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E. J. KOCOUR

2,102,848

VACUUM BREAKING DEVICE

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Fig. 1

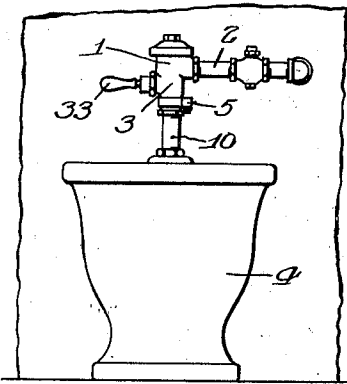


Fig. 2

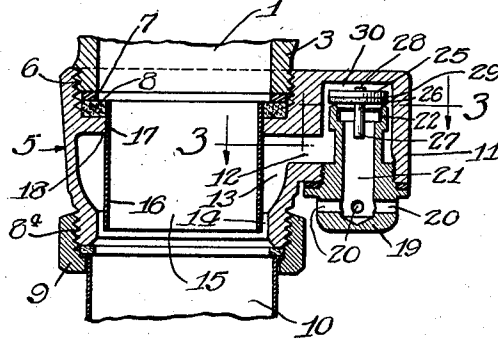


Fig. 3

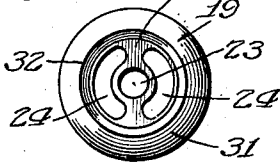


Fig. 4

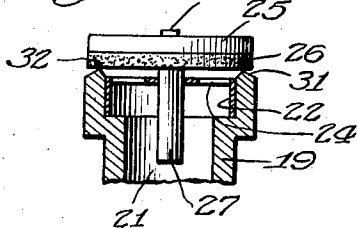
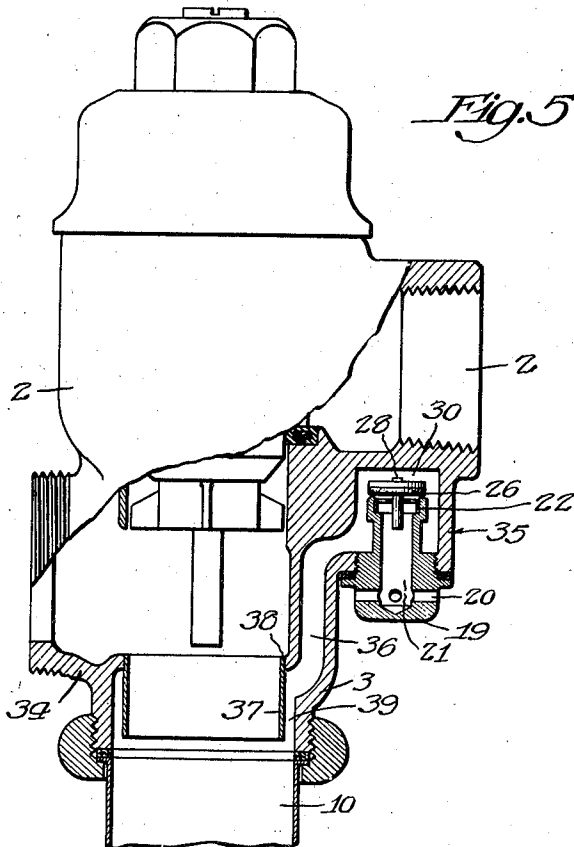


Fig. 5



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UNITED STATES PATENT OFFICE

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VACUUM BREAKING DEVICE

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9 Claims. (Cl. 137—93)

This invention relates to vacuum breaking devices and has for its object to provide a new and improved device of this description.

The invention has as a further object to provide a vacuum breaking device which will prevent back syphonage in water systems.

The invention has as a further object to provide a vacuum breaking device particularly adapted to be used in connection with flush valves.

The invention has as a further object to provide a vacuum breaking device for preventing back syphonage in water systems which will prevent leakage and which will also prevent noise during the flush of the flush valve.

The invention has as a further object to provide a vacuum breaking device which will be inconspicuous and attractive in appearance and which can be put upon any flush valve.

The invention has other objects which are more particularly pointed out in the accompanying description.

Referring now to the drawing, Fig. 1 is a view showing a flush valve with one form of vacuum breaker embodying the device in position.

Fig. 2 is a vertical sectional view through the vacuum breaking device.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2 with the closing device omitted.

Fig. 4 is an enlarged view of the upper end of the seating member.

Fig. 5 is a view showing a modified construction.

Like numerals refer to like parts throughout the several figures.

Referring now to the drawing, I have shown a flush valve 1 connected by a pipe 2 with the source of water supply, and having an outlet 3 which connects it to the water closet bowl 4. Connected with the discharge end of the flush valve is the vacuum breaking device which consists of the body portion 5 attached to the lower end of the flush valve by means of the thread 6.

I prefer to provide at the connecting point of the body portion with the flush valve suitable packing, such as the thin gasket 7 and the thick rubber gasket 8. This secures proper tightness at the joint.

The lower end of the body portion 5 is provided with a thread 8a by means of which an ordinary coupling 9 connects it with the discharge pipe 10. The body 5 of the vacuum breaking device has a hollow extension 11 which is connected by a passageway 12 with the chamber 13 in the body portion 5. This chamber 13 is connected by a narrow passageway 14 with the interior of the discharge pipe 10. The chamber 13 and passageway 14 are protected from the discharge passage 15 for the water from the flush valve, by the wall 16 which may be formed in any desired manner. As herein shown in Fig. 2 it consists of

a separate hollow pipe section threaded at 17 into a threaded opening 18 in the body portion 5.

The hollow side extension 11 of the vacuum breaking device is open at the bottom to receive the seating member 19. This seating member has threads at its lower end and is threaded into this opening. This seating member is provided with a central opening 21. Arranged at the top of this central opening is a guiding member 22 having a central opening 23 and the side openings 24. A closing member is located at the top of the seating member so as to close the opening 21. This closing member consists of the plate 25 with the soft rubber section 26 connected therewith and a pin 27 extending through both the parts 25 and 26. The upper end 28 of the pin projects beyond the part 25 so that when the closing device is lifted it will engage the wall of the extension 11 and prevent the closing device from sticking thereto.

This pin 27 passes through the guiding opening 23 so that the closing device will always be properly guided to its seat. Instead of having the central opening 21 open at the bottom, I prefer to provide a wall across the bottom and then provide lateral extending openings 29 which connect the central opening 21 with the external atmosphere. This prevents the seating member from being injured by anyone holding a lighted match at the bottom of the opening, or by inserting something therein.

The seating member 19 has its upper end surrounded by a space 29 which communicates with the space 30 located above said seating member. The spaces 29 and 30 are connected by the passageway 12 with the chamber 13. The seating face of the seating device 19 is preferably arranged to provide a line contact with the closing device. This is arranged by providing the upper end of the seating device with the beveled or inclined face 31 so as to provide the sharp part 32 upon which the soft material 26 of the closing device rests when it is in its closed position.

It will be seen that by this construction as pressure is applied to the closing device, the part 32 becomes more or less embedded in the soft material 26, thereby insuring a tight seating joint. The flush valve may be of any suitable form and is operated to flush the bowl by moving the handle 33.

Figure 5 shows a construction wherein the vacuum breaking device is made integral with the casing of the flush valve. In this construction the lower portion 34 of the casing of the flush valve is provided with the side extension 35 integral therewith and which forms the vacuum breaking device. This side extension has an opening at the bottom for the seating device 19 which is similar to the seating device shown in Fig. 2.

A similar closing device and associated parts are used. In this construction the space 30 above the closing device communicates with a passageway 36 formed in the body of the casing and which connects with the interior of the casing opposite the wall 37, which is formed by inserting a screw threaded hollow pipe section in a threaded opening in the casing, the threads being shown at 38. This forms a narrow inlet 39 for the mouth of the passageway leading to the space 30.

The use and operation of my invention are as follows:

When the device is used, it is placed in position at the discharge end of the flush valve, as shown in Fig. 1. Normally the closing device stands in its closed position resting upon the top of the seating member 19. When the flush valve is operated by moving the handle 33, water rushes down through the passageway 15 into the discharge pipe 10, thence into the bowl or other fixture. On first opening the flush valve the water rushes through the passageway 15, and this rushing water by an injector action suddenly draws air out of the hollow extension 11 and causes the closing member to be suddenly and forcibly lifted from its seat. As the water continues to flow, this closing member again seats.

The wall 16 keeps the water out of the extension 11 of the vacuum breaking device. By providing a narrow opening 14 leading to the chamber 13 and space 30, very little water will pass up into the chamber 30 and agitation of water will be prevented. Whatever water does pass up through the opening 14 will compress the air in the chamber 13 and the space 30 and this will insure the seating of the seating member 25 so as to prevent any water from escaping. The air in the space 30 and the chamber 13 also prevents the water from getting up into the space 30 so that there will be no water in said space at any time.

Upon closing the flush valve, the suction created by the weight of the water in the outlet 10 again raises the seating member from its seat. The air enters to fill the lower portion of the flush valve, the outlet pipe, and in some cases the upper chambers of the closet bowl to which the flush pipe is connected. It will thus be seen that the closing device is opened twice at every flush of the flush valve, the first opening being forcible, thereby insuring the proper action of the closing device and preventing its becoming stuck. This insures the proper operation of the closing device under all conditions and insures it against becoming inoperative by non use.

It will be noted that the seating member 25 and the portion 32 of the seating member are above the side inlet 12, so that the inrush of the air at the beginning of the flush does not strike the closing member and will, therefore, not knock it off its seat and cause leakage. This arrangement also insures the drawing back through the outlet 16 of any water which may be in the vacuum breaking device due to the flush of the flush valve.

The wall 16 obstructs the direct flow of water or air from the outlet pipe into the chamber 13 by the extension 11 of the vacuum breaking device. It also serves to prevent noise created by the rush of the water through the outlet from finding its way out through the vacuum breaking device and causing annoyance. The space 29 below and around the seat of the seating device

19 directs the inrushing current of air up around the inside and through the space 30, clear of the edges of the seating device so that the pressure in the space 30 will be on top of the closing device and create a holding down pressure thereon to insure the proper seating of the closing device, thereby insuring against leakage.

It will be seen that this construction, whereby the cubicle contents of the space below the level of the seat of the closing device, is large as compared with that of the space above the seat of the closing device, and the narrow outlet 14 for this space provides means which insures very little agitation of the surface of the rising water due to eddies, whirls and cross currents during the flow of the water. The pressures existing in the vacuum breaking device during the flush of the flush valve are never sufficiently great to force the level of the water up into the space above the seat of the closing device. Therefore, there can be no harmful effect produced by this water and no leakage under any conditions.

It is important to arrange the device so that water cannot reach this space due to the fact that when the pressure in the vacuum breaking device changes from pressure to vacuum, so as to lift up the closing device as hereinbefore set out, there would be escape of water if any water should be in this space. In the event the water closet outlet becomes stopped and the bowl is filled above the level of the rim flush holes and a partial vacuum occurs in the supply or riser at the same time, the closing device will be lifted by the suction thus created, the reduction of pressure above the closing device causing the pressure of the air in the apartment to lift it, and this will supply air to the flush valve and supply pipe until the vacuum is completely broken, thereby preventing the polluted water from the closet from being drawn back into the pure water supply pipes.

It will therefore be seen that this construction prevents back syphonage and at the same time prevents leakage and noise, and is inconspicuous and attractive in appearance.

I claim:—

1. The combination with a flush valve casing of a vacuum breaking device having a vertically disposed body portion through which the water from the flush valve passes, said body portion having a hollow eccentrically arranged extension which is a part of the flush valve casing, a seating element in said extension provided with a passageway communicating with the atmosphere, a closing device within the flush valve casing normally engaging said seating device so as to close said passageway, said extension being provided with a space above said seating device, a connection leading from said space to said body portion, and means associated with said connection for preventing the water from the flush valve from passing up to the top of said seating device.

2. The combination with a flush valve casing of a vacuum breaking device having a vertically disposed body portion through which the water from the flush valve passes, said body portion having a hollow eccentrically arranged extension which is a part of the flush valve casing, a seating element in said extension provided with a passageway communicating with the atmosphere, a closing device within the flush valve casing normally engaging said seating device so as to close said passageway, said extension being provided with a space above said seating device, a connection leading from said space to said body portion, and means for preventing the sound waves

produced by the water discharging from the flush valve from escaping to the exterior of the device.

3. The combination with a flush valve casing of a vacuum breaking device having a vertically disposed body portion through which the water from the flush valve passes, said body portion having a hollow eccentrically arranged extension which is a part of the flush valve casing, a seating element in said extension provided with a passageway communicating with the atmosphere, a closing device within the flush valve casing normally engaging said seating device so as to close said passageway, said extension being provided with a space above said seating device, a connection leading from said space to said body portion, a hollow pipe section in said body portion having a wall opposite the mouth of said connection so as to protect the same.

4. A flushing valve comprising a casing having an inlet chamber, a displacement chamber, and an outlet chamber, there being a valve port disposed between said inlet and outlet chambers for communication therebetween; automatic valve mechanism to control said valve port influenced by pressure in said displacement chamber to open or close said valve port, relief means normally closed and adapted to be opened to connect said displacement chamber to said outlet chamber, a bleeder by-pass disposed between said displacement and inlet chambers; siphon breaking means having a passage for placing the outlet chamber in communication with the atmosphere, said passage having an upright air chamber incorporated within the wall of the flushing valve with its inlet at the lower end, and an open ended tube upstanding in said air chamber ending short of the top thereof and communicating with the atmosphere at its lower end to form a trap for liquid and a muffler.

5. A flushing valve comprising a casing having an inlet chamber, a displacement chamber, and an outlet chamber, there being a valve port disposed between said inlet and outlet chambers for communication therebetween; automatic valve mechanism to control said valve port influenced by pressure in said displacement chamber to open or close said valve port, relief means normally closed and adapted to be opened to connect said displacement chamber to said outlet chamber, a bleeder by-pass disposed between said displacement and inlet chambers; siphon breaking means having a passage for placing the outlet chamber in communication with the atmosphere, said passage having an upright air chamber incorporated within the wall of the flushing valve with its inlet at the lower end, and an open ended tube upstanding in said air chamber ending short of the top thereof and communicating with the atmosphere at its lower end to form a trap for liquid and a muffler, said tube having a bolt like head threaded into the lower end of said air chamber and extending therethrough.

6. A flushing valve comprising a casing having an inlet chamber, a displacement chamber, and an outlet chamber, there being a valve port disposed between said inlet and outlet chambers for communication therebetween; automatic valve mechanism to control said valve port influenced by pressure in said displacement chamber to open or close said valve port, relief means normally closed and adapted to be opened to connect said

displacement chamber to said outlet chamber, a bleeder by-pass disposed between said displacement and inlet chambers; siphon breaking means having a passage for placing the outlet chamber in communication with the atmosphere, said passage having an upright air chamber incorporated within the wall of the flushing valve with its inlet at the lower end, an open ended tube upstanding in said air chamber ending short of the top thereof and communicating with the atmosphere at its lower end to form a trap for liquid and a muffler, and a normally closed check valve in said tube preventing egress of water from said air chamber.

7. A flushing valve comprising a casing having an inlet chamber, a displacement chamber, and an outlet chamber, there being a valve port disposed between said inlet and outlet chambers for communication therebetween; automatic valve mechanism to control said valve port influenced by pressure in said displacement chamber to open or close said valve port, relief means normally closed and adapted to be opened to connect said displacement chamber to said outlet chamber, a bleeder by-pass disposed between said displacement and inlet chambers; siphon breaking means having a passage for placing the outlet chamber in communication with the atmosphere, said passage having an upright air chamber incorporated within the wall of the flushing valve with its inlet at the lower end, an open ended tube upstanding in said air chamber ending short of the top thereof and communicating with the atmosphere at its lower end to form a trap for liquid and a muffler, and a normally closed check valve in said tube preventing egress of water from said air chamber, said tube having a bolt like head threaded into the lower end of said air chamber and extending therethrough.

8. In a valve structure having an inlet chamber through which a liquid is delivered under pressure, an outlet chamber through which said liquid flows, and a valve element adapted to establish and interrupt communication between said chambers, siphon breaking means having a passageway placing the outlet chamber in communication with the atmosphere, said passageway having an upright air chamber incorporated within the wall of the valve structure with its inlet at its lower end and an open ended tube upstanding in said air chamber and communicating with the atmosphere at its lower end to form a passageway for air leading into the chamber and to the outlet chamber.

9. In a valve structure having an inlet chamber through which a liquid is delivered under pressure, an outlet chamber through which said liquid flows, a valve element adapted to establish and interrupt communication between said chambers, siphon breaking means having a passageway placing the outlet chamber in communication with the atmosphere, said passageway having an upright air chamber incorporated within the wall of the valve structure with its inlet at its lower end and an open ended tube upstanding in said air chamber and communicating with the atmosphere at its lower end to form a passageway for air leading into the chamber and to the outlet chamber, and means checking the egress of air from the passageway to the atmosphere.

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