Oct. 8, 1940. J. R. O'BRIEN 2,217,132

VACUUM BREAKING DEVICE IN WATER SYSTEMS

Filed July 7, 1939

Fig. 1

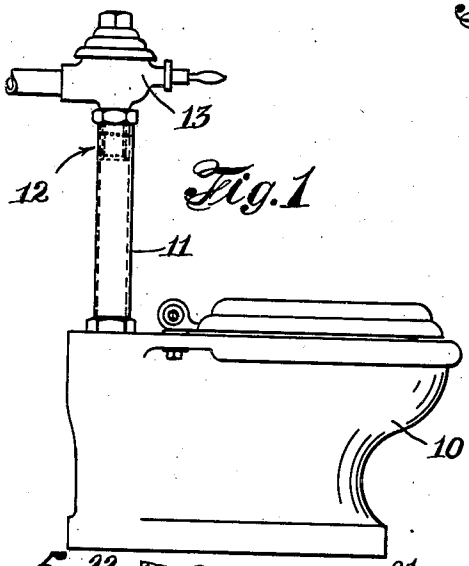


Fig. 2

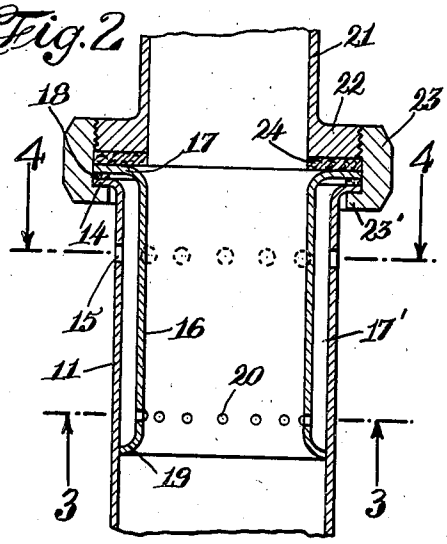


Fig. 5

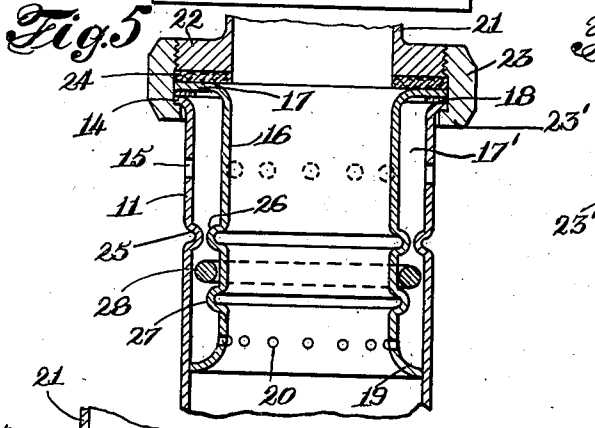


Fig. 3

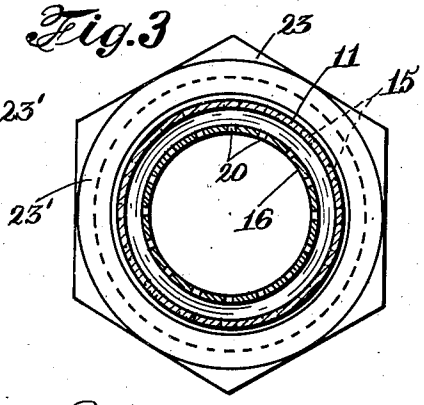


Fig. 7

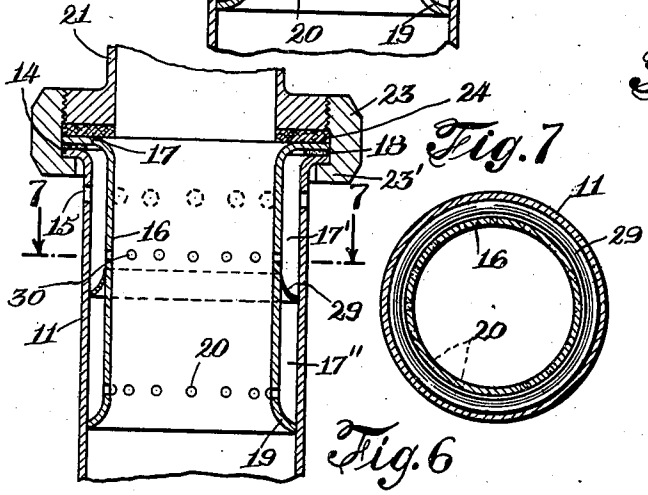
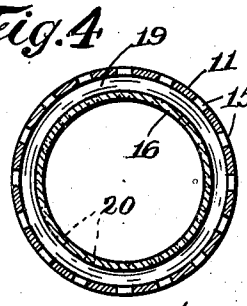


Fig. 6

Fig. 4



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VACUUM BREAKING DEVICE IN WATER SYSTEMS

John R. O'Brien, Jackson Heights, N. Y.

Application July 7, 1939, Serial No. 283,759

3 Claims. (Cl. 137—69)

This invention relates generally to vacuum breaking devices used in connection with water closet bowls or other fixtures where the end of the flush connection is above the water line or submerged in the water thereof and is an improvement over my invention embodied in an application for patent filed by me in the United States Patent Office on May 22, 1939, Serial No. 275,024.

The main object of the present invention is to provide a vacuum breaker which is installed as a flush connection or tail piece in a water system to prevent back siphonage of the water from the closet bowl or other receptacle thereby preventing contamination of the water in the system.

A further object of the invention resides in the provision of a vacuum breaker for both normal and abnormal needs which may be manufactured integral with the tail piece, which is economically installed in a water system by the substitution of a new tail piece and which operates very efficiently.

Another object of the invention resides in the provision of a vacuum breaker of the above nature which is capable of housing an emergency check valve to prevent leakage of water in the event of back spray or excessive back pressure from the bowl.

These objects and other incidental ends and advantages of the invention will hereinafter appear in the progress of the disclosure and as pointed out in the appended claims.

Accompanying this specification is a drawing showing preferred forms of the invention wherein corresponding reference characters designate corresponding parts throughout the several views and wherein:

Figure 1 is a side elevation of a closet bowl and associated mechanism embodying the features of the invention herein.

Figure 2 is a vertical diametrical section of one form of tail piece shown in Figure 1.

Figure 3 is a transverse sectional view of Figure 2 along the plane 3—3 thereof.

Figure 4 is a transverse sectional view of Figure 2 along the plane 4—4 thereof.

Figure 5 is a vertical diametrical section of another form of tail piece modified from that shown in Figure 2.

Figure 6 is a transverse sectional view of a third species of tail piece modified from those shown in Figures 2 and 5.

Figure 7 is a sectional view of Figure 6 along the plane 7—7 thereof.

In accordance with the invention and in accordance with the preferred forms shown, a conventional closet bowl 10 is provided with the usual flush connection or tail piece 11. The upper end of the tail piece represented generally by numeral 12 provides a housing for a vacuum breaker construction, the said tail piece leading off a conventional flush valve such as flush valve 13. At the upper end of the tail piece 11 is a flange 14 and directly beneath is a series of radially disposed openings 15.

A shell or baffle 16 is secured to tail piece 11 at an upper flanged portion 17 and forms a chamber 17' between the outer walls of said shell 16 and the inner walls of tail piece 11. The shell or baffle 16 is secured to the upper end of tail piece 11 by any means such as by brazing or welding 18 between the flanges 17 and 14. However, it is also feasible to cast the shell 16 together with the tail piece or flush connection 11.

The shell 16 terminates at its lower end in a flange 19, said flange abutting against the inner walls of tail piece 11. Directly above the flange 19 is a series of radially disposed openings 20 which form communicating channels between chamber 17' and shell 16.

The main line 21 leading from flush valve 13 is joined to the upper end of the tail piece 11 in the conventional manner. As shown, the main line terminates at its lower end in an externally threaded shoulder 22, the said shoulder being secured to the flanges 14 and 17 of the tail piece 11 and the shell 16 by means of a coupling nut 23. As shown, the inner surface of nut 23 is internally threaded at the upper portion to engage with threaded shoulder 22; at the lower portion it engages the sides of flanges 17 and 14. A bottom flange 23 engages the undersurface of flange 14. In this manner, the nut 23 may be removed by unscrewing downwardly along the tail piece 11. In order to make a fluid tight joint between shoulder 22 and the tail piece 11, a packing ring 24 is interposed between the lower surface of shoulder 22 and the upper surface of flange 17.

In Figure 5, tail piece 11 is provided with an internal peripheral projection or bead 25, the said bead being located directly below openings 15, while the shell 16 is provided with a pair of spaced external peripheral beads 26 and 27, the bead 26 opposing bead 25 whereby a constriction is made within chamber 17'. A check valve, preferably in the form of a circular ring is normally adapted to rest on the peripheral and external bead 27 inwardly of wall 11 and is adapted to close the constriction between beads 25 and

26 within chamber 17' in the event that back spray from bowl 10 or excessive back pressure therefrom causes water to enter chamber 17' below beads 25 and 26 through openings 20, as will hereinafter be more fully explained.

In Figure 6, the baffle or shell 16 below openings 15 and intermediate the length thereof, is provided with a peripheral skirt 29 abutting the inner walls of tail piece 11, and dividing chamber 17' into a lower chamber portion 17''. Above skirt 29 are a series of radially disposed openings 30.

When the flush valve 13, shown in Figures 2, 3 and 4, is actuated, water is discharged from the main line 21 through the shell 16 connected therewith and empties into bowl 10. If a vacuum is present in the system, there is a tendency for water to be sucked up from bowl 10 into the main line 21 by siphonic action during the actuation of valve 13. The presence of such a vacuum is counteracted by the construction shown. For during movement of water in shell 16 in either direction, maximum venturi action takes place at openings 20 because they are perpendicularly disposed relative to the water flow. Upon the occurrence of sub-atmospheric pressure in the main line 21, air is drawn into shell 16 from openings 15 through chamber 17', thereby tending to eliminate back siphonage.

In the form of the invention shown in Figure 5, the flow of air entering openings 15 proceeds downwardly along chamber 17' and is broken by the constriction afforded between beads 25 and 26. Such a break prevents the development of noise within the chamber 17' if said chamber is of any appreciable length. The said constriction also permits the use of a loosely fitting floatable emergency check valve 28 within chamber 17'. Upon the occurrence of sub-atmospheric pressure in line 21, air is drawn in through the openings 15 and 20 tending to prevent back siphoning from bowl 10. The valve or ring 28, under such circumstances, remains or rests on bead 27 and is in the open position as shown in Figure 5. Should said sub-atmospheric pressure be sufficiently low and of such duration as to cause liquid to rise in shell 16 and chamber 17' to the level of openings 20, and the valve 26, said valve would remain open since the reduced pressure necessary to cause such rise of liquid would cause the inflow of air to continue. However, should the bowl 10 develop back spray or excessive back pressure, valve 28 would be caused to close the constriction between opposite beads 25 and 26'', thereby preventing leakage through opening 15.

In Figure 6, skirt 29 breaks chamber 17' into a lower chamber portion 17''. Openings 30 of shell 16 communicate with chamber 17' while openings 20 communicate with chamber portion 17''. The division of chamber 17' into a lower chamber portion 17'' breaks the length of the former and prevents development of noise therein during operation. During flow of water in shell 16 and during sub-atmospheric pressure in line 21, venturi action takes place at both the openings 30 and 20 because skirt 29 permits air to travel from chamber 17' to 17''.

I wish it understood that minor changes and variations in the material, integration, shape, location and construction of parts of the described embodiments of the invention may all be resorted to without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. In a vacuum breaker for use in water systems including a receptacle and a supply line, a conduit, an inner spaced shell having communicating openings with the conduit adjacent the lower edge and connected at the upper edge thereof to the conduit, the said shell forming a chamber with the said conduit, the conduit below the top having a plurality of openings leading into said chamber whereby in the presence of sub-atmospheric pressure in the supply line, air is sucked through the conduit openings and flows along the chamber into the conduit, means within the chamber between the conduit openings and the lower end of the shell to break the flow of air along the said chamber to prevent development of noises therein, said means also serving as a valve seat, the lower end of said chamber being provided with a supporting member, a ring valve slidable between the valve seat and the supporting member whereby in the presence of sub-atmospheric pressure in the supply line, the ring valve rests on the supporting member permitting air to pass through the chamber into the conduit to counteract sub-atmospheric pressure in the supply line and whereby during excessive back pressure or back spray from the receptacle the ring valve is seated against the valve seat thereby preventing discharge of water through the conduit openings.

2. In a vacuum breaker for use in water systems including a receptacle and a supply line, a conduit, an inner spaced shell having communicating openings with the conduit adjacent the lower edge and connected at the upper edge thereof to the conduit and forming a chamber with the said conduit, the conduit below the top having a plurality of openings leading into said chamber whereby in the presence of sub-atmospheric pressure in the supply line, air is sucked through the conduit openings and flows along the said chamber into the conduit, the conduit and the shell both having opposing beads within the chamber to form a constriction therein to break the flow of air along the said chamber to prevent development of noises and to serve as a valve seat, the shell near the lower end having an outwardly disposed bead, a ring valve loosely disposed between the shell bead and the opposing beads whereby in the presence of sub-atmospheric pressure in the supply line, the ring valve loosely rests on the said shell bead permitting air to pass through the chamber into the conduit to counteract sub-atmospheric pressure in the supply line and whereby during excessive back pressure or back spray from the receptacle the opposing beads serve as a seat for the ring valve preventing water from passing through the opposing beads and out of the conduit openings.

3. In a vacuum breaker for use in water systems including a receptacle and a supply line, a conduit, an inner spaced shell having communicating openings with the conduit adjacent the lower edge and connected to the conduit at the upper edge thereby forming a chamber therewith, the upper end of the chamber having openings to the atmosphere whereby in the presence of sub-atmospheric pressure in the supply line, air is sucked through said openings, a seat formed within and intermediate the height of the chamber dividing the said chamber into communicating sub-chambers to break the flow of air between the upper and lower sub-chambers to prevent development of noises and to serve as a valve seat, the lower sub-chamber having a supporting ledge, a ring valve slidable between the

seat and the supporting ledge whereby in the presence of sub-atmospheric pressure in the supply line, the ring valve rests on the supporting ledge permitting air to pass through the lower sub-chamber into the conduit to counteract sub-atmospheric pressure in the supply line and whereby during excessive back pressure or back spray from the receptacle, the ring valve is seated against the seat thereby preventing discharge of water through the chamber openings.

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