

[54] **MULTINOZZLE SPRAYING APPARATUS**

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[51] Int. Cl. .... **A62c 31/02**

[58] Field of Search. .... 239/390, 394, 397, 392, 71

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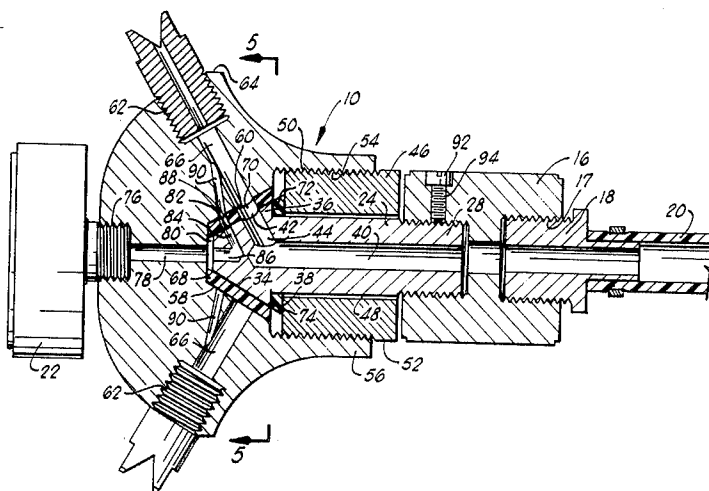
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**ABSTRACT**

The present invention relates to multinozzle spraying apparatus for spraying insecticides and the like. A plurality of spray nozzles having differing spray characteristics are provided attached to a multiport turret member. The turret member is rotatably secured to a hollow spindle having a hose connection on the rearward end and a seating surface on the forward end thereof for continuously engaging a seating surface formed in the turret member during the rotation of the turret member. The seating surface of the hollow spindle includes a flow port therein, and ports are provided in the seating surface of the turret member each communicated with a separate spray nozzle and positioned with respect to the spindle flow port so that rotation of the turret member brings the ports therein into selective registration with the spindle flow port. Means for indicating the pressure of fluid passing through the apparatus to a selected spray nozzle are provided as well as means for adding selected quantities of dye or other separate ingredient to the fluid.

**5 Claims, 8 Drawing Figures**



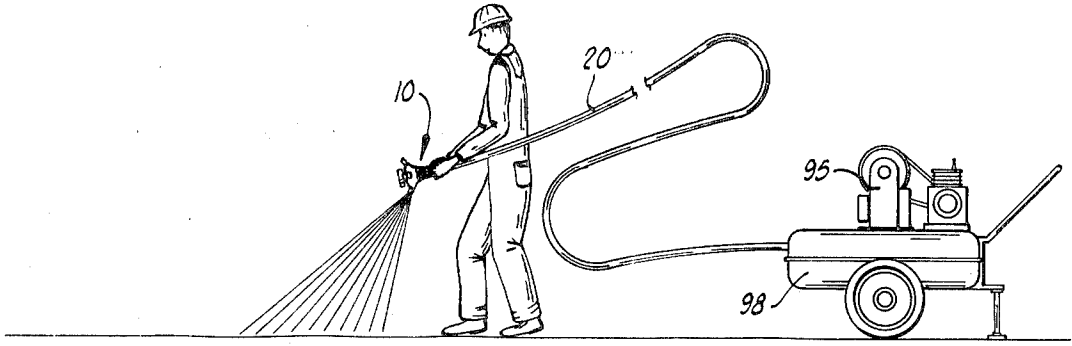


FIG. 1

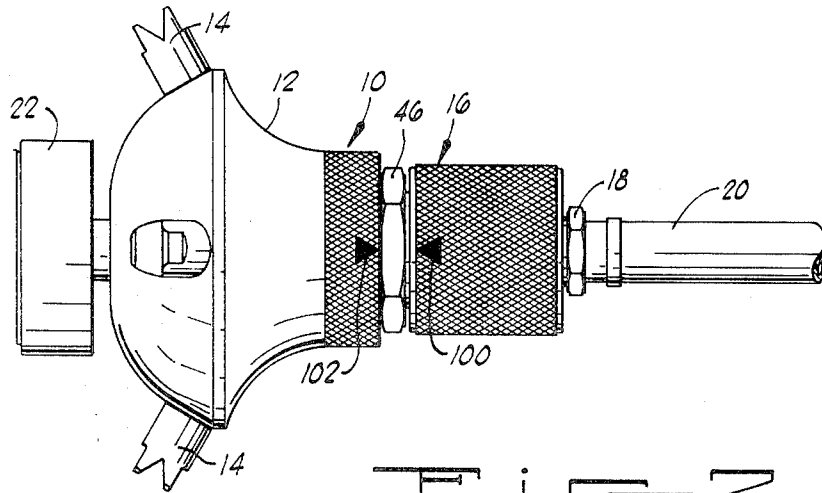


FIG. 2

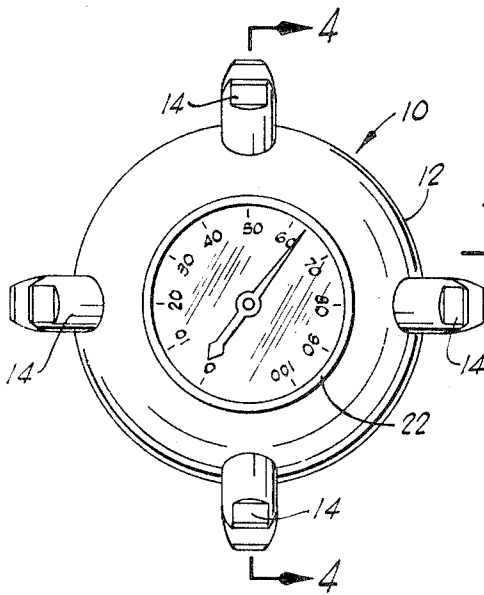
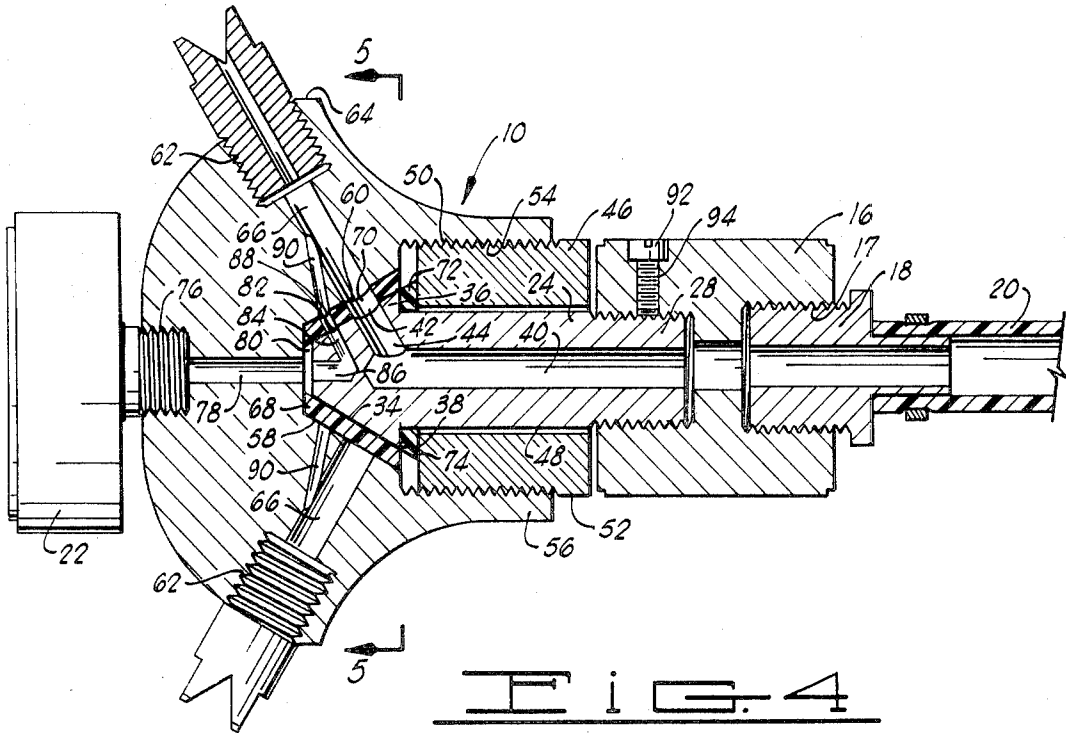
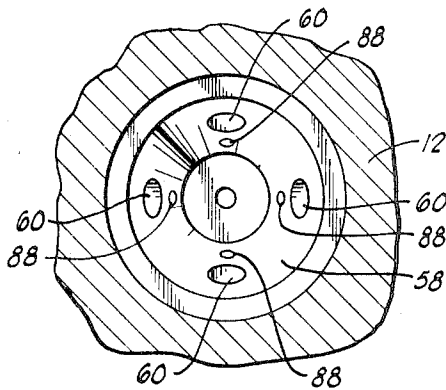
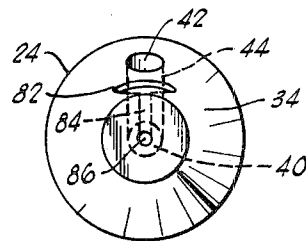


FIG. 3

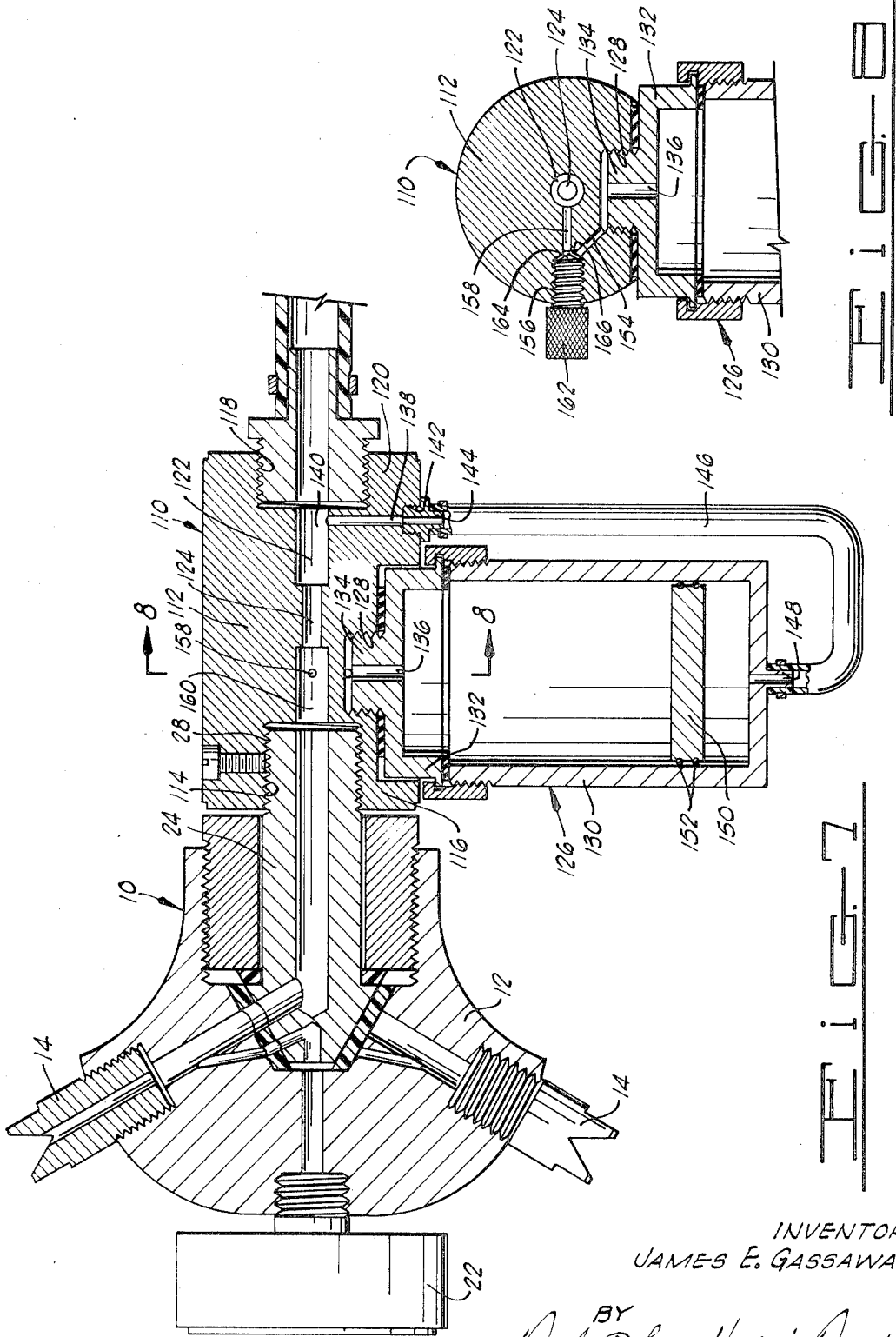
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## MULTINOZZLE SPRAYING APPARATUS

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

The present invention relates generally to multinozzle spraying apparatus, and more particularly, but not by way of limitation, to multinozzle spraying apparatus wherein one of a plurality of spray nozzles having differing spray characteristics may be selected.

## 2. Description of the Prior Art

Many various spray nozzle apparatus for spraying insecticides and the like have been developed. The most commonly used of such apparatus include single spray nozzles, and in order to change the spray angle or swath of the fluid or the volume being sprayed, the fluid flow to the apparatus must be stopped and nozzles having the desired spray characteristics manually installed thereon.

While multinozzle spray apparatus have been developed and used heretofore, such apparatus generally require that the flow of fluid thereto be stopped prior to changing nozzles. Further, such apparatus cannot conveniently be used to throttle or adjust the flow rate of the fluid being sprayed or to shut off the flow of fluid altogether.

In spraying fluids such as insecticides it is often desirable to apply the fluid to the surface being sprayed at a particular rate. While spray nozzles are available which will deliver a known volume rate of fluid at a particular fluid pressure immediately upstream thereof, heretofore used spraying apparatus have not included means for accurately determining the fluid pressure immediately upstream of the nozzle being used. Consequently, it has been necessary to more or less guess at the volume rate of fluid being sprayed. Further, it is often desirable to add small quantities of dye or other ingredient to the fluid being sprayed without interrupting the flow of the fluid.

By the present invention, multinozzle apparatus for spraying fluids is provided whereby the flow of fluid to the apparatus need not be stopped in order to change nozzles, the volume of fluid being sprayed from a selected nozzle may be readily determined and adjusted, the flow of fluid may be shut off altogether at the apparatus and desired quantities of dye or other ingredient may be selectively added to the fluid as it is continuously being sprayed.

## SUMMARY OF THE INVENTION

The present invention relates to a multinozzle spraying apparatus comprising a spindle having a fluid passageway therethrough and having a seating surface on the forward end and a hose connection on the rearward end thereof, the seating surface including a flow port therein communicated with said passageway. A turret member is rotatably secured on the forward portion of the spindle having a multiport seating surface formed therein for continuous sealing engagement during the rotation of said turret member with the seating surface of the spindle. The turret member includes a plurality of fluid passages each extending from one of the ports in the multiport seating surface thereof to one of a plurality of threaded recesses disposed in the external surface thereof. The ports in the turret member are positioned with respect to the flow port in the spindle so that rotation of the turret member brings the ports therein into selective registration with the flow port in the spindle. Means are provided for maintaining the seating surface of the spindle in mated engagement with the multiport seating surface of the turret member, and a plurality of spray nozzles each threadedly secured in one of the threaded recesses in the valve member are provided.

It is, therefore, a general object of the present invention to provide a multinozzle spraying apparatus.

A further object of the present invention is the provision of a multinozzle spraying apparatus whereby any one of a plurality of spray nozzles having differing spray characteristics may be conveniently selected without the necessity of shutting off the flow of fluid to the apparatus.

Another object of the present invention is to provide a multinozzle spray apparatus wherein the flow of fluid through the apparatus may be conveniently shut off immediately upstream of the nozzles thereby minimizing loss of fluid from the apparatus and related equipment.

Yet another object of the present invention is to provide a multinozzle spraying apparatus wherein the volume of fluid being sprayed from a selected nozzle may readily be determined and adjusted to a desired level.

Still a further object of the present invention is the provision of a multinozzle spraying apparatus wherein selected quantities of a dye or other ingredient may be added to the fluid as it is continuously being sprayed.

Other and further objects, features and advantages will be apparent from the following detailed description of presently preferred embodiments of the invention, given for the purpose of disclosure, and taken in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view of the apparatus of the present invention being used to spray a surface.

FIG. 2 is a side elevational view of one form of the apparatus of the present invention.

FIG. 3 is a front end view of the apparatus of FIG. 2.

FIG. 4 is an enlarged sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is a partial enlarged sectional view of the turret member of the present invention taken substantially along line 5—5 of FIG. 4.

FIG. 6 is an end view of the seating surface of the spindle of the present invention.

FIG. 7 is an enlarged sectional view of an alternate form of the present invention including means for adding a separate ingredient to the fluid being sprayed, and

FIG. 8 is a view taken along line 8—8 of FIG. 7.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring particularly to FIGS 2 and 3, the apparatus of the present invention is generally designated by the numeral 10. The apparatus 10 basically comprises a head or turret member 12 having a plurality of spray nozzles 14 of differing spray characteristics threadedly secured in recesses positioned around the periphery thereof. The turret member 12 is rotatably secured on a spindle (not shown), and the spindle is secured to a member 16 having a hose connection on the rearward end thereof. A conventional fitting 18 having a hose 20 connected thereto is threadedly secured in the hose connection. A pressure indicator 22 is attached to the forward end of the turret member 12.

Referring now particularly to FIG. 4, the apparatus 10 is illustrated in cross section. The apparatus 10 basically comprises an elongated hollow spindle 24 having a threaded rearward end 28. A member 16, which includes a hose connection 17 in the rearward end thereof, is threadedly secured on the rearward end 28 of the spindle 24. The spindle 24 includes a seating surface 34 on the forward end 36 thereof. The seating surface 34 is of a frustoconical shape, and an annular shoulder 38 positioned in a plane perpendicular to the axis of the spindle 24 is provided at the rearward end of the seating surface 34. The spindle 24 includes a fluid passageway 40 extending from the rearward end 28 thereof to a point near the forward end 36 thereof. As best seen in FIG. 6, a flow port 42 is provided in the seating surface 34 which is communicated with the fluid passageway 40 by a passage 44.

A cylindrical sleeve member 46 is slidably disposed over the middle portion 48 of the spindle 24 having a forward outside-threaded portion 50. The rearward portion 52 of the sleeve member 46 is formed in the shape of a hexagon.

The turret member 12 includes a threaded bore 54 in the rearward end 56 thereof threadedly connected to the forward threaded portion 50 of the sleeve member 46. The bore 54 in-

cludes a multiport seating surface 58 formed in the forward end 80 thereof. The seating surface 58 is formed in a frustoconical shape for continuous sealing engagement with the seating surface 34 of the spindle 24 during rotation of the turret member 12.

Referring particularly to FIG. 5, a plurality of ports 60 are disposed in the seating surface 58 of the turret member 12 positioned in spaced relation to each other in a plane perpendicular to the axis of turret member 12. The turret member 12 includes a plurality of threaded recesses 62 (FIG. 4) disposed in the external surface 64 thereof, each of which is connected to one of the ports 60 in the seating surface 58 by a separate fluid passage 66. As will be understood, the ports 60 in the seating surface 58 of the turret member 12 are positioned with respect to the flow port 42 of the spindle 24 so that rotation of the turret member 12 about its axis brings the ports 60 into selective registration with the flow port 42. A conventional spray nozzle 14 is threadably secured in each of the threaded recesses 62 of the turret member 12.

A liner 68 of frustoconical shape is positioned between the seating surface 34 of the spindle 24 and the seating surface 58 of the turret member 12. The liner 68 is preferably bonded to the seating surface 58 and includes a plurality of openings 70 therein coinciding with the ports 60 in the seating surface 58. A bearing member 72 is disposed between the forward end 74 of the sleeve member 46 and the annular shoulder 38 of the spindle 24. The liner 68 and bearing member 72 are preferably formed of a plastic material which is self-lubricating such as polytetrafluoroethylene (Teflon).

The turret member 12 includes a threaded recess 76 disposed in the forward end thereof. A passageway 78 is disposed within the turret member 12 connecting the recess 76 with the forward end 80 of the bore 54.

The seating surface 34 of the spindle 24 includes a second port 82 therein. The port 82 is positioned on a line passing through the center of the port 42 which intersects a line passing through the axis of the spindle 24. A pressure passage 84 connects the port 82 with a bore 86 disposed in the forward end 36 of the spindle 24 positioned on a line coinciding with the axis of the spindle 24. The seating surface 58 of the turret member 12 includes a second plurality of ports 88 equal in number to the ports 60 previously described. Each of the ports 88 is positioned on a line passing through the center of a port 60 which intersects with a line coinciding with the axis of the turret member 12. A plurality of pressure passages 90 each connects one of the ports 88 with one of the fluid passages 66. As will be understood, the ports 88 are positioned in a plane perpendicular to the axis of the turret member 12, and are positioned with respect to the port 82 so that rotation of the turret member 12 brings the ports 88 into registration with the port 82. As best seen in FIG. 6, the port 82 in the seating surface 34 of the spindle 24 is formed in the shape of an ellipse with the longest axis thereof lying in a plane perpendicular as to the axis of the spindle 24.

#### ASSEMBLY OF THE APPARATUS 10

Referring particularly to FIGS. 2-4, the apparatus 10 is assembled by first positioning the bearing member 72 on the spindle 24 adjacent to the annular shoulder 38 thereof. The cylindrical sleeve member 46 is then positioned on the middle portion 48 of the spindle 24 with the forward end 74 thereof adjacent to the bearing member 72. The turret member 12 is threadably secured on the sleeve member 46 and tightened to the point where the seating surface 34 of the spindle 24 is brought into mated engagement with the inside surface of the liner 68 bonded to the seating surface 58. The sleeve member 46 may be tightened with a wrench fitted over the hexagonal rearward portion 52 thereof. The sleeve member 46 is tightened enough to prevent leakage of fluid between the turret member 12 and the spindle 24, but is allowed to remain loose enough so that the turret member 12 and sleeve 46 may be rotated on the spindle 24.

The spray nozzles 14 are threadably secured in the threaded recesses 62 of the turret member 24 and the pressure indicator 22 is threadably secured in the recess 76. The handle and base connection member 16 is threadably secured on the rearward end 28 of the spindle 24, and a lock screw 92 disposed in a threaded bore 94 in the member 16 is tightened against the spindle 24. The fitting 18 having the hose 20 attached thereto is threadably secured in the hose connection 17 of the member 16.

#### OPERATION OF THE APPARATUS 10

Referring particularly to FIG. 1, the hose 20 attached to the apparatus 10 is attached to a conventional fluid pump 96 which is in turn attached to a tank 98 containing a reservoir of the fluid to be sprayed. The pump 96 and tank 98 may be mounted on wheels or other movable apparatus so that they may be conveniently moved from place to place.

In using the apparatus 10 for spraying a fluid such as a pesticide on a surface, the apparatus 10 is grasped by the member 16 (FIG. 2) and the turret member 12 is rotated to bring the flow port 42 of the spindle 24 into registration with one of the ports 60 of the turret member 12. An arrow 100 (FIG. 2) is engraved on the member 16 positioned in alignment with the flow port 42 of the spindle 24. A set of indicator marks 102 each of which is positioned in alignment with one of the spray nozzles 14 and ports 60, are engraved on the turret member 12 positioned so that when the arrow 100 is at a point adjacent thereto, the flow port 42 of the spindle 24 is positioned in registration with one of the ports 60. Thus, the operator of the apparatus 10 may select one of the spray nozzles 14 having desired spray characteristics by positioning the appropriate indicator mark 102 adjacent to the arrow 100 on the member 16.

The pump 96 causes the fluid to be sprayed to pass through the hose 20 into the fluid passageway 40 of the spindle 24. Referring particularly to FIG. 4, the fluid passing into the passageway 40 passes through the passage 44 and through the flow port 42. When the flow port 42 of the spindle 24 is positioned in registration with one of the ports 60 of the turret member 12, the fluid to be sprayed passes into the passage 66 and out of the apparatus 10 through the selected spray nozzle 14. As will be understood, when it is desired to change the spray nozzle 14 in order to change the swath or volume rate of the fluid being sprayed, the turret member 12 may be rotated to bring the flow port 42 of the spindle 24 into registration with another of the ports 60 without shutting off the pump 96 or flow of fluid to the apparatus 10. As will be further understood, if it is desired to shut off the flow of fluid being sprayed, the turret member 12 may be rotated to a position wherein the flow port 42 of the spindle 24 is positioned between any two of the ports 60. It should be noted that the ports 60 of the turret member 12 are positioned so that the distance between any two of the ports 60 is greater than the diameter of the flow port 42. Thus, when the flow port 42 is positioned between two of the ports 60 the flow of fluid is shut off and contained within the passageway 40 and passage 44 of the spindle 24.

Each of the spray nozzles 14 is of a conventional type and design whereby if the fluid pressure immediately upstream of the nozzle is known the volume rate of the fluid passing through the nozzle may be determined. Generally, such spray nozzles are rated for a specific volume rate when operated at an upstream pressure of 40 p.s.i.g. However, tables are available which indicate the volume rate of the fluid being sprayed for pressures lower or higher than 40 pounds. In operation of the apparatus 10, the fluid pressure in the fluid passage 66 of the turret member 12 through which the fluid being sprayed is flowing is communicated through the pressure passages 90, 84 and 86 to the pressure passages 78 and the pressure gauge 22. The port 82 in the spindle 24 is enlarged so that if the port 42 thereof is out of alignment with one of the ports 60 of the turret member 12 the fluid pressure in the passage 66 will still be

communicated with the pressure gauge 22. Thus, the pressure of the fluid being sprayed immediately upstream of the selected nozzle is indicated by the pressure gauge 22.

To adjust the volume rate of fluid being sprayed from a selected spray nozzle 14 to a desired volume rate, the operator of the apparatus 10, knowing the nozzle upstream pressure corresponding to the desired volume rate, may adjust the fluid pressure upstream of the nozzle by rotating the turret member 12 a small amount in either direction. The small amount of rotation causes the port 60 of the turret member 12 to be moved out of alignment with the flow port 42 of the spindle 24 thereby restricting the flow of fluid into the passage 66. For example, assuming that the pump 96 is of a size and capacity to maintain a fluid pressure on the apparatus 10 of 100 p.s.i.g., and a flow rate is desired corresponding to a pressure upstream of the selected nozzle of 40 p.s.i.g., the valve member 12 may be rotated thereby throttling the fluid passing through the port 60 until a pressure of 40 pounds is indicated on the gauge 22. If it is desirable to then increase the flow rate of fluid passing through the selected nozzle 14, the operator of the apparatus 10 may increase the nozzle upstream pressure by rotating the valve member 12 in the opposite direction until the desired upstream pressure is indicated on the gauge 22. Thus, the apparatus 10 may be used to conveniently control the swath or spray angle of the fluid being sprayed as well as the volume rate of the fluid being sprayed without the necessity of stopping the pump 96 or changing the fluid output of the pump 96. As described above, the apparatus 10 may also be used to shut off the flow of fluid altogether without the necessity of shutting off the pump 90.

Referring now to FIGS. 7 and 8, the apparatus 10 is illustrated with an assembly 110 for selectively adding a separate ingredient to the fluid being sprayed attached thereto. As will be understood, when the assembly 110 is used, the member 16 is removed from the threaded end 28 of the spindle 24 and the assembly 110 is attached thereto. The assembly 110 basically comprises a cylindrical body member 112 having a threaded recess 114 in the forward end 116 thereof and a hose connection 118 in the rearward end 120 thereof connected by a fluid passageway 122. The middle portion 124 of the fluid passageway 122 is of a reduced diameter as compared to the ends thereof. It should be noted that the middle portion 124 of the fluid passageway 122 may be made adjustable, such as by the use of a thumbscrew or other means, so that the effective diameter thereof may be selectively varied.

A fluid container assembly generally designated by the numeral 126 is threadedly secured in a threaded bore 128 disposed in the body member 112. The container assembly 126 comprises a closed container 130 having a removable top 132. The top 132 includes a threaded upper portion 134 which is threadedly secured in the bore 128 of the body member 112. A passage 136 is disposed in the top 132 extending from inside the container 130 to the upper end of the upper portion 134 thereof. A passage 138 is disposed in the body member 112 extending from the rearward portion 140 of the passageway 122 to a threaded recess 142 in the body member 112. A threaded fitting 144 is secured in the recess 142, and a length of flexible hose 146 is attached to the fitting 144. The other end of the hose 146 is attached to a connection 148 disposed in the bottom of the container 130. A free-floating piston 150 is disposed within the container 130 having a pair of conventional O-rings 152 disposed around the periphery thereof for sealing against the inside surface of the container 130.

Referring now particularly to FIG. 8, a passage 154 disposed in the body member 112 connects the threaded bore 128 to a threaded bore 156 disposed therein. A passage 158 connects the threaded bore 156 to the forward portion 160 of the passageway 122. A thumbscrew 162 is disposed in the threaded bore 156 having a seating surface 164 for mating with the bottom portion 166 of the threaded bore 156.

## OPERATION OF THE ASSEMBLY 110

Referring still to FIGS. 7 and 8, the lower portion of the container 130 is removed from the top 132 thereof, and the piston 150 moved to the bottom of the container 150. A quantity of dye or other ingredient is placed in the container 130 above the piston 150 and the container 130 is again attached to the top 132. As the fluid being sprayed by the apparatus 10 passes through the middle portion 124 of the passageway 122 of the member 112, its pressure is reduced. That is, the pressure of the fluid in the rearward portion 140 of the passageway 122 is greater than the pressure of the fluid in the forward portion 160 of the passageway 122 due to friction loss caused by the reduced diameter of middle portion 124 of the passageway 122. When it is desired to add a portion of the fluid contained in the container 130 to the fluid being sprayed by the apparatus 10, the thumbscrew 162 is loosened thereby allowing the threaded bore 128 of the member 112 to be communicated with the forward portion 160 of the passageway 122 via the passages 154 and 158. As will be understood, the pressure differential between the rearward portion 140 and forward portion 160 of the passageway 122 causes a fluid pressure to be transmitted through the passage 138 of the member 112, through the hose 146 and into the container 130 below the piston 150 which is greater than the pressure above the piston 150. The piston 150 is moved upwardly by the greater fluid pressure on its lower side thereby forcing the dye or other ingredient contained in the container 130 above the piston 150 through the passage 136 in the upper portion 132 of the container 130, through the passages 154 and 158 of the member 112 and into the forward portion 160 of the passageway 122. Thus, by opening and closing the thumbscrew 162, selected quantities of the dye or other ingredient contained within the container 130 may be added to the fluid being sprayed from the apparatus 10.

In use of the apparatus 10 in combination with the assembly 110 for spraying pesticides, a dye may be selectively added to the pesticide while it is continuously being sprayed. The addition of quantities of dye allows the operator to distinguish sprayed areas from unsprayed areas. If desirable, the assembly 110 may be used to selectively add an additional pesticide or other ingredient to the pesticide while it is continuously being sprayed.

The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as those inherent therein. While presently preferred embodiments of the invention are given for the purpose of disclosure, numerous changes in the details of construction and arrangement of parts can be made which will readily suggest themselves to those skilled in the art and which are encompassed within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A multinozzle spraying apparatus comprising:

a spindle having a fluid passageway therethrough and having a seating surface on the forward end thereof and a hose connection on the rearward end thereof, said seating surface including a flow port therein communicating with said passageway;

a turret member rotatably secured on the forward portion of said spindle having a multiport seating surface formed therein for matingly engaging the seating surface of said spindle and including a plurality of fluid passages each extending from one of the ports in said multiport seating surface to one of a plurality of threaded recesses disposed in the external surface thereof, said ports in said turret member being spaced apart from each other and positioned with respect to the flow port in said spindle so that the turret member may be rotated to bring the ports therein into selective registration with the flow port in said spindle or to shut off flow therethrough;

means for indicating the pressure of the fluid flowing through any one of said fluid passages in said turret member comprising:

a threaded recess disposed in said turret member;

a pressure passage disposed in said turret member communicating said threaded recess with the forward end of said spindle;

said spindle including a second port in the seating surface thereof connected to the forward end thereof by a pressure passage;

said turret member including a second plurality of ports in the seating surface thereof, each communicated with one of said fluid passageways therein by a pressure passage, said second ports in said turret member being positioned with respect to the second port in said spindle so that when said flow port in said spindle is aligned with a port in said turret member, one of said second ports in said turret member is aligned with said second port in said spindle; and

a pressure indicator threadedly secured in said threaded recess;

means for maintaining the seating surface of said spindle in mated engagement with the multiport seating surface of said turret member attached to said turret member and to said spindle; and

a plurality of spray nozzles having different spray characteristics each threadedly secured in one of said threaded recess in said turret member.

2. The apparatus of claim 1, wherein the means for maintaining the seating surface of said spindle in mated engagement with the multiport seating surface of said turret member comprises:

said spindle including an outwardly extending annular shoulder positioned near the forward end thereof in a plane perpendicular to the axis thereof;

a cylindrical sleeve rotatably secured on said spindle with the forward end thereof positioned adjacent to said shoulder and threadedly attached to said turret member so that movement of said sleeve in a forward direction tightens the seating surface of said spindle against the seating surface of said turret member.

3. The apparatus of claim 2, which is further characterized to include a bearing member of frustoconical shape formed of self-lubricating material positioned between the seating surface of said turret member and the seating surface of said spindle.

4. The apparatus of claim 3, which is further characterized to include a bearing member formed of a self-lubricating material positioned between said annular shoulder of said spindle and the forward end of said cylindrical sleeve.

5. The apparatus of claim 4, which is further characterized to include means for injecting selected quantities of a separate fluid into the fluid passing through said spindle fluid passageway attached to said spindle.

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