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PUMP

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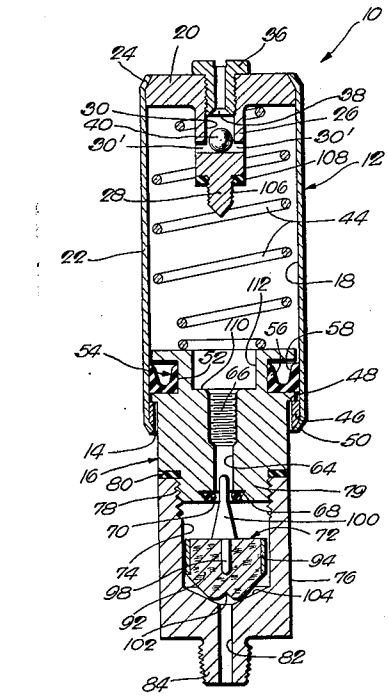


FIG. 2

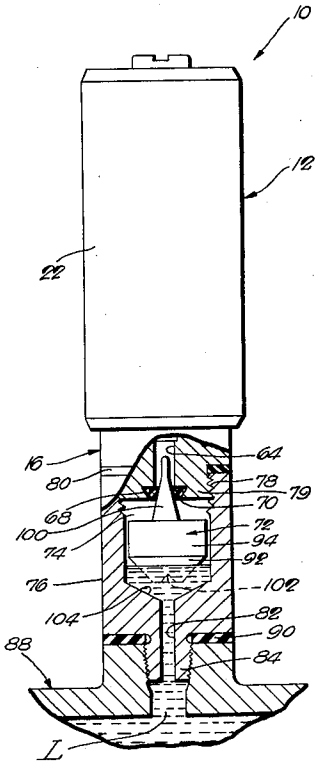


FIG. 1

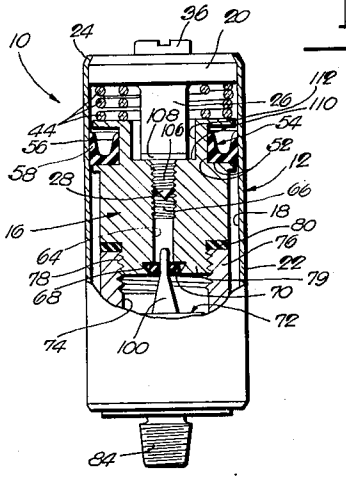


FIG. 3

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PUMP

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12 Claims. (Cl. 222—402)

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This invention relates to pumps, and more especially, though not exclusively, to pumps for injecting a gaseous medium into a liquid container.

It is the primary object of the present invention to provide a pump of this type which may permanently be mounted on a liquid container and applied instantaneously for the injection into the latter of a gaseous medium, such as air, without at any time admitting to the working parts of the pump any liquid from the container even when the latter is filled to capacity.

In this connection, it is an important object of the present invention to make provisions in the pump for automatically blocking the flow of liquid into the latter whenever the liquid level rises to the pump, without interfering with the normal performance of the pump to force compressed air into the liquid container.

In the same connection, it is another important object of the present invention to provide in the pump a plug which may at any time be applied, when the pump is not in operation, not only for the purpose of blocking the flow of liquid from the container into the pump, but also for the purpose of hermetically sealing the liquid container from the pump.

It is another object of the present invention to provide a pump of this type which is efficient in operation over a long period of time, and which consists of a minimum number of simple and inexpensive parts that do not require overly close tolerances and may readily be assembled without requiring much skill.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is an elevational view, partly in section, of a pump embodying the present invention;

Fig. 2 is a longitudinal section through the pump; and

Fig. 3 is another sectional view, partly in elevation, of the pump in a different position.

Referring to the drawings, the reference numeral 10 designates a pump which comprises a cylinder 12 having an open end 14, and a piston 16 which extends into the cylinder 12 and has some clearance from the adjacent cylinder wall 18. The cylinder 12 consists, in the present instance, of a cylinder shell 22 and an end member 20 which may be press-fitted into the shell 22 and secured therein by the adjacent inwardly

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crimped end 24 of the latter. The end member 20 may additionally be secured to the cylinder shell 22 in any suitable manner, as by brazing, for instance. The end member 20 is provided with an inwardly projecting shank 26 having a diametrically reduced plug extension 28. The end member 20 is further provided with an inlet passage 30 which extends into the shank 26 and communicates with the interior of the cylinder through lateral branches 30' (Fig. 2). Conveniently threaded into the inlet passage 30 is an orificed valve member 36 having a seat 38 for a check valve 40 in the inlet passage 30. The check valve 40 may be in the form of a ball, and the valve seat 38 in the member 36 is conveniently made conical for uniform seating engagement with the ball check 40 when a fluid charge in the interior of the cylinder is being compressed.

Preferably, there is provided in the cylinder 12 a pre-loaded compression spring 44 which normally urges the cylinder 12 and piston 16 into the maximum expanded relative position shown in Fig. 2, in which a stop collar 46 in the open end 14 of the cylinder 12 is engaged by an annular shoulder 48 on the piston 16. The stop collar 46 may conveniently be secured in the cylinder 12 by inwardly crimping the adjacent end of the cylinder shell 22 as at 50.

The piston 16 is provided with a peripheral groove 52 of preferably rectangular cross section, in which is received a piston ring 54. The piston ring 54 is, in the present instance, preferably made of resilient material, such as rubber or a rubber-like substance, so that it may be drawn over the adjacent end of the piston 16 for its insertion into the groove 52 therein. The piston ring 54 is preferably U-shaped in cross section, with the inner rim 56 bearing against the bottom of the groove 52 and the outer rim 58 bearing against the cylinder wall 18. As shown in Fig. 2, the U of the piston ring 54 is open toward the interior of the cylinder, so that an air charge, for instance, in the cylinder will, on being compressed, force the inner and outer rims 56 and 58, respectively, of the piston ring 54 apart, i. e., into firm engagement with the bottom of the groove 52 and the cylinder wall 18, respectively. A very effective seal against the escape of the compressed air charge from the cylinder past the piston 16 is thus provided.

The piston 16 is provided with an outlet passage 64 which is part-way threaded as at 66 for a purpose hereinafter described. The outer end of the outlet passage 64 is provided with a preferably frusto-conical recess 68 for the reception

of an hydraulic packing ring 70 of any suitable material. The packing ring 70 serves as a seat for a float valve 72 in a float chamber 74. The float chamber 74 is provided in a cap 76 that may conveniently be screwed at 78 over the adjacent reduced end 79 of the piston 16, there being preferably interposed between the latter and the cap 76 a gasket 80. The cap 76 is provided with an outlet duct 82 which is in communication with the float chamber 74 and extends through a plug-like projection 84 on the cap 76. The plug-like projection 84 may be externally threaded for its convenient attachment to any suitable container 88 that may hold any kind of liquid L (Fig. 1). Preferably, there is interposed a gasket 90 between the container 88 and the cap 76 of the pump 10.

The float valve 72 is, in the present instance, in the form of a cylindrical core 92 of cork or any other suitable buoyant material, and the same is preferably peripherally harnessed by a metal sleeve 94. The core 92 of the float valve 72 has a projecting valve stem 100 which is preferably conical in shape and extends into the valve seat 70 in any position of the float valve. The valve stem 100 is preferably a separate metallic part, having a shank 98 inserted in the valve core 92 for its secure mounting on the latter. The bottom end of the valve core 92 is preferably notched as at 102 to provide communication between the float chamber 74 and the outlet duct 82 when the float valve 72 is seated at the bottom 104 of the float chamber as shown in Fig. 2. In using the mounted pump 10, the cylinder 12 thereof is conveniently used as a handle. Thus, on a downward stroke of the cylinder 12, the fluid-charge therein, in the present instance air, is forced through the outlet passage 64, float chamber 74 and outlet duct 82 into the liquid container 88, the check valve 40 then preventing the escape of air from the cylinder 12 through the inlet passage 30, as will be readily understood. For the successful operation of the pump 10, the container 88 must be filled with liquid at least up to, or nearly to, the outlet duct 82 of the pump, and the container must be so shaped as to permit the forced-in air to segregate above the liquid level therein, so that liquid separates the pump 10 from any air in the container. In the case where the liquid level in a container is below the outlet duct 82 of the mounted pump 10 thereon, recourse may be had to the well-known expediency of extending a tube (not shown) from the outlet duct 82 into the liquid thereby blocking the air in the container from the pump.

Thus, on repeated downward strokes, of the cylinder 12 of the pump, successive air charges are forced into the container. Should the level of the liquid rise to or slightly above the point shown in Fig. 1, the float valve 72 will become seated on the packing ring 70, so that the liquid may not enter the interior of the cylinder and render the same liquid-bound, i. e. inoperative for its assigned function of forcing air into the container 88. Of course, even if the float valve 72 is closed as in Fig. 1, the pump is still operative and will, on operation, force air into the container 88 past the float valve 72, as will be readily understood. Thus, the instant pump will perform satisfactorily as long as the liquid level in any container, on which the pump may be mounted, will not rise substantially above the level shown in Fig. 1.

If the pump 10 is not needed for any length of time, the same may be sealed completely from the liquid container 88. To this end, the plug extension 28 on the shank 26 in the cylinder 12 is threaded as at 106 so as to be screwable into the threaded end 66 of the outlet passage 64 as shown in Fig. 3. The cylinder 12 is for that purpose depressed and then turned until a gasket 108 around the plug extension 28 becomes firmly seated on the adjacent bottom surface 110 of a counterbore 112 in the piston 16. To release the pump for operation, it is merely necessary to turn the cylinder in the opposite direction so as to unscrew the plug extension 28 from the outlet passage 64, as will be readily understood.

While I have shown and described the preferred embodiments of my invention, it will be understood that various changes may be made in the present invention without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. A pump for injecting a gaseous medium into a liquid container, comprising a cylinder member with an open end, a piston member extending through the open end of, and slidably received in, said cylinder member to form therein a compression chamber, said members having an inlet passage into, and an outlet passage from, said compression chamber, respectively, of which said outlet passage is provided with a valve seat intermediate its ends, means for opening and closing said inlet passage, said means comprising a check valve in said inlet passage closing the latter on compression of a fluid charge in said chamber and a float valve in said outlet passage adapted to become seated on said valve seat by liquid entering said outlet passage from the outer end thereof.

2. A pump as set forth in claim 1, further comprising a compression spring in said chamber urging said members apart one end of said compression spring bearing against said cylinder member and the opposite end of said spring bearing against said piston member, and cooperating stop means on said members limiting the spring-urged movement of said members apart from each other.

3. A pump as set forth in claim 1, in which said valve seat is a hydraulic packing ring peripherally mounted in said outlet pasage, and said float valve is provided with a conical stem projecting into said packing ring.

4. A pump, comprising a cylinder with an open end, a piston extending through the open end of, and slidably received in, said cylinder to form therein a compression chamber, said cylinder and piston having an inlet passage into, and an outlet passage from, said chamber, respectively, of which the outer end of said outlet passage is provided with a valve seat, means for opening and closing said inlet passage, a hollow cap secured to the outer end of said piston and forming with the latter a float chamber in communication with said valve seat, said cap having an outlet duct from said float chamber, and a float valve in said float chamber adapted to become seated on said valve seat by liquid entering said float chamber through said outlet duct.

5. A pump as set forth in claim 4, in which said valve seat is a circular hydraulic packing ring peripherally mounted in said outer end of the outlet passage, and said float valve comprises a buoyant body provided with a conical projection extending into said packing ring.

6. A pump as set forth in claim 4, in which said float chamber is substantially cylindrical with said valve seat disposed axially thereof, said valve seat is a hydraulic packing ring peripherally mounted in said outer end of the outlet passage, and said float valve comprises a substantially cylindrical cork plug, a metal harness carried by, and surrounding the periphery of, said plug, and a conical valve stem carried by said plug and projecting axially therefrom, said valve stem extending into said packing ring.

7. A pump as set forth in claim 4, in which said cap is provided with a threaded projecting shank through which said outlet duct extends and which is adapted for removably mounting said pump on a complementary threaded container.

8. A pump for injecting a gaseous medium into a liquid container, comprising a cylinder member with an open end, a cylindrical piston member extending through the open end of, and slidably as well as turnably received in, said cylinder member to form therein a compression chamber, one of said members having an inlet passage into, and the other member having an outlet passage from, said compression chamber of which said outlet passage is provided with a valve seat intermediate its ends, first means for opening and closing said inlet passage, a float valve in said outlet passage adapted to become seated on said valve seat by liquid entering said outlet passage from the outer end thereof, and second complementary threaded means provided by the adjacent ends of said members and cooperating to seal said outlet passage from, and open it to, said compression chamber on relative rotation between said members in opposite directions, respectively, when the latter are in their innermost relative position.

9. A pump as set forth in claim 8, in which said outlet passage extends axially of said other member, and said second means comprises threads in the inner end of said outlet passage, and a threaded plug carried by said one member and projecting axially inwardly of the latter, said plug being in axial alignment with, and threadedly receivable by, said threaded inner end of the outlet passage.

10. A pump as set forth in claim 8, in which said outlet passage extends axially of said other member, said second means comprises threads in the inner end of said outlet passage, and a shank with a threaded plug extension carried by said one member and projecting axially inwardly of the latter, said plug extension being in axial alignment with, and threadedly receivable by, said threaded inner end of the outlet passage, said inlet passage extending through said shank and leading from the latter into said compression chamber remote from said plug extension, and having a valve seat intermediate its ends, and said first means comprises a check valve in said inlet passage adapted to become seated on the last mentioned valve seat on compression of a fluid charge in said compression chamber.

11. A pump for injecting a gaseous medium into a liquid container, comprising a cylinder member with an open end, a cylindrical piston member extending through the open end of, and slidably as well as turnably received in, said cylinder member to form therein a compression chamber, one of said members having an inlet passage into, and the other member having an outlet passage from, said compression chamber, first valve means for opening and closing said inlet passage, and second means provided by said members and cooperating to seal said outlet passage from, and open it to, said compression chamber on relative rotation between said members in opposite directions, respectively, when the latter are in their innermost relative position, said second means comprising a threaded plug carried by said one member and complementary threads in the inner end of said outlet passage.

12. A pump as set forth in claim 11, in which said outlet passage extends axially of said other member, and said second means comprises threads in the inner end of said outlet passage, and a threaded plug carried by said one member and projecting axially inwardly of the latter, said plug being in axial alignment with, and threadedly receivable by, said threaded inner end of the outlet passage.

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