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APPARATUS FOR SPRAYING LIQUIDS

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Fig. 1.

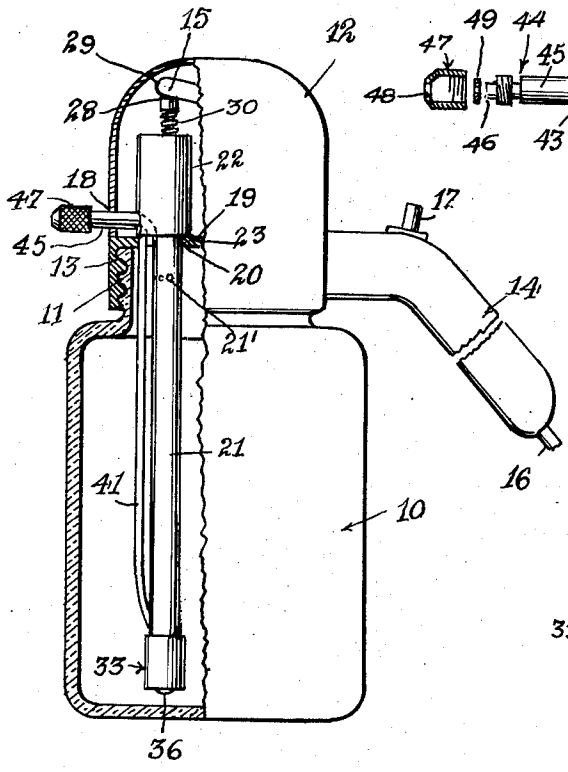
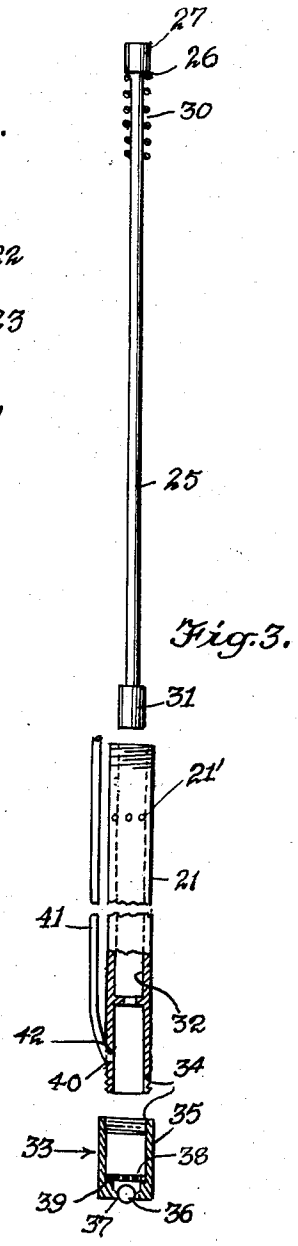


Fig. 2.

Fig. 3.



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APPARATUS FOR SPRAYING LIQUIDS

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5 Claims. (Cl. 222—333)

This invention relates to apparatus for spraying liquids and more particularly to sprayers wherein the liquid to be sprayed is forcibly ejected in substantially atomized form.

The utility of an inexpensive electrically operated device for spraying liquids in non-commercial or semi-commercial use has long been recognized. Various sprayers have been proposed for use for this purpose having vibrator type motors activating reciprocatory movement of a rod extending through an outlet tube to force the liquid up through the outlet tube. However, these sprayers employ means whereby the liquid, seeking its level in the container, partially rises in the discharge tube and is thereafter pumped out to be sprayed by means of the reciprocatory movement of the rod extending through the tube as aforesaid. In other words, the liquid is forced into and thereafter out of the tube by means of the pressure exerted and the displacement of the liquid by the rod in its downward stroke. With such construction, the spraying operation oftentimes proves unsatisfactory in that in many instances, especially when the liquid in the container is at a relatively low level, an insufficient amount of liquid seeks its level in the discharge tube to be pumped out and sprayed. In addition if the intake means at the base of the tube becomes clogged, the sprayer is rendered completely inoperative.

It is an object of the present invention to provide means for forcing liquid to be sprayed from a container with considerable force and in appropriate quantities.

It is a further object of the present invention to provide means for forcing liquid to be sprayed from a container which will permit the utilization of all of the liquid in the container.

It is still a further object of the present invention to provide means for forcing liquid to be sprayed from a container in which clogging of the passage means carrying the liquid to be sprayed, is substantially prevented.

It is still a further object of the present invention to provide means for forcing liquid to be sprayed from a container which has all of the aforesaid advantages but which is nevertheless inexpensive to manufacture and simple to construct.

Other objects and advantages of the present invention are set forth in detail in the accompanying specification taken in conjunction with the accompanying drawings in which:

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

Fig. 2 is a side view of the means for the liquid to be sprayed from a container; and

Fig. 3 is an exploded fragmentary view partially in sections showing the parts comprising the means for forcing the liquid to be sprayed from a container.

Referring to the drawing there is shown a container 10 to hold the liquid to be sprayed. The container may be a glass jar or aluminum jar or any other suitable material may be used. The container is provided with external threads 11. A substantially hollow cover 12

constructed of plastic, aluminum or any other suitable material, having internal threads 13 is threadedly secured to the container 10. The cover 12 is provided at one side with a handle 14, constructed of any desired size or shape, by means of which the sprayer is held by the user in operation.

The usual type of magnetic vibrator motor (not shown) is located within the cover 12 and is provided with an arm 15 of magnetizable material. The arm 15 is adapted to rock pivotally about a predetermined axis in response to the energizing of the coils in the vibrator motor. The cover 12 is provided with internal stops in any manner well known in the art to limit the movement of the arm 15. Electrical impulses are furnished to the motor through the wire 16 which passes through the handle 14 for connection at one extremity to the motor. The wire extends at its other extremity to an alternating current supply source or to a direct current supply source which has been converted to alternating current in any well-known manner, as for example, by means of an interrupter in the circuit. A switch 17, is provided in the handle 14, for controlling the supply of electricity to the motor. The other side of the cover has an aperture 18 for the purposes hereinafter set forth. The cover 12 is provided with a base plate 19 having an opening 20 adapted to receive a cylinder 21. The cylinder is provided at the upper end with a cylinder head 22 extending into the cover 14 as shown. The base 23 of the cylinder head rests against the edges of the aperture 20 in the base plate 19. The cylinder head 22 is provided with a bore 24 adapted to receive the upper portion of a vertically extending piston rod 25. The upper extremity 26 is provided with a collar 27 which underlies the underside 28 of one extremity 29 of the arm 15. A coiled expansion spring 30 is mounted around the piston rod 25 with its opposite ends engaging the top of the cylinder head 22 and the base of the collar 27.

The lower portion of the piston rod 25 extends into the cylinder 21. The lower portion of said piston rod is provided with an enlarged portion 31 which is of substantially the same diameter as the diameter of the bore 32 of the cylinder 21. Preferably the outer walls of the enlarged portion 31 of the piston 25 slidably engages the walls of the bore 32 providing a substantially air-tight interfitting relation for the purposes hereinafter set forth.

The cylinder 21 is disposed in the container 10 in a vertical position. The upper portion of the cylinder 21 is provided with apertures 21' for the purposes hereinafter set forth. The lower portion is located adjacent the bottom of the said container. The lower portion of the cylinder 21 is secured, to a check valve 33 by means of co-operating threads 34 provided on the exterior of the cylinder and the interior of the check valve as shown, or by any other suitable securing means. The check valve 33 comprises a fitting 35, a ball 36 seated within an opening 37 at the base of the fitting 35 and a screen 38 overlying the ball 36 and held in place in the lower portion of the fitting 35 between an annular shoulder 39 in the fitting and the base of the cylinder 21.

The cylinder 21 is provided with an aperture or port 40 located on one side of the cylinder a relatively small distance from the base of the cylinder. The location of the aperture 40 on the cylinder is such that it is not blocked or closed by the check valve 33 when secured to the cylinder 21 as hereinbefore described.

The piston rod 25 is so arranged that in its maximum upward position the base of the collar 31 is slightly above the aperture 40 for the purposes hereinafter set forth.

A discharge tube 41 is provided adjacent the cylinder 21 as shown in the drawings. The opening 42 at the base of the discharge tube is located on the aperture 40

in the cylinder **21**. Preferably, the opening **42** is of the same diameter as the aperture **40**, with the portion of the discharge tube surrounding the opening **42** abutting that portion of the cylinder **21** which surrounds the aperture **40**. The lower portion of the discharge tube is so constructed as to curve into the cylinder **21** at the aperture **40**. The upper extremity **43** of the discharge tube is connected to a nozzle **44** for the ejection of the liquid to the article to be sprayed. The nozzle **44** comprises a body **45**, provided with an orifice **46**, a cap **47**, also provided with an orifice **48**, secured to the body and an O-ring **49** to prevent leakage held between the body **45** and the cap **46**. The body **45** and the cap **47** co-operate to cause the fluid forced therethrough to be in the form of a fine mist or spray. Adjustment of the spray may be obtained by turning the cap **47** on the body **45** so that the relation between the orifice **46** and the orifice **48** is varied whereby sprays of varying density are obtained.

Having thus described in detail the various parts of the sprayer of this invention, the coaction of these parts to operate the sprayer is as follows:

The container **10**, while uncovered, is filled with a substantially non-viscous liquid, such as paint, varnish, or water. The cover **12** carrying base plate **19**, handle **14**, cylinder head **22**, cylinder **21**, discharge tube **41**, nozzle **44** and all other parts hereinbefore described and interfitting therewith, is tightly secured to the container **10**. The lower portion of the cylinder **21** is immersed in the liquid in the container **10**. The spring **30** on the piston rod **25** normally urges the collar **27** against the underside of the arm **15** at its end portion **29** when the arm is stationary.

The wire **16** is connected to a power supply of the alternating current type whereby the closing of the switch **17** energizes the magnetic motor, not shown, which in turn causes the arm **15** to pivot about an axis within predetermined limits so as to rock. The pivoting of the arm **15** causes the underside thereof to strike the top of the collar **27** depressing the spring **30** and causing the piston rod **25** to move down into the cylinder **21** slightly beyond the aperture **40**. The arm **15** then swings up causing the spring **30** to urge the collar **27** carrying the piston rod **25** upwardly to a point where the bottom of the enlarged portion **31** is slightly above the aperture **40** in the cylinder **21**. This upward movement creates a vacuum within the bottom portion of the cylinder **21** as a result of no air passing thereto because of the substantial airtight fit between the outer walls of the enlarged portion **31** and the inner walls of the bore **32** within the cylinder **21**. The ball **36** in the check valve **33** is displaced by the vacuum so created and permits a relatively large amount of the liquid to rush from the container **10** into the bottom portion of the cylinder and, upon downward movement of the piston, such liquid is forced through the aperture **40** in the side of the cylinder and the opening **42** at the base of the discharge tube **42**, up a substantial distance into said discharge tube. The next or succeeding downward stroke of the piston **25** further urges the liquid up into the discharge tube **41** for forcible ejection from the nozzle **44**, in spray or mist form. The above operation is thereafter repeated with the arm **15** rocking rapidly causing the piston to move up and down a great many times per second. The small diameter of the tube **41**, as compared with the large area of the opening **37**, will prevent any appreciable amount of liquid from being sucked into the lower portion of the cylinder **21** from the tube, during the existence of the vacuum therein; most of the liquid will enter the cylinder through the much larger opening **37**. In other proposed sprayers the vacuum described is not created and the amount of liquid drawn up into the cylinder is negligible. In most instances the cylinder itself acts as the discharge tube. In those structures where a separate discharge tube is provided, there

is no co-relation between the discharge tube and the cylinder, and piston particularly, as shown in the present invention. It is to be noted that the vacuum created causes the liquid to rush up into the cylinder and during the compression stroke the liquid is forced into the discharge tube. Thus it may be easily discharged in an extremely advantageous manner with great force by the pressure of the downward stroke of the piston rod **25**. Liquids at very low levels within the container may be utilized for the reason that the vacuum created will cause even such low level liquid to rush into the lower portion of the cylinder as aforesaid. In other devices in which the cylinder also acts as the discharge tube, the liquid by-passes the cylinder at all times causing the same to clog up in many instances whereby the entire device is rendered inoperative. In accordance with the present invention the pressure exerted by the liquid in the separate discharge tube will prevent such clogging. A further advantage resides in the fact that any clogging of the screen **38** or the opening **37** wherein the ball **36** is seated, will be eliminated by the force as exerted by the liquid seeking the vacuum within the cylinder. In the event, as may occur in rare instances, that liquid does seep by the enlarged portion **31** and up into the upper portion of the cylinder, apertures **21'** are provided in said upper portion of the cylinder so that the liquid may return therefrom into the container. It will be noted that these apertures are so located that they are normally above the top level of the liquid within the container and are not blocked thereby.

While I have described my invention in some detail, it will be understood that variations and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

I claim:

1. An apparatus for spraying liquids comprising a container in which the liquid is to be placed, a discharge tube extending into the container, the lower end of said tube being closely adjacent the bottom of the container, a cylinder disposed in the container in a vertical position adjacent the bottom, the lower portion of the cylinder having a port and around said port being secured to said discharge tube, a piston closely fitting said cylinder at said port and reciprocable past the port to cover and uncover the latter; a check valve communicating with the cylinder and arranged to permit ingress of liquid into the cylinder, a magnetic vibrator motor connected to the piston to reciprocate the same, the piston moving upward and downward in the cylinder to uncover and cover respectively the port connected to the discharge tube and said piston during part of its downward stroke forcing the liquid into the discharge tube.

2. An apparatus for spraying liquids comprising a container in which the liquid is to be placed, a discharge tube extending into the container, the lower end of said tube being closely adjacent the bottom of the container, a cylinder disposed in the container in a vertical position adjacent the bottom, the lower portion of the cylinder having a port and around said port being secured to said discharge tube, a piston slidably engaging the inner wall of said cylinder at said port and reciprocable past the port to cover and uncover the latter; a check valve communicating with the cylinder and arranged to permit ingress of liquid into the cylinder, a magnetic vibrator motor connected to the piston to reciprocate the same, the piston moving upward and downward in the cylinder to uncover and cover respectively the port connected to the discharge tube and said piston during part of its downward stroke forcing the liquid into the discharge tube.

3. The invention as defined in claim 1 in which the lower end of the discharge tube abuts a side wall portion of the cylinder surrounding the said port.

4. The invention as defined in claim 3 in which the port is substantially the same size as the bore of the discharge tube.

5. The invention as defined in claim 1 in which the lower end portion of the discharge tube meets and makes an acute angle with a side wall of the cylinder at the said port.

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