Oct. 3, 1950 F. S. ABBOTT 2,524,645

PUMP

Filed Nov. 13, 1946

Fig. 1.

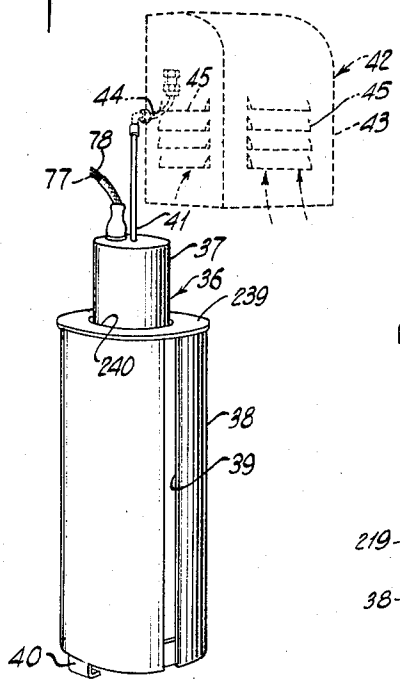


Fig. 2.

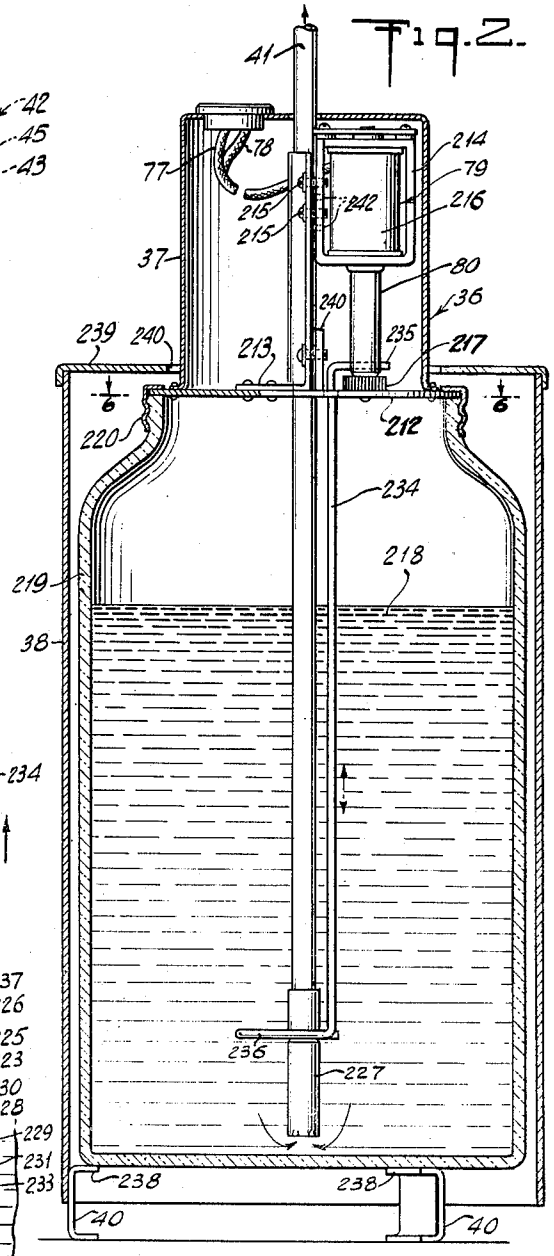


Fig. 3.

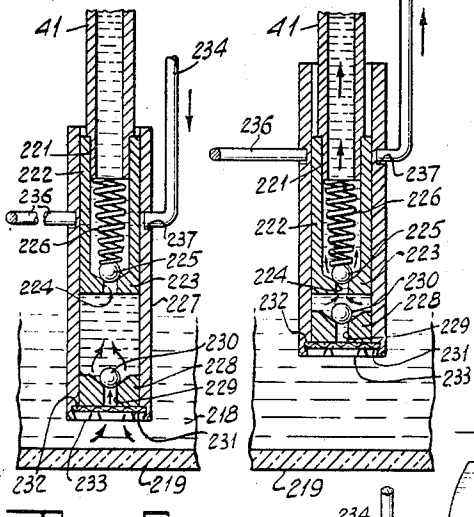


Fig. 4.

Fig. 5.

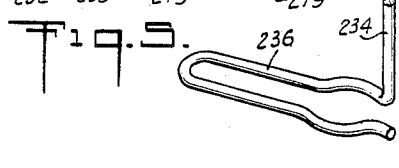
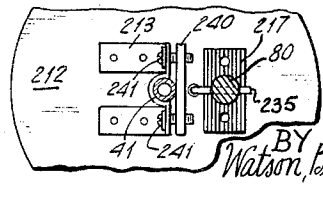


Fig. 6.



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PUMP

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6 Claims. (Cl. 103—53)

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The present invention relates to pumps of the piston or plunger type and, for convenience, it will be identified as being of the "piston" type with the intent that that term be understood to include within its scope plunger pump structure since the chief technical distinction is in the pump packing having no material bearing on the structure of the present invention.

A general object of the present invention is the provision of such pump structure which is of simple and economical construction which efficiently permits controlled operation whereby one or any desired greater number of strokes may be obtained selectively to assure efficient delivery of certain amounts of liquid determined by the number of strokes, and in which the length of stroke can be readily varied to vary the amount of delivery per stroke, while permitting simple adjustment of pump structure to adapt it to supply reservoirs of different depths.

More specific objects of the invention are to provide in such pump mechanism simple working parts so associated that a pulse of liquid is delivered from a discharge tube through a hollow valved piston by a stroke motion thereon of a cylinder sleeve effectively connected by a pulling member, such as a wire or rod, easily adjusted in length, connected to the moving member of an electrical motive means so that each energization of the latter will effect one pump stroke, which may be in the form of a plunger core solenoid, the mechanical pump structure as well as its operating electrical motive means preferably being adjustably mounted on supporting structure so that the pump stroke may be easily varied at will and the pump can be adapted to efficient withdrawal of substantial portions of contained liquid from reservoirs of different depths.

A further object of the present invention is to provide a structural embodiment of the pump invention which is readily constructed and permits efficient use and operation thereof.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in

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connection with the accompanying drawing, in which:

Fig. 1 is an elevational perspective of an embodiment of the pump of the present invention showing it associated with a supply reservoir or container and with its discharge pipe leading to a vaporizer indicated in dotted lines which may be employed for converting pump liquid to vapors and mixing or diffusing the latter into passing currents of gaseous medium, such as air;

Fig. 2 is an enlarged elevational section of the pump embodiment and associated supply reservoir shown in Fig. 1, with parts broken away;

Fig. 3 is an enlarged elevational section to a still larger scale showing details of construction of certain pump mechanism of Fig. 2, with the parts of the pump mechanism positioned for a pumping stroke;

Fig. 4 is a view similar to Fig. 3 of the structure shown therein but with the parts thereof in different positions as assumed after a pumping stroke;

Fig. 5 is a fragmentary elevational perspective, with parts broken away, of an operating element of the pump structure shown in Figs. 3 and 4; and

Fig. 6 is a sectional view, with parts broken away, taken substantially on line 6—6 of Fig. 2.

An embodiment of the pump of the present invention is shown, by way of example, in the accompanying drawing, in which like numerals identify similar parts throughout. As therein shown pump unit 36 preferably includes a pump supporting plate 212 on which a bracket 213 is fixed. A yoke 214 is secured to bracket 213 by any suitable means, such as screws 215, 215. The yoke 214 supports a solenoid 79, winding 216 of which is connected to circuit conductors 77 and 78 so that when power is supplied therethrough the solenoid will be energized. Solenoid 79 is of the plunger core type having plunger 80 adapted to be lifted when the solenoid is energized. A bumper 217, preferably in the form of a rubber block, is mounted on the base plate 212 beneath the plunger core 80 to assure quiet operation.

Pump bracket 213 also supports outlet tube 41 which extends downwardly for access to liquid, such as body 218 in a container 219 on which pump base plate 212 may rest and be secured thereto by a cap ring 220. The bottom end of tube 41 is preferably reduced in section at 221 to receive thereon a hollow piston 222 which may be soldered or brazed in position. The hollow piston 222 is provided with an end wall or head

223 having an axially located inlet hole 224. The inlet hole 224 is valved, preferably by a ball 225 seating down against the end wall or head 223 to close off the hole 224. A helical biasing spring 226 is held under stress between the reduced end section 221 of tube 41 and the ball 225.

A pump cylinder 227 is closely fitted about piston 222 for relative sliding movement. The lower end of pump cylinder 227 is fitted with a head block 228 having an axial inlet hole 229 therein closed off by a gravity-biased check valve ball 230. The head block 228 is held in position in the lower end of cylinder sleeve 227 by means of a screen 231 which seats against a circular shoulder 232 in the cylinder sleeve with the edge 233 of the cylinder sleeve crimped inwardly to hold the screen in position. The cylinder sleeve 227 is to be reciprocated up and down relative to the hollow piston 222, and for this purpose a vertical rod or pull wire 234 has its upper end bent laterally at 235 to provide a hook to be received in a transverse hole in the plunger core 80. The core material below the transverse hole or the bottom side of the latter forms an upwardly facing abutment over which the rod hook is engaged. The pump operating wire or rod 234 is provided at its lower end with a spring clip 236 which is mounted in a circumferential groove 237 in the external surface of cylinder sleeve 227 by snap engagement. The downwardly facing shoulder formed by the upper edge of the groove forms a clip-engaging abutment. Clip 236 is preferably formed by bending the lower end of wire 234 back upon itself, as shown.

Preferably pump housing 37 is mounted on supporting base 212 and the container 219 is provided with a cover 38 having a vertical sight slot 39 therein and a plurality of supporting feet 40—40 having lateral extensions 238—238 to support the bottom of the container 219. A cover plate 239 is provided for the casing 38 and has a hole 240 therein which receives the pump housing 37.

In many cases it is desirable to adjust the stroke of the pump so as to assure delivery of a certain predetermined amount of liquid with each pulse or on each pump stroke, and also to adjust the elevation of the pump mechanism to adapt the pump to supply containers of different sizes. For this purpose it is preferable to provide for support bracket 213 separate means for clamping the discharge tube 41 thereto and mounting the solenoid supporting bracket 214 thereon. Accordingly, the discharge tube 41 may be clamped to the mounting bracket 213 by means of a plate 240 fastened to the bracket by screws 241, 241, as shown in Figs. 2 and 6. This means may thus be employed to adjust the vertical position of the discharge tube 41 irrespective of the solenoid mount and so that the bottom end of the discharge tube, where the working parts of the pump are located, may be positioned substantially at the bottom of the container 219 for most effective withdrawal of substantially all of the liquid therein.

Further, adjustment of the stroke of the pump, to vary the volume of discharge, may be readily attained with provision of sets of holes in the solenoid bracket 214 in addition to those in which the mounting screws 215, 215 are shown engaged. For example, another set of holes 242, 242 may be provided so that with screws 215, 215 engaged therein the solenoid will be lowered to permit a shorter stroke of the pump between the lowered position, with the bottom end of plunger core 80 resting on the bumper 217, and the upward position of the core when the solenoid is energized. Of course it will be understood that the mounting of solenoid bracket 214 is in one respect similar to that of the clamp bracket 240, with the screws 215, 215, the holes in the bracket in which they are engaged and the additional set of holes 242, 242, duplicated on the far side of supporting bracket 213 and the discharge tube 41 as the structure is viewed in Fig. 2. Further variation in the stroke of the pump may be obtained by providing bumper blocks at 217 of different heights.

In operation of the pump unit shown in Figs. 1 to 6, inclusive, when wires 77 and 78 are connected to a power input circuit having a circuit-closing switch therein, the pump may be caused to operate one stroke by closure of the switch to deliver a single pulse of liquid.

With closure of the switch the winding 216 of the solenoid 79 is energized so that the core plunger 80 is quickly pulled upwardly. The pump operating rod or pull wire 234 is lifted with the plunger core 80 so as to lift the pump cylinder sleeve 227. With the pump primed, as shown in Fig. 3, lifting of the cylinder sleeve 227 will develop increased pressure in the cylinder below the piston 222, since the valve ball 230 closes off the inlet passage 229. Eventually this internal pressure becomes greater than the biasing force of spring 226 and valve ball 225 is forced upwardly to open piston passage 224. When the internal pressure in the cylinder sleeve 227 is relieved by this upward passage of liquid, the biasing force of spring 226 re-seats valve ball 225 and the pump parts assume the relative positions shown in Fig. 4. The liquid from the cylinder sleeve 227 passes upwardly through the hollow piston 222 into and through the outlet tube 41 in the form of a spurt of pulse thereof. When the solenoid is de-energized by breaking the power supply circuit of its winding, force of gravity pulls plunger core 80, operating rod 234 and pump cylinder sleeve 227 downwardly back to their relative starting positions shown in Figs. 2 and 3. The pump parts will then be in their initial positions ready for another stroke.

This pump may be employed successfully to deliver spurts or pulses of liquid, such as a deodorant or air-freshening liquid, to any suitable diffusing means, such as a vaporizer structure indicated in dotted lines in Fig. 1. For example, such a vaporizer structure may comprise a hood 43 having louvered inlet openings 45—45 and an outlet opening in the back side thereof (not shown) through which air currents may be drawn to pick up vapors of the liquid pumped to the vaporizer. For this purpose the outlet tube 41 of the pump may be connected by a conduit 44 to any suitable spray head (not shown) located within the vaporizer casing or hood 43.

It will thus be seen that the objects set forth above, among others made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the

invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A casingless pump comprising, in combination, an upwardly extending discharge tube having a lower intake portion, a hollow piston having its lower end constituting an intake head and its upper portion mounted concentric of the lower intake portion of said tube and interiorly communicating only and directly with the latter, a downwardly-biased cylinder reciprocatively mounted coaxially on said piston with its lower end constituting an intake head, downwardly-biased valve means at the intake heads of said piston and cylinder adapted to open outwardly for valving passages therein, a downwardly-biased upwardly-extending lift member connected to said cylinder, and an electrical solenoid above said cylinder having a liftable downwardly-biased upwardly-extending plunger core connected to said lift member to exert upward pull thereon when lifted with energization of said solenoid the latter when energized being adapted to lift said cylinder producing one stroke thereof and causing a single pulse of liquid to be delivered from said discharge tube with said cylinder, lift member and plunger core being adapted to fall together to stroke-starting position upon de-energization of said solenoid.

2. A casingless pump comprising, in combination, an upwardly extending discharge tube having a lower intake portion, a hollow piston having its lower end constituting an intake head and its upper portion mounted concentric of the lower intake portion of said tube and interiorly communicating only and directly with the latter, a downwardly-biased cylinder reciprocatively mounted coaxially on said piston with its lower end constituting an intake head, downwardly-biased valve means at the intake heads of said piston and cylinder adapted to open upwardly for valving passages therein, a lift member connected to said cylinder, an electrical solenoid having a downwardly-biased plunger core connected to said lift member to exert upward pull thereon when said solenoid is energized to lift said cylinder producing one stroke thereof and causing a single pulse of liquid to be delivered from said discharge tube, supporting means for said solenoid, stop means to limit the downward movement of said plunger core, and means to mount said solenoid to said supporting means in any one of a plurality of different elevational positions for adjustment of the pump stroke.

3. A casingless pump comprising, in combination, an upwardly extending discharge tube having a lower intake portion, a hollow piston having its lower end constituting an intake head and its upper portion mounted concentric of the lower intake portion of said tube and interiorly communicating only and directly with the latter, a downwardly-biased cylinder reciprocatively mounted coaxially on said piston with its lower end constituting an intake head, downwardly-biased valve means at the intake heads of said piston and cylinder adapted to open outwardly for valving passages therein, a lift member adjustable in length and connected to said cylinder, an electrical solenoid having a downwardly-biased plunger core connected to said lift member to exert upward pull thereon when said solenoid is energized to lift said cylinder producing one stroke thereof and causing a single pulse of liquid to be delivered from said discharge tube,

adjustable supporting means for said discharge tube permitting variation in the elevational position of the intake portion thereof, supporting means for said solenoid, stop means to limit the downward movement of said plunger core, and means to mount said solenoid to said supporting means in any one of a plurality of different elevational positions for adjustment of the pump stroke.

4. A casingless pump comprising, in combination, an upwardly extending discharge tube having a lower intake portion, a hollow piston having its lower end constituting an intake head and its upper portion mounted concentric of the lower intake portion of said tube and interiorly communicating only and directly with the latter, a downwardly-biased cylinder reciprocatively mounted coaxially on said piston with its lower end constituting an intake head, downwardly-biased valve means at the intake heads of said piston and cylinder adapted to open upwardly for valving passages therein, a lift member adjustable in length and connected to said cylinder, an electrical solenoid having a downwardly-biased plunger core connected to said lift member to exert upward pull thereon when said solenoid is energized to lift said cylinder producing one stroke thereof and causing a single pulse of liquid to be delivered from said discharge tube, adjustable supporting means for said discharge tube permitting variation in the elevational position of the intake portion thereof, supporting means for said solenoid, stop means to limit the downward movement of said plunger core, said stop means having a core abutment adjustable in elevation to vary the pump stroke, and means to mount said solenoid to said supporting means in any one of a plurality of different elevational positions for adjustment of the pump stroke.

5. A casingless pump comprising, in combination, a supporting structure, an upwardly extending discharge tube, means adjustably mounting said tube to said supporting structure and permitting elevational adjustment of the lower intake end of said tube, a hollow piston intercommunicatively located at the lower intake end of said tube, a downwardly biased cylinder reciprocatively mounted on said piston, a pair of downwardly biased valves mounted on the heads of said piston and cylinder and valving passages therein, a pull rod having a clip on its lower end snapped onto a reduced portion of the outer surface of said cylinder, an electrical solenoid having a downwardly biased plunger core, means adjustably fastening said solenoid to said supporting structure and permitting elevational adjustment thereof to vary the core stroke, a stop abutment on said supporting structure to limit downward movement of said core, and means removably connecting said core to said rod to permit variation in the length of the latter.

6. A casingless pump comprising, in combination, a supporting structure, an upwardly extending discharge tube, clamp means mounting said tube to said supporting structure and permitting elevational adjustment of the lower intake end of said tube, a hollow cylindrical piston mounted on the lower intake end of said tube in axial alignment and communication therewith, a piston head closing off the lower end of said piston and having a valved passage, a downwardly biased cylinder sleeve reciprocatively mounted on said piston, a cylinder head closing off the lower end of said sleeve and having a valved passage, a pair of downwardly biased valves mounted on the

piston and sleeve heads and valving the passages therein, a pull wire having a reversely bent portion at its lower end providing a spring clip snapped into a groove into the outer surface of said sleeve, an electrical solenoid having a downwardly biased plunger core, adjustable fastening means mounting said solenoid to said supporting structure and permitting elevational adjustment thereof to vary the core and pump stroke, a bumper on said supporting structure to limit downward movement of said core, an upwardly facing abutment means on the lower end of said core, and a hook on the upper end of said pull wire engaged over said abutment means so that as said core is lifted said wire will lift said sleeve operating the pump one stroke and to permit variation in the length of said pull wire by reformation of said hook.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 12,331	Deis	Mar. 28, 1905
97,382	Fuller	Nov. 30, 1869
750,115	Orr	Jan. 19, 1904
954,994	Petersen	Apr. 12, 1910
2,253,122	Hamant	Aug. 19, 1941
2,286,888	Arnold	June 16, 1942