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VALVED FLUID PRESSURE ACCUMULATOR

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This application is a continuation in part of Ser. No. 852,110, filed November 10, 1959, in turn continuing from Ser. No. 673,815, filed July 24, 1957, now Pat. 2,918,680, December 29, 1959; original application March 29, 1954, Ser. No. 419,213.

The present application also pertains to application August 19, 1957, Ser. No. 678,799; the construction disclosed by the last mentioned application now Pat. 2,915,-761, December 8, 1959, is closely related to the disclosure of the present application.

The primary object of this invention is to protect the hazardous pressure accumulator of the various species of the invention disclosed by the above recited cross references.

This invention is made for the purpose of obtaining the following results:

(1) Simplified construction.
(2) Quick opening of the valve for rapid fluid evacuation.
(3) Delayed closure of the valve permitting atmosphere to enter the accumulation chamber of the reservoir after fluid pressure has been evacuated.
(4) To permit liquid under pressure to flow thru an inlet and be discharged thru an outlet of greater capacity than the inlet, at one and the same time permitting atmosphere to enter the accumulation chamber by bypassing liquid flowing from the outlet.
(5) The provision of means providing a flow of liquid from the inlet thru the outlet whereby a trap provided for a water-closet is refilled with liquid after a flushing operation induced by liquid flowing from the accumulation chamber.
(6) The utilization of pneumatic pressure built up by liquid under pressure entering the accumulation chamber via the inlet, whereby liquid is urged to gush thru the outlet accordingly when the valve is opened.
(7) To provide auxiliary air inlet means in combination with the liquid inlet whereby gaseous of fluid thru the inlet is prevented when a negative pressure exists therein.

Other and further objects and purposes will appear during the progress of the specification, as illustrated by the drawing.

The reduction to practice illustrated by the drawing is purely diagrammatic and may be changed within the scope of the claims.

Of the drawing:

The figure of the drawing illustrates a valve fluid pressure accumulator for the containment of air and liquid, comprising, a reservoir 1 having a liquid inlet 2, a combined air inlet and liquid outlet passage 3 of greater capacity than said liquid inlet and adapted to communicate with atmosphere at least part of the time when in active use, a valve casing 4 being inserted into the lower side of and provided with conduit portion 5 projecting downwardly of said reservoir 1, an annular valve seat 6 projecting radially inwardly of said conduit portion 5, a valve member 7 having a downwardly projecting stem 8, an upwardly projecting eyelet 9 and being adapted to rest on valve seat 6, a ring 10 loosely disposed thru eyelet 9, a flanged plunger 18 provided with a stem having a conical end and being reciprocated by being attached thru the wall of conduit 5, a handle 19 having a flanged end abutting the flange of plunger 18 with its stem surrounded by a resilient member 20, disposed between the wall of conduit 5 and the flange of plunger 18, same being held in operative relationship with handle 19 by cylindrical housing 21 having its outer end flanged radially inward resting against the outer face of the handle flange near its periphery and being attached to the wall of conduit 5.

The stem 8 of valve 7 has a lower conical end abutting the conical end of plunger 18, the coniform ends providing a wedging effect giving additional leverage for tipping valve 7 open more easily. Preferably the abutting conical ends of plunger 18 and stem 8 are set off center in axial relationship producing a lateral frictional contact, this feature serves to rotate the valve 7 thereby distributing the wear upon the lower peripheral edge of the valve head against the seat 6 by turning the valve slightly every time the handle 19 is opened and the valve 7 is closed.

When the handle 19 is actuated and the valve 7 is opened, the reservoir 1 being filled with fluid under pressure in the shape of air compressed in chamber A above liquid level W, pneumatic pressure in chamber A urges liquid to gush forth from passage 3 much faster than liquid under pressure can enter thru liquid inlet 2, immediately evacuating reservoir 1 of liquid except for the relatively small amount of liquid entering thru inlet 2 and flowing thru passage 3.

The ring 10 thru stem 11, when float 12 is in position O, provides partial closure means for opening 13, delaying closure of valve 7.

The top of cup 15 is located below any possible predetermined minimum liquid level and is therefore filled with liquid when the reservoir is filled. The opening 13 around stem 11 permits slow drainage of liquid retained in the cup 15, said liquid effecting buoy the float 12 to position O when the valve 7 is open, thereby holding the valve 7 in open position after the liquid is evacuated from the reservoir 1, whereupon, atmosphere is permitted to enter reservoir 1 until cup 15 is drained. While the valve 7 is in open position, liquid entering thru inlet 2 flows thru passage 3. During the evacuation of reservoir 1, the weight of the column of, plus the velocity head of liquid projected thru the passage 3 of conduit 5 creates a slight negative pressure in reservoir 1; atmosphere immediately bypassing liquid flowing from inlet 2 and by gravity thru the passage 3 of greater capacity enters reservoir 1 balancing the pressure therein until the cup 15 is drained, thereby permitting float 12 to drop closing the valve 7: whereupon liquid under pressure rises above and holds valve 7 closed until the accumulation chamber of reservoir 1 is refilled with pressure fluid.

Another feature of the invention is that during the interim when the valve is held open to permit entry of atmosphere, liquid flowing from inlet 2 thru passage 3 will provide liquid to refill the trap of a water-closet if attached thereto.

Additional features illustrated by the drawing include an auxiliary air inlet 22 which is shown as communicating with conduit 5 to provide liquid drain if valve 23 leaks. The air inlet 22 may communicate directly with atmosphere if desired.

It will be noted inlet 2 has its inner end opening spaced from and disposed opposite to the inner end opening of air inlet 22 which is capped by check valve 23 having downwardly projecting retaining legs of greater length than the space between the opposed inner ends of liquid.
inlet 2 and air inlet 22, whereby the valve 23 will at all times be held in seating alignment with both inner ends of liquid inlet 22 and air inlet 22.

This construction prevents contaminated fluid from entering the inner end of inlet 2 when a negative pressure exists therein; at which time atmosphere entering reservoir 4 thru air inlet 22 is effective to urge valve 23 upwardly against and close the inner end of liquid inlet 2. It will be noted air inlet 22 terminates slightly below a liquid level below the level of ports 17 where a reservoir liquid level is effective to minimize noise due to entrance of atmospheric pressure into reservoir 1 via air inlet 22.

Having described the invention, the operation thereof and the new results obtained, the following claims are made:

1. A valved fluid pressure accumulator for air and liquid, comprising a tank provided with a liquid inlet, a valved casing having its upper end inserted into the lower portion of and providing an outlet for said tank normally closed by a tiltable valve member, said outlet being of substantially greater capacity than said liquid inlet to permit atmosphere to bypass liquid flowing thru said inlet to and from said outlet; wherein said outlet projects beyond the lower end of said tank, a valve seat being formed by the inner end of said outlet, a tiltable valve member having a head resting on said valve seat and closing said outlet, the wall of the upper end of said casing projecting into said tank and being ported above said valve seat for communicating between the hollow of said tank and said outlet, a chamber in said upper end of said outlet provided below a predetermined liquid level in said outlet, liquid in the cavity of said tank and cup to a pressure equal to the inlet pressure, when said valve is tilted open, releasing the pressure head above said valve, said float rising in said cup lifts said valve into the chamber above said ports, pneumatic pressure above the liquid, sufficient to quickly level in said hollow of said tank and said outlet, liquid in said outlet port having being slowly drained into said chamber via said orifice delaying the closure of said valve until after the liquid content of the tank has been evacuated, said outlet being of substantially greater capacity than said liquid inlet, permitting communication between the inside of said tank and atmosphere to equalize the air pressure both sides of said outlet.

4. A device of the character defined by claim 3; wherein the depending stem of the valve member is unguided, relatively large and heavy, the lower end of said stem being configured, a stem and a valve member being reciprocally mounted in a housing projecting from the outside of the outlet, said plunger being held in normal position of rest by a resilient member disposed around the plunger stem between the head of the plunger and the outside wall of said outlet, the stem of the plunger slidably disposed thru the outlet wall and provided with a conical terminal end having its apex projecting against the rounded coniform surface of the lower end of the valve stem; whereby pressure against the plunger head will cause its stem to urge said valve stem off center with respect to the axial alignment of said plunger, said valve stem of the tiltable valve being unguided is thrust aside by the impingement of the plunger apex against the rounded coniform surface of the terminal end of said valve stem thereby exerting a frictional stress laterally between the rounded surfaces of the two conical ends tending to rotate the tiltable valve each time said plunger is activated thereby distributing the wear around the valve head periphery contacting the valve seat.

References Cited in the file of this patent

UNITED STATES PATENTS

2,170,321 Charroin ---------- Aug. 22, 1939
2,915,761 Langdon ---------- Dec. 8, 1959
2,918,680 Langdon ---------- Dec. 29, 1959