June 13, 1939. W. C. GROENIGER 2,162,671

AIR VALVE

Filed Feb. 13, 1937

Fig. 2.

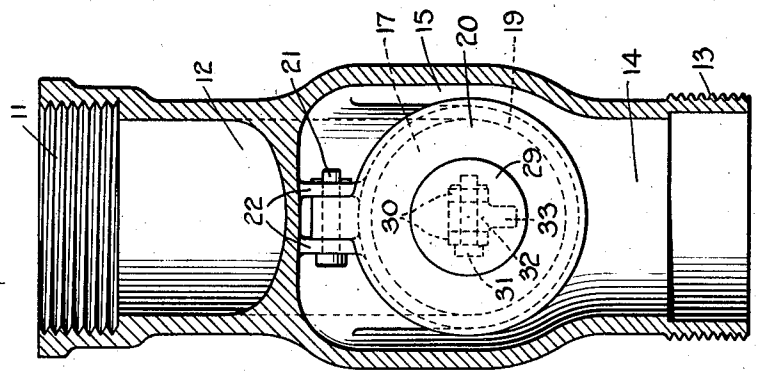
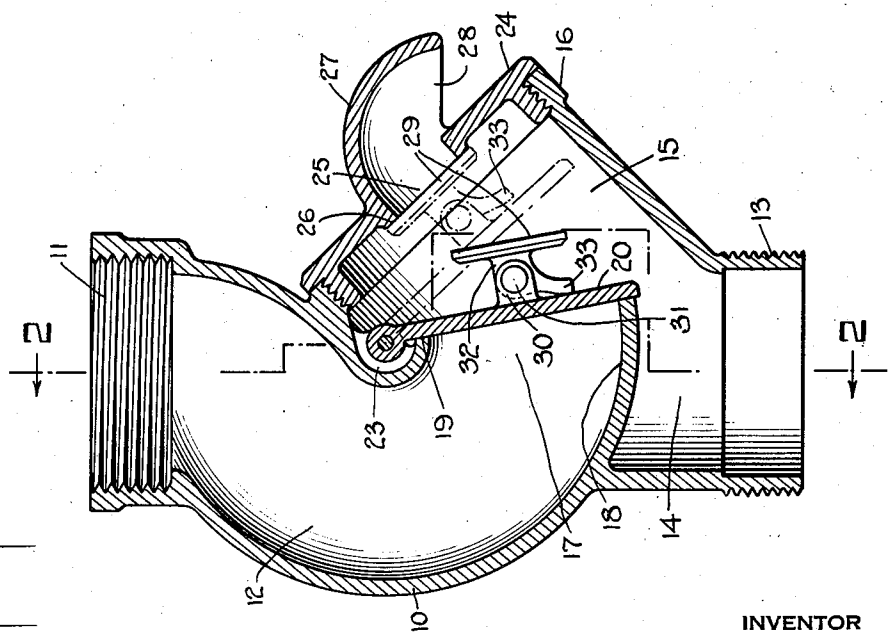


Fig. 1.



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Patented June 13, 1939 2,162,671

UNITED STATES PATENT OFFICE

2,162,671

AIR VALVE

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Application February 13, 1937, Serial No. 125,611

6 Claims. (Cl. 137—69)

My present invention relates to valves, and more particularly to improved automatic valves especially adapted to control the inflow of air to fluid conveying piping upon the tendency for a vacuum to form within the piping.

My invention is applicable as a plumbing fitting in a variety of situations, but has been designed particularly as an adjunct in a water supply system. When thus used, it prevents the establishment of a siphon in the water supply system, upon reduction of pressure therein from any cause. Its use prevents the possible redrawing into the system of water which has once passed out of the system.

The invention when used as a means for preventing the establishment of a siphon in a water supply system, as above described, is preferably inserted in a feed line of the water supply system, and in advance of the entrance end of a receptacle which receives its supply of water from the water supply system.

In a water supply system, supplying water to a receptacle or other container, there is always the possibility of water which has once been delivered from the supply system of being re-drawn into the water supply system upon a reduction of pressure or the establishment of a vacuum in the water supply system, unless the receptacle is physically disassociated from the water supply system. As physical disassociation is in many instances impractical, the device of my present invention serves as means which will insure that no water can be re-drawn from the receptacle into the water supply system under any circumstances, by dissipation of the vacuum.

A primary purpose of my invention, therefore, is to provide an improved combined air break and check valve.

Another purpose of my invention is to provide an improved means for air venting, such means including a valve elements, preferably biased under gravity, coordinated with an air vent means for affording flow of liquid under normal conditions without leakage through the air vent and for effecting, when there is a tendency toward creation of a vacuum in the liquid supply system, air venting for preventing a vacuum from forming.

In the accompanying drawing:

Fig. 1 is a view in sectional elevation of a structure embodying my present invention, and

Fig. 2 is a view in section taken on the line 2—2, of Fig. 1.

Referring to the drawing, 10 designates a valve body which is provided with an inlet end 11 connecting with a chamber 12 in the interior of the body, and with an exit end 13 connecting with a discharge passage 14, leading to chamber 15 which may be formed as a lateral Y, or extension 16 of the body.

The chamber 12 in the body 10 may be curved, as illustrated in Fig. 1, the curvature may be approximately a semi-circle terminating in a discharge portion 17 which opens into a chamber 15 formed in the extension 16, as shown. The lower wall of the discharge portion of the chamber 12 extends across discharge passage 14, see 18, and is so arranged as to direct flow from the chamber 12. At the discharge orifice of portion 17, is formed an annular valve seat 19, with which cooperates a displaceable valve 20, shown as a flap valve in the drawings.

Such flap valve 20 may be pivotally mounted on a shaft 21, which may be secured to parallelly arranged lugs or ears 22, which may be formed integrally with the body of the valve 10, and located in a recess 23 formed in such body.

The structure shown in the drawing is adapted to have its entrance end 11 connected to a water supply system, and to have its exit end 13 connected to a pipe leading to a receptacle, or directly connected to the receptacle. Accordingly, upon flow of water from the water supply system downwardly through the inlet 12, thence through the chamber 12 and its extension 17, the flap valve 20 is displaced, affording flow of the water into and through the chambers 15, 14 and thence through the outlet 13.

As is noted, upon an inspection of Fig. 1, the annular face of the valve seat 19 lies at an angle to the vertical, and by reason of the flap valve 20 being pivotally mounted at the upper end, the flap valve 20 is biased under gravity to be in engagement with the valve seat 19, unless displaced therefrom by the flow of water through the valve body 10, or possibly because of the non-functioning of the flap valve 20, or other abnormal cause. Therefore, upon cessation of flow of water through the valve, the valve 20 normally is in stated relationship with its valve seat 19.

The lateral extension 16 at its upper end is open and is arranged to receive a vented cover plate 24.

The venting of the cover plate 24 is shown as an inlet passage 25. The function of such venting passage 25 is to afford flow of air into the chamber 15 and thus to the chamber 14, under normal conditions, and under abnormal conditions into the chamber 12, as appears more fully

hereinafter. Because of the location of the air inlet passage 25, I have provided the same with a hood 27, the open end 28 of which is lowerly positioned to prevent the possibility of dropping of extraneous matter into the interior of the chamber 15.

Associated with such vent opening 25 is a valve seat 26 and a valve 29. Such valve 29 may be articulatively carried by valve 20, as by pivotal mounting the same thereon. Such pivotal mounting may comprise parallelly arranged lugs, or ears 30, which may be formed integral with the valve 20, such ears carrying a shaft 31 on which is mounted a member 32, which may carry the valve 29. The member 32 has formed integral therewith or otherwise provided with a lateral extension or foot 33, which normally serves to hold the valve 29 in position to be brought into operative association with its valve seat 26, upon displacement of the valve 20 under condition of flow of water through the chamber 12.

When the valve 20, as above set out, engages its valve seat 19, the valve 29 is out of engagement with its valve seat 26, which status of position is shown in Fig. 1, in full lines. When, however, water is flowing through the valve body 10, displacing the valve 20, and into and through the chambers 15 and 14 and out through the exit end 13, the valve 20 is rotated about its shaft 21, from its full line position shown in Fig. 1 to its dot-and-dash position shown in Fig. 1, under which condition the valve 29 is brought in engagement with its valve seat 26.

Under such condition of flow of water ingress of air through the air inlet 25 is precluded and leakage of water through the air vent passage 25 is prevented.

Under abnormal conditions, as for example in the circumstances of a vacuum or negative pressure set up in the water supply system, under which latter circumstance there arises the grave danger of watef from the receptacle into which it has flowed, being siphoned back into and through the valve body 10 into the water supply system, thus polluting the water supply, the valve 20 is brought into closing position with its valve seat 19, and the valve 29 opens the air vent 25, thus dissipating all vacuum condition in the chamber 15 and/or chamber 14, and thereby precluding back-siphoning of the water from such receptacle.

Also, under the abnormal condition of failure of operation of the valve 20, under normal flow of water through the valve body, such defective condition will be made manifest to an observer, by the leakage of water through the vent opening 28.

The chamber 12, by reason of its preferred curved formation, directs flow at substantially right angles to that face of flap valve 20 which is disposed adjacent the seat 19, when such flap valve is seated. The valve 29 extends from its mounting on flap valve 20 into the general vicinity of its valve seat 26. The distance of extension determines the degree of maximum opening available to flap valve 20. For attaining tight closure of air inlet 25, the distance of extension is such that, when valve 29 is seated, the aforementioned face of flap valve 20 which is disposed adjacent seat 19, is disposed substantially within the direct line of flow from the discharge end 17 of chamber 12.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. In an improved combined air valve with back pressure control, the combination of a body having a passage extending longitudinally therethrough, a valve seat formed in said passage intermediate the ends thereof, a pivotally mounted flap valve normally biased under gravity in engagement with its valve seat and rotatable on its pivot to permit normal flow of liquid through said passage, air inlet means leading into said passage, a valve seat associated with said air inlet means and a valve articulatively mounted on said flap valve for cooperating with the last-named valve seat to close said air inlet means under normal flow of liquid through said passage and to afford inflow of air to said passage under condition of sub-atmospheric pressure therein.

2. In an improved valve with back pressure control, the combination of a valve body having a passage extending therethrough, a valve seat in said passage intermediate the ends thereof and lying at an angle to the direction of flow through said passage, a pivotally mounted flap check valve cooperating with said valve seat and normally engaging with said valve seat, said valve being rotatable on its pivot to permit flow of liquid through the passage in one direction only, air inlet means having a valve seat formed at its inner end, receiving means extending from that face of said flap check valve which is opposite to the seating face thereof, a valve pivotally mounted on said receiving means for cooperating with said valve seat at the inner end of said air inlet means to prevent flow of air into the passageway when said flap valve permits flow of liquid through the passage and to afford flow of air into said valve body under condition of sub-atmospheric pressure therein, and means for maintaining said valve, which valve is pivotally mounted on said receiving means, in predetermined articulative placement relative to said flap check valve.

3. A valve comprising a valve body provided with a passage therethrough, a valve seat formed within said passage, a flap check valve pivoted within said passage for normally seating against said valve seat by the force of gravity, the portion of said passage leading to said valve seat being arranged to direct flow substantially perpendicularly to the adjacent face of said check valve as normally seated, an air inlet leading into said passage, valve seating means disposed about said air inlet, and valve means secured to and carried by said check valve, said valve means having a valve member extending into the vicinity of said valve seating means for seating thereagainst to close said air inlet when said check valve is unseated, said valve member extending a distance such that when seated said adjacent face of the check valve remains substantially within the direct line of discharge from the portion of said passage which leads to said valve seat.

4. A valve as set forth in claim 3 wherein the stated valve member is articulatively mounted on the flap valve.

5. A valve comprising a valve body, an inflow passage of approximately semi-circular configuration formed with in said valve body, a valve seat formed about the discharge end of said inflow passage, a flap valve pivoted within said passage for normally seating against said valve

seat by the force of gravity, the portion of said passage leading to said valve seat being arranged to direct flow substantially perpendicularly to the adjacent face of said check valve as normally seated, an air inlet leading into said passage, valve seating means disposed about said air inlet, and valve means secured to and carried by said check valve, said valve means having a valve member extending into the vicinity of said valve seating means for seating thereagainst to close said air inlet when said check valve is unseated, said valve member extending a distance such that when seated said adjacent face of the check valve remains substantially within the direct line of discharge from the discharge end of said inflow passage.

6. A valve comprising a valve body provided with a passage therethrough, a valve seat formed within said passage, a check valve disposed within said passage for normally seating against said valve seat by the force of gravity, the portion of said passage leading to said valve seat being arranged to direct flow substantially perpendicularly to the adjacent face of said flap check valve as normally seated, an air inlet leading into said passage, valve seating means disposed about said air inlet, and valve means articulatively secured to and carried by said flap check valve, said valve means having a valve member extending into the vicinity of said valve seating means for seating thereagainst to close said air inlet when said flap check valve is unseated, said valve member extending a distance such that when seated said adjacent face of the flap check valve remains substantially within the direct line of discharge from the portion of said passage which leads to said valve seat.

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