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FLUID GUN

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2 Sheets-Sheet 1

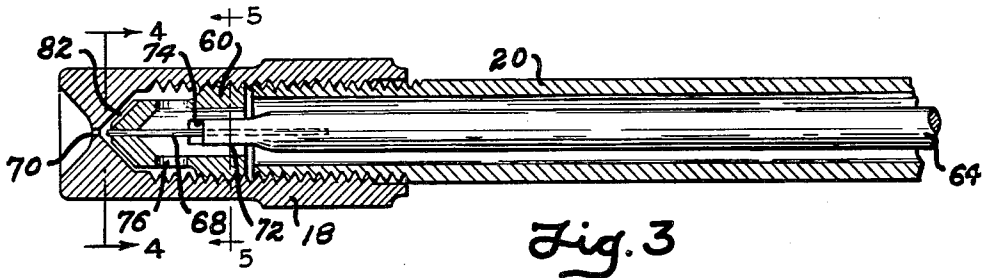


Fig. 3

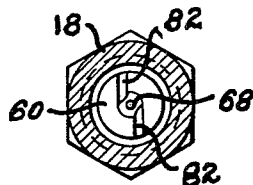


Fig. 4

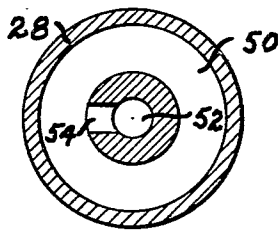


Fig. 2

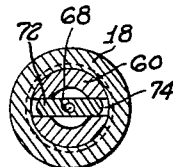


Fig. 5

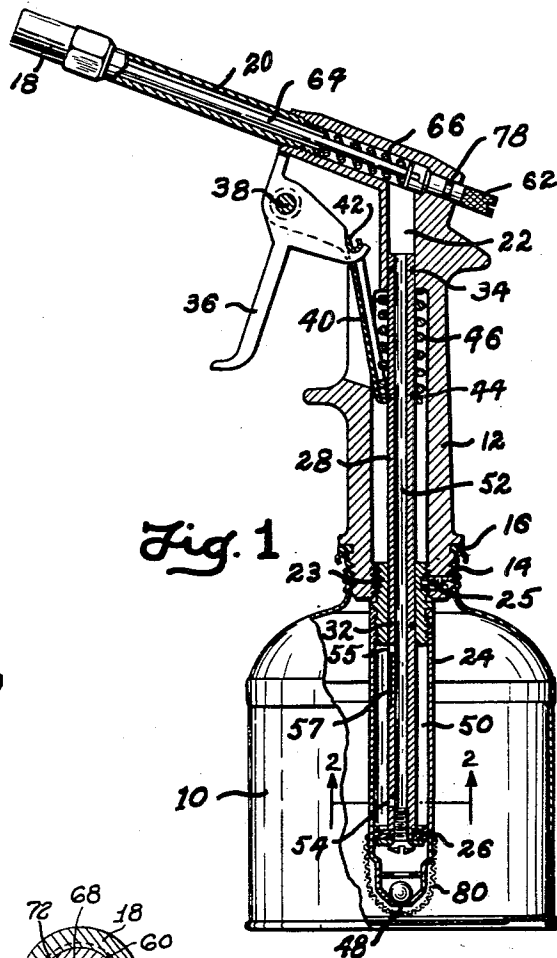


Fig. 1

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2,772,031

FLUID GUN

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12 Claims. (Cl. 222—324)

This invention relates to a fluid stream and spray gun of the general type used for dispensing liquids of various kinds and represents an improvement over the gun shown in my earlier Patent No. 1,900,668. This application is a continuation-in-part of my copending application Serial No. 117,461, filed September 23, 1949, now Patent No. 2,626,185.

Guns of this type are frequently used in places where they are given very rough treatment and therefore must be designed to withstand much abuse and at the same time must be made to sell in competition with low cost inferior designs. It is an object of this invention to eliminate the need for using a large number of precision parts or parts which are quick to bind if not assembled with care.

Another object of this invention is to provide a low cost dispenser having a very simple and handy means whereby the fluid may be dispensed either in the form of a fine spray or in the form of a fluid stream.

More particularly, it is an object of this invention to provide a spray gun in which operation of a single button is used for either cleaning the nozzle or for changing the characteristics of the fluid stream leaving the nozzle.

Other objects and advantages reside in the construction of parts, the combination thereof and the mode of operation, as will become more apparent from the following description.

In the drawings, Figure 1 is a vertical sectional view showing the general construction and arrangement of the parts.

Figure 2 is a sectional view on an enlarged scale taken substantially on line 2—2 of Figure 1.

Figure 3 is a sectional view on an enlarged scale showing the nozzle construction.

Figure 4 is a sectional view taken substantially on line 4—4 of Figure 3.

Figure 5 is a sectional view taken substantially on line 5—5 of Figure 3.

Figure 6 is a sectional view on an enlarged scale showing the nozzle construction of a preferred modification of the invention.

Figure 7 is a vertical sectional view showing the general construction and arrangement of parts in the preferred modification.

Figure 8 is a sectional view taken substantially on line 8—8 of Figure 6.

Figure 9 is a sectional view taken substantially on line 9—9 of Figure 7.

Figure 10 is a sectional view taken substantially on line 10—10 of Figure 6.

Referring now to the drawings wherein I have shown a preferred embodiment of my invention, reference numeral 10 designates the main liquid receptacle which is adapted to contain a supply of liquid to be dispensed. Reference numeral 12 designates a pistol grip type of handle which is provided with a conventional screw threaded connection 14 to the receptacle 10 as shown. A suitable gasket 16 is provided between the upper end of the re-

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ceptacle 10 and the handle 12 so as to prevent the leakage of liquid at this point. The handle 12 is preferably in the form of a casting which serves not only as a handle but also serves as a support for the pumping mechanism and the dispensing nozzle and nozzle control mechanism. The nozzle 18 is screw threaded or otherwise secured to the outer end of the pipe 20 which in turn is supported adjacent the upper end of the handle 12 and which has its central passage communicating with a central passage 22 formed in the handle 12.

A self aligning piston guide bearing 23 is loosely carried by the lower end of the handle, as shown. The connection between the bearing 23 and the handle is a threaded connection in which the pitch diameter of the threads on the bearing 23 is one to two hundredths of an inch less than the pitch diameter of the threads on the handle. The clearance between the threads constitutes a labyrinth passage through which air may freely enter to replace the oil dispensed but through which only a negligible amount of oil would ever pass. This clearance thus serves a multiple purpose. A set screw 25 is used to prevent unscrewing of the guide after the parts are once assembled.

A tubular extension 24 is threaded to the guide bearing 23 and this extension serves as a pumping cylinder in which a plunger 26 is adapted to operate. The plunger 26 is a conventional cup-shaped member as shown in the drawings and is carried by the lower end of a hollow rod 28 which is supported for sliding movement within the guide bearing 23 carried by the handle 12, as shown. Upon downward movement of the plunger, the fluid being pumped rushes past the plunger, but upon upward movement of the plunger, the fluid above the plunger is forced upwardly ahead of the plunger in accordance with well-known principles.

Leakage of fluid between the rod 28 and the bearing 23 is prevented by means of a fluid seal 32 which is preferably in the form of an O ring disposed within a circumferential groove formed on the rod 28. The upper end of the rod 28 slides within the central fluid passage and guide recess 22 formed in the handle 12. A similar fluid seal 34 is provided at the upper end of the rod 28, as shown, so as to prevent any leakage between the rod 28 and the walls of the fluid passage 22. The clearance between the threads on the handle 12 and the guide bearing 23 eliminates the danger of binding between the rod and either the bearing 23 or the handle 12.

Reciprocation of the piston 26 is produced by operation of the bell crank lever or trigger 36 which is pivotally supported on the handle 12 by means of a fixed pin 38. When the operator applies pressure on the bell crank lever 36, the piston rod 28 is pulled upwardly by means of the connecting link 40 which has its upper end journaled in the bell crank lever 36, as indicated at 42, and which has its lower end arranged to engage a shoulder 44 provided on the rod 28. A coil spring 46 serves to bias the piston rod 28 downwardly at all times and consequently as the pressure on the trigger 36 is relieved, the piston rod 28 moves downwardly.

Fluid to be pumped enters the lower end of the pumping chamber 24 through a check valve 48 which allows free flow of fluid into the pumping chamber but prevents the escape of fluid therefrom when the piston 26 moves downwardly. As the piston 26 moves upwardly, the fluid which has entered the cylinder chamber 50 is forced through the aperture 54 into the hollow passage 52 provided in the piston rod 28. As the piston rod continues to move upwardly, the fluid trapped in the chamber 50 is forced up through the passage 52, the passage 22 in the handle 12, the pipe 20, and is discharged out through the nozzle 18. Any air which may be trapped in the pumping chamber 50 may escape through

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the hole 55 in the side wall of the piston rod 28. A portion of the rod 28 is cut away directly beneath the hole 55 as indicated at 57, so as to allow air to escape even after the hole 55 moves up into the bearing 23.

In order to control the flow of fluid from the nozzle, there is provided a rotatable element 60 within the nozzle which is provided with a screw threaded connection to the inner wall of the main nozzle housing. The location of the member 60 within the nozzle may be changed by rotating the button 62 which is drivingly connected to the outer end of the plunger 64. The plunger 64 may be either rotated or reciprocated. A spring 66 serves to bias it into the position in which it is shown in Figure 1 of the drawings. However, pressure on the button 62 serves to reciprocate the plunger 64 so that the projecting pin 68 carried by the plunger 64 enters the nozzle orifice 70 so as to clear out any obstructions that may be lodged therein. This reciprocation of the plunger 64 does not change the location of the element 60, as the flattened end portion 72 of the plunger 64 is free to slide within the slot 74 which is provided in the end of the member 60.

By turning the button 62, the member 60 will be moved toward or away from the outlet orifice 70 in the nozzle, depending upon the direction of rotation of the button. The member 60 is provided with one or more grooves 82 adjacent the outer end which are so arranged that when the member 60 moves toward the orifice, the grooves cause the liquid passing between the member 60 and the nozzle wall to flow in a direction tangential to the walls of the orifice 70 so as to cause the liquid to leave the nozzle in the form of a fine spray. These grooves have no appreciable effect when the element 60 is moved toward the rear and consequently the liquid then leaves the nozzle in a solid stream or jet. Thus, when the member 60 is moved away from the outlet of the nozzle by rotation of the button 62, the liquid will be delivered from the nozzle in a solid stream, whereas if the member 60 is moved up toward the nozzle outlet, the liquid will leave the nozzle in the form of a fine spray.

The member 60 is a hollow screw machine part which may be manufactured very cheaply and still have the necessary accuracy required. Apertures 76 are provided in the side walls of the member 60, as shown, so that the liquid coming through the tube 20 can find its way to the orifice 70. Both ends of the plunger 64 are flattened, as shown, and loosely fit within slots in the members 60 and 62, as shown. By virtue of this construction, there is no trouble in obtaining proper alignment of the parts and all danger of binding has been eliminated. A suitable seal 78 has been provided on the shank of the button member 62 so as to prevent leakage between the member 62 and the opening in the handle 12 through which the member 62 slides.

A screen 80 has been provided at the inlet to the pumping chamber, as shown, so as to prevent dirt particles from entering the pumping chamber.

A preferred modification of the invention is shown in Figures 6, 7, 8, 9 and 10. Pumped fluid enters the lower end of a pumping chamber 90 through a check valve 92. The check valve 92 and a screen 94 are constructed of two separate parts, thus permitting the removal of both the valve and screen or removal of either the valve 92 or screen 94, if replacement becomes necessary.

As a piston 96 is reciprocated, fluid enters a cylinder chamber 98 through a passage 100 and a check valve 102. The fluid then flows upwardly a short distance to an orifice 104 which allows the fluid to pass out of a piston rod 106 into the cylinder chamber 98. The piston rod 106 is reduced in cross section at 110 to allow the escape of air from the cylinder chamber 98 during the first few reciprocations of the piston 96 as oil fills

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the cylinder chamber 98. An orifice 112 at the upper part of this reduced section 110 permits the escaping air from the cylinder chamber 98 to pass upwardly along the reduced section 110, thence through the orifice 112, and upwardly through a passage 113 of the piston rod 106. As the piston rod 106 moves upwardly, fluid in the cylinder chamber 98 is forced into the passage 113 through the orifices 104 and 112.

Following the ejection of air from the cylinder chamber 98, only fluid from a receptacle 114 will pass through the passage 113 of the piston rod 106. As may be noted, the pumping chamber 90 is tapered down in diameter to fit closely over the piston rod 106 above the cylinder chamber 98. The receptacle 114 is threadedly attached to a handle assembly 116. A retaining flange 118 is threadedly attached in the handle assembly 116. Cup-shaped openings 120 in the flange 118 are adapted to receive a spanner wrench to tighten the flange in the handle. The pumping chamber 90 is attached loosely to the flange 118 by means of two snap rings 122. The loose fit of the pumping chamber 90 into the retaining flange 118 permits alignment of the piston rod 106 and also provides a vent to insure atmospheric pressure upon the fluid in the receptacle 114 at all times.

Leakage of fluid between the piston rod 106 and the upper portion of the pumping chamber 90 is prevented by means of a fluid seal 124. Leakage of fluid between the piston rod 106 and the upper part of the handle assembly 116 is prevented by means of a fluid seal 126.

A plunger 128 is similar to the plunger 64 shown in Figures 1 and 3 except that the plunger 128 as disclosed in Figures 6 and 7 is hexagonal in cross section throughout its entire length. A nozzle insert 130 is adapted to receive an end of the plunger 128. The plunger 128 is used similarly to the plunger 64. A projecting pin 132 is carried in the plunger 128. The nozzle insert 130 is provided with one or more grooves 134. The position of the nozzle insert 130 with respect to the nozzle 135 and the orifice 136 determines the pattern of the fluid as the fluid emanates from the nozzle 135. The pattern may be changed from that of a stream to that of a fine spray.

Diametrically opposite portions of the essentially cylindrical nozzle insert 130 are flat to form openings 138 between the nozzle 135 and the nozzle insert 130 for the passage of fluid to the orifice 136. Fluid moves upwardly from the piston rod 106 into the upper portion of the handle. The fluid then moves into a pipe 140 and continues within the pipe 140 flowing between the plunger 128 and the pipe 140. Fluid then passes into the nozzle 135, between the nozzle insert 130 and the nozzle 135, and thence outwardly through the orifice 136, as above described.

Although the preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. In a device of the class described, a receptacle, a hollow handle member mounted in one wall of said receptacle and having an internal threaded portion at its lower end, pump means secured to said lower end, said pump means including a piston rod, a guide bearing for said piston rod, the piston rod being axially movable within said guide bearing said guide bearing having a threaded portion arranged in threaded engagement with said first named threaded portion, said threaded portion on said guide bearing having a smaller pitch diameter than said first named threaded portion whereby a labyrinth air passage is provided between said guide bearing and said handle member, and pump operating means supported by said handle member.

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2. In a device of the class described, a receptacle, an elongate hollow handle member mounted in one wall of said receptacle and having an internal threaded portion at its lower end, pump means secured to said lower end, said pump means including a hollow piston rod, a guide bearing for said hollow piston rod, said guide bearing having a threaded portion arranged in threaded engagement with said first named threaded portion, said threaded portion on said guide bearing having a smaller pitch diameter than said first named threaded portion whereby a labyrinth air passage is provided between said guide bearing and said handle member, and pump operating means supported by said handle member, said pump operating means comprising a bell crank lever having one arm thereof serving as a pump operating trigger arranged adjacent one side of said handle member, and a link having one end operatively connected to said piston rod and having its other end operatively connected to the other arm of said bell crank lever.

3. In a device of the class described, a receptacle, a hollow handle member mounted in one wall of said receptacle and having a threaded portion at its lower end, pump means secured to said lower end, said pump means including a piston rod, a guide bearing for said piston rod, said guide bearing having a threaded portion arranged in threaded engagement with said first named threaded portion, said threaded portion on said guide bearing having a smaller pitch diameter than said first named threaded portion whereby a labyrinth passage is provided between said guide bearing and said handle member, and pump operating means supported by said handle member, the upper end of said piston rod being arranged to be guided within the upper end of said hollow handle member.

4. In a device of the class described, a receptacle having an opening, a pump supporting member mounted in said opening and having a passage formed therein, a hollow piston rod supported for reciprocation in said passage and having one end projecting down into said receptacle, means forming a pump cylinder, piston means carried by the lower end of said piston rod for reciprocation within said cylinder, said cylinder having an inlet port, and a check valve in said inlet port, said hollow piston rod having an aperture connecting the interior thereof to said cylinder so as to form an outlet port for fluid within said cylinder, said aperture being located in close proximity to said piston means, said hollow piston rod having a second aperture spaced from said first aperture and having a portion of its outer surface cut away adjacent said second aperture so as to form an air vent for exhausting any air which may be trapped in the upper end of said cylinder before discharging liquid from said cylinder, upon any operation of the device.

5. In a device of the class described, a receptacle having an opening in one wall thereof, a pump supporting member mounted in said opening, a piston rod supported by said member and having one end projecting into said receptacle, a guide bearing for said piston rod, said guide bearing and said supporting member having complementary threaded portions whereby said guide bearing is threaded to said supporting member, the threads on said guide bearing having a smaller pitch diameter than the threads on said supporting member whereby a tortuous air passage is provided for admitting air into said receptacle so as to replace fluid dispensed from the receptacle, and pumping means including a pump cylinder supported by said guide bearing.

6. In a device of the class described, a receptacle, a pump supporting member mounted in one wall of said receptacle and having one end projecting into said receptacle, said end having an internal threaded bore, pump means secured to said projecting end, said pump means including a piston rod, a guide bearing for said piston rod, the peripheral surface of the guide bearing being threaded, the guide bearing being threadedly secured within the threaded bore of the end of the supporting member, the pitch diameter of the threads of the guide bearing being

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less than the pitch diameter of the threads of the threaded bore, thus forming a labyrinth passage between said guide bearing and said end of the support member through which passage air may pass but through which a negligible amount of oil may pass, said pump supporting member having a bearing aperture provided therein forming a second guide bearing for said piston rod.

7. In a device of the class described, a receptacle, a pump supporting member mounted in one wall of said receptacle and having one end projecting into said receptacle, pump means secured to said projecting end, said pump means including a piston rod, sealing means for said piston rod, the sealing means being threadedly attached to said projecting end, the pitch diameter of the threads of the sealing means being slightly less than the pitch diameter of the threads of said projecting end so as to allow limited movement of said sealing means relative to said projecting end.

8. In a fluid dispensing device including a receptacle adapted to receive a pump means, the pump means having a hollow handle member, a pump cylinder attached to said handle member, a piston rod contained within said pump cylinder and said handle member, a piston at the lower end of said piston rod, a guide bearing for said piston rod, said guide bearing loosely and threadedly attached to the handle member, the pitch diameter of the threads of the handle member being slightly larger than the pitch diameter of the threads of the guide bearing, thus providing a labyrinth passage between the handle member and the guide bearing, whereby said guide bearing is allowed limited movement relative to said handle member, and pump operating means supported by said handle member.

9. In a fluid dispensing device including a receptacle adapted to receive a pump means, the combination including means forming a pump cylinder, the pump means having a hollow handle member having a hollow piston rod, a guide bearing for said piston rod, a piston means carried by the lower end of said piston rod for reciprocation within said cylinder, said cylinder having an inlet port, a check valve in said inlet port, said hollow piston rod having an aperture connecting the interior thereof to said pump cylinder so as to form an outlet port for fluid within said pump cylinder, said hollow piston rod having a second aperture spaced from said first aperture and having a portion of its outer surface cut away adjacent said second aperture so as to form an air vent for exhausting air trapped in the upper end of said pump cylinder before discharging fluid from said pump cylinder upon any operation of the dispensing device.

10. In a portable pump mechanism adapted for use with portable receptacles, the pump mechanism having a handle member including a pump cylinder containing a hollow piston rod, a piston attached at the lower end of said hollow piston rod, a guide bearing for said hollow piston rod, said pump cylinder having an inlet port, a check valve in said inlet port, said hollow piston rod having an aperture connecting the interior thereof to said pump cylinder, said hollow piston rod having a second aperture spaced from said first aperture and having a portion of its outer surface cut away adjacent said second aperture so as to form an air vent for exhausting any air which may be trapped in the upper end of said pump cylinder before discharging fluid from the cylinder upon any operation of the pump mechanism, a pump operating means comprising a bell crank having one arm thereof serving as a pump operating trigger adjacent one side of said handle member, and a link having one end operatively connected to said hollow piston rod and having its other end operatively connected to the other arm of said bell crank.

11. In a pump mechanism having a handle member including a pump cylinder containing a hollow piston rod, a piston attached at the lower end of said hollow piston rod, a valve in the lower end of said piston rod permitting passage of fluid into the piston rod, a guide bearing for said hollow piston rod, said pump cylinder having an

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inlet port, a check valve in said inlet port, said hollow piston rod having an aperture connecting the interior thereof to said pump cylinder so as to form an outlet port for fluid within said cylinder, said aperture being in close proximity to said piston, said hollow piston rod having a second aperture spaced from said first aperture and having a portion of its outer surface cut away adjacent said second aperture so as to form an air vent for exhausting any air which may be trapped in the upper end of said pump cylinder before discharging fluid from the cylinder upon any operation of the pump mechanism, pump operating means comprising a bell crank having one arm thereof serving as a pump operating trigger pivotally attached adjacent one side of said handle member, and a link having one end operatively connected to said hollow piston rod and having its other end operatively connected to the other arm of said bell crank.

12. In a fluid pump mechanism comprising a pump cylinder having an inlet port provided with a check valve, an elongate hollow handle member, a guide bearing joining the pump cylinder to the handle member, a hollow piston rod within the pump cylinder and extending through the guide bearing and into the handle member, a piston attached to the piston rod at the lower end thereof,

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said hollow piston rod having an aperture at the lower end thereof connecting the interior of the hollow piston rod to the pump cylinder forming an outlet port for fluid within the cylinder, said hollow piston rod having a second aperture spaced above the first aperture, the hollow piston rod having a portion of its outer surface cut away adjacent the second aperture forming an air vent for exhausting air trapped in the upper end of said pump cylinder, pump operating means comprising a bell crank having two arms, one arm thereof serving as a pump operating trigger pivotally attached adjacent the handle member, and a link having one end operatively connected to said hollow piston rod and having its other end operatively connected to the second arm of said bell crank.

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