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VACUUM BREAKER

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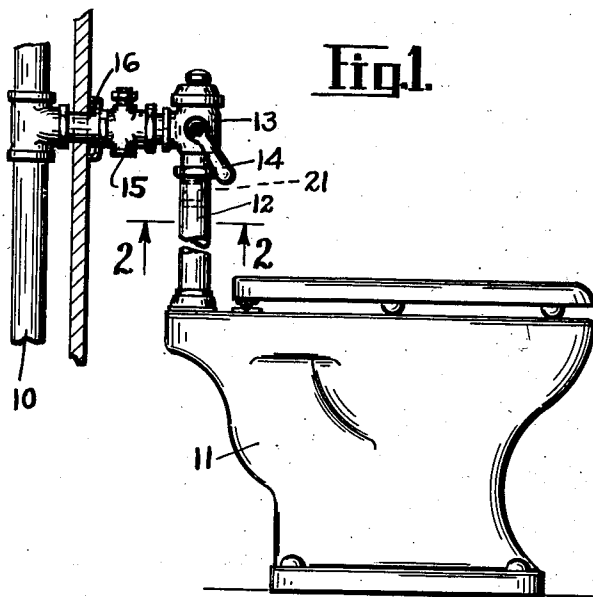


Fig. 1.

Fig. 2.

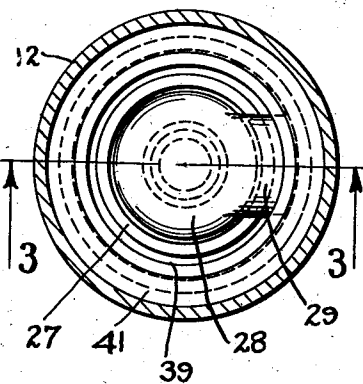


Fig. 3.

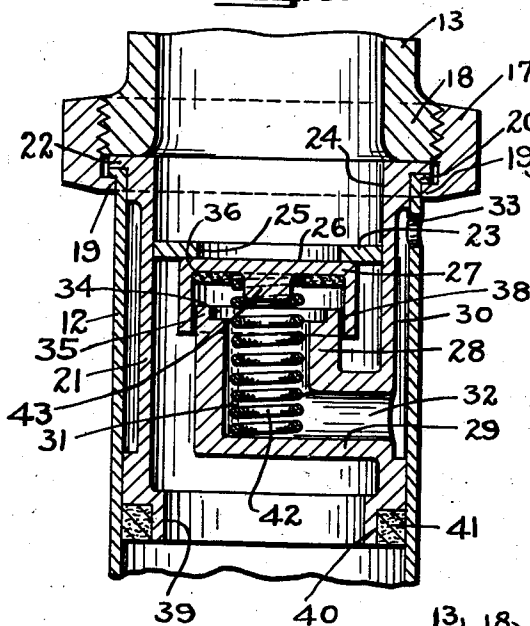


Fig. 4.

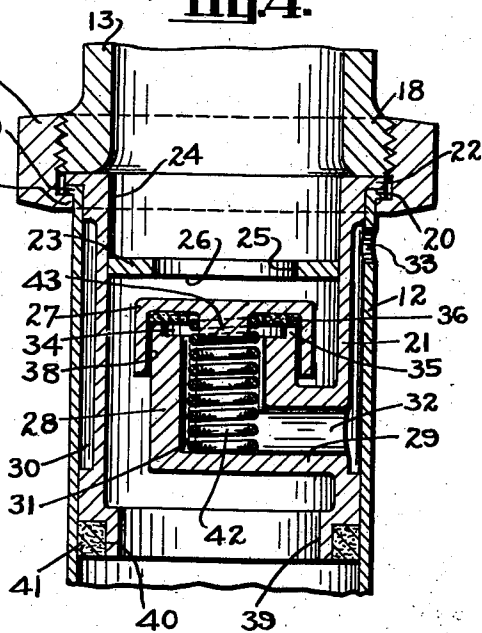
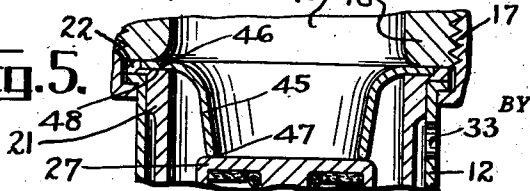


Fig. 5.



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VACUUM BREAKER

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5 Claims. (Cl. 137-69)

This invention relates to plumbing apparatus and more particularly to an improved vacuum breaker adapted to be inserted in the pipe leading from a flush valve to a water closet bowl.

This invention is particularly adapted for use with water supply systems wherein the feed line is utilized to furnish water not only for washing, drinking and cooking, but also for sanitary purposes. It has been found that when a sanitary fixture such as a water closet bowl or bathtub is connected to the riser pipe of a supply line, grave danger exists that the supply line may become contaminated by the return of liquid from said fixture into the supply whenever vacuum conditions occur in the supply line. This danger is present in almost all household and building water supply systems and arises usually when a large flow of water is being taken from other fixtures connected to the same supply line. The vacuum so produced is often sufficient to draw contaminated material from these fixtures back into the supply system and thus cause the spread of diseases such as typhoid fever.

One object of the present invention is to provide a vacuum breaker of the above nature which is adapted to be readily inserted within the interior of the riser pipe connecting a flush valve and a sanitary fixture in a water supply system.

A still further object is to provide a vacuum breaking device of the above nature which will not interfere with the flow of water in one direction but will positively prevent reverse flow of water whenever a vacuum occurs back of the vacuum breaking device, this being accomplished by providing a passage leading to the outer atmosphere which serves to destroy any vacuum formed in the fixture.

A still further object is to provide a vacuum breaker of the above nature which will be comparatively simple in construction, inexpensive to manufacture, easy to install, compact, inconspicuous, and very efficient and durable in use.

With these and other objects in view there have been illustrated on the accompanying drawing two forms in which the invention may be conveniently embodied in practice.

In the drawing:

Fig. 1 is a side elevation of a portion of a water supply system leading to a flush valve connected to control the flow of water to a sanitary plumbing fixture, such as a water closet bowl, and with the improved vacuum breaker shown installed within the vertical pipe connected to said flush valve.

Fig. 2 is an enlarged transverse cross-sectional

view taken through the connecting pipe and vacuum breaker located therein, said view being taken on the line 2-2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is an enlarged longitudinal sectional view taken on the line 3-3 of Fig. 2, and showing the parts thereof in their normal position when no water is flowing therethrough.

Fig. 4 is a longitudinal section, similar to Fig. 3, showing the parts of the device as they appear when the flush valve is being actuated to permit water to flow into the sanitary fixture.

Fig. 5 is a fragmentary enlarged longitudinal section showing a modified form of partition member against which the movable valve member is normally seated.

Referring now to the drawing wherein like reference characters designate like parts throughout the several views, the numeral 10 designates a vertical water supply pipe or riser which is herein shown located behind the wall of the room and may be connected to other fixtures and outlets both above and below the one illustrated. The plumbing fixture herein shown comprises a water closet bowl 11 which is connected to the riser pipe 10 by means of a vertical pipe 12, through a flush valve 13, having a control handle 14 and a horizontal pipe section 15 joined to the riser 10 by a short nipple 16.

As clearly shown in Figures 2, 3, and 4, the flush valve 13 is connected to the vertical pipe 12 by the usual union nut 17 which has threaded engagement with a depending enlarged threaded portion 18 of said flush valve and has an annular inwardly extending clamping flange 19 at its lower end. The vertical pipe 12 is preferably provided at its upper end with an annular outstanding flange 20, which is adapted to be firmly clamped between the inturned flange 19 and the flange 22 of the casing by means of the union nut 17 screwed on the end of the enlarged valve portion 18.

The improved vacuum breaker device includes a hollow cylindrical casing 21 adapted to be inserted from above into the vertical pipe 12. The casing 21 is provided a transverse metal partition, herein shown in the shape of a circular disc ring 23, tightly fitted within the bore 24 of said casing. The disc ring 23 has a central opening 25 therein, the lower surface of said ring forming a valve seat 26 for an inverted cup shaped valve member 27 also preferably formed of metal.

The casing 21 is provided with a concentric hollow cylindrical vertical boss 28 which is supported by a laterally extending hollow lug 29 integrally

connected to the boss 28 at one side of the casing 21. An annular air channel 30 is formed in the outer peripheral surface of the casing 21, and said channel is connected to the boss 28 by means of a transverse bore 32 formed in the lug 29. The channel 30 is also adapted to be connected to the atmosphere through one or more side holes 33 provided in the pipe 12 adjacent the upper end thereof.

The upper end of the vertical boss 28 is counterbored as at 34 to provide an annular rib 35 around the periphery thereof. A gasket 36 is disposed within the base of the inverted cup shaped valve member 27 which is adapted to engage the annular rib 35 on the boss 28 to seal the bore 31 thereof and prevent the escape of water there-through when the flush valve is operating. The hollow boss 28 is of such a diameter that the side portion 37 of the inverted cup-shaped valve member 27 loosely telescopes over it and a small space 38 is provided therebetween. The bottom of the casing 21 is provided with a reduced central passage 39 and an outer annular recess 40 which forms a seat for a packing ring 41 to tightly seal said casing 21 in the interior of the pipe 12 at this point.

In order to normally hold the valve member 27 upwardly upon its seat on the partition disc ring 23, provision is made of a coiled spring 42 having its lower end seated in the bottom of the bore 31 of the boss 28. The upper end of the spring 42 encircles a concentric lug 43 depending from the base of the cup shaped valve member 27, whereby the spring is held substantially concentric thereto. The compression of the spring 42 is preferably only sufficient to force the valve member 27 lightly against the partition ring 23, but is not great enough to interfere with the free flow of water downwardly through the opening 25 when the flush valve 13 is actuated. The compression of the spring 42 is also insufficient to prevent the gasket 36 from seating upon the rib 35 of the boss 28 when the water is flowing down through the vacuum breaker device to the closet bowl 11.

In the modified form of the invention shown in Fig. 5, the partition 45 corresponding to the partition 23 of the previously described form, is made in the shape of an inverted hollow frustum of a cone, and is provided with an annular flange 46 about its upper base. The lower edge 47 of the tubular partition 45 forms an annular seat for the cup-shaped valve member 27. The flange 46 of the partition 45 is disposed in a recess 48 formed in the flange 22 of the casing 21, and said flange 46 is held in said recess by the clamping action of the lower end of the enlarged threaded portion 18 of the flush valve.

Operation

In operation, under normal conditions, when the flush valve is closed and no water is flowing therethrough, the inverted cup-shaped valve member 27 will remain in the uppermost position shown in Fig. 3 under the influence of the spring 42. When the flush valve 13 is actuated by manipulation of the handle 14, water will flow through said flush valve into the vacuum breaker device and will force the valve 27 downwardly into sealing engagement with the annular rib 35, the gasket 36 then preventing water from flowing out through the bores 31 and 32 in the boss 28 and lug 27 respectively, and thence through the channel 30 and out of the opening 33 in the pipe 12.

When water is being drawn from the other fix-

tures and outlets in the supply pipe system in sufficient quantities to cause a vacuum to be developed in or above the flush valve 13, the spring 42 assisted by the pressure of the atmosphere acting upon the valve member 27 will press it against its seat 26 on the partition ring 23. In case a vacuum should be formed beneath the partition ring 23 and the cup-shaped valve 27 seated upon it, air will flow into the valve casing 21 through the opening 33 in the pipe 12, and will immediately destroy such vacuum, and thereby prevent any possibility of back siphonage from the closet bowl.

One advantage of the present invention is that it may be readily inserted in existing installations without expensive changes.

A further advantage is that the vacuum breaker device will be completely concealed within the pipe connecting the flush valve and the water closet bowl, thereby avoiding unsightly protuberances on said pipe as in prior vacuum breaking devices.

While there have been disclosed in this specification two forms in which the invention may be embodied, it is to be understood that these forms are shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosures, but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In a vacuum breaker for a liquid system, a liquid supply member having a cylindrical threaded end portion, a union nut adapted to be screwed upon said end portion and having an intumed clamping flange, a cylindrical check valve casing adapted to be inserted into a pipe having an annular flanged end, said casing having an annular flange adapted to be clamped by said union nut between said threaded end portion and the flange on the end of said pipe, said casing having a transverse partition ring forming an upper valve seat, a hollow boss in said casing connected to the atmosphere and forming a lower valve seat, a movable valve member interposed between said boss and said partition ring and a spring to normally hold said valve member up against said partition ring.

2. In a vacuum breaker for a liquid system, a liquid supply member having a cylindrical threaded end portion, a union nut adapted to be screwed upon said end portion and having an intumed clamping flange, a cylindrical valve casing adapted to be inserted into the outwardly flanged end of a pipe, said casing having an annular flange adapted to be clamped by said union nut between said threaded end portion and the flange on the end of said pipe, said casing having a transverse partition ring forming an upper valve seat, a hollow boss in said casing forming a lower valve seat, a movable valve member interposed between said boss and said partition ring, a spring to normally hold said valve member against said partition ring, and means for connecting said boss with the outside atmosphere to break the vacuum in said pipe.

3. In a vacuum breaker for a liquid supply system, a cylindrical casing adapted to be inserted tightly within a supply pipe having an aperture, said casing having an annular channel in its peripheral surface embracing the aperture in the

pipe, said casing having a hollow interior boss connected to said channel, a transverse partition ring disposed in said casing and vertically spaced from said boss, and a movable spring pressed valve member normally in engagement with said partition ring to close the opening therein.

4. In a vacuum breaker for a liquid system, a liquid supply member having a cylindrical threaded end portion, a union nut adapted to be screwed upon said end portion and having an intumed clamping flange, a cylindrical valve casing adapted to be inserted into the outwardly flanged end of a pipe, said casing having an annular flange adapted to be clamped by said union nut between said threaded end portion and the flange on the end of said pipe, said casing having a transverse partition ring forming an upper valve seat, a hollow boss in said casing forming a lower valve seat, a movable valve member interposed between said boss and said partition ring,

a spring to normally hold said valve member against said partition ring, and means for connecting said boss with the outside atmosphere to break the vacuum in said pipe, said casing having an exterior annular groove connected by a transverse air passage with said boss, and said pipe having an air opening in alinement with said groove.

5. In a vacuum breaker for a liquid supply system, a cylindrical casing adapted to be inserted tightly within a supply pipe having an aperture, said casing having a hollow interior boss, means for connecting the interior of said boss with said aperture to break the vacuum in said supply pipe, a transverse partition ring in said casing upwardly spaced from said boss, and a movable spring-pressed valve member normally engaging said partition ring to close the opening therein.

ERNEST W. WORK. 20