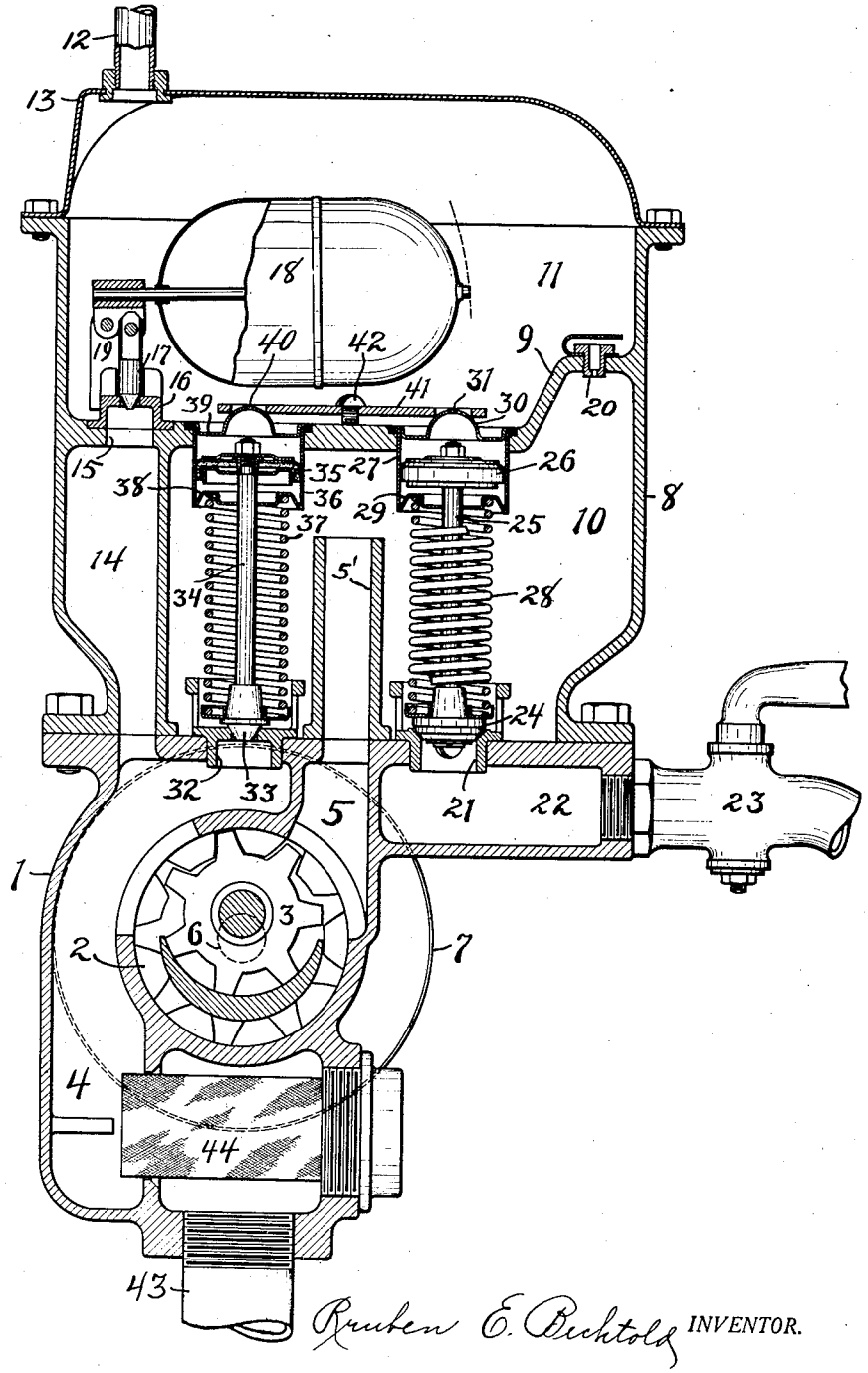
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AIR ELIMINATOR FOR LIQUID

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AIR ELIMINATOR FOR LIQUID

Application filed November 16, 1931. Serial No. 575,204.

This invention relates to improvements in an air eliminator for liquid dispensing apparatus similar in character to that previously disclosed in Patent No. 1,826,340 issued to me October 6, 1931, for liquid dispensing apparatus, and particularly described in said patent under the caption "The separator unit."

The object of the invention is to provide an appliance for connection with a liquid dispensing apparatus by which the liquid to be dispensed is relieved of any accumulation therein of air or gas that it may contain, due to agitation or otherwise, before finally being dispensed from the apparatus.

An illustrative embodiment of this invention is shown in the accompanying drawing which is a vertical section thereof.

The structure shown in the drawing comprises a pump having a housing 1, rotors 2 and 3, a suction inlet 4 and discharge outlet 5, the rotor 2 having a drive-shaft 6 provided with a drive-pulley 7 therefor. The construction of the pump may be of any suitable character capable of withdrawing liquid from a source of supply (not shown) through a suction inlet and delivering the liquid under pressure through a discharge outlet. The pump shown in the drawing, being well known, is not herein described in detail.

In connection with the pump is arranged a case 8 having a partition 9 disposed transversely therein so as to provide a receiving chamber 10 and an overflow or float chamber 11. A vent pipe 12 has communication with the overflow chamber 11 through the cover 13 of the case to permit free escapement of air therefrom. Also, the case has therein a return duct 14 and a drain opening 15 in the partition 9 through which the overflow chamber has communication with the suction inlet 4 of the pump.

Positioned upon the partition 9 over the opening 15 therein is a valve seat 16 normally closed by a drain valve 17 which is actuated by means of a float 18 pivotally supported upon a bracket 19 provided therefor, said float being disposed within the chamber 11 so as to be affected by the rise and fall of the liquid level in the overflow chamber 11 and thereby open or close said drain valve 17 accordingly. Thus, when a quantity of liquid accumulates within the overflow chamber 11 the float 18 is raised causing the drain valve to open which permits the over-accumulation of liquid in the overflow chamber to be withdrawn therefrom through the duct 14 into the suction inlet 4 of the pump.

In the partition 9 is secured a choke nipple 20 affording a restricted passageway between the upper part of the receiving chamber 10 into the overflow chamber 11 through which air and a limited quantity of liquid escapes from the receiving chamber. The air passing through the nipple into the overflow chamber is finally eliminated through the vent pipe 12.

In the lower end of the receiving chamber 10 is disposed a valve seat 21 through which said chamber has communication with an outlet duct 22 which is provided with a dispensing nozzle 23. The seat 21 is normally closed by a regulating valve 24 provided with a stem 25 having secured upon its upper end a piston head 26 disposed within a piston chamber 27.

A compression spring 28 is positioned between the valve 24 and the lower head 29 of the piston chamber 27 which tends to hold said valve in closed position upon the seat 21. The upper head 30 of the piston chamber 27 is secured in the partition 9 and has in its top a restricted vent opening 31 that affords communication between said piston chamber and the overflow chamber 11 so as to relieve pressure or vacuum in the upper end thereof during operation of the piston head 26 therein. The stem 25 of the regulating valve extends loosely through the lower head 29 of the piston chamber 27, the opening therefor in said head being ample for the passage of air or liquid between the lower end of said piston chamber and the receiving chamber sufficient to permit operation of said piston head according to the rise and fall of pressure within the receiving chamber.

As liquid enters the receiving chamber from the pump through the discharge outlet therefor, pressure is created thereby in the

receiving chamber, which pressure acts upwardly upon said piston head 26, and when the pressure is sufficient to overcome the resistance of the spring 28 the regulating valve 24 is raised from its seat thus permitting discharge of liquid from the receiving chamber into the outlet duct upon opening of the dispensing nozzle 23.

Also, in the lower end of the receiving chamber 10 is disposed another valve seat 32 through which said chamber has communication with the suction inlet 4 for the pump. The said seat 32 is normally closed by a by-pass valve 33 provided with a stem 34 having upon its upper end a piston head 35 disposed within a piston chamber 36.

A compression spring 37 is positioned between said by-pass valve 33 and the lower head 38 of said piston chamber 36 which tends to hold said valve in closed position upon its seat 32. The upper head 39 of the piston chamber 36 is secured in the partition 9 and has in its top a restricted vent opening 40 that affords communication between said piston chamber and the float chamber 11 so as to relieve pressure or vacuum in the upper end of said piston chamber during operation of the piston head 35 therein. The stem 34 of the by-pass valve extends loosely through the lower head 38 of said piston chamber, the opening therefor in said head being ample for the passage of air or liquid between the lower end of the piston chamber and the receiving chamber sufficient to permit operation of said piston head according to the rise and fall of pressure within the receiving chamber.

When pressure is created in the receiving chamber because of entrance of liquid from the pump through its discharge outlet 5 the piston head 35 tends to move upwardly, and when the pressure is sufficient to overcome the resistance of the spring 37 the by-pass valve is raised from its seat thus permitting liquid to be withdrawn from the receiving chamber into the suction inlet 4 for the pump.

The piston chambers 27 and 36 may be conveniently held in place in the partition 9 by means of a bar 41 that bears upon the corresponding heads 30 and 39 of said chambers which is secured to the partition by means of a screw 42.

The regulating valve 24 and the by-pass valve 33 are opened by pressure within the receiving chamber created by the flow of liquid thereinto from the pump, the opening of which valves takes place at different stages of pressure. The spring 37 for the by-pass valve 33 is of greater resistance than the spring 28 for the regulating valve, and thus, the regulating valve is automatically opened upon the rise of pressure within the receiving chamber 10 in advance of the opening of the by-pass valve. In this manner as liquid is supplied to the chamber by the pump, when the dispensing valve 23 is open, a substantial body of the liquid accumulates in the receiving chamber 10 and its outflow through the duct and dispensing nozzle is restrained until the pressure within the chamber is sufficient to cause opening of the regulating valve 24. While the body of liquid accumulated in the receiving chamber is thus restrained, the effervescence arising therefrom escapes through the choke nipple 20 into the overflow chamber 11, and when the pressure in the receiving chamber is raised sufficiently to open the regulating valve 24, the liquid, freed from any content of air or gas, is discharged through the duct 22 and dispensing nozzle 23.

When the dispensing nozzle 23 is closed and the pressure within the receiving chamber 10 is raised sufficiently, due to continued operation of the pump, the by-pass valve is automatically raised from its seat, whereupon the liquid is circulated through the pump and receiving chamber, thus stalling of the pump is prevented.

The regulating valve serves to prevent backflow of liquid from the outlet duct into the receiving chamber under normal operating conditions while pressure in the outlet duct is insufficient to raise the regulating valve. However, any excess pressure, above normal, that may be occasioned by expansion of the liquid in the outlet duct causes the regulating valve to rise, whereupon the excess pressure is relieved by backflow of liquid from the outlet duct into the receiving chamber. The provision for backflow of liquid is desirable especially when there is connected between the outlet duct and the nozzle an extension pipe or hose (not shown) of considerable length. The regulating valve prevents the discharge line from becoming drained back through the outlet duct which provision is desirable especially when a liquid measuring appliance (not shown) is connected between the outlet duct and the dispensing nozzle.

In operation, the pump is connected with a source of supply of liquid (not shown) by means of a suction pipe 43, from which source liquid is drawn, upon operation of the pump, through the pipe and a screen 44 into the suction inlet 4 of the pump, and thereafter is expelled through the discharge outlet 5 of the pump into the receiving chamber 10, from whence the liquid accumulation in the receiving chamber is withdrawn through the dispensing nozzle and the effervescence is expelled separately through the choke nipple.

The passageway through the nipple 20 is of such size as to permit escape therethrough of all air accumulations from within the chamber 10, but restricted to such extent as to permit escape therethrough of only a negligible volume of liquid. Upon operation of the

pump fluid is supplied to the chamber 10, preferably through an extension 5' of the discharge outlet 5 of said pump so that the fluid is delivered at a point in the chamber near the top thereof and agitation of the liquid content of the chamber is avoided. More or less pressure is created within the chamber because of the forced entrance thereinto of the fluid supplied by the pump which pressure is readily relieved by escape of air through the nipple. However, when the chamber is substantially filled with liquid the volume of the discharge through the nipple is greatly reduced as the liquid tends to choke the passageway therein, whereupon the pressure in the chamber is materially increased causing the regulating valve 24 to open which permits withdrawal of liquid from the chamber through the nozzle 23. Upon closing of the nozzle and continued operation of the pump the pressure within the chamber 10 is raised further which causes the by-pass valve 33 to open and thus permit the liquid in the chamber to escape into the suction inlet of the pump.

As the vent openings 31 and 40 in the piston chambers 27 and 36 are restricted as to size passage of fluid therethrough is slow and consequently chattering of the valves is obviated.

I claim:

1. In an appliance of the class described, a pump, a case having a receiving chamber and an overflow chamber, the partition between said chambers being provided with a restricted passageway therethrough, said case having also a duct affording communication between the overflow chamber and the suction inlet of said pump, a float-controlled valve mechanism in said overflow chamber controlling said duct, an outlet duct including a dispensing valve having communication with said receiving chamber, a spring-restrained regulating valve controlling communication between the receiving chamber and said outlet duct actuated by pressure created within the receiving chamber, and a spring-restrained by-pass valve controlling communication between said receiving chamber and the suction inlet of said pump actuated by pressure created within said receiving chamber, said regulating valve being operable at a pressure comparatively lower than that required to operate said by-pass valve.

2. In apparatus of the class described, a case having a receiving chamber and an overflow chamber and provided with a restricted passageway between said chambers, a pump the outlet of which communicates with said receiving chamber and the suction inlet of which has communication with said overflow chamber, a float valve mechanism in said overflow chamber controlling communication between said float chamber and suction inlet of the pump, a spring-restrained by-pass valve controlled connection between said receiving chamber and the suction inlet of the pump, and a spring-restrained regulating valve controlled discharge outlet for said receiving chamber, the valves for said connection and outlet being actuated by pressure created within said receiving chamber, the valve for said outlet being operable at a lower pressure than that required to operate the valve for said connection.

3. In apparatus of the class described, a case having receiving and overflow chambers provided with a restricted connecting passageway for the escape of effervescence from the receiving chamber into said overflow chamber, said receiving chamber having a liquid discharge outlet, a spring-pressed valve controlling said outlet, means in connection with said valve operated by pressure created in the receiving chamber adapted to open said valve, means for supplying liquid under pressure to said receiving chamber, and a float operated valve controlled drain outlet for said overflow chamber.

4. In air eliminating means for a dispensing apparatus, a case having a receiving chamber provided with a discharge outlet and a vented overflow chamber provided with a drain outlet, there being a restricted passageway between said chambers for the escape of air from the receiving chamber into the overflow chamber, a float-valve controlling means in said overflow chamber for said drain outlet, a valve mechanism controlling the discharge outlet for the receiving chamber operated by pressure created within said chamber, and means for supplying liquid under pressure to said receiving chamber.

5. In air eliminating means for liquid dispensing apparatus, a supply pump, a chamber having connection with the outlet of said pump to receive liquid therefrom and provided with a discharge outlet, and also a by-pass opening communicating with the suction inlet of said pump, a vented overflow chamber having a drain outlet and also a connection with said receiving chamber affording a restricted passageway for the escape of air from the receiving chamber into said overflow chamber, a regulating valve for said discharge outlet, a by-pass valve controlling said by-pass opening, operating means for each of said valves actuated by pressure created in the receiving chamber so constituted that the valve for the discharge outlet is opened in advance of the opening of the by-pass valve as pressure in the receiving chamber is raised, and a float operated means controlling said drain outlet.

6. In air eliminating means for liquid dispensing apparatus, a supply pump, a chamber having connection with the outlet of said pump to receive liquid therefrom and provided with a discharge outlet, and also a by-

pass opening communicating with the suction inlet of said pump, a vented overflow chamber having a drain outlet and also a connection with said receiving chamber affording a restricted passageway for the escape of air from the receiving chamber into said overflow chamber, a regulating valve for said discharge outlet, a by-pass valve controlling said by-pass opening, and operating means for each of said valves actuated by pressure created in the receiving chamber so constituted that the valve for the discharge outlet is opened in advance of the opening of the by-pass valve as pressure in the receiving chamber is raised.

7. In air eliminating means for liquid dispensing apparatus, a pump, a receiving chamber connected with said pump and having a discharge outlet, a vented overflow chamber having a drain opening, there being a restricted passageway for air between said chambers, a float operated valve controlling said opening, a regulating valve for said outlet, operating means for said regulating valve actuated by pressure created in said receiving chamber by said pump, and a manually operated valve controlled nozzle for said discharge outlet.

8. In air eliminating means for liquid dispensing apparatus, a pump, a receiving chamber connected with said pump and having a discharge outlet, an overflow chamber having a vent and a drain opening, there being a restricted passageway for air between said chambers, a regulating valve for said outlet, operating means for said regulating valve actuated by pressure created in said receiving chamber by said pump, and a manually operated valve controlled nozzle for said discharge outlet.

9. In apparatus of the class described, a pump, a receiving chamber supplied with liquid by said pump, provided with a discharge outlet for liquid and a restricted opening for the escape of air therefrom, said receiving chamber being provided also with a by-pass opening communicating with the suction inlet of said pump, two spring-restrained valves normally closing said discharge outlet and by-pass opening respectively, and means for separately opening said valves by pressure created in the receiving chamber through action of said pump, the valve for the discharge outlet being operable at a comparatively lower pressure than that required to cause opening of the valve for the by-pass opening.

10. In apparatus of the class described, a liquid supply means, a receiving chamber connected with said means, provided with a discharge outlet for liquid and a restricted opening for the escape of air therefrom, a piston chamber one end of which has communication with said receiving chamber and the opposite end of which is vented externally of said receiving chamber, and a spring-pressed regulating valve normally closing said discharge outlet and having a piston head in connection therewith in said piston chamber so that said valve is opened by the action of said piston by pressure created within said receiving chamber through action of said supply means.

11. In apparatus for separating air from liquid, a receiving chamber having an inlet and an outlet and also a restricted passageway for the escape of air therefrom, means for supplying liquid under pressure to said chamber, a valve mechanism controlling said outlet including a spring-pressed valve, and a piston chamber provided with a piston head therein operatively connected with said valve and actuated by pressure created within said receiving chamber, said piston chamber having a restricted vent opening in the upper end thereof.

In testimony whereof I affix my signature.

REUBEN E. BECHTOLD.