Spray Attachment for Fluid Containers

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9 Claims. (Cl. 299—97)

This invention relates, as indicated, to a spray attachment for fluid containers, but has reference more particularly to an attachment of this character which has been designed especially for use in connection with containers of insecticides.

A primary object of the invention is to provide a spray attachment of the character described, utilizing a reciprocable plunger, and in which means have been incorporated for obtaining a spraying action on both strokes of the plunger.

Another object of the invention is to provide a spray attachment of the character described, in which means have been incorporated for sustaining the spraying action at the termination of each stroke of the plunger, thereby effecting a substantially continuous spraying action.

A further object of the invention is to provide a spray attachment of the character described, in which means have been incorporated to permit release of air pressure within the attachment, thereby preventing undesirable leakage of fluid through the nozzle of the device after the spraying operation.

A still further object of the invention is to provide a spray attachment of the character described, having a nozzle insert of advantageous construction embodied therein.

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 fragmentary cross-sectional view of a spray attachment embodying the invention, and showing also the manner in which it is secured to a fluid container;

Fig. 2 is a view of a portion of Fig. 1, on an enlarged scale, and with the nozzle in longitudinal cross-section;

Fig. 3 is a cross-sectional view, taken on the line 3—3 of Fig. 2;

Fig. 4 is a view of a portion of Fig. 1, on an enlarged scale, and with the relief valve in longitudinal cross-section;

Fig. 5 is a view of a portion of Fig. 1, on an enlarged scale, and with the fluid intake valve in longitudinal cross-section, and

Fig. 6 is a view of a portion of Fig. 1, on an enlarged scale, and with the lower end of the spray attachment in longitudinal cross-section, and

Referring more particularly to the drawings, the spray attachment will be seen to comprise the body member 1, having a central passageway 2 within which a plunger 3 is reciprocable, the plunger having threadedly secured to its upper end a handle or knob 4, by means of which reciprocal movement of the plunger is effected.

The body member 1 is counterbored as at 5 to form an air reservoir or chamber 6, the function of which will be presently explained.

The upper end of the counterbore 5 is threaded as at 7 for the reception of the threads 8 of the reduced extension 9 of a body plug 10, a vegetable fiber washer 11 being interposed between the upper end of the body member 1 and the body plug to insure a fluid-tight seal at this joint. The body plug 10 has a central opening 12, in which the plunger 3 slides, and the position of that movement, and the plug is counterbored as at 13 for the reception of an O-ring 14 of synthetic rubber or the like, which ring is held against displacement axially from the plug by means of a cap 15, which is threadedly secured to the plug 13. The cap 15 serves also as a guide for the plunger 3 during reciprocal movement of the latter. The function of the ring 14 will be presently explained.

The body member 1 is also counterbored below the passageway 2, as at 16, and this counterbore is threaded, for the connection to the body member of a tube 17, which is in axial alignment with the passageway 2.

The passageway 2 communicates with a radially-extending fluid passageway 18 in the member 1, which terminates in a conical seat 19 for a ball 20. The ball 20 normally closes the passageway 18, being normally urged against the seat 19 by a compression coil spring 21.

The body member 1 is threaded as at 22 for the attachment thereto of a nozzle 23 having a nozzle or spray opening 24. The nozzle 23 has an inner cylindrical wall 25 which terminates at the base of a conical forward wall 26, the apex of which lies at the bottom of the nozzle or spray opening 24.

Disposed within the nozzle 23 is a nozzle insert 27, which is of hexagonal cross-section, having flat sides 28, which coact with the cylindrical wall 25 to provide a multiplicity of passageways 29 for the fluid which is to be sprayed. The insert 27 has an extension 30 which is cylindrical for a portion of its length and has a frusto-conical extension 31 which bears against the conical wall 26 of the nozzle 23, the angle of this frusto-conical extension 31 being that of the conical wall 26. The insert 27 is provided with a second frusto-conical extension 32, forwardly of the extension 31, but spaced from the wall 26, the
angle of the extension 32 being the same as that of the extension 31 and wall 26. The space between the extension 32 and wall 26 forms an annular passageway 33, the function of which will be presently described.

The nozzle insert 27 has a series of circumferentially-spaced notches or grooves 34 cut therein, which extend tangentially with respect to the cylindrical extension 30 and has diverging side walls, as better shown in applicant's copending application, Serial No. 722,213. These grooves extend generally in the direction of the incline of the frusto-conical extension 31, so that fluid directed through the grooves will be forced toward the nozzle opening 24.

The nozzle insert 27 is normally maintained in the position shown in Fig. 2 by means of the compression col spring 21, which is interposed between the nozzle insert and the ball 29.

The passageway 3 in the body member 1 also communicates with a radially-extending passageway 35 in axial alignment with the passageway 10, the passageway 35 is counterbored at its inner end to provide a recess 36 for the conical head 37 of a plug valve 38 which is mounted for reciprocal sliding movement in the passageway 35. The conical face of the head 37 is normally seated on the conical seat 39 formed at the juncture of the passageway 35 and counterbore 36, so as to seal off communication therewith. A collar 40 is press-fitted to the outer end of the plug valve 38, and constitutes a button for actuating the valve, as will be presently explained.

The passageway 35 is counterbored at its outer end to provide a recess 41 for a synthetic rubber washer 42, and the recess 41 is counterbored to provide a recess 43 for a cup-like spring seat 44, within which a compression coil spring 45 is disposed. The spring 45 is interposed between the seat 44 and the collar 40, and acts normally to maintain the valve 38 in closed position, i.e., with the head 37 thereof seated on the seat 39. The washer 42 acts to seal off any possibility of fluid leakage between the body member 1 and valve 38.

The body member 1 is provided in its lower end with an annular groove or recess 45, and a passageway 35 to establish communication therebetween, for a purpose to be presently described.

As previously stated, the tube 17 is threadedly secured to the body member 1, and is provided with a valve seat 48, which is locked against axial displacement relative to the tube by forming the tube over a shoulder 49 of the valve seat, and flanging the lower end of the tube over into engagement with the valve seat, as best shown in Fig. 6. A screen 50 is interposed between the valve seat 48 and the flange 51 of the tube. A ball 52 is disposed on the valve seat, normally closing the opening 53 in the valve seat. The wall of the tube 17 is provided with indentations 54 at circumferentially-spaced points, which serve to prevent displacement of the ball 52 to a point above these indentations.

Secured in threaded engagement with the lower end of the plunger 3 is a valve body 55 having an axially extending passageway 56, which is counterbored, as at 57, for the reception of a ball 58, which normally closes the passageway 56. The portion of the valve body in which the ball 58 is disposed is of slightly smaller external diameter than the internal diameter of the tube 17, providing an annular passageway 59 between the valve body and the tube. This passageway 59 communicates with the counterbore 57 through ports, or openings 60 and 61, which extend radially through the valve body.

The lower portion of the valve body 55 is provided with an annular flange 62, between which and a nut 63 a synthetic rubber cup 64 is clamped. This cup 64 forms a substantially fluid-tight seal between the valve body 55 and the inner wall of the tube 17. The nut 63 is secured to the lower end of the valve body 55 and has an opening 65 therein, in alignment with the passageway 56.

The nozzle 23 may also be provided with a screen 66, if so desired.

For the purpose of securing the spray attachment to a fluid container, in this case a glass bottle B, an internally-threaded bottle cap 66 is provided, which is loosely supported by a flange 67 of the body member 1, the cap 66 normally carrying an annular washer 68, which acts as a seal when the spray attachment is secured to the fluid container by means of the cap 66, as shown in Fig. 1.

The method of using the aforesaid spray attachment will now be briefly described.

As the handle 4 is pulled upwardly (Fig. 1), the plunger 3 produces a suction which draws the space between the plunger and ball 52, thereby causing the ball to be lifted from its seat, and causing a small quantity of the fluid in the bottle B to be drawn up into this space. As this occurs, the ball 58 remains seated. The ball 29 remains seated on the initial upstream, but opens on each succeeding up and down stroke of the handle.

Then, as the handle 4 is pushed downwardly, a pressure is set up in this space, causing the ball 52 to be reseated, and unseating the ball 58. At the same time, the fluid in said space is forced through the opening 65, the passageway 56, ports 60 and 61, passageway 59, the space between the plunger 3 and tube 17, passageway 2, passageway 10, and ball seat 19, unseating the ball 29. The fluid then passes through the nozzle, through the passageways 29, and through the grooves 34 and nozzle opening 24.

Some of the fluid bypasses the nozzle and flows upwardly through the passageway 38 and into the air chamber 6, compressing the air in this chamber.

The handle 4 is again pulled upwardly, drawing a fresh supply of fluid into the space between the plunger 3 and ball 52. At the same time, however, excess fluid which has previously been trapped in the space between the plunger 3 and tube 17 is expelled through the nozzle 23, so that, in this way, a spraying action is obtained on both strokes of the plunger 3, so that a "double action" is, in effect, secured.

As the air in the chamber 6 becomes increasingly compressed by leakage of excess fluid into this chamber, this compressed air becomes effective to automatically continue the spraying action for a brief interval at the end of each stroke of the plunger 3, so that the periods or intervals of non-spraying between strokes are reduced. In this manner, a substantially continuous spraying action is obtained.

When the pressure of the air in the chamber 6 becomes excessive, this air will produce a spraying action even after the spraying operation is discontinued. In other words, an undesirable leakage or loss of fluid through the nozzle occurs. In order to relieve the pressure which causes such leakage, the button 49 is pushed inwardly, thereby unseating the valve head 37.
This permits the compressed air within the chamber to force the fluid in said chamber through the passageways and back into the bottle. In this way, the straight stream leakage through the nozzle is eliminated. The spray produced by the nozzle insert is of conical shape and is diffused in the form of a mist or fine spray. The tangential arrangement of the groove 31 imparts a whirling or twirling movement or action to the spray, which is highly effective for diffusion purposes. The length of the spray or stream can be accurately controlled by the intensity or speed of the reciprocating action of the plunger. By providing the annular space 33 between the extension 32 and wall 26, any foreign particles which might otherwise become lodged in the grooves 34 have an opportunity of becoming freed by the swirling action of the fluid in this space.

The O ring 14 not only acts as a seal or gasket to prevent the fluid from passing upward through the cap 15, but also produces a desired wiping or cleaning action on the plunger 3. The screen 50 is effective to prevent foreign matter from finding access from the bottle B into the tube 17.

Most of the metallic parts of the spray attachment are made of a corrosion-resistant metal such as brass or aluminum.

The sprayer has been so designed that the various parts can be readily assembled, 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 machine and at fairly low cost.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example 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. A spray attachment of the character described, said attachment comprising a body member adapted for attachment to a fluid container, said body member having a constricted axial passageway and an annular chamber of substantially larger diameter than said passageway forming an air compression chamber, a plunger reciprocally movable in said body member through said chamber and axial passageway, and a nozzle removably secured to said body member and extending radially therefrom, said nozzle communicating with said axial passageway.

2. A spray attachment, as defined in claim 1, in which said body member has a passageway in axial alignment with said nozzle, and a spring-pressed valve for closing said passageway, said valve-closed passageway communicating with said constricted axial passageway.

3. A spray attachment, as defined in claim 2, in which opening of said valve releases the air pressure in said chamber, and bleeds fluid therein back into the container.

4. A spray attachment of the character described, said attachment comprising a body member adapted for attachment to a fluid container, said body member having a constricted axial passageway and an annular chamber of substantially larger diameter than said passageway, said annular chamber disposed above said axial passageway and communicating with the latter, a plunger reciprocally movable through said chamber and said axial passageway, a fluid outlet extending radially through said member and communicating with said passageway.

5. A spray attachment, as defined in claim 4, in which said body member has a passageway in axial alignment with said outlet, and a spring-pressed valve for closing said last-named passageway, said valve-closed passageway communicating with said constricted axial passageway.

6. A spray attachment, as defined in claim 5, in which opening of said valve releases the air pressure in said chamber, and bleeds fluid therein back into said container.

7. A spray attachment, as defined in claim 6, in which a third passageway is provided in the body member, extending from said second passageway towards the container, said third passageway having its axis parallel with the axis of said axial passageway and annular chamber.

8. A spray attachment, as defined in claim 5, in which a third passageway is provided in the body member, extending from said second passageway towards the container, said third passageway being spaced from said axial passageway and having its axis parallel with the axis of said axial passageway and annular chamber.

9. A spray attachment, as defined in claim 8, in which said valve has a plunger projecting beyond said body member, which plunger is accessible from the exterior of said body member for radially-inward movement for opening said valve.

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