Feb. 27, 1945. E. J. KENNEY 2,370,247

VACUUM BREAKER

Filed July 25, 1942

FIG. 1.

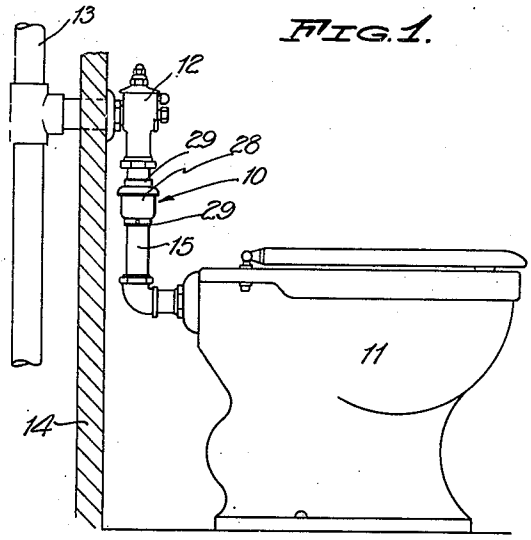


FIG. 2.

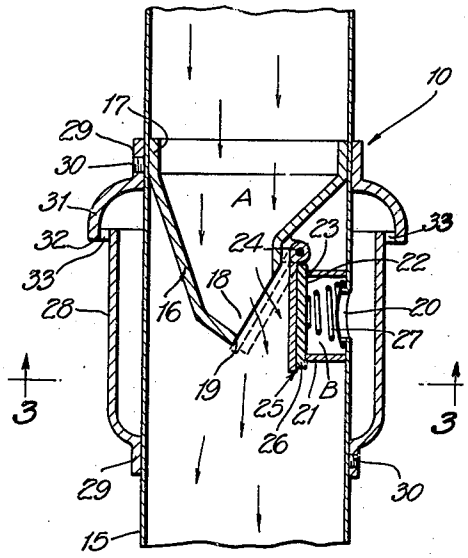


FIG. 3.

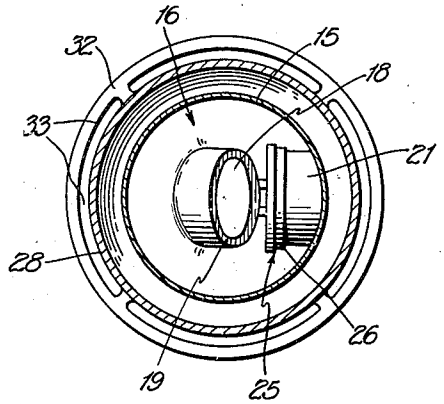
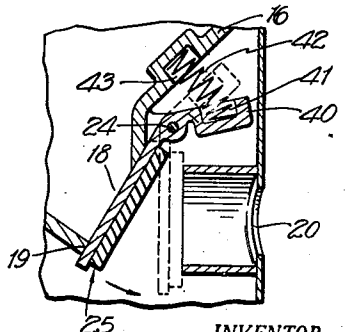


FIG. 4.



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WITNESS:

Patented Feb. 27, 1945 2,370,247

UNITED STATES PATENT OFFICE

2,370,247

VACUUM BREAKER

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Application July 25, 1942, Serial No. 452,259

1 Claim. (Cl. 137—69)

This invention relates to improvements in vacuum breakers for use in connection with flush valve operated water closet bowls to prevent syphonage of contaminated water from the water closet bowl back into the fresh water supply system.

One of the features of the invention resides in a vacuum breaker which is embodied in the vertical tail-piece which connects the flush valve with the inlet to a water closet bowl and which effects a saving of time and labor during the plumbing installation.

Another feature of the invention is to provide a vacuum breaker in which the outer cylindrical casing is constructed by casting the same in one piece as distinguished from other conventional breakers in which the casing is composed of two or more separate pieces. By this improvement it is possible to effect a saving of time and labor during assembling of the various parts of the breaker.

A further feature of the invention is the provision of a vacuum breaker in which the breaker valve is positively opened after a flushing operation by spring means to admit atmospheric air into the tail-piece and thereby break any vacuum present therein between the valve and the water closet bowl inlet.

Further features of the invention reside in a vacuum breaker which is simple and inexpensive of construction and manufacture; which is not likely to become out of working order; which may be readily removed and replaced from its installed position in a plumbing system; and which meets the rigid specifications required by the plumbing ordinances of various communities.

Other features of the invention will become apparent as the following specification is read in conjunction with the accompanying drawing, in which:

Figure 1 is a side elevational view of a flush valve operated water closet installation equipped with the improved vacuum breaker, a wall structure being shown in vertical section.

Figure 2 is an enlarged vertical sectional view through the vacuum breaker illustrating the valve member in closing engagement with the air inlet chamber in full lines and in closing engagement with the water chamber in dotted lines.

Figure 3 is a horizontal sectional view on the line 3—3 of Figure 2, looking in the direction of the indicating arrows.

Figure 4 is a detail vertical sectional view of a modified form of spring actuating means for the flap valve, the flap valve being shown in full lines in closing engagement with the water outlet, and in dotted position in closing engagement with the air outlet.

Referring to the drawing by reference characters, the numeral 10 designates my improved vacuum breaker in its entirety, and which is shown in Figure 1 of the drawing as being interposed in the water supply line of a plumbing installation between a water closet bowl 11 and its operating flush valve 12. The inlet to the flush valve 12 connects with a vertical water supply pipe 13 disposed behind a wall structure 14. It is well known that after operation of a flush valve, a vacuum is created between the valve and the water closet bowl which produces a siphoning action and causes contaminated water from the bowl to enter the fresh water supply system. This is a serious condition, and has been the cause of many diseases such as typhoid fever. The vacuum breaker device 10 acts to break any vacuum which might occur between the flush valve and the water closet bowl, thus preventing the danger of the syphoning of contaminated water from the bowl to the water supply system.

The vacuum breaker device 10 includes a length of tube or what is known as a tail-piece 15, the same being made of tubing. Mounted within the tail-piece 15 is a substantially conical shaped member 16, constructed of cast metal. The member 16 is tubular and has an annular flange 17 at its upper end, the said flange being in snug engagement with the inner walls of the tail-piece and fixedly secured thereto by any conventional means such as brazing or the like. The lower end of the member 16 is provided with a water outlet 18 which is disposed at an angle less than a right angle, with respect to the axis of the tail-piece 15. Formed about the water outlet 18 and coaxial therewith is a valve seat 19. The interior of the hollow conical member 16 constitutes a water chamber A through which flushed water from the flush valve 13 passes in its flow to the water closet bowl 11.

The portion of the side wall of the tail-piece 15 which is disposed in confronting relation to the water outlet 18, is provided with an air inlet 20 and surrounding the inlet 20 and being coaxial therewith is an annular collar 21, one end of which is fixedly secured to the inner side of the tail-piece 15 by brazing or soldering. The collar 21 defines an air inlet chamber B which is provided with an air outlet 22 which is disposed adjacent and in confronting relation with respect to the laterally disposed water outlet 18. The valve seat 23 is coaxial with the air outlet 22.

Pivoted at 24 to the lower end of the member 16 is a flap valve member 25 which consists of a metal disk body, and that side of the disk body facing the seat 23 is provided with a leather or rubber washer 26. The flap valve 25 is provided with an ear 27' to which the small end of a conical shaped helical expandable spring 27 is connected, the other or larger end of the spring seating against the side wall of the tail-piece 15 at a point surrounding the air inlet opening 20. From the foregoing description it will be understood that the expansion spring 27 normally urges the valve member 25 to a closed position against the seat 19 as indicated in dotted lines in Figure 2, whereby to close the water outlet 18 immediately after a flushing operation. However, water entering the water chamber A as indicated by arrows will force the valve member 25 to a position against the seat 23 for the pressure of the water is sufficient to overcome the tension of the spring 27. Thus as the water flows through the water chamber A, the supply of air to the tail-piece 15 is shut off and leakage of water through the air inlet 20 is prevented.

Mounted exteriorly of the tail-piece 15 is a shell like body 28, the diameter of which is greater than the external diameter of the tail-piece 15. Formed integral with the body 28 at opposite ends thereof are annular flanges 29, the diameter of which is less than the diameter of the body 28 for snug fit about the exterior of the tail-piece 15. Screws 30 pass through the flanges 29 and rigidly secure the body 28 to the tail-piece, although these flanges may be secured by means of rivets, tapered pins or by brazing or soldering. The upper end of the cylindrical body 28 is provided with an enlarged bell-shaped portion 31 which defines a horizontal shoulder 32 having arcuate shaped air inlet openings 33 therein. The space between the body 28 and the tail-piece constitutes an air chamber which is in open communication with the air inlet 20, said body being disposed within and beyond the plane of the inlet 20. The body 28, bell-shaped portion 31, and annular flanges 29—29 are integral and formed of a metal casting.

In operation, assume that the valve member 25 is in the dotted position shown in Figure 2, that is, it is against the seat 19 of the water outlet 18. In this position, atmospheric air is free to enter the tail-piece 15 through the air outlet 26. Upon operation of the flush valve 12, water will flow through the upper end of the tail-piece into the water chamber A and will force the valve member 25 outwardly against the tension of the spring 27 to closed position in sealing engagement with the seat 23. The supply of atmospheric air to the tail-piece is now shut off and the flushed water passing through the water chamber A, outlet 18, and the lower end of the tail piece is free to enter the inlet of the water closet bowl. After completion of the flushing operation, the pressure of the flow of water through the water chamber A is reduced, whereupon the spring 27 forces the valve member 25 against the seat 19 of the water outlet 18, and thereby admits air from the air chamber B into the lower end of the tail-piece, thus breaking any vacuum in the tail-piece which might cause a syphoning action from the water closet bowl to the water supply line 13. When the valve member 25 is seated against the seat 18, the backward flow of any water from the water closet bowl to the water supply pipe 13 is prevented.

In Figure 4 of the drawing, I have illustrated a modified form of spring means for normally urging the flap valve member 25 to closed position against the valve seat 19 of the water outlet. In this instance the valve member 25 is provided with a short angularly extending arm 40. The arm 40 extends radially from the pivotal axis of the valve member and has a shallow socket 41 for receiving one end of an expansion spring 42. The other end of the spring 41 is seated in a socket recess 43 provided in an adjacent wall of the member 16. The spring 41 tends to normally swing the pivoted valve member to a position to close the water outlet 18 as shown in full lines, but the pressure of flushed water passing through the water chamber is greater than the tension of the spring and forces the valve member to a closed position against the air inlet 23 as shown in dotted lines, thereby effecting an opening of the water passage and closing of the air passage.

While I have shown and described what I consider to be the most practical embodiment of my invention, I wish it to be understood that such changes in construction and design as come within the scope of the appended claim may be resorted to if desired.

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

A vacuum breaker comprising a vertical tubular tail-piece adapted to be arranged in a plumbing installation between the water closet bowl and the flush valve thereof, a hollow conical shaped member snugly fitted into and secured to said tail-piece and having a water outlet in the bottom thereof, said water outlet being disposed at an angle relative to the axis of the tail-piece, a valve seat co-axial with the water outlet, an air chamber provided within said tail-piece adjacent the water outlet, said air chamber having an air inlet opening through the side wall of the tail-piece and an air outlet arranged in confronting spaced relation to the water outlet, a valve member pivoted to the conical shaped member for swinging movement between the air outlet and the water outlet, a seat co-axial with the air outlet, an arm secured to and extending from the valve member adjacent its pivotal axis, confronting sockets provided in said arm and in an adjacent wall of the conical shaped member, and an expansion spring having its ends respectively seated in said confronting sockets; said spring acting to normally urge the valve member into engagement with the valve seat of the water outlet, the pressure of flushed water passing through the water chamber adapted to move the valve member to a position against the seat of the air outlet, a shell like body surrounding the exterior of said tail-piece within the plane of the air inlet, said body having air vents therein, and means for securing the shell like body with its walls in spaced relation to the exterior of the tail-piece.

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