Nov. 14, 1967 L. D. ABRAMSON 3,352,497

POWERIZED SPRAY GUN

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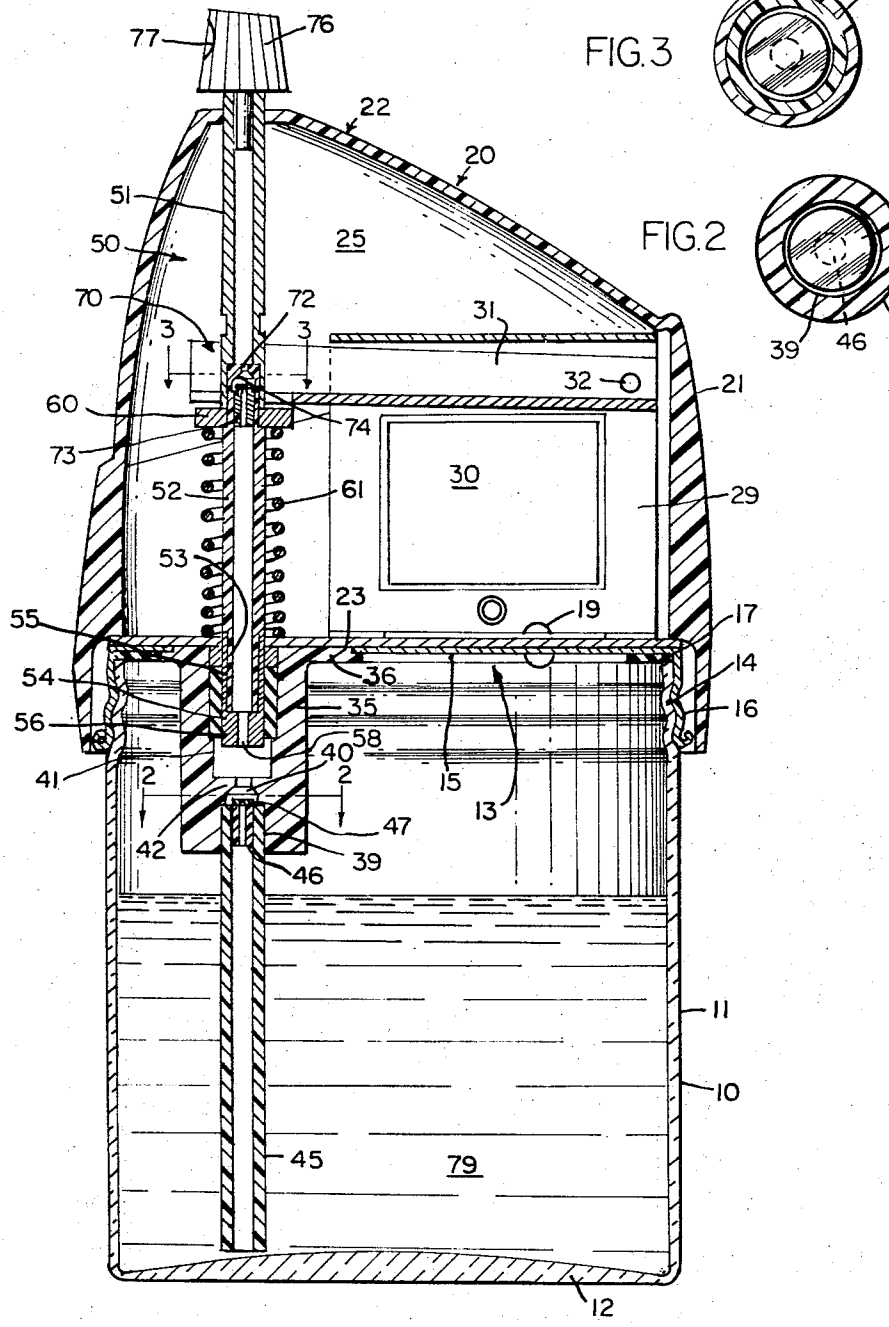


FIG. 1

FIG. 3

FIG. 2

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POWERIZED SPRAY GUN

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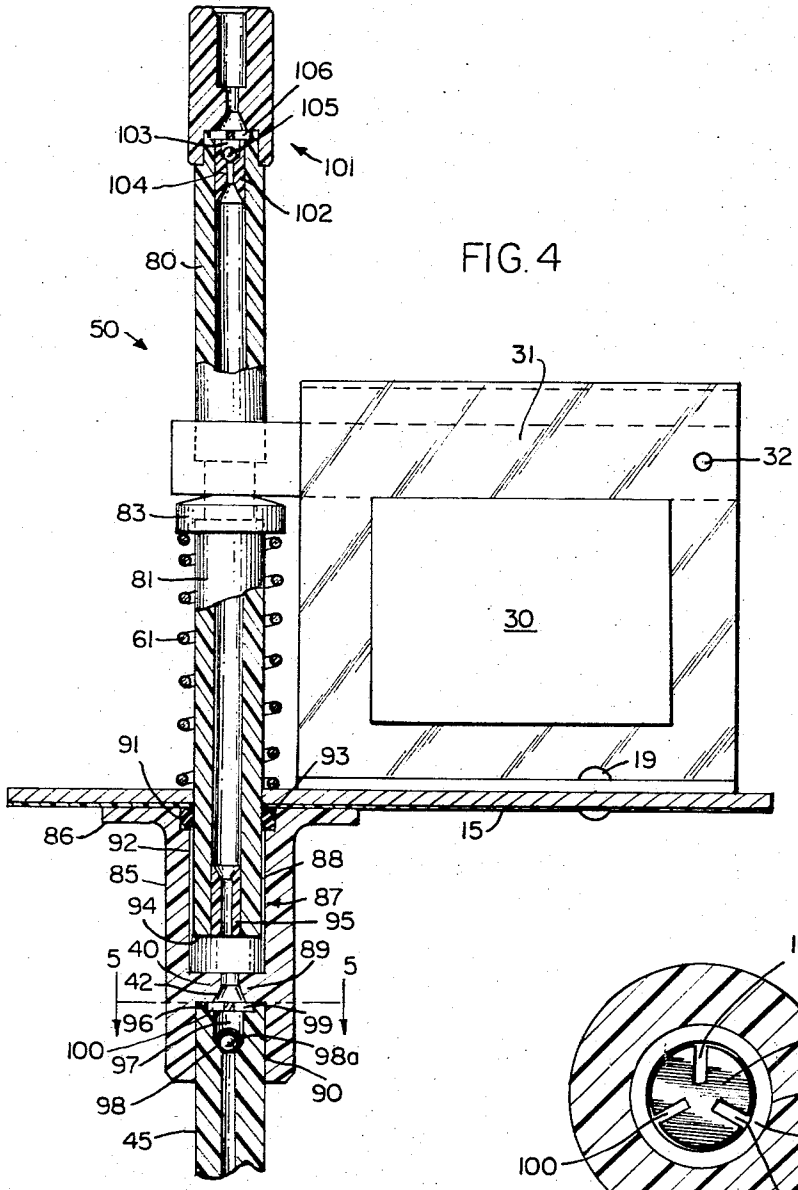


FIG. 4

FIG. 5

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POWERIZED SPRAY GUN

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3 Claims. (Cl. 239—332)

The present invention relates to a powerized spray gun having a refillable container that is useful for spraying a wide variety of products including, for example, various liquid cosmetics, coatings and paints.

Presently available powerized spray guns or atomizers have certain inherent limitations which often affect their utility and commercial desirability. In addition, there is a need for a relatively inexpensive, reliable and versatile powerized spray gun. Thus, it is an object of this invention to provide such a powerized spray gun.

There is a particular need for a powerized spray gun for application of various cosmetics and hair lacquers. Such cosmetics and lacquers are usually film forming and have a wide range of viscosity. Consequently, some lacquers have a tendency to form films or coatings that may impair the proper operation of the previously available spray guns with which they have been used. Other lacquers have such a high viscosity that they are emitted from presently available spray guns in an uneven spray or a spray of relatively heavy droplets.

It is an object of the present invention to provide a spray gun which overcomes such difficulties. In the present invention there is provided a spray gun which is capable of handling relatively thick or highly viscous fluids and which is not normally jammed or rendered inoperative by the formation of films within the component parts by film forming lacquers.

It is also an object of the present invention to provide an improved spray gun that is adapted to operate with certainty and which may be manufactured inexpensively and easily repaired.

A further object of the present invention is to provide a spray gun of improved design for use in connection with a refillable container. One further object of this invention is to provide a spray gun which is capable of efficiently handling fluids of different viscosity.

A still further object of this invention is to provide a spray gun having a pumping action with means for raising a column of fluid with an amplitude of motion that is considerably greater upon initial operation of the spray gun than during a period subsequent thereto. Such an arrangement has a tendency to break any films that may have formed within the spray gun on standing and to deliver a uniform finely divided spray upon sustained operation.

A still further object of this invention is to provide a construction for a spray gun that may be modified for use in a professional style spray gun or atomizer capable of handling relatively heavy viscous materials for sustained periods or alternately may be used in a commercial construction which is relatively inexpensive to manufacture.

One further object of this invention is to provide a powerized spray gun which is capable of operating from house current sources in the order of 110 volts to provide piston oscillations of the spray gun mechanism in the order of 3600 cycles per minute with minimum amplitude.

A further object of this invention is to provide an improved powerized spray gun having an oscillatable mechanism capable of 3600 cycles per minute in which improved gasketing means are provided to seal this mechanism against undesired leakage.

These and other objects and advantages of the present invention will be more clearly understood when considered in conjunction with the accompanying drawings in which:

FIG. 1 is an elevational cross section of a powered spray device embodying the invention;

FIG. 2 is a cross sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a cross sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary cross sectional elevation of a preferred embodiment of the invention, and

FIG. 5 is a cross section taken along the lines 5—5 of FIG. 4.

In one embodiment of this invention, a container 10 may be formed of suitable materials such as glass or plastic. This container 10 has a cylindrical wall 11 and continuous bottom 12 with an open upper end 13. The wall 11 at the upper end 13 of the container 10 is preferably threaded as illustrated at 14. A cover 15 having an annular outer depending lip 16, complementarily threaded to the threads 14 is screwed to the upper end 13 of the container 10. If desired an annular gasket 17 may be positioned within the cover 15 and over the open end 13 of the container 10.

A cap having depending sidewalls 21 and an upper portion 22 is positioned over and is secured to the cover 15. A reinforcing support 23 is positioned within the cap 20 at its lower end and is secured to the cover 15 by suitable means such as the rivets 19. Positioned within the upper chamber 25 formed within cap 20 is a solenoid 29 having a coil 30 which may be connected to a power source (not shown) by a conventional electric cord. An armature 31 has one end pivotably secured to the solenoid by a pin 32.

A collar 35 having an annular outwardly extending flange 36 is integrally secured to the reinforcing support 23 and projects downwardly from the support 23 through an opening in the cover 15 into the lower chamber 38 formed by the container 10. This collar 35 has a vertically extending opening through it, with the opening consisting of a series arrangement of a lower section 39, an intermediate section 40 and an upper section 41. The intermediate section 40 is preferably formed by an inwardly extending annular shoulder 42 integral with the collar 35. This shoulder 42 forms the intermediate section 40 of the opening with a narrower diameter or cross sectional area than the diameters or the cross sectional areas of the lower and upper sections 39, 41 of the opening through the collar 35. The annular shoulder 42 is formed with a lower surface that is outwardly flared or bevelled toward the lower section 39. A lower tube 45, having its lower end preferably extending toward the bottom of the container 10 is secured to the collar 35 with the upper end of tube 45 positioned within the lower section 39 and spaced from the flared surface of the shoulder 42. Positioned within the upper end of the lower tube 45 is a sleeve member 46. This sleeve member 46 has an opening that extends longitudinally through it and connects the passageway through the lower tube 45 with the lower section 39. A float 47 is positioned within the space between the sleeve 46 and the lower surface of the annular shoulder 42. This float 47 is preferably flat and disc-shaped. It has a diameter sufficient to cover sleeve mem-

ber 46 and thereby close the opening through the sleeve 46 and the intermediate section 40 of the opening. The thickness of this disc is such that it may move vertically no more than .015 inch within the space between the end of the sleeve 46 and the shoulder 42. This disc is preferably made of metal.

A tube means generally indicated at 50 extends vertically through the cap. This tube means comprises an upper tube 51 and an intermediate tube 52. The intermediate tube 52 has a lower end 53 that extends into the upper section 41 of the collar 35. This lower end 53 of the intermediate tube is formed with a shoulder section on which is mounted a sleeve 54. The sleeve 54 has an annular sidewall 55 fitting close to and within the shoulder section of the lower end of intermediate tube 52. The lower end of the sleeve 54 is formed with an inwardly extending annular shoulder 56 that covers the lower end of the intermediate tube 52 within the upper section 41 of the collar 35. This inward extending shoulder 56 is formed with an opening 58 that interconnects the upper section 41 with the passage formed by the intermediate tube 52. The intermediate tube is formed with a shoulder section at its upper end. Supported on this shoulder section is an outwardly extending preferably annular flange 60. The flange 60 is engageable on its upper surface by the free end of the armature 31. The lower surface of the flange 60 is engaged by the upper end of helical spring 61. Helical spring 61 is coaxially mounted with the intermediate tube 52 and exerts an upward tension on the flange 60 toward the armature 31 so as to maintain the flange 60 and the intermediate tube 52 which is integrally connected to it in pressure contact with the armature 31.

An upper valve 70 is positioned within the tube means, preferably at the junction of the upper and intermediate tubes 51, 52. This upper valve comprises an annular collar 72 secured within the passage of the upper tube 51 and forming a narrow opening. The lower surface of annular collar 72 is flared outwardly and is spaced from a sleeve 73 which in turn is positioned within the shoulder portion at the upper end of the intermediate tube 52. This sleeve 73 is formed with a vertically extending opening through it that is narrower than passage formed within the intermediate and upper tubes 52, 51. A float 74 is positioned within the space between the sleeve 73 and annular collar 72. This float is similar in construction to the float 47 in the lower valve and is also adapted for limited vertical movement of .015 inch.

The upper tube 51 projects outwardly of the cap 20 at its upper portion 22 and may be terminated in a button 76 of suitable design having a passageway extending from an orifice 77 to the passageway in the upper tube 51.

The illustrated power spray gun is designed to emit a continuous and finely divided spray from the orifice 77. This will occur when the solenoid 29 is actuated, preferably on a conventional 60 cycle AC, 110 volt current. Such power will cause the armature 31 to vibrate at a rate in the order of 7200 strokes per minute. The vibration of the armature causes downward movement of the tube means 50 against the tension of spring 61 and upward movement of the tube means in response to the pressure of spring 61. This in turn causes fluid 79 to enter the lower end of the lower tube 45. This fluid is drawn upwardly through the lower valve and into the upper section of the opening in the collar 35. The fluid is maintained within the intermediate section 41 as a reservoir by the up and down movement of the tube means 50 which causes a constant sucking action in response to the opening and closing of the upper valve 70. The fluid passes through the passageway in the tube means and out of the orifice in a finely divided constant spray. Any film which may have developed in passageway of the tube means or collar is readily broken up by the relatively large amplitude of movement and piston like action of the tube means.

Referring now to FIGS. 4 and 5, there is illustrated

a preferred embodiment of this invention. In these figures numerals corresponding to those illustrated in FIGS. 1–3 identify components similar to those shown in the embodiment of FIGS. 1–3. The armature 31 engages the tube means 50 composed of the upper tube 80 and intermediate tube 81. These tubes are joined together in a manner similar to the embodiment shown in FIG. 1 and are provided with a flange 83 positioned below the armature 31 and in engagement with the spring 61 which functions in the same manner in this preferred embodiment as in the embodiment shown in FIG. 1. The intermediate tube 81 is connected to the lower tube 45 by the collar 85. This collar 85 is formed with a flange 86 extending outwardly at the upper end of the collar. This peripheral outwardly extending flange 86 is suitably secured to the cover 15. The collar 85 is formed with a longitudinally extending opening 87 extending vertically through the collar. This opening has an upper section 88, an interediate section 89 and a lower section 90. The upper section 88 is formed with an offset shoulder portion 91 and a narrower diameter lower portion 92 integral and continuous with the shoulder section 91. The intermediate tube 61 has its lower end 94 extending into the upper section of the sleeve 85 and has a relatively loose fit within this section. An O-ring 93 is positioned within the shoulder section 91. This O-ring has a normal unexpanded inner dimension which is less than the outer dimension of the intermediate tube 81. The O-ring 93 engages the side walls of the intermediate tube 81 in a relatively tight, squeezing and substantially fluid-proof engagement. This O-ring permits the intermediate tube 81 to move vertically in the collar 85 while the junction at the O-ring, tube 81 and collar 85 is maintained in a substantially watertight condition.

The lower end of the intermediate tube 81 is provided with a tubular insert 95 which is preferably coplanar at its lower end with the lower end of the intermediate tube 81. The hole through this tubular insert 95 is preferably flared outwardly at its upper end. The lower tube 45 is formed with an opening that has a shoulder section 96 at its upper end and a section 97 of a diameter greater than the passage of the major portion of the tube but less than the diameter of the shoulder section. This section 97 extends downwardly from the shoulder section 96 and terminates in a bevelled portion 98 in an area within the collar 85. Positioned within the section 97 is a ball valve 98*a*. Positioned within the shoulder section 96 is a retaining disc 99 having a plurality of radially extending slots 100 which interconnect the passage or hole through the tube 45 with the opening through the inwardly extending annular shoulder 42. The retaining disc 99 is positioned above the ball valve 98*a* a distance no more than the diameter or thickness of the ball valve 98*a*, and preferably no more than 0.015 inch. This disc 99 thereby limits the vertical oscillatory movement of the ball valve 98*a* to an amplitude of less than .015 inch.

The upper valve 101 is similar in construction to the lower valve. In this arrangement however, the upper ball bearing is supported within a tubular insert 102 which is provided with an opening having an upper section 103 of greater diameter than the lower section 104. A ball valve 105 is positioned within this upper portion 103 and is limited in its vertical movement by a disc 106 which is similar in construction to the disc or retaining member 99.

The embodment of the construction illustrated in FIG. 4 is designed for use with relatively heavy viscous materials and is particularly useful in connection with atomizers or spray guns designed for use by professional hairdressers.

Having now described my invention, I claim:

1. A powered spray device for emitting a fiine spray comprising

a container for a quantity of sprayable fluid having an upper end and forming a lower chamber,

a cap having depending sidewalls shaped to engage said

upper end of said container and forming an upper chamber,

a cover within said container and cap and defining said upper chamber from said lower chamber,

a collar supported by said cover and projecting downwardly into said lower chamber, said collar having an opening extending vertically therethrough with said opening having upper, lower and intermediate sections with the intermediate section having a narrower diameter than diameters of the upper and lower sections,

a lower tube positioned within said lower chamber with its upper end secured in said lower section,

a lower valve positioned within said collar including a lower flat float horizontally positioned within said lower section for vertical movement to and from a position closing the upper end of said lower tube, means limiting the upward movement of said lower flat float, and a sleeve member having an opening extending therethrough positioned within the upper end of said lower tube with said sleeve member opening positioned to be closed by said lower flat float,

an inwardly extending annular shoulder forming said intermediate section of the opening of said collar and positioned to limit the upward movement of said lower flat float,

tube means comprising an upper tube and an intermediate tube continuous with one another and positioned within said upper chamber, said intermediate tube having its lower end positioned within said upper section of the opening in said collar,

an upper valve positioned within said tube means at the junction of said upper and intermediate tubes including a sleeve within said tube means and a flat float horizontally positioned within the passage extending longitudinally of said tube means for vertical movement to and from a position closing the passage through said sleeve,

means for limiting the upward movement of said flat float,

means for vertically reciprocating said tube means including a solenoid having a vibratable armature supported within said cap with one end of said armature projecting toward said tube means,

flange means projecting from said tube means for engagement by said end of said armature,

a spring engaging said flange means and tensioning it toward said end of said armature, and

means providing a passage from the upper end of said tube means through said cap and terminating in a nozzle.

2. A powered spray device for emitting a fine spray comprising

a container for a quantity of sprayable fluid having an upper end and forming a lower chamber,

a cover within said container and cap and defining said upper chamber from said lower chamber,

a collar supported by said cover and projecting downwardly into said lower chamber, said collar having an opening extending vertically therethrough with said opening having upper, lower and intermediate sections with the intermediate section having a narrower diameter than diameters of the upper and lower sections,

a lower tube positioned within said lower chamber with its upper end secured in said lower section,

a lower valve positioned within said collar including a lower flat float horizontally positioned within said lower section for vertical movement to and from a position closing the upper end of said lower tube, means limiting the upward movement of said lower flat float,

an inwardly extending annular shoulder forming said intermediate section of the opening of said collar and

positioned to limit the upward movement of said lower flat float,

tube means comprising an upper tube and an intermediate tube continuous with one another and positioned within said upper chamber, said intermediate tube having its lower end positioned within said upper section of the opening in said collar,

a sleeve within said collar and encircling the lower end of said intermediate tube, said sleeve having an inwardly projecting annular shoulder at the lower end constricting the passage from said tube means,

an upper valve positioned within said tube means at the junction of said upper and intermediate tubes including a sleeve within said tube means and a flat float horizontally positioned within the passage extending longitudinally of said tube means for vertical movement to and from a position closing the passage through said sleeve,

means for limiting the upward movement of said flat float,

means for vertically reciprocating said tube means including a solenoid having a vibratable armature supported within said cap with one end of said armature projecting toward said tube means,

flange means projecting from said tube means for engagement by said end of said armature,

a spring engaging said flange means and tensioning it toward said end of said armature, and

means providing a passage from the upper end of said tube means through said cap and terminating in a nozzle.

3. A powered spray device for emitting a fine spray comprising

a container for a quantity of sprayable fluid having an upper end and forming a lower chamber,

a cap having depending sidewalls shaped to engage said upper end of said container and forming an upper chamber,

a cover within said container and cap and defining said upper chamber from said lower chamber,

a collar supported by said cover and projecting downwardly into said lower chamber, said collar having an opening extending vertically therethrough with said opening having upper, lower and intermediate sections with the intermediate section having a narrower diameter than diameters of the upper and lower sections,

a lower tube positioned within said lower chamber with its upper end secured in said lower section,

a lower valve positioned within the said collar including a lower flat float horizontally positioned within said lower section for vertical movement to and from a position closing the upper end of said lower tube, means limiting the upward movement of said lower flat float,

an inwardly extending annular shoulder forming said intermediate section of the opening of said collar and positioned to limit the upward movement of said lower flat float,

tube means comprising an upper tube and an intermediate tube continuous with one another and positioned within said upper chamber, said intermediate tube having its lower end positioned within said upper section of the opening in said collar,

an annular collar positioned within the passage of said tube means above said upper flat float to limit the upward movement of said upper flat float,

an upper valve positioned within said tube means at the junction of said upper and intermediate tubes including a sleeve within said tube means and a flat float horizontally positioned within the passage extending longitudinally of said tube means for vertical movement to and from a position closing the passage through said sleeve,

means for limiting the upward movement of said flat float,

means for vertically reciprocating said tube means including a solenoid having a vibratable armature supported within said cap with one end of said armature projecting toward said tube means,

flange means projecting from said tube means for engagement by said end of said armature,

a spring engaging said flange means and tensioning it toward said end of said armature, and

means providing a passage from the upper end of said tube means through said cap and terminating in a nozzle.

References Cited

UNITED STATES PATENTS

1,881,963	10/1932	Perrin	239—332 X
2,410,692	11/1946	Strobell	239—332 X
3,218,022	11/1965	Lewis	251—141 X
3,247,849	4/1966	Wise et al.	222—321

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