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2,648,017

ELECTRICAL SPRAYING DEVICE

Filed July 27, 1949

2 Sheets-Sheet 1

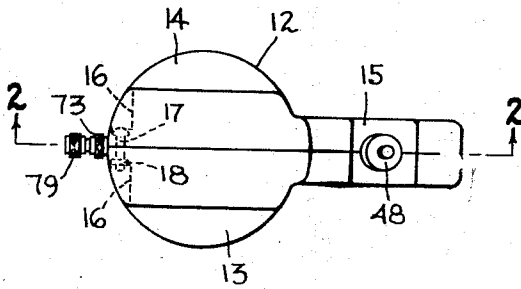


FIG. 1

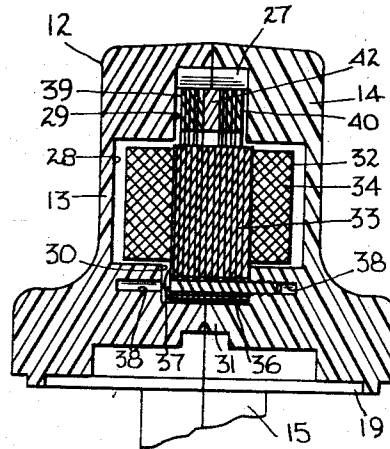


FIG. 4

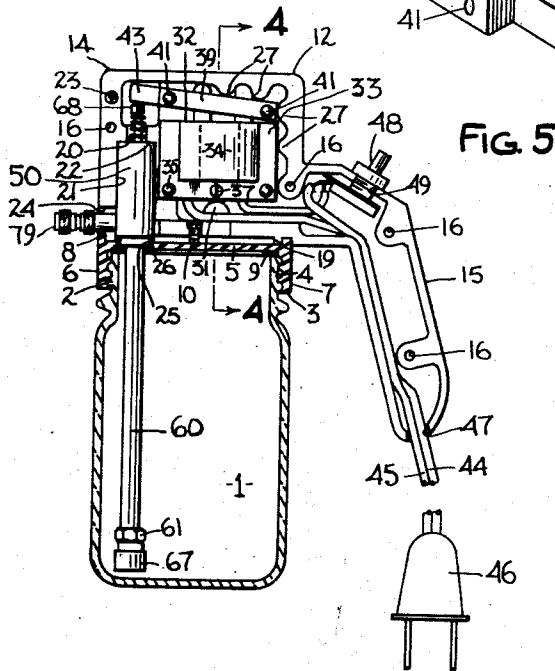


FIG. 2

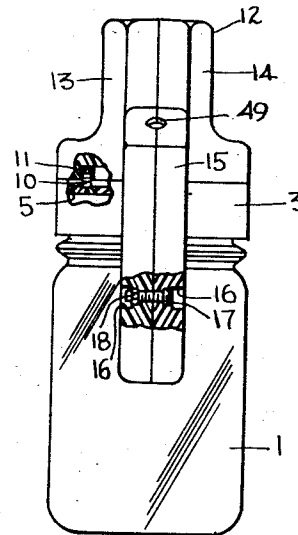


FIG. 3

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2 Sheets-Sheet 2

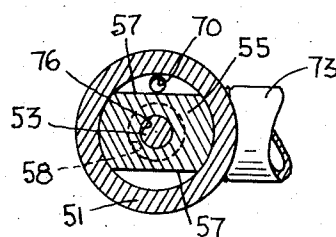
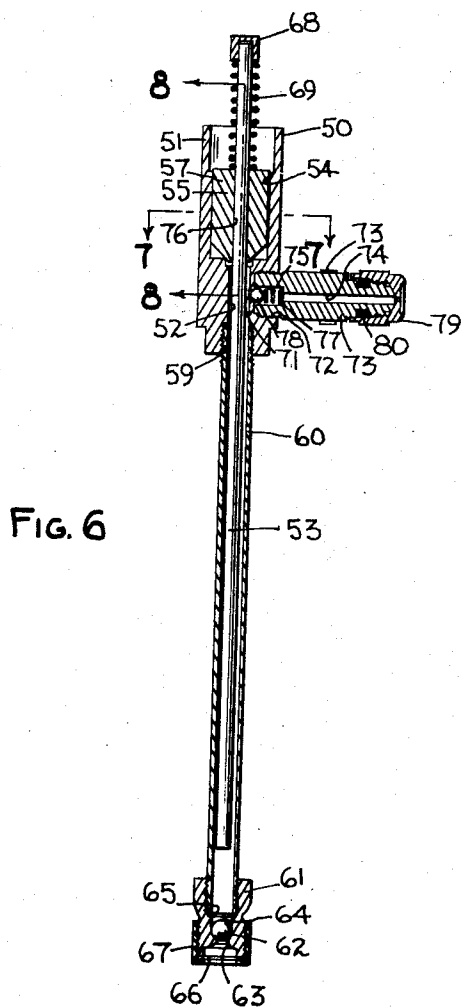
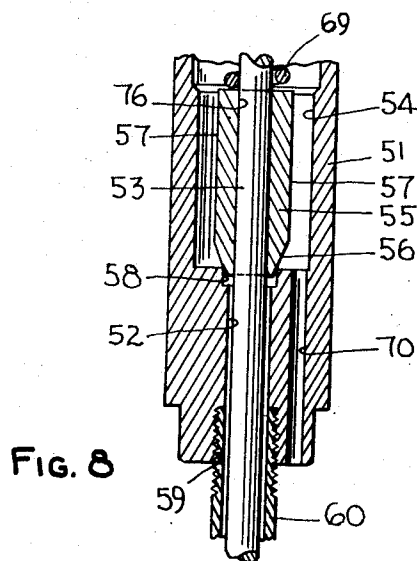


FIG. 7



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ELECTRICAL SPRAYING DEVICE

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Application July 27, 1949, Serial No. 107,029

2 Claims. (Cl. 310—18)

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The present invention relates to a spraying device for liquids and more particularly to an electrically energized spraying device which is particularly suitable for non-commercial use.

It is believed that a real need exists for an inexpensive, compact spraying device which can be used around the home or the like for occasional spraying of paints, insecticides, wax coatings, water and other fluids.

The spraying devices which are now known are generally of two types. One type is the commercial type which needs to be operated by compressed air, thereby requiring some form of auxiliary pump or compressor unit. This type is far too bulky and expensive for occasional use. The other type is a hand operated type in which compression is created by a hand or foot actuated piston or bellows. This type is inconvenient and tiresome to use and does not give satisfactory results inasmuch as a steady pressure is not maintained.

It is a primary object of the present invention to provide a spraying device which is electrically operated by a self-contained pump.

Another object of the invention is to provide such a device in a compact, easily manufactured form.

Still another object of my invention is to provide such a device which has novel means for preventing fluid leakage therefrom.

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 top plan view of a sprayer embodying the features of my invention;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is an elevational view taken from the right side of Fig. 2, parts being broken away to show details of construction;

Fig. 4 is an enlarged fragmentary cross-sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a perspective view of the armature;

Fig. 6 is a longitudinal sectional view of the pump assembly shown in Fig. 2;

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

Fig. 8 is a cross-sectional view taken on line 8—8 of Fig. 6.

Referring more particularly to Figs. 1—5 of the drawings, my invention includes a receptacle or container 1 which serves to contain the fluid to be sprayed. In this instance, the container is a standard form of glass Mason jar such as is used for home canning, thus making replace-

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ments thereof readily available at reasonable cost.

The housing

The jar 1 is provided with external threads 2, and a cover 3 having internal threads 4 is threadedly secured to the jar over the mouth thereof.

The cover 2 may be of molded plastic resin or the like and comprises a median horizontal or flat portion 5 having an annular flange 6 formed thereon. The flange 6 extends both above and below the flat portion 5. The lower portion 7 has the aforementioned threads 4 formed thereon, and the upper portion forms a shoulder or ridge 8 for a purpose to be described.

To prevent leakage between the cover 2 and the jar 1, a circular gasket 9 is disposed therebetween.

Surmounting the cover 2 and secured thereto as by screws 10 and nuts 11 is a molded plastic motor housing 12 which is formed of two symmetrical halves, a left half 13 and a right half 14. For convenience and clarity in describing the housing it will generally be referred to as though it were a unitary structure.

The motor housing 11 is of generally cylindrical contour and has a hollow handle or grip portion 15 integrally formed thereon, which handle extends angularly downwardly from the housing.

A plurality of suitably located counterbored openings 16 are provided in each half of the housing 12 and fastening means such as screws 17 and nuts 18 are utilized to secure the halves 13 and 14 to each other. In order to assist in locating the housing portions 13 and 14 properly relatively to each other for purposes of assembly, a locating hub or dowel 23 may be formed on one of the halves, say 14, which will enter a corresponding opening (not shown) on the other half housing.

An annular flange 19 is provided on the lower portion of the housing 12, this flange being of such diameter that it nests into the cover 2 and is contained by the ridge or shoulder 8 on the cover.

Diametrically opposite the handle portion 15, the housing 12 is provided interiorly thereof with a longitudinal bore 20 which is counterbored as at 21 to provide a shoulder 22. A pump assembly 50 is received in the bores 20 and 21, the upper portions of the pump body abutting the shoulder 22.

A horizontal opening 24 in the wall of the housing 12 communicates with the bore 21 and permits the nozzle portion of the pump assembly 50 to extend outwardly of the housing 12.

In assembling the housing 12 to the cover 2, the pump assembly 50 is aligned with an opening 25 which is provided in the flat portion 5 of the

cover, this opening being of such dimension as to permit the tube portion of the pump assembly to pass therethrough, but preventing the body portion from passing therethrough.

The body portion of the pump assembly is thus positioned and retained between the cover 2 and the shoulder 22 of the counterbore 21.

A gasket 26 is interposed between the body of the pump assembly and the portion 5 of the cover 2 so as to seal the opening 25 against the leakage of fluid therethrough.

As best seen in Figs. 2 and 4, the interior of the walls of the housing 12 is provided with a plurality of arcuate ribs 27 which define a coil receiving cavity 28, an armature receiving cavity 29 and a core receiving cavity 30, the bottom of the latter being defined by a rib 31. The cavities 28, 29, and 30, in combination, comprise the motor cavity.

The motor

In the cavities 28 and 30 is placed an electromagnet 32 consisting of an E-shaped laminated iron core 33 and a copper wound coil 34. The laminations of the core 33 are secured together by means of rivets 35. An opening 36 is provided transversely of the core 33, which permits a self-tapping screw 37 to pass therethrough and be threaded into a cored cavity 38 which is provided in the wall of the housing 12. The electromagnet 32 is thus fastened in position within the housing.

The cavity 29 is adapted to receive an armature or rocker arm 39 which comprises a series of iron laminations 40 secured together by means of rivets 41, and a hardened steel arm 42 which is integrated with riveted laminations 43 and has a longitudinally-projecting portion 43.

The ribs 27, which dimensionally define the cavity 29 cause the rocker arm 39 to be positioned in operative alignment with the core 33 of the electromagnet 32. As best seen in Fig. 2, the ribs 27 also limit vertical movement of the armature in a manner to cause the arm to be movable pivotally about a horizontal axis located approximately in line with the rivet 41 shown at the right in Fig. 2. The portion 43 of the rocker arm 39, it will be observed, is free to move arcuately, within limits, in a vertical plane.

The coil 34 is electrically connected by means of insulated conductor wires 44 and 45 to a two-prong electrical plug 46 which is adapted to be connected to the line power supply in the customary manner. An opening 47 is provided at the end of the handle 15 to permit egress of the conductor wires 44, 45.

The power supply to the coil is controlled by a push canopy switch 48 which is interposed in the circuit, this switch being mounted in an opening 49 provided therefor on the upper end of the handle 15.

The pump assembly

Referring now more particularly to Figs. 2, 6, 7 and 8, it will be observed, as heretofore mentioned, that a pump assembly 50 is contained and positioned in the housing 12 and extends downwardly into the container 1.

The pump assembly comprises a cylindrical body 51 which is bored as at 52 to provide a passageway for a piston or plunger 53. The body is counterbored as at 54 to snugly receive a plunger guide 55 which has a conical end 56 and two parallel sides 57, the distance between the sides 57 being less than the diameter of the counterbore 54.

The bore 52 is further counterbored as at 53

to provide a seat for the conical end 56 of the guide 55. In assembly, the guide 55 is pressed into the bore 54 until the conical end 56 seats in the counterbore 53 so as to seal the opening of the bore.

The lower portion of the bore 52 is counterbored and tapped as at 59 to receive one end of a threaded tube 60, the internal bore of which is, in effect, a continuation of the bore 52.

The tube 60 extends downwardly into the container 1 and terminates substantially near the bottom of the container, where it is threadedly secured to a fitting 61 which forms part of a ball check assembly.

The fitting 61 is adapted to receive a ball 62 which is seated therein to normally block the orifice 63 of the fitting. A perforated ball stop element 64 overlies the ball 62 and is compressed against an annular shoulder 65 of the fitting 61 by the end of the tube 60.

A wire screen 66 is disposed over the lower end of the fitting 61 and is held in place by a threaded flanged sleeve or nut 67 which is secured to the end of fitting 61.

A button 68 is secured to the upper end of the rod or plunger 53 and a compression coil spring 69 is carried on the rod between the button 68 and the top of guide 55 so as to urge the plunger upwardly.

In order to properly vent the container 1, a passageway or vent opening 70 is provided in the wall of the body 51, this vent extending vertically from the bottom of counterbore 54 to the lower end of the body. One end of the vent 70 is exposed to the contents of the container 1 and the other end thereof is exposed to atmosphere through bore 54. As will be observed by reference to Figs. 7 and 8, the vent is unobstructed by the guide 55, as, it communicates with the space between the wall of bore 54 and one surface 57 of the guide.

A small opening 71 is provided in the wall of body 51 at a right angle to the bore 52 thereof, and this opening 71 is counterbored and tapped as at 72 to receive a nozzle body 73 which is bored longitudinally thereof as at 74 to provide a fluid passageway.

The bore 74 is counterbored as at 75 to provide a cavity in which is mounted a compression coil spring 77 which biases a ball 78 so as to normally seat it against the opening 71 and thereby seal said opening.

A nozzle 79 of suitable form is threadedly secured to the end of nozzle body 73, an O-ring 80 being utilized to prevent leakage between the threads of the nozzle and nozzle body. The nozzle and the nozzle body, in combination, cause a fine mist or spray of fluid to be formed when fluid is forced therethrough.

Details of spray nozzle structure which may be utilized are fully disclosed in my copending application, Serial No. 52,338, filed October 5, 1948, now Patent No. 2,556,051.

The divergence of the spray cone can be adjusted by threading the nozzle 79 toward or away from the nozzle body 73.

It will be observed that the plunger 53 extends through the guide 55 by means of a bore 76 in the guide, and extends approximately the full length of tube 60. The fit between the plunger 53 and the bore 76 of the guide 55 is a tight sliding fit so as to mitigate against the leakage of fluid therebetween.

Operation of the sprayer

The construction and arrangement of the var-

ious parts of the sprayer now having been described, the operation and coaction of the parts will be described.

With the cover 3 removed, the jar or container 1 is filled with the fluid to be sprayed. This fluid may be water, paint, varnish, insecticide or similar non-viscous liquids. The cover 3 with its associated housing 12 is then threaded onto the jar 1 and tightly secured, the tube 60 of the sprayer assembly 50 being thereby immersed in the liquid.

The electromagnet 32 is then energized by closing switch 48, the plug 46 being suitably connected to an A. C. power supply. In response to energization of the electromagnet 32, the armature or rocker arm 39 will be periodically attracted to the core 33. As heretofore mentioned, the arrangement of ribs 27 in the motor housing 12 is such that the rocker arm will have limited pivotal movement about an axis defined approximately by the rearmost rivet 41, the portion 43 of arm 42 thereby being movable in an arc vertically.

The projection portion 43 of hardened arm 42 overlies and abuts button 68 on plunger 53. Due to the cyclic nature of the electrical current supply, the arm 42 will be attracted to the core 33 at the rate of 60 times per second if the current supply is 60 cycle A. C., and each time it moves downwardly it depresses the plunger 53. The rocker arm and plunger are returned by the action of spring 69.

During a very brief initial period of operation, no spraying action will take place, it being necessary that the tube 60 be filled with liquid before the spraying action occurs.

On the initial upstroke of plunger 53, the ball 62 is displaced by the vacuum resulting from the upward movement of the plunger, and liquid is drawn into the tube 60 through the orifice 63 of fitting 61. The wire mesh or screen 66, which overlies the orifice, serves to strain the fluid and prevent oversize particles from entering the sprayer assembly. The upward movement of ball 62 is limited by the ball stop 64.

In one particular embodiment of the invention, the stroke of the plunger 53 is approximately $\frac{1}{8}$ " , so that approximately a $\frac{3}{16}$ " column of fluid will be drawn into the tube at each upstroke of the plunger.

On the downstroke of the plunger, the ball 62 closes orifice 63 and prevents the liquid in the tube from flowing back into the container 1. The plunger displaces the fluid and it rises into the annular space between the plunger and the wall of tube 60.

On the following upstroke the cycle is repeated until the aforementioned annular space is filled with liquid to a level limited by the sealing engagement of guide 55 with the bore 58.

It will be understood that the vent channel or passageway 70 in body 51 of the sprayer permits air to enter the jar 1 as its contents are removed.

When the tube 60 has been filled in the manner previously stated, additional strokes of the plunger create a pressure sufficiently great to displace the spring-pressed ball 78 and force the liquid into bore 74 from which it exits as a spray through nozzle 79.

Due to the rapidity of movement of the rocker arm 39 and, correspondingly, of the plunger 53, the liquid is sprayed in, what is for all practical purposes, an uninterrupted steady stream.

The sliding fit between plunger 53 and the bore

76 of guide 55 is sufficiently close to prevent leakage of fluid through the bore 76. However, if through clogging or blockage of the nozzle, very high pressures are produced, some fluid may escape through bore 76. In this respect it is to be noted that the arrangement of the parts is such that any such fluid which escapes will flow back into bore 54 of the body 51 and will return to jar 1 through vent 70, this return being encouraged by the pressure of the air passing through the vent into the jar.

Upon completion of the spraying operation, the sprayer may be easily disassembled by unscrewing the cover 3 from the jar 1. Usually it will be unnecessary to further disassemble the sprayer, as it can be cleaned by spraying a wash, such as paint thinner, therethrough. However, if it is desired to remove the entire spray assembly 50, for example, for cleaning, this is quickly and easily accomplished by unloosening the various screws 10 and 17 which hold the housing parts together.

As thus described, it will be apparent that I have provided a handy, compact spraying unit which requires no separate air compressor unit or the like, and which consists of a relatively few easily manufactured parts.

The spraying device is sturdily constructed and can be manufactured at low cost so as to be within the reach of most consumers.

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.

I claim:

1. In an electrically operated spraying device including a pump and electromagnetic means for actuating said pump; the combination of an unsecured armature operatively associated with said electromagnet, and a housing enclosing said electromagnet, said housing having vertically and horizontally extending integral internal projections abutting the top and side of said armature to define the path of movement of said armature, said vertically extending projections progressively abutting said armature.

2. In an electrically operated spraying device including a pump and electromagnetic means for actuating said pump; the combination of an unsecured armature magnetically coupled to said electromagnet, a housing enclosing said electromagnet and armature, vertical internal projections integrally formed on said housing and progressively abutting said armature in overlying relationship thereto to define an arcuate path of movement therefor, and horizontal internal projections integrally formed on said housing and abutting said armature to restrict the plane of movement thereof.

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