

May 31, 1960

J. FRASER
VACUUM BREAKER

2,938,532

Filed April 16, 1956

2 Sheets-Sheet 1

FIG. 1.

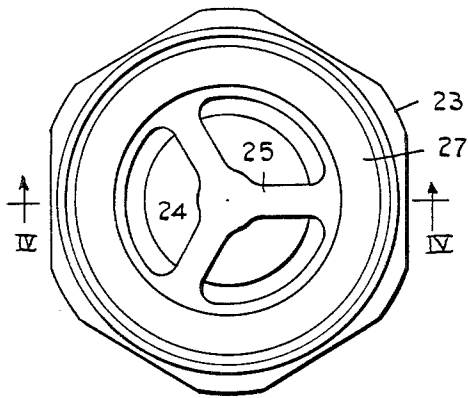


FIG. 2.

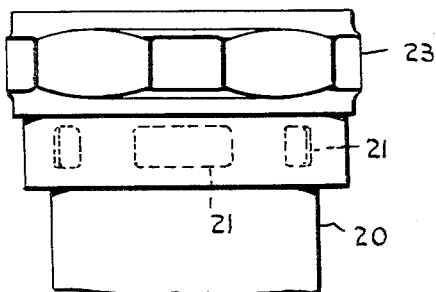


FIG. 3.

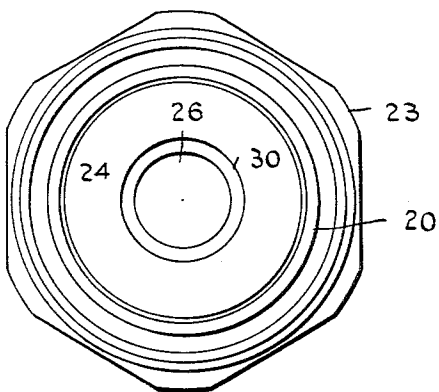


FIG. 4.

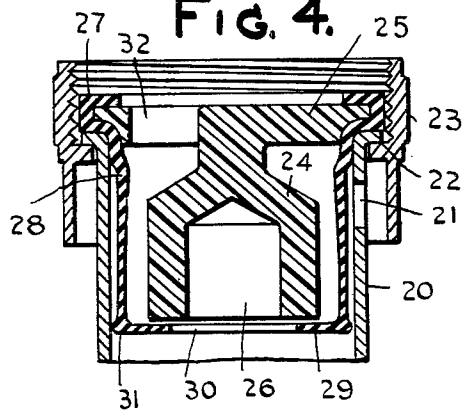


FIG. 5.

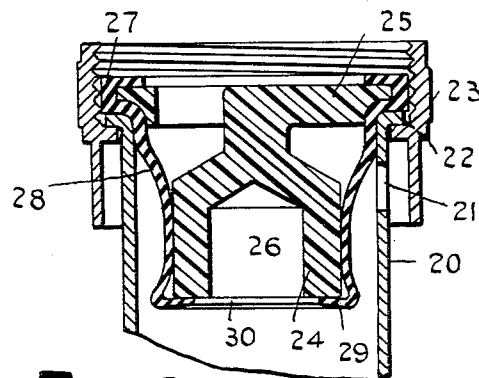
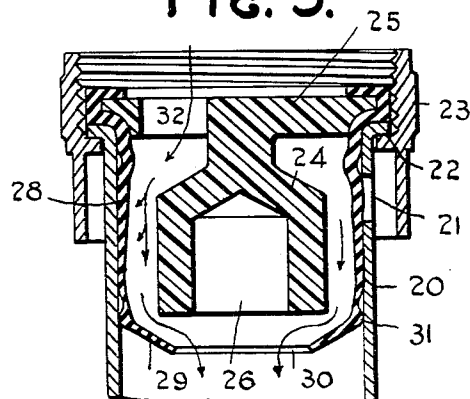


FIG. 6.

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FIG. 7.

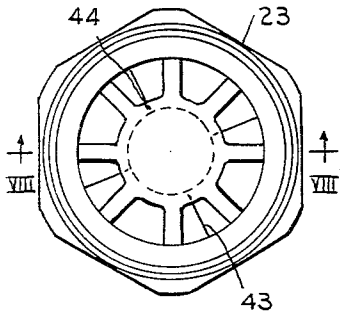


FIG. 8.

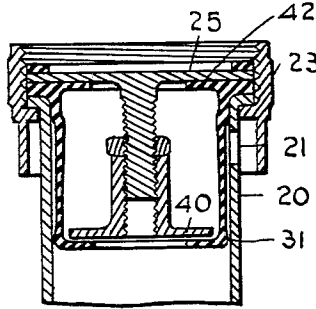


FIG. 9.

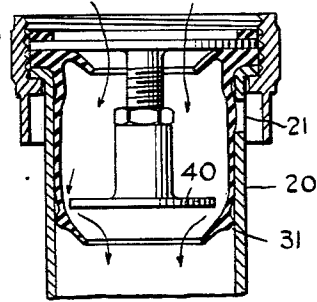


FIG. 10.

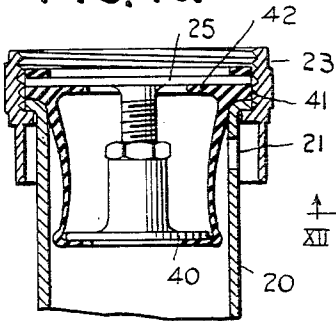


FIG. 11.

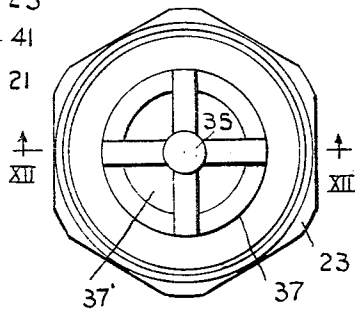


FIG. 12.

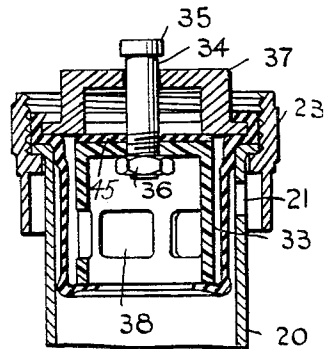


FIG. 13.

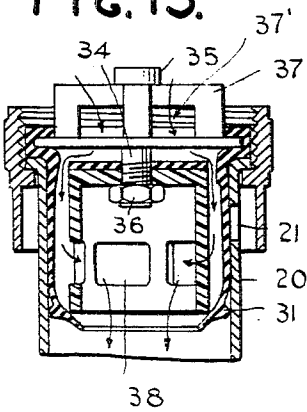


FIG. 14.

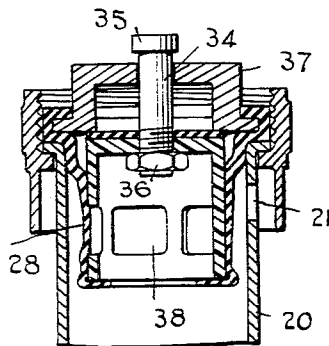
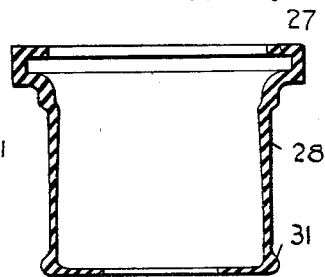


FIG. 15.



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VACUUM BREAKER

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4 Claims. (Cl. 137—218)

This invention relates to a valve device, and more in particular to a vacuum breaker adapted to be used in a water system where there is danger of back syphonage occurring and thereby causing contamination of the supply water system.

Heretofore vacuum breakers have generally been made having an opposed lip or lips which under normal conditions are closed to the flow of water by the rigidity of the flexible valve member. The prior devices of this type have an inherent disadvantage that under extreme vacuum the flexible valve member is inverted and the seal formed by the opposed lips is broken. Another type has a cup-shaped member which protrudes through the flexible valve member and forms a seal. Under extreme vacuum conditions these lips will be inverted and tear and thereafter the lips will not form the required seal.

It is an object of the present invention to provide a vacuum breaker that is normally open and therefore may be drained without disassembly.

It is another object of this invention to provide a vacuum breaker which under pressure will seal the tubular casing at a plurality of points.

It is still another object of this invention to provide a vacuum breaker that will be simple in construction and free from parts that usually tear under excessive pressure.

A still further object of this invention is to provide a vacuum breaker free from opposed lips and to provide a rigid support for the flexible part under back pressure.

These and other features of novelty which characterize this invention are pointed out with particularity in the claims annexed to and forming part of this specification. For the better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which have been illustrated and described the preferred embodiments of the invention.

In the drawings:

Fig. 1 is a top view of the preferred embodiment of the invention.

Fig. 2 is a side view of Figure 1.

Fig. 3 is a bottom view of Fig. 1.

Fig. 4 is a sectional view on line IV—IV of Fig. 1, with the valve shown in normal position.

Fig. 5 is a sectional view similar to Fig. 4, illustrating the valve under pressure.

Fig. 6 is a sectional view similar to Fig. 4, illustrating the valve under vacuum.

Fig. 7 is a top view of a second embodiment of this invention.

Fig. 8 is a sectional view on line VIII—VIII of Fig. 7, showing the valve in a normal position.

Fig. 9 is a view, partially in section, showing the valve under pressure.

Fig. 10 is a view, partially in section, showing the valve under vacuum.

Fig. 11 is a top view of the third embodiment of the invention.

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Fig. 12 is a sectional view on line XII—XII of Fig. 11, showing the valve in normal position.

Fig. 13 is a sectional view similar to Fig. 12, showing the valve under pressure.

Fig. 14 is a sectional view similar to Fig. 12, showing the valve under vacuum.

Fig. 15 is a sectional view of the flexible sleeve member.

The embodiment of the invention illustrated in Figs. 1 to 6 of the drawings comprises a casing 20 having air ports 21, 21 in the side thereof and a flange 22 on the upper end thereof. This flange fits within the coupling 23 as shown in Fig. 4, for attachment to the flush valve (not shown). The casing conducts the water admitted thereto by the valve member to the source of use, usually a toilet. The ports 21, 21 are normally open to the air and cause the interior of the casing 20 to be subjected to atmospheric pressure conditions. This casing may be made of any material that is desired, usually brass or iron tubing and has the air ports pierced or punched therein.

Within this casing is a baffle 24 supported by a spider 25. This baffle may be made of metal or of a molded plastic material such as nylon, polyethylene or any other material that will not deform or deteriorate due to constant exposure to water. If it is made of a plastic material as illustrated in the drawings, it is desirable to have an opening 26 countersunk in the bottom thereof to avoid excessive strain during molding caused by a thick section. This opening 26 does not connect with any other part of the valve mechanism and is only used to lighten the molded part.

A flexible valve member 27 shown in Fig. 15 is placed around the baffle 24 and lies between it and the casing 20. Normally this valve member takes the position shown in Fig. 4, and for convenience in securing a water-tight fit between the spider 25 and the flange 22 by means of the coupling 23, it is desirable to have the flexible valve member 27 cover both edges of the spider 25 as shown in Figs. 4, 5 and 6. This flexible valve member has the side wall 28 tapered so that it is thinner at the bottom than it is at the top, and the bottom wall 29 is as thin as the bottom part of the side wall. The bottom wall has a vent 30 near the central portion thereof, shown in section in Fig. 6 and in Fig. 3. This vent normally takes the open position shown in Fig. 4 allowing any seepage from the valve member (not shown) that precedes the vacuum breaker to flow around the baffle, and through the vent 30. This vent is always in the open position unless a vacuum condition exists in the main supply line. The flexible valve member 27 may be made of synthetic rubber, natural rubber, or any other material that will regain its original shape after being deformed. Where the side wall and the bottom wall intersect, a bead 31 shown in Fig. 15, is formed on the exterior part thereof. This bead when forced against the casing forms a seal therewith.

When the water is admitted to the casing by the control valve (not shown) it flows by the spider through the passage 32 around the outside of the baffle 24 forcing the side wall 28 of the flexible valve member against the casing, as shown in Fig. 5, and flows through the vent 30 into the lower part of the casing and is thereby admitted to the toilet. This seals the air ports 21, 21 preventing the water from escaping through these ports. The bead 31 is always forced against the side wall of the casing thereby forming a double seal. The advantage of having a positive double seal under the pressure cycle prevents any liquid from escaping through the air ports 21, 21.

If for any reason a vacuum is created in the main supply line and the supply valve is open, a vacuum condition is

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created which would normally raise the contents of the toilet into the main supply line and contaminate the same. If this condition should exist the vacuum breaker takes the position shown in Fig. 6 and admits air through the air ports 21, 21 in the wall of the casing and closes the water vent 30 against the bottom of the baffle and prevents the raising of any fluid through the casing 20.

During the vacuum cycle the positive opening of the air ports 21, 21 is caused by the movement of the side wall 28 in and around the baffle 24. This baffle positively prevents the inverting of the rubber cup formed by the side wall and the bottom wall thereof, which is a common fault of vacuum breakers depending on converging surfaces.

A second modification of this invention is shown in Figs. 7, 8, 9 and 10. This modification comprises a casing 20 as described above, having air ports 21, 21 therein. A baffle 40 adjustably mounted on the spider 25 being held in position by means of coupling 23, has a flexible valve member 41 held in position by the spider 25. This flexible valve member has side walls similar to the side walls described above and shown in Fig. 15, but in addition thereto it has a top wall 42 which has slits 43, 43 cut therein, as shown in Fig. 7. The central opening in the top wall lies under the central part 44 of the spider 25 and forms therewith a seal on the vacuum cycle as the portions of the top wall between the slits are prevented from inverting by the spider 25. When water is admitted under pressure, as shown in Fig. 9, the top wall being unsupported on its under side allows the water to flow therethrough around the baffle and through the vent 30 in the bottom wall thereof forcing the side walls against the casing 20 forming a seal therewith where the bead 31 contacts the side wall and also the side wall seals over the air ports 21, 21. This forms a double seal on the pressure cycle. On the vacuum cycle the upper wall is sealed against the under side of the spider as described above and the vent 30 in the bottom thereof seals against the baffle 40, as shown in Fig. 10, thus forming a double seal in the vacuum cycle.

A third modification is illustrated in Figs. 11, 12, 13 and 14, wherein the baffle 33 is attached to the shaft 34 having the flange 35, by means of the nut 36 on the inner end thereof. This shaft is held in sliding relation to the spider 37. This spider as shown in Fig. 11 has four openings 37' in the top thereof to allow water to flow therethrough. The baffle has water vents 38 in the sides thereof. The same flexible valve member 27, that is described above, as illustrated in Fig. 15, is placed about the baffle and covers the edge of the spider as described above. The baffle is shown in the normal position in Fig. 13 and is held in a retracted position by the flexible valve member 27 so that the upper surface of the baffle 33 and the rubber washer 45 thereon contacts the lower part of the spider housing 37, and forms a sealed closure therewith. When water is admitted under pressure the baffle moves downwardly and admits the water which forces the flexible valve member against the casing, closing the air ports therein and forces the bead 31 against the side wall thereof forming a double seal thereon. The water flows through the water vents 38 and through the vent 30 into the casing 20, as shown in Fig. 13. When this valve is subjected to vacuum conditions it assumes the position shown in Fig. 14, the side wall 28 closing the vent 38 and the upper surfaces of the baffle seat against the spider housing 37 forming a double seal under the vacuum condition, and opening the air ports 21, 21 to allow air free access to the casing 20.

While in accordance with the provisions of the Statutes the best forms of embodiment of this invention have been illustrated and described, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of this invention as set forth in the appended claims

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and that in some cases features of this invention may be used without the corresponding use of other features.

What is claimed is:

1. A vacuum breaker valve device of the character described comprising a casing having an inlet end and an outlet end with a chamber therebetween; air ports in the side of said casing near the inlet end thereof; a rigid baffle having a plane bottom surface supported within said casing, a flexible valve member intermediate said baffle and said casing, said valve member having a greater side wall thickness near the inlet end thereof than at the outlet end thereof, and extending below said air ports and around the bottom of said baffle and having a central vent normally open in its bottom wall, said bottom wall normally having an opening between its inner surface and the plane bottom surface of said baffle, the exterior portion of said valve member having a bead on the side walls at the lower end thereof, said bead normally not being in contact with said casing.

2. A vacuum breaker valve device of the character described comprising a casing having an inlet end and an outlet end with a chamber therebetween; air ports in the side of said casing near the inlet end thereof, a flange on the top of said casing; a rigid baffle within said casing supported by a spider overlying said flange said baffle having a plane bottom surface and a side wall substantially perpendicular thereto, a flexible valve member having a side wall and a bottom wall intermediate said baffle and said casing the upper edges of said side wall overlying both sides of said spider, said valve member having a greater side wall thickness near the inlet end thereof than at the outlet end thereof, and extending below said air ports and around the bottom of said baffle and having a central vent normally open in its bottom wall, said bottom wall normally having an opening between its inner surface and the plane bottom surface of said baffle, the exterior portion of said valve member having a bead on the side walls at the outlet end thereof, said bead normally being not in contact with said casing, whereby under conditions of water pressure the side wall of the valve member at its thickened portion seals the air ports in the casing and said bead forms a second seal against the casing below the air ports, and under conditions of vacuum the bottom wall of said valve member seals against the bottom surface of said baffle and the side wall of said valve member seals against the side wall of said baffle member thereby producing a double seal under these conditions.

3. A vacuum breaker valve device of the character described comprising a casing having an inlet end and an outlet end with a chamber therebetween; air ports in the side of said casing near the inlet end thereof, a flange on the top of said casing, a rigid baffle within said casing supported by a spider overlying said flange said baffle having a plane bottom surface and a side wall substantially perpendicular thereto, a rubber valve member having a side wall and a bottom wall, the upper edge of said side wall overlying both sides of said spider, said valve member having a greater side wall thickness near the inlet end thereof than at the outlet end thereof, and extending below said air ports and around the bottom of said baffle and having a central vent normally open in its bottom wall, said bottom wall normally having an opening between its inner surface and the plane bottom surface of said baffle, the exterior portion of said valve member having a bead on the side wall at the outlet end thereof, said bead normally not being in contact with said casing, whereby under conditions of water pressure the side walls of the valve member at its thickened portion seals the air ports in the casing and said bead forms a second seal against the casing below the air ports, and under conditions of vacuum the bottom wall of said valve member seals against the bottom surface of said baffle and the side wall of said valve member seals against the side

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wall of said baffle member thereby producing a double seal under these conditions.

4. A vacuum breaker valve device of the character described comprising a casing having an inlet end and an outlet end with the chamber therebetween; air ports in the side of said casing near the inlet end thereof, a flange on the top of said casing; a rigid baffle supported within said casing, said baffle having a plane bottom surface at least one-half as wide as the baffle and the side wall being substantially perpendicular thereto; a flexible valve member having a side wall and a bottom wall intermediate said baffle within said casing, said valve member having greater side wall thickness near the inlet end thereof than at the outlet end thereof and extending below said air port and around the bottom of said baffle and overlying substantially all of the bottom surface of the baffle and having a central vent normally open in its bottom wall, said bottom wall being substantially as thick as the thinner portion of said side wall, normally having an opening between its inner surface and the plane bottom surface of said baffle, the exterior portion of said

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valve member having a bead on the side wall at the outlet end thereof, said bead normally not being in contact with said casing whereby under conditions of water pressure the side wall of the valve member at its thickened portion seals the air ports in the casing and said bead forms a second seal against the casing below the air port, and under conditions of vacuum the bottom wall of said valve member seals against the bottom surface of the baffle and the side wall of said valve member seals against the side wall of said baffle member producing a double seal under these conditions.

References Cited in the file of this patent

UNITED STATES PATENTS

2,270,737	Langdon	Jan. 20, 1942
2,347,988	Burke	May 2, 1944
2,629,393	Langdon	Feb. 24, 1953
2,663,309	Filliung	Dec. 22, 1953
2,707,481	McPherson	May 3, 1955
2,746,477	Krause	May 22, 1956