June 19, 1951 F. ZIHERL 2,557,247

DOUBLE-ACTION SPRAYER

Filed March 11, 1948 3 Sheets-Sheet 1

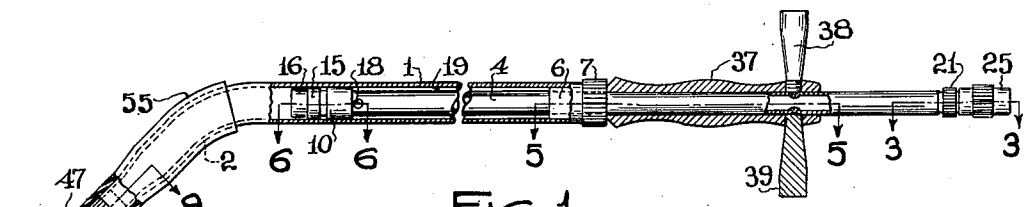


FIG. 1

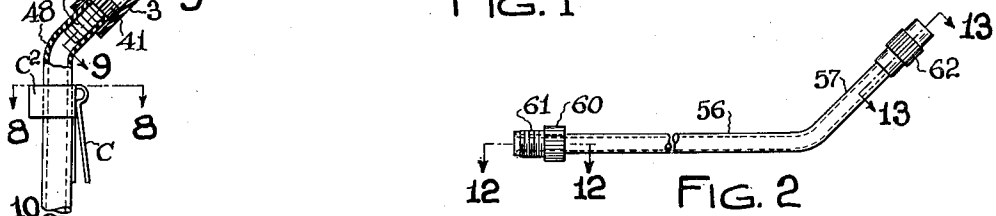


FIG. 2

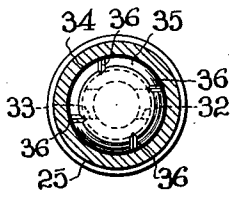


FIG. 4

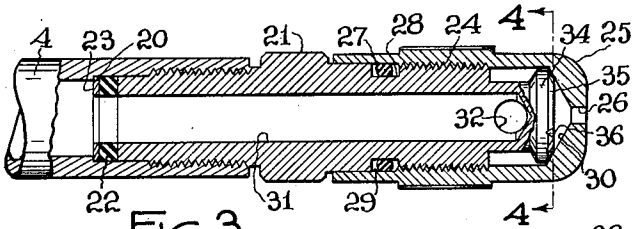


FIG. 3

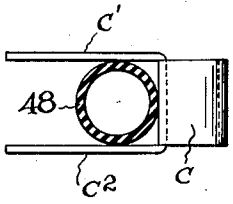


FIG. 8

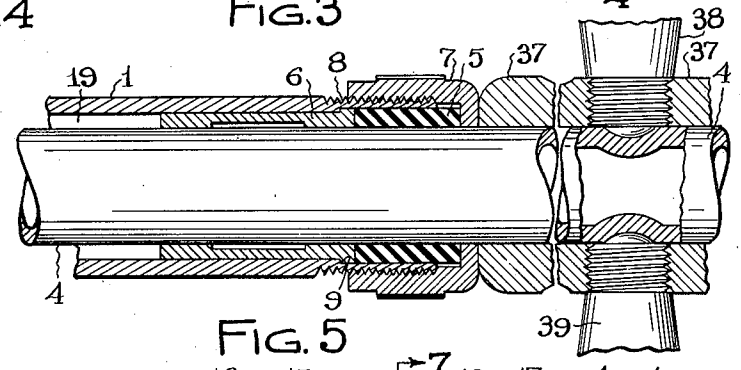


FIG. 5

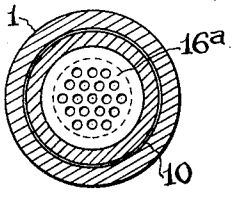


FIG. 7

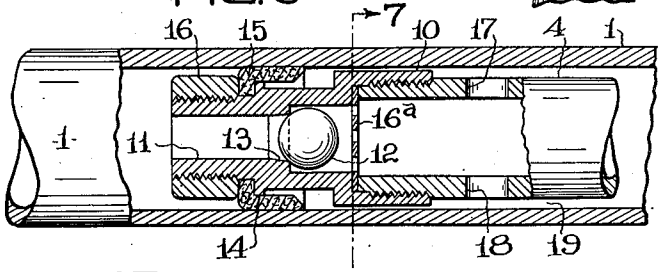


FIG. 6

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DOUBLE-ACTION SPRAYER

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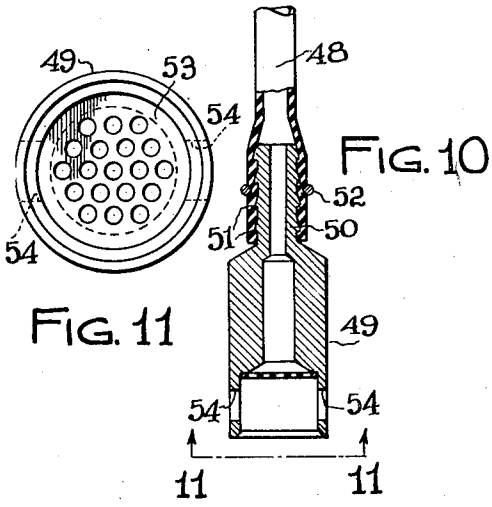


FIG. 10

FIG. 11

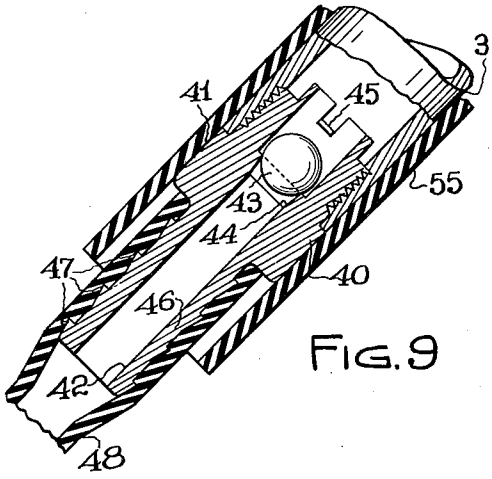


FIG. 9

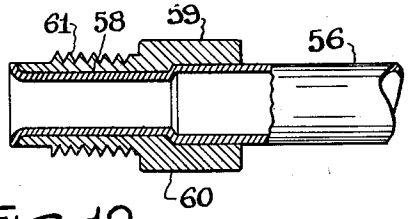


FIG. 12

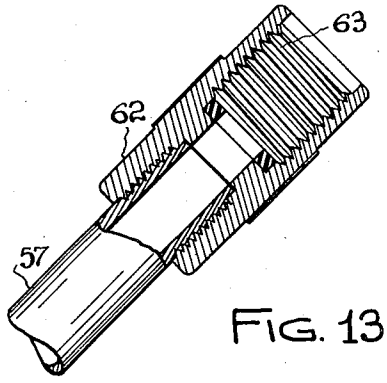


FIG. 13

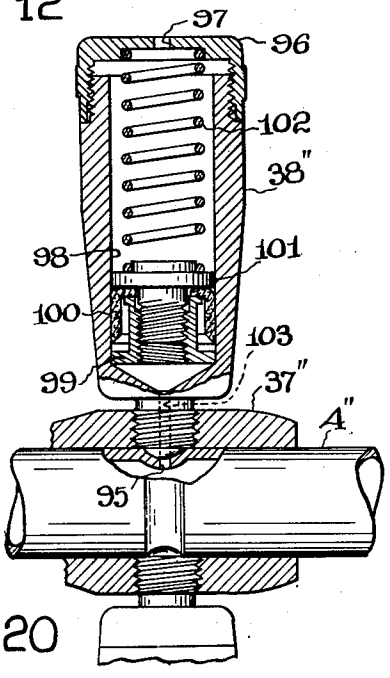


FIG. 20

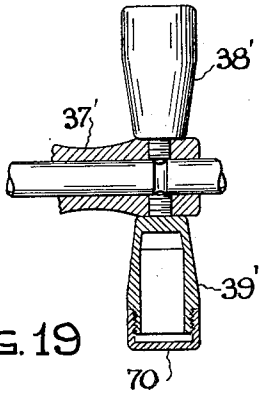


FIG. 19

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DOUBLE-ACTION SPRAYER

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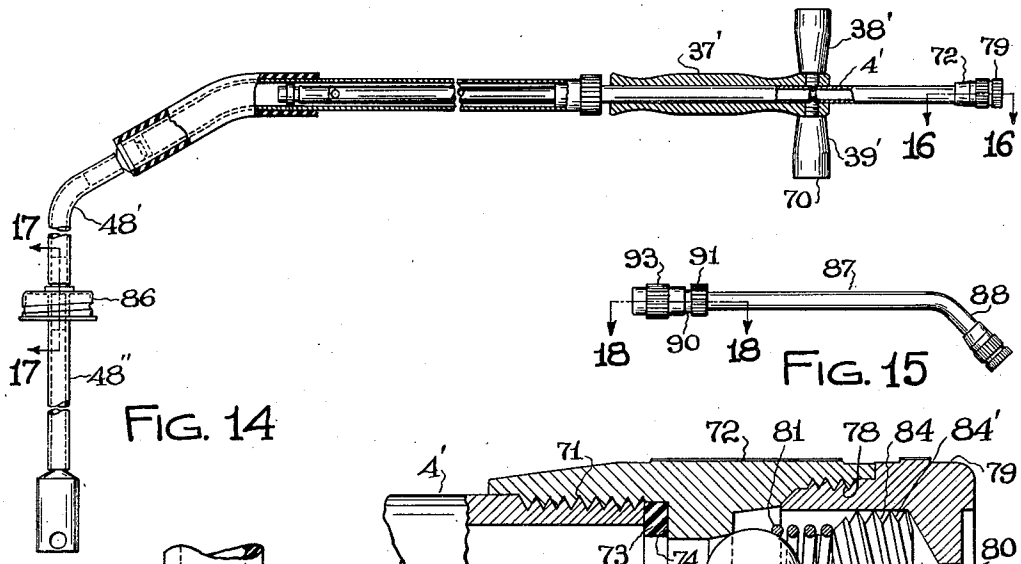


FIG. 14

FIG. 15

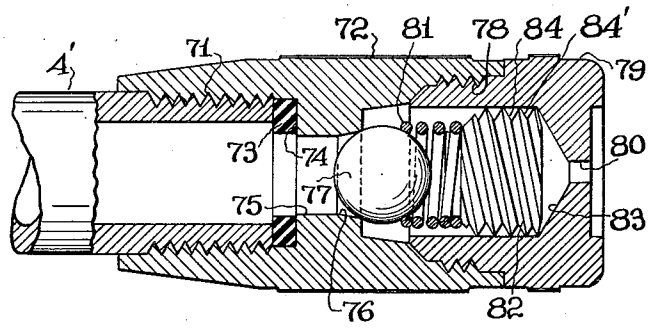


FIG. 16

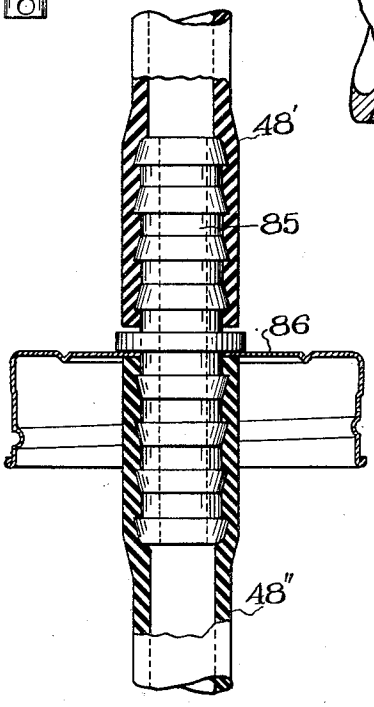


FIG. 17

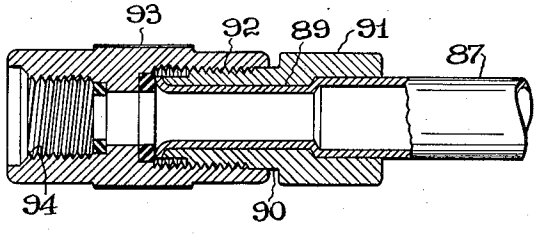


FIG. 18

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UNITED STATES PATENT OFFICE

2,557,247

DOUBLE-ACTION SPRAYER

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Application March 11, 1948, Serial No. 14,336

9 Claims. (Cl. 299—97)

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This invention relates, as indicated, to sprayers, but has reference more particularly to sprayers of the double action type.

A primary object of the invention is to provide a sprayer of the character described, by means of which a novel form or type of spraying action is obtained.

Another object of the invention is to provide a sprayer of the character described, embodying a reciprocable tubular member, movement of which in either direction causes a spraying action.

A further object of the invention is to provide a sprayer of the character described, having embodied therein an annular fluid chamber for storing fluid to be sprayed.

A further object of the invention is to provide a sprayer of the character described having an operating handle which constitutes an air compression chamber which is effective for spraying.

A further object of the invention is to provide a sprayer of the character described, which consists of a minimum number of parts which can be readily assembled and replaced, if necessary, and can be easily disassembled for cleaning purposes.

A still further object of the invention is to provide a sprayer most of the parts of which are so designed as to permit of manufacture in commercially desirable quantities on standard screw machines, and at fairly low cost.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a view, partially in side elevation and partially in section, of a sprayer embodying the invention;

Fig. 2 is a side elevational view of an extension or auxiliary attachment for the sprayer of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 3—3 of Fig. 1;

Fig. 4 is a transverse cross-sectional view, taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 6—6 of Fig. 1;

Fig. 7 is a transverse cross-sectional view, taken on the line 7—7 of Fig. 6;

Fig. 8 is a transverse cross-sectional view, on an enlarged scale, taken on the line 8—8 of Fig. 1;

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Fig. 9 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 9—9 of Fig. 1;

Fig. 10 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 10—10 of Fig. 1;

Fig. 11 is a view taken in the direction indicated by the line 11—11 of Fig. 10;

Fig. 12 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 12—12 of Fig. 2;

Fig. 13 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 13—13 of Fig. 2;

Fig. 14 is a view similar to Fig. 1, but showing a modified form of sprayer;

Fig. 15 is a view similar to Fig. 2, but showing an extension attachment adapted for use with the sprayer shown in Fig. 14;

Fig. 16 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 16—16 of Fig. 14;

Fig. 17 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 17—17 of Fig. 14;

Fig. 18 is a fragmentary cross-sectional view, on an enlarged scale, taken on the line 18—18 of Fig. 15;

Fig. 19 is a view, partly in elevation, and partly in section, and on an enlarged scale, of a portion of Fig. 14, and

Fig. 20 is a view similar to Fig. 19, but showing another modification of the invention.

Referring more particularly to Figs. 1 and 3 to 11, inclusive, of the drawings, the sprayer will be seen to comprise an aluminum tube 1 having an angularly disposed portion 2 at the rear thereof, which terminates in an extension 3 of reduced diameter.

Disposed within the tube 1 for reciprocating movement in the latter is a brass tube 4 of smaller diameter than the tube 1, the tube 4 being concentric with the tube 1. The tube 4 is maintained in fluid tight relationship with the forward end of the tube 1 by means of a packing sleeve 5 of a soft material such as neoprene and laminated duck which is interposed and fills the space between the tube 1 and tube 4. The sleeve 5 is maintained against axial movement relatively to the tube 1 by means of a bushing 6 and a packing nut 7. The bushing 6 is disposed within the forward end of the tube 1 and has a flange 8 which bears against a shoulder 9 formed by counterboring the forward end of the tube 1. The packing nut 7 is threadedly secured to the tube 1.

Secured in threaded engagement with the rear end of the tube 4 is a hollow valve or check body 10, preferably formed of brass and having a fluid

passageway 11, which is normally closed by means of a ball 12. The body 10 is provided with a conical ball seat 13 for the ball 12. The body 10 is also provided with a radial flange 14 against which a cup leather 15 is secured, as by means of a nut 16 which is threadedly secured to the rear portion of the body 10. This cup leather is preferably impregnated to withstand water emulsions and oil insecticides, and forms a substantially fluid-tight seal between the body 10 and the inner wall of the tube 1. A perforated metal screen 16a is secured between the body 10 and rear end of the tube 4 for the purpose of filtering out any solid particles or foreign matter which might otherwise pass into the tube 4. Immediately ahead of the valve body 10, the wall of the tube 4 is provided with a pair of diametrically opposed fluid ports or openings 17 and 18, which establish communication between the inside of the tube 4 and the annular chamber 19 between the outer surface of the tube 4 and the inner surface of the tube 1.

The tube 4 is counterbored at its forward end to provide a shoulder 20, and is threaded for the connection thereto of a diffuser 21. A fluid-tight seal between the diffuser 21 and the tube 4 is had through the use of a rubber gasket 22, which is interposed between the rear end of the diffuser and a brass washer 23, which bears against the shoulder 20 of the tube 4.

The diffuser 21 is threaded as at 24 for the attachment thereto of a brass nozzle 25 having a spray opening 26. A fluid-tight seal between the nozzle 25 and the diffuser is effected by means of an O ring 27, which is disposed in an annular recess 28 in the diffuser and bears against the inner cylindrical wall 29 of the nozzle. The wall 29 terminates at the base of a conical forward wall 30, the apex of which lies at the bottom of the nozzle or spray opening 26.

The diffuser 21 has a fluid passageway 31 extending axially therethrough which communicates at its forward end with a pair of radially-extending openings or ports 32 and 33, which are diametrically opposite each other. The diffuser has a head 34 at its forward end which is cylindrical for a portion of its length and has a conical end 35 which bears against the conical wall 30 of the nozzle, the angle of the conical end 35 being the same as that of the conical wall 30.

The head 34 has a series of circumferentially-spaced grooves 36 cut therein, which extend tangentially with respect to the head, and which, as shown in Fig. 3, have inclined side walls. These grooves, moreover, extend generally in the direction of the incline of the conical wall 35, so that fluid directed through the grooves will be forced toward the nozzle opening 26.

Rigidly secured to the tube 4 at a point adjacent the forward end of the tube is a handle 37, preferably formed of aluminum. A pair of cross-handles 38 and 39, also formed of aluminum, are threadedly secured to the handle 37, and extend radially in opposite directions from the forward end of the handle 37.

The extension 3 of the tube 1 has threadedly secured thereto an aluminum valve or check body 40 having an externally knurled flange 41 which bears against the lower end of the extension 3, the body 40 having a fluid passageway 42 therethrough which is normally closed by means of a ball 43. The valve body 40 has a conical seat 44, and the ball 43 normally rests on this seat, due to gravity or its own weight. The ball 43 is adapted to be lifted from its seat during use of the sprayer, but is prevented from leaving the valve body by means of retaining ears or lugs 45, formed by slitting the upper end of the body 40 at circumferentially-spaced points and bending inwardly the portions of the valve body formed by such slitting.

The valve body 40 is provided with an extension 46 of reduced diameter, provided with annular corrugations 47, for the attachment thereto of a hose 48, preferably made of neoprene, and which is adapted to extend into a bucket or other container containing the fluid which is to be sprayed.

For the purpose of maintaining the hose 48 in a bucket, a weight 49 is provided for the lower end of the hose. This weight has an extension 50 of reduced diameter, which extends into the lower end of the hose and is provided with annular corrugations 51, which frictionally grip the inner wall of the hose. A wire clip 52 is used to clamp the hose to the extension 50. A perforated metal screen 53 is secured within the weight 49 and is used to prevent foreign matter or solid particles from entering the hose 48. In order to admit fluid into the weight 49 when the weight rests on the bottom of a bucket, a pair of diametrically-opposite openings or ports 54 are provided in the wall of the weight.

A grip 55, preferably formed of neoprene tubing, is cemented or otherwise secured to the portions 2 and 3 of the tube 1.

A sheet metal clip C (Figs. 1 and 8), may be used for securing to the upper edge of a bucket containing the fluid to be sprayed a hose 48. This clip has flanges C' and C^2 for supporting the hose 48 in an upright position.

In using the sprayer, the operator will grasp the handles 37, 38 and 39 with one hand, and will grasp the grip 55 with the other hand in approximately the manner in which a pistol is gripped, and will reciprocate the tube 4 by means of the handles 37, 38 and 39, thereby producing a spray from the nozzle 25. The spraying action is accomplished in the following manner:

As the tube 4 is moved to the right, as viewed in Fig. 1, a suction is created in the tube 1 behind the ball 12, causing the ball 43 to be lifted from its seat, permitting a small quantity of fluid from the bucket to be drawn up into this space or portion of the tube. During this movement, the ball 12 remains seated due to compression of the air in the annular chamber 19 between the tubes 1 and 4, which pressure is sufficient to retain the ball 12 in closed position. The tube 4 is then moved to the left or to its original position, as shown in Fig. 1, causing the valve body 10 to exert pressure on the fluid behind the valve body, thereby causing the ball 43 to be reseated, and the ball 12 to be unseated. At the same time, the fluid in said space is forced through the valve body 10 and tube 4, and through the nozzle 25. An excess of such fluid will flow through the ports or openings 17 and 18, and fill the annular chamber 19 between the tubes 1 and 4.

Then, as the tube 4 is again moved to the right, the ball 12 will be seated and pressure on the fluid within the chamber 19 will cause such fluid to flow through the ports 17 and 18 into the tube 4 and out through the nozzle 25. At the same time, the ball 43 will be unseated and a fresh supply of fluid will enter the space behind the body 10.

In this way, a spraying action is obtained on both strokes of the tube 4, so that a "double action" is, in effect, secured.

With the conical end 35 of the diffuser bearing

tightly against the wall 30 of the nozzle 25, the fluid is forced only through the grooves 36 and through the nozzle opening 26. The spray thus produced is of conical shape and is diffused in the form of a mist or fine spray. The tangential arrangement of the grooves 36 imparts a whirling or twirling movement or action to the spray, which is highly effective for such diffusion purposes. The shape of the spray cone can be varied to some extent by rotating the nozzle 25 so as to adjust or change the pressure of the surface 35 on the wall 30 of the nozzle.

When the surface 30 of the nozzle is moved out of contact with the surface 30 of the diffuser, the fluid will flow over the entire cylindrical portion of the head 34 of the diffuser, and emerge in the form of a long thin stream or spray, which is not of conical form. The passage of some of the fluid through the grooves 36 will nevertheless impart to such stream some of the twirling movement already referred to.

The length of the spray or stream can be accurately controlled by the intensity or speed of the reciprocating action.

For certain applications or uses, particularly where it is desired to reach places to which access is otherwise difficult, an extension attachment, as shown in Figs. 2, 12 and 13, is provided.

This attachment comprises a long tube 56 of slightly smaller diameter than the tube 4, and having an angularly disposed portion 57. One end of this tube has an extension 58 of reduced diameter to which a nut 59 is swaged or otherwise secured, this nut having a knurled head 60 and threads 61 adapted for threaded engagement with the threads on the forward end of the tube 4. One end of the portion 57 of the attachment 56 is threaded for the attachment thereto of a coupling 62 having threads 63 adapted for engagement with the threads at the rear portion of the diffuser 21.

When it is desired to use the aforesaid extention attachment, the diffuser 21 is unscrewed from the tube 4, and the nut 59 screwed to the tube 4, after which the diffuser, with its attached nozzle, is secured to the threads 63 of the coupling 62.

Figs. 14, 16, 17 and 19 show a modification of the sprayer, which, in many respects is of a construction similar to that of the sprayer which has been described, with the following exceptions:

The handle 37' is provided with a pair of cross-handles 38' and 39', which are threadedly secured to the handle 37' and extend radially in opposite directions from the forward end of the latter. The handle 39' is made hollow for a purpose to be presently described, being provided with a closure or cap 70, which is threadedly secured thereto.

The forward end of the tube 4' is externally threaded as at 71 for the attachment thereto of a nozzle body 72, a rubber gasket 73 being interposed between the end of the tube 4' and the shoulder 74 formed by counter-boring the fluid passageway 75 of the nozzle body. The passageway 75 has a conical seat 76 for a ball 77. The forward end of the nozzle body 72 is threaded as at 78 for the attachment thereto of a nozzle 79 having a spray opening 80 at its forward end. The ball 77 is normally urged against the seat 76 by a compression coil spring 81, which is disposed within the nozzle 79. One end of this spring bears against the ball 77, while the other end thereof bears against a nozzle insert 82. The

insert 82 bears against the conical surface 83 of the nozzle, and has spiral grooves 84 and 84' in its outer surface. The construction and operation of this insert 32 is similar to that of the insert 25 described in my copending application, Serial No. 14,335. A fluid impinging on the nozzle insert passes through these spiral grooves, imparting to the fluid a whirling action, which causes it to emerge from the opening 80 in the form of a conical spray, covering a relatively large area.

The ball 77 becomes unseated during the spraying action, and its main function is to prevent a siphoning action in cases where the nozzle end of the sprayer happens to be at a lower level than the level of the fluid in the bucket or container from which the spray fluid is derived.

This type of sprayer is designed for use with an extra nozzle (not shown) having a finer spray opening than that shown. This extra nozzle may be stored in the hollow handle 39' when not in use.

This type of sprayer is also designed for attachment to a bottle or jar containing the fluid to be sprayed. For this purpose, a union or coupling 85 is secured to one end of the hose 48', and is used for the connection to the hose 48' of a second hose 48''. A bottle or jar cap 86 is clamped between the hoses 48' and 48'', as shown in Fig. 17.

For certain applications or uses, particularly where it is desired to reach places to which access is otherwise difficult, an extension attachment, as shown in Figs. 15 and 18, is provided.

This attachment comprises a long tube 87 of substantially the same diameter as the tube 4', and having an angularly disposed portion 88. One end of this tube has an extension 89 of reduced diameter to which a nut 90 is swaged or otherwise secured, this nut having a knurled head 91, and threads 92 adapted for the attachment thereto of a coupling 93.

The coupling 93 has threads 94 adapted for engagement with the threads on the forward end of the tube 4'. One end of the portion 88 of the attachment 87 is threaded for the attachment thereto of either the nozzle unit 72—79, or the extra nozzle unit which is stored in the handle 39'.

When it is desired to use the aforesaid extension attachment, the nozzle unit 72—79 is unscrewed from the tube 4', and the nut 93 screwed to the tube 4', after which the nozzle unit 72—79 or the other (stored) nozzle unit is secured to the threads at the end of the portion 88 of the attachment 87.

Referring to Fig. 20, the sprayer, in this case, is similar to that shown in Fig. 14, and comprises a tube 4'', having an aperture 95 in the wall thereof. Secured to the tube 4'', is a handle 37'', which is similar to the handle 37'. Secured to the handle 37'', at a point adjacent the aperture 95, is a hollow handle 38'', provided with a closure or cap 96, having an aperture 97 therein, which is in axial alignment with the aperture 95. Mounted for sliding movement in the hollow chamber or compartment 98 of the handle 38'', is a guide nut 99, to which a cup leather 100 is clamped, as by means of a screw 101, which is threadedly secured to the nut 99. A compression coil spring 102 is interposed between the screw 101 and the cap 96. The handle 38'' also has a passageway 103, which is in axial alignment with the aperture 95 and establishes communication between the latter and the compartment 98 of the handle.

The hollow chamber or compartment 98 forms a storage reservoir or container in which air is compressed during the reciprocating action of the tube 4'', this compression of the air being resisted or built up by the pressure of the spring 102 on the piston formed by the cup leather 100. The air thus stored or compressed within this chamber is effective to continue the spraying action for a brief interval at the end of each stroke of the tube 4'', so that the periods of non-spraying between strokes are reduced. In this manner, a substantially continuous spraying action is obtained.

Sprayers, as thus described, are of general utility, being adapted for numerous uses, particularly outdoor uses. They consist of a minimum number of parts which can be readily assembled and replaced, if necessary, and can be easily disassembled for cleaning purposes. Each part is so designed as to permit of manufacture in commercially desirable quantities on standard screw machines, and at fairly low cost. Moreover, the sprayers are adapted for attachment to jars, bottles or other contains of conventional form.

It is to be understood that the forms of my invention, herewith shown and described, are to be taken as preferred examples of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In a sprayer of the character described, a tubular member, a second tubular member telescopically movable in said first tubular member, means operable upon relative movement of said second member to said first member for ejecting fluid through said second member, an operating handle removably secured to and having its axis extending radially from said second tubular member, said handle being hollow and in communication with the interior of said second tubular member, and constituting an air chamber for storing air which is effective to discharge fluid from said second tubular member.

2. A sprayer, as defined in claim 1, in which said hollow handle has piston means disposed therein for resisting the storing of said air in the handle, said piston means being under pressure of a compression coil spring.

3. In a sprayer of the character described, a tubular member having a straight portion and a portion formed integrally with the straight portion and extending at an obtuse angle to the latter, said last-named portion constituting a hand grip for holding the sprayer during the spraying operation, a second tubular member telescopically movable in the straight portion of said first tubular member and projecting from the latter, normally closed valve means at the lower end of said hand grip portion of said first tubular member, normally closed valve means at the inner end of said second tubular member, said first-named valve means adapted to be opened upon movement of the second tubular member away from said first tubular member, and said second-named valve means adapted to be opened upon movement of the second tubular member toward said first tubular member, said second tubular member being provided with a tubular handgrip for reciprocating the same, and a pair of cross-handles threadedly and removably secured to said tubular hand grip and extending radially in opposite directions therefrom.

4. A sprayer, as defined in claim 3, in which a flexible tube is attached to the valve means at the lower end of the hand grip portion of the first-named tubular member, and a weight is appended to said flexible tube, said weight adapted to sustain the flexible tube in a vertical position, said weight being hollow and having inlet openings in the wall thereof adjacent its lower end.

5. In a sprayer of the character described, a tubular member, a second tubular member telescopically movable in said first tubular member, valve means operable upon relative movement of said second member to said first member for permitting fluid to flow through said second member, a hollow handle in communication with the interior of said second tubular member, and constituting an air chamber for storing air which is effective to discharge fluid from said second tubular member, and means in said hollow handle for resisting the storing of said air in the handle.

6. A sprayer, as defined in claim 5, in which said last-named means includes a piston.

7. A sprayer, as defined in claim 6, in which spring means are provided for resisting movement of said piston in said handle.

8. In a sprayer of the character described, a tubular member, a second tubular member movable telescopically in said first tubular member, valve means operable upon relative movement of said second member relatively to said first member for permitting fluid to flow through said second member, and a handle having its axis extending radially to said second tubular member, said handle being hollow and in communication with the interior of said second tubular member, and constituting an air chamber for storing air which is effective to discharge fluid from said second tubular member, said hollow handle having piston means for resisting the storing of air in the handle, and said piston means being under pressure of a compression coil spring.

9. A sprayer, as defined in claim 8, in which said handle has a removable cap, and said spring is interposed between said cap and said piston means.

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