specifically encompasses a nozzle-orifice assembly, and it is illustrated by the exploded portion of the drawing.

First, a cylindrical insert 36 made of Teflon™, or other plastic material adapted to have little affinity for the mixture employed, would have an exterior diameter of approximately the diameter of opening 31 of annular outlet 33 and would be precisely dimensioned to effect a frictional fit within opening 31. Typically, the outer diameter of insert 36 would be from 0.277 to 0.280 inch and its inner diameter would be from 0.200 to 0.205 inch. Typically, insert 36 would be on the order of 0.815 plus or minus 0.020 inch long, and it has a tapered end region 38, being tapered toward the spray body wherein the inner and outer diameters merge as shown in FIG. 2.

Normally, and in accordance with the prior art, the fluid outlet of annular outlet 33 would be directly fed to an orifice plate 40 which meters flow to a nozzle 42, the nozzle being particularly configured to effect a selected pattern of spray as, for example, a fan-shaped pattern. A gasket 44 is placed between orifice plate 40 and annular outlet 33, and the two are compressed together in final assembly by collar nut 35. Collar nut 35 has an inwardly extending flange 46 which fits around an annular extension 48 of nozzle 42 and then, via its internal threads, 42, orifices are fed by orifice plate 40 which meters a component through one of metering tubes 18 and 20. The metering valves include adjustably positioned orifices (not shown) installable and removable via installation nuts 22 and 24. The forward portion of the body is generally shaped as shown. The outer case includes a forward, generally oblong region 26 and rear region 27 which extends above the front region. It also includes a mounting bolt 28 adapted to secure the sprayer to a grippable member, for example, a handgripping member or, as shown, a cylinder 30 which may be gripped by a mechanical or robotic arm, diagrammatically illustrated by dashed line 32 connected to a conventional robotic arm control 34. Thus, body 10 of the sprayer is remotely controllable to direct a spray pattern over a particularly configured object.

By means of the conventional structure thus far described, a fluid mixture, such as forming polyurethane, or polysiocyanurate foam, is supplied from mixing chamber 16 outward through an opening 31 of annular outlet 33. Annular outlet 33 has an exterior threaded region 34 adapted to enable the mounting of particular nozzle-orifice assemblies by collar nut 35.

As stated above, the present invention specifically encompasses a nozzle-orifice assembly, and it is illustrated by the exploded portion of the drawing.

First, a cylindrical insert 36 made of Teflon™, or other plastic material adapted to have little affinity for the mixture employed, would have an exterior diameter of approximately the diameter of opening 31 of annular outlet 33 and would be precisely dimensioned to effect a frictional fit within opening 31. Typically, the outer diameter of insert 36 would be from 0.277 to 0.280 inch and its inner diameter would be from 0.200 to 0.205 inch. Typically, insert 36 would be on the order of 0.815 plus or minus 0.020 inch long, and it has a tapered end region 38, being tapered toward the spray body wherein the inner and outer diameters merge as shown in FIG. 2.

Normally, and in accordance with the prior art, the fluid outlet of annular outlet 33 would be directly fed to an orifice plate 40 which meters flow to a nozzle 42, the nozzle being particularly configured to effect a selected pattern of spray as, for example, a fan-shaped pattern. A gasket 44 is placed between orifice plate 40 and annular outlet 33, and the two are compressed together in final assembly by collar nut 35. Collar nut 35 has an inwardly extending flange 46 which fits around an annular extension 48 of nozzle 42 and then, via its internal threads, 42, orifices are fed by orifice plate 40 which meters a component through one of metering tubes 18 and 20. The metering valves include adjustably positioned orifices (not shown) installable and removable via installation nuts 22 and 24. The forward portion of the body is generally shaped as shown. The outer case includes a forward, generally oblong region 26 and rear region 27 which extends above the front region. It also includes a mounting bolt 28 adapted to secure the sprayer to a grippable member, for example, a handgripping member or, as shown, a cylinder 30 which may be gripped by a mechanical or robotic arm, diagrammatically illustrated by dashed line 32 connected to a conventional robotic arm control 34. Thus, body 10 of the sprayer is remotely controllable to direct a spray pattern over a particularly configured object.
a circular orifice plate having a central opening, said orifice plate having an outer diameter closely following the diameter of said recess and positionable in said recess, said orifice plate being of a thickness less than the depth of said recess and being closely radially secured by said flange;

a circular nozzle having an axial opening therethrough and having an outer diameter region dimensioned to closely fit within said recess and said flange and thereby said last-named opening is held in alignment with said opening of said orifice plate; and

an annular collar having an inner dimension generally coinciding with the outer dimension of said flange and positionable over said nozzle, said orifice plate, said annular member, and said insert, and said collar including means for concentrically securing said collar to said body and applying an axial force to said nozzle, said orifice plate and said annular member for securing said nozzle and orifice plate in said recess.

2. A hydraulic atomization spray gun as set forth in claim 1 wherein:

said body member includes a cylindrical opening communicating with said mixing chamber, and said cylindrical insert is of a yieldable plastic material and frictionally positionable within said cylindrical opening of said body member.

3. A hydraulic atomization spray gun as set forth in claim 2 wherein an end region of said axial passageway of said cylindrical insert is tapered between its inner diameter and its outer diameter, and said last-named end region is positionable as a fluid entrance end region of said insert and supplied fluid by said mixing chamber.

4. A hydraulic atomization spray gun as set forth in claim 3 wherein an end of said end region of said elongated cylindrical region of said annular member is tapered from its inner diameter to its outer diameter, whereby there is a generally smooth fluid transition path from said mixing chamber through said insert and said annular member to said orifice plate.

5. A hydraulic atomization spray gun as set forth in claim 4 wherein:

said body member includes a generally annular protrusion having a threaded outer region and includes said cylindrical opening adapted to communicate with said mixing chamber and to receive said insert, and said annular collar having a threaded interior configured to thread onto said threaded end region of said protrusion; and

an annular gasket positioned around said elongated cylindrical region of said annular member and compressed by said annular collar between said annular protrusion and said opposite end region of said annular member.

6. A hydraulic atomization spray gun as set forth in claim 1 wherein said body member includes a grippable region and gripping means for gripping said grippable region and control means for orienting said grippable region through said gripping means.

7. A hydraulic atomization spray gun as set forth in claim 5 wherein said body member includes a grippable region and gripping means for gripping said grippable region and control means for orienting said grippable region through said gripping means.

* * * * *