May 18, 1965 R. R. CURTIS 3,184,113

FLUID OPERATED SPRAYING DEVICE HAVING NON-RIGID FOLLOWER AND METERING VALVE

Filed Dec. 6, 1962 2 Sheets-Sheet 1

FIG-1

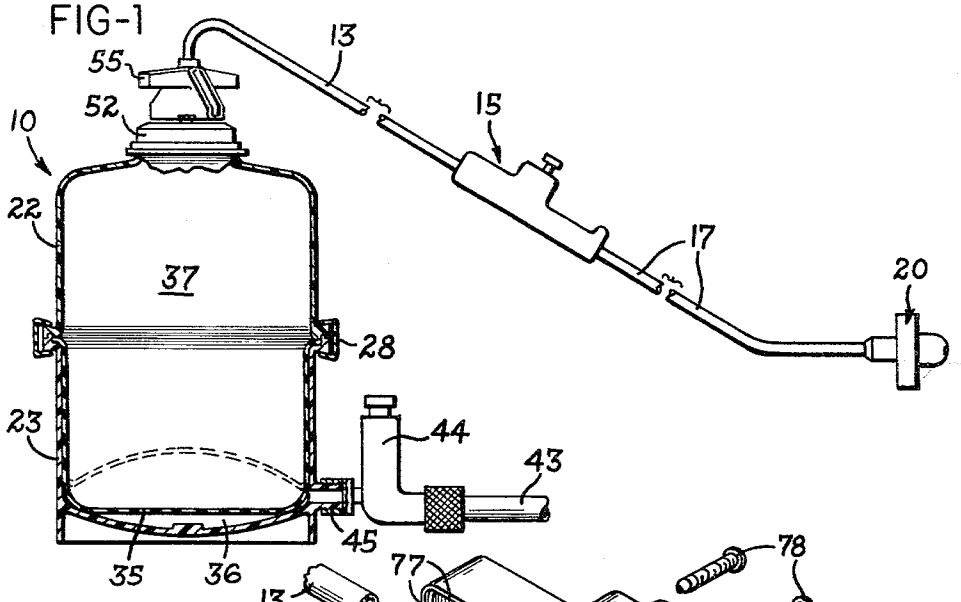


FIG-2

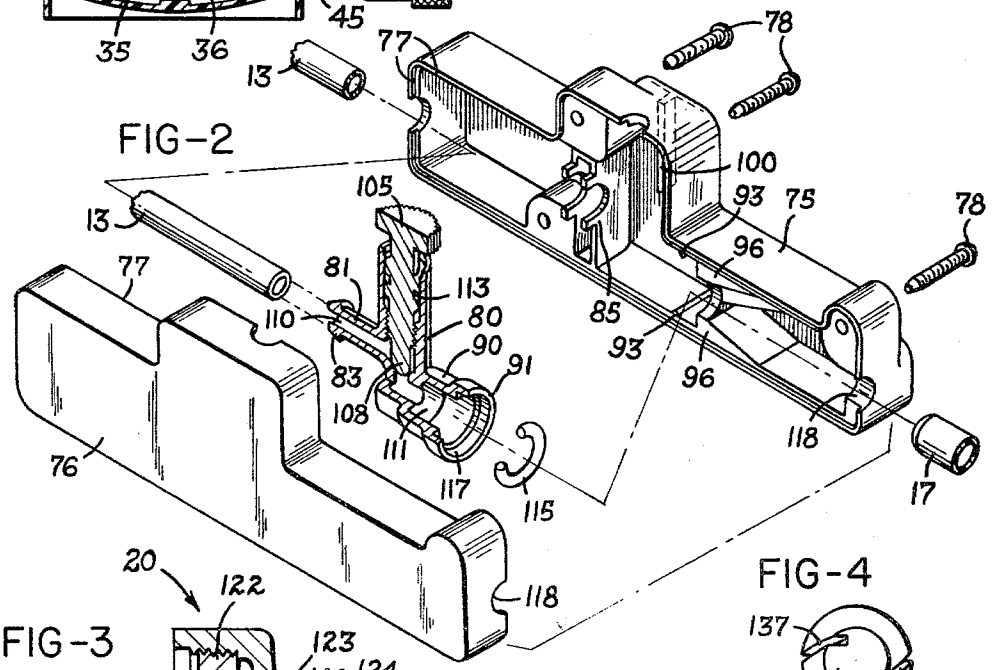


FIG-3

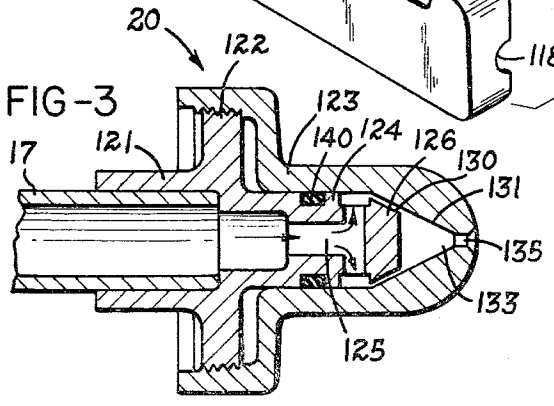
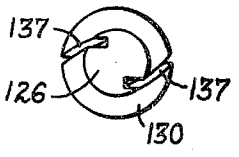


FIG-4



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FIG-5

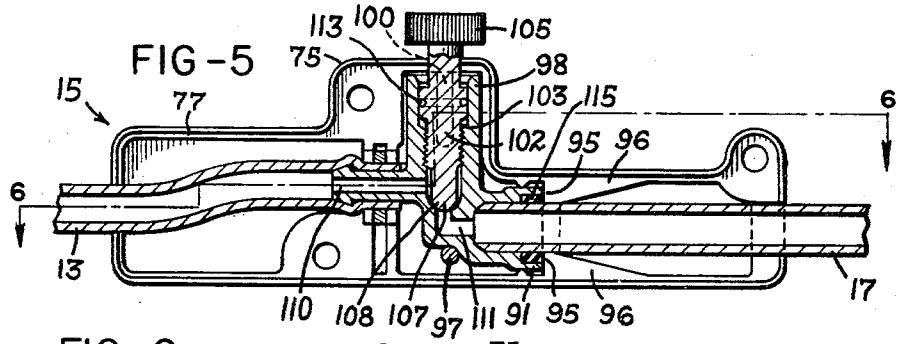


FIG-6

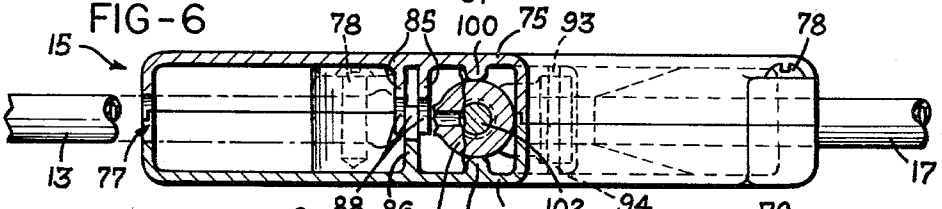


FIG-7

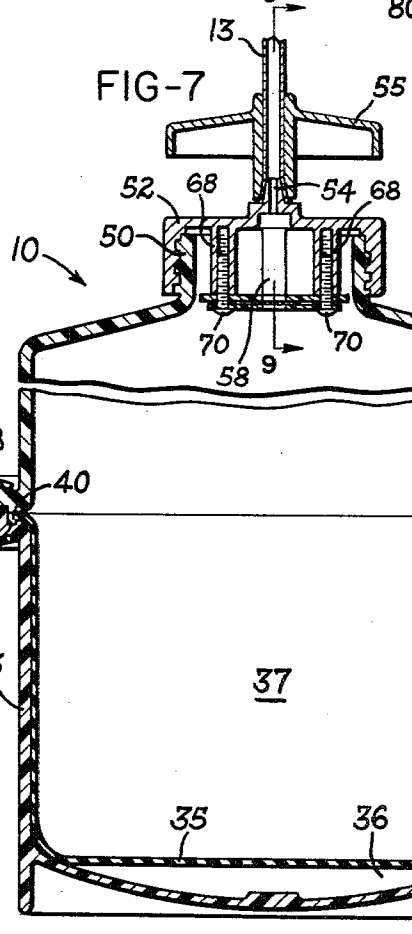


FIG-8

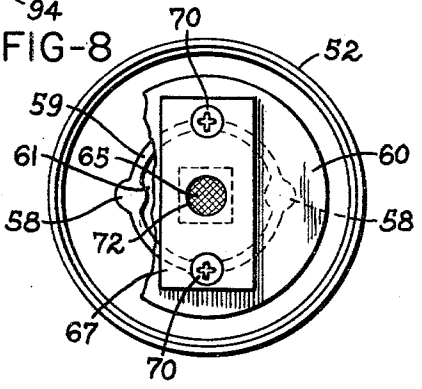
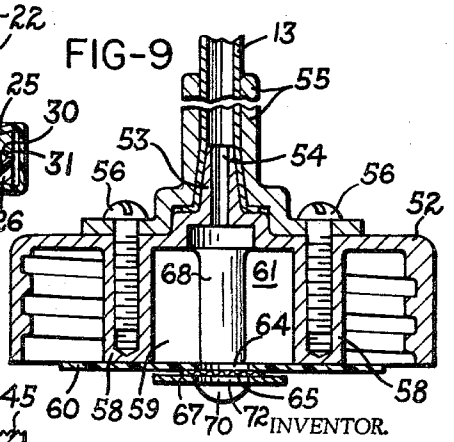


FIG-9



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United States Patent Office 3,184,113 Patented May 18, 1965

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FLUID OPERATED SPRAYING DEVICE HAVING NON-RIGID FOLLOWER AND METERING VALVE

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5 Claims. (Cl. 222—386.5)

This invention relates to spraying devices and particularly to a hand-held pressurized device for spraying liquid insecticides and the like.

An important object of this invention is to provide a spray device which utilizes the pressure from a domestic water supply system to pump liquid insecticide or the like from a supply container without diluting the liquid being sprayed, and particularly to such apparatus which is constructed from light weight molded plastic materials.

Another object of this invention is to provide a spraying device of the aforesaid type which has improved valve structure for controlling the flow from an insecticide storage tank, and more specifically to provide a valve which is simple and light-weight in design, dependable in operation, and also capable of interconnecting and securely holding together an inlet tube and a spraying wand, as well as the other components of the valve mechanism.

A further object of this invention is to provide an inexpensive and dependable spraying apparatus of the aforesaid type which has a minimum number of movable components including a novel control valve structure which automatically locks the various components thereof together by merely assembling the valve in its housing.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

FIG. 1 is an elevation view, partially in section, of the spraying device;

FIG. 2 is an exploded view of a valve mechanism showing the various components thereof;

FIG. 3 is an enlarged sectional view of the nozzle from which the insecticide is sprayed;

FIG. 4 is an end view of the baffle used in the spray outlet of the nozzle;

FIG. 5 is a longitudinal sectional view through the valve mechanism illustrating the manner in which the valve element interconnects with the inlet and outlet tubes;

FIG. 6 is a sectional view essentially along the line 6—6 of FIG. 5 but showing portions of both sides of the valve housing;

FIG. 7 is an enlarged sectional view through the storage container illustrating the cover and its connection to the outlet tube;

FIG. 8 is a bottom view partially broken away to show the cap and the associated filter screen; and

FIG. 9 is an enlarged sectional view of the cover taken essentially along the line 9—9 of FIG. 7.

Referring to the drawings which illustrate a preferred embodiment of the invention, FIG. 1 shows a pressurized container 10 which can be filled with a liquid insecticide or other liquid to be sprayed which, when the system is in operation, is forced from the container through the flexible tube 13 to the handle and control valve mechanism 15, from where it flows through the rigid tube or wand 17 to the spray nozzle 20.

The container 10 includes upper and lower sections 22 and 23, which have radially outwardly extending flanges 25 and 26, respectively, interconnected in a fluid tight manner by the U-shaped clamp ring 28. To insure that the upper and lower sections 22 and 23 of the container will be easily and properly aligned during assembly, the

flange 25 around the lower edge of the upper section 22 is provided with a groove 30 (FIG. 7) for engaging the tongue 31 on the flange 26 of the lower section 23.

A flexible diaphragm 35 effectively divides the container 10 into two separate fluid tight chambers 36 and 37 of variable volume so that when the upper chamber 37 is filled with insecticide or other liquid to be sprayed, and a source of pressurized fluid is connected to the lower chamber 36 below the diaphragm 35, the insecticide will be similarly pressurized and forced from the container 10. The diaphragm 35 is held in position between the sections 22 and 23 when the enlarged integral bead 40 around the periphery of the diaphragm is secured in the groove 41 provided in the flange 26 by the flange 25, when the sections 22 and 23 are clamped together, as shown in FIG. 7. The diaphragm 35 is slightly smaller in area than the inside surfaces of the lower section 23 so that the lower chamber 36 will at all times have at least a minimum volume as shown in FIG. 7, thereby facilitating flow of the pressurizing fluid into this chamber. The chamber 36 may be connected to a domestic water supply by a conventional garden hose 43 (FIG. 1) through the valve 44 which is threadedly secured to the similarly threaded connection 45 on the lower section 23 of the container 10, thus providing a convenient expedient for pressurizing the container 10 and operating the system. However, the valve 44 could be eliminated and the hose 43 connected directly to the nozzle 45.

The neck 50 on the upper section of the container 10 is externally threaded for fluid tight engagement by the similarly threaded cap or cover 52 having an upstanding tapered boss 53 (FIG. 9) centrally formed thereon. An aperture 54 extends through the boss 53 and communicates with the upper chamber 37 for the passage of the insecticide from the latter, and the flexible tubing 13 is secured around the outside of the boss 53 by the clamping action between tapered outer surface of the boss and the mating handle member 55, which is secured to the cover 52 by the bolts 56. As seen in FIGS. 8 and 9, the bolts 56 extend into the enlarged portions 58 of a downwardly extending impervious circular wall or partition 59 formed as part of the cover.

A disk 60 is secured on the lower end of the partition 59 to form a closed chamber 61 having an inlet opening 64 and the outlet aperture 54, and this disk, together with the filter screen 65 which covers the opening 64, is clamped in place by the elongated plate 67 fastened in turn to the enlarged portions 68 (FIGS. 8 and 9) of the partition 59 by the bolts 70. The plate 67 also has an opening 72 aligned with the inlet opening 64 in the disk 60 so that flow from the upper chamber 37 of the container 10 into the chamber 61 in the cap 52 can only be achieved through the filter screen 65.

As shown in FIG. 2, the valve mechanism 15 includes the split housing formed by the opposed members 75 and 76 having the complementary edges 77 thereon (see FIG. 6) for insuring proper alignment between these two housing members. The members 75 and 76, which are secured together by the screws 78, serve the important purpose of interconnecting and securely positioning the tubes 13 and 17 and the valve body 80 in a simple but reliable manner requiring only the assembly of these housing members. Thus the flexible tubing 13 is connected to the inlet extension 81 of the valve body 80 by first sliding this tube over the enlarged outer flange 83 on the extension 81. Then the valve body 80 is placed in the housing member 75 and the member 76 secured thereto so that the two U-shaped webs 85 on the member 75 engage one side of the tube 13, and a similar web 86 on the other member 76 engages the tube on the opposite side thereof intermediate the webs 85, thereby clamping the tube 13

to the extension 83, as well as holding this portion of the valve body 80 securely in the valve housings. The webs 85 and 86 are formed integrally with the housing members and include semi-circular cut out portions 88 which have a radius slightly smaller than the outside radius of the tube 13 so that the latter is securely clamped in position, such as seen in FIG. 5.

The outlet extension 90 of the valve body 80 has an enlarged outer flange 91 thereon which is engaged around its periphery by the identical bosses 93 and 94 formed in the housing members 75 and 76, respectively, so that this portion of the valve body 80 is held against lateral movement with respect to the axis of the outlet extension 90. Movement of the valve body 80 in an axial direction to the right, as viewed in FIG. 5, is prohibited by the shoulders 95 formed by the enlarged bosses 96 which are engaged by the outlet extension 90, whereas axial movement to the left is blocked by the post 97 which projects from the housing member 76 and engages the body at the left end of the outlet extension 90 (see FIG. 5). The upper section 98 of the valve body 80 is held against movement by the bosses 100 (see FIG. 6) which contact either side of this section and prohibit rotation about a horizontal axis as viewed in FIG. 5.

The section 98 of the valve body 80 has the valve element 102 threadedly received in a similarly threaded bore 103 so that rotation of the enlarged knob 105 will effect vertical movement of the spherical valve surface 107 on the lower end of the element 102 with respect to the complementary seat 108 formed in the body 80 intermediate the inlet and outlet passages 110 and 111. A suitable seal 113 is provided between the valve element 102 and the valve body 80 in the bore 103 so that liquids cannot escape around the valve element.

The rigid tube or wand 17 is securely connected to the valve body 80 by press fitting the upstream end thereof into the outlet extension 90 of the valve body. A seal 115, such as an O ring or the like, is interposed between this wand and the counterbored portion 117 of the enlarged flange 91 for blocking leakage between the valve body 80 and the wand 17, and the latter is supported against movement in a radial direction with respect to the housing members 75 and 76 by the bosses 96 and the semi-circular openings 118 (FIG. 2) in the housing members 75 and 76 on each side of the wand 17. The bosses 96 are tapered in such a manner that the wand can be inserted into the outlet extension 90 after the valve housing members 75 and 76 have been secured together.

On the terminal end of the rigid wand 17 is secured a spray nozzle 20 (FIG. 3) which consists of a hollow body member 121 which is rigidly secured to the wand tube 17, e.g., by press fitting or use of a suitable resin cement material, and which has a radially outwardly extending flange 122 suitably threaded for receiving the nozzle cover 123. The body member 121 also includes an extension 124 having the passageway 125 therein and a baffle element 126 mounted thereon for cooperation with the nozzle cover 123. The baffle element 126 has a tapered surface 130 thereon which mates with the similarly tapered surface 131 of the cover 123 to control the liquid which flows into the outlet chamber 133 and through the spray orifice 135.

Thus the amount of liquid flowing between the surfaces 130 and 131 can be varied within a prescribed range by merely rotating the nozzle cover with respect to the body member 121, changing the distance between these two surfaces. The baffle 126 preferably has two grooves or channels 137 (FIG. 4) cut in the surface 130 thereof for imparting a swirling motion to the liquid flowing around into the chamber 133 so that the liquid emerges from the orifice 135 in a swirling conical spray with a substantially stable configuration for the particular position of the nozzle.

A suitable O ring seal 140 is interposed between the

extension 124 of the body member 121 and the nozzle cover 123 so that the liquid will not flow between these two components and outwardly from the rear end of the nozzle. It should be apparent that the nozzle is not intended for completely terminating or blocking the flow of insecticide from the container 10, and that the adjustments provided therein are for the purpose of varying the spray configuration.

In operation, the upper chamber 11 of container 10 is first filled with liquid insecticide or the like by removing the cover 52 and pouring the insecticide thereinto. The flexible diaphragm 35 prohibits this fluid from leaking into the lower chamber 37 formed below the diaphragm so that when the household water supply or its equivalent is secured to the connection, and the valve 44 opened, the water will flow into and pressurize the chamber 36, causing similar pressurization of the insecticide in the upper chamber 37, thus tending to force the insecticide out of the container through the flexible tubing 13. When the valve element 102 of the control valves 15 is positioned to permit flow between the passages 110 and 111, the insecticide flows through the filter screen 65 in the cover 52, the flexible tubing 13, the handle and valve mechanism 15, the rigid wand 17 and the nozzle 20 under the pressure in the chamber 37 to provide an evenly distributed spray which can be varied by making the appropriate adjustment to the nozzle 20.

It should be apparent that the wand 17 cooperates with the handle and valve mechanism 15 so that the operator may easily direct the nozzle 20 toward the objects to be sprayed while being itself spaced a satisfactory distance therefrom so that toxic insecticides do not come into contact with the operator. Similarly, the handle member 55 is provided on the cover 52 so that the container 10 may be easily grasped by the operator and carried as he traverses the objects to be sprayed.

It should now be apparent that the invention has provided a greatly simplified spraying system which is simply constructed from inexpensive molded plastic components for increased strength and reliability while reducing the cost of production and maintenance. The easily assembled valve and handle mechanism 15 is utilized to interconnect the inlet and outlet conduits 13 as well as to position the valve body 80 by merely securing the housing sections 75 and 76 together. The valve knob 105 provides a handy control for regulating the flow of insecticide to the outlet nozzle 20 from the handle mechanism 15 which is also utilized to direct the spray nozzle.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a hand spray device of the character described, a container comprising, upper and lower cup shaped sections each having a radially outwardly extending flange around the periphery of the open end thereof, each of said flanges having a face extending radially of the associated said section, said faces adapted to contact one another when said sections are secured together, a circumferential groove in one of said flanges extending from said face thereof in a direction parallel to the axis of said section, a complementary mating tongue projecting from said face of the other of said flanges in an axial direction for snug insertion into said groove to insure proper alignment and a fluid tight connection between said sections, clamp means for engaging said flanges and forcing them together to provide a fluid tight container, a flexible diaphragm for dividing the interior of said container into upper and lower fluid tight chambers, said diaphragm having an enlarged bead around the periphery thereof, said bead having a predetermined configuration and a thickness substantially larger than the thickness of the adjacent portion

of said diaphragm, and means defining a second circumferential groove in said other flange extending axially inward from said face of the associated said flange and being spaced radially inward of said tongue and radially outward of the inner edge of said face for receiving said bead so that when said sections are secured together said flat faces tightly clamp said diaphragm adjacent said bead to lock said diaphragm in place.

2. In a hand spray device of the character described, a container comprising, upper and lower cup shaped sections each having a radially outwardly extending flange around the periphery of the open end thereof, each of said flanges having a face extending radially of the associated said section, said faces adapted to contact one another when said sections are secured together, circumferential groove means in one of said flanges extending from said face thereof in a direction parallel to the axis of said section, a complementary mating tongue projecting from said face of the other of said flanges in an axial direction for snug insertion into said groove means to insure proper alignment and a fluid tight connection between said sections, circumferential clamp means for engaging said flanges and holding them together to provide a fluid tight container, and a cup shaped flexible diaphragm for dividing the interior of said container into upper and lower fluid tight chambers, said diaphragm having an enlarged bead around the periphery thereof, said bead having a thickness substantially larger than the thickness of the adjacent portion of said diaphragm, means defining a second circumferential groove in said other flange extending axially inward from said face of the associated said flange and having a size to accommodate snugly said bead, said second groove being spaced radially inward of said tongue and radially outward of the inner edge of said face for receiving said bead so that when said sections are secured together said flat faces tightly clamp said diaphragm adjacent said bead to lock said diaphragm in place, said flexible diaphragm having an effective area which is slightly less than the area of the inner surface of said lower section so that said lower chamber has a predetermined minimum volume at all times.

3. In a spray device of the character described, a metering valve assembly for controlling the flow of fluid comprising, a housing including complementary casings adapted to be secured together, a valve fitting adapted to be secured in said housing having substantially parallel tubular inlet and outlet ends, a fluid passageway internally of said fitting between said ends and parallel to the longitudinal axis of said housing, a metering orifice in said passageway, an upstanding stem portion in said fitting extending perpendicularly to said passageway, a valve stem in said stem portion having a head cooperating with said orifice to control the flow of liquid through said passageway, an enlarged diameter socket formed in said fitting surrounding said outlet end thereof, a rigid tube extending through one end of said housing and received in said socket in a fluid tight manner, means on said casing providing spaced supports for said tube, a flexible supply tube having one end adapted to receive said tubular inlet end, a pair of spaced parallel web members molded in one of said casings and having a semi-circular cut-out therein adapted to engage said supply tube around said inlet end, and a single web member on the other of said casings aligned between said spaced web members and having a semi-circular cut-out therein to cooperate with the portion of said supply tube around the other side of said inlet end for fluid tight clamping of said one end of said supply tube to said inlet end when said casings are secured together.

4. In a spray device of the character described, a metering valve assembly for controlling the flow of fluid comprising, a housing including complementary casings adapted to be secured together to form a handle for the spray device, cooperating semi-circular openings in each end of each of said casings to define a circular opening at each end of said housing, a valve fitting adapted to be secured in said housing having substantially parallel inlet and outlet ends, a fluid passageway internally of said fitting between said ends parallel to the longitudinal axis of said housing, a metering orifice in said passageway, a stem portion in said fitting extending perpendicularly to said passageway, a valve stem in said stem portion having a head cooperating with said orifice to control the flow of liquid through said passageway, an enlarged diameter socket formed in said fitting on said outlet end thereof, a rigid tube extending through the opening in one end of said housing and having one end thereof secured in said socket, means on said housing for supporting said rigid tube at intermediate points along its length, means on said housing providing spaced supports for said tube, a flexible supply tube extending through said opening in the other of said ends of said housing, one end of said tube being received on said inlet end, a pair of spaced parallel web members molded in one of said casings and having a semi-circular cut-out therein adapted to receive said supply tube around said inlet end, and a single web member on the other portion of said casing aligned between said spaced web members and having a semi-circular cut-out therein to cooperate with the portion of said supply tube around the other side of said inlet end for fluid tight clamping of said end of said supply tube to said inlet end when said casings are secured together.

5. In a spray device of the character described, a metering valve assembly for controlling the flow of fluid comprising, a housing including complementary casings adapted to be secured together, a valve fitting adapted to be secured in said housing having substantially parallel tubular inlet and outlet ends, means in said casings to engage said fittings when said casings are secured together to hold said fitting therein against movement, a fluid passageway internally of said fitting between said ends parallel to the longitudinal axis of said housing, a metering orifice in said passageway, an upstanding stem portion in said fitting extending perpendicularly to said passageway, a valve stem in said stem portion having a head cooperating with said orifice to control the flow of liquid through said passageway, an enlarged diameter neck portion on said tubular inlet end of said fitting, a flexible supply tube having one end received on said neck portion, a pair of spaced parallel web members molded in one of said casings and having a semi-circular cut-out therein adapted to engage said supply tube around said tubular inlet end between said neck portion and said stem portion, and a single web member on the other portion of said casing aligned between said spaced web members and having a semi-circular cut-out therein to engage the portion of said supply tube around the other side of said tubular inlet end for fluid tight clamping of said supply tube to said inlet end when said casings are secured together.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,184,113 May 18, 1965

Russell R. Curtis

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 67, for "2,94,359" read -- 2,924,359 --; line 68, for "Wettenberg et al." read -- Wittenberg et al. --.

Signed and sealed this 28th day of September 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents