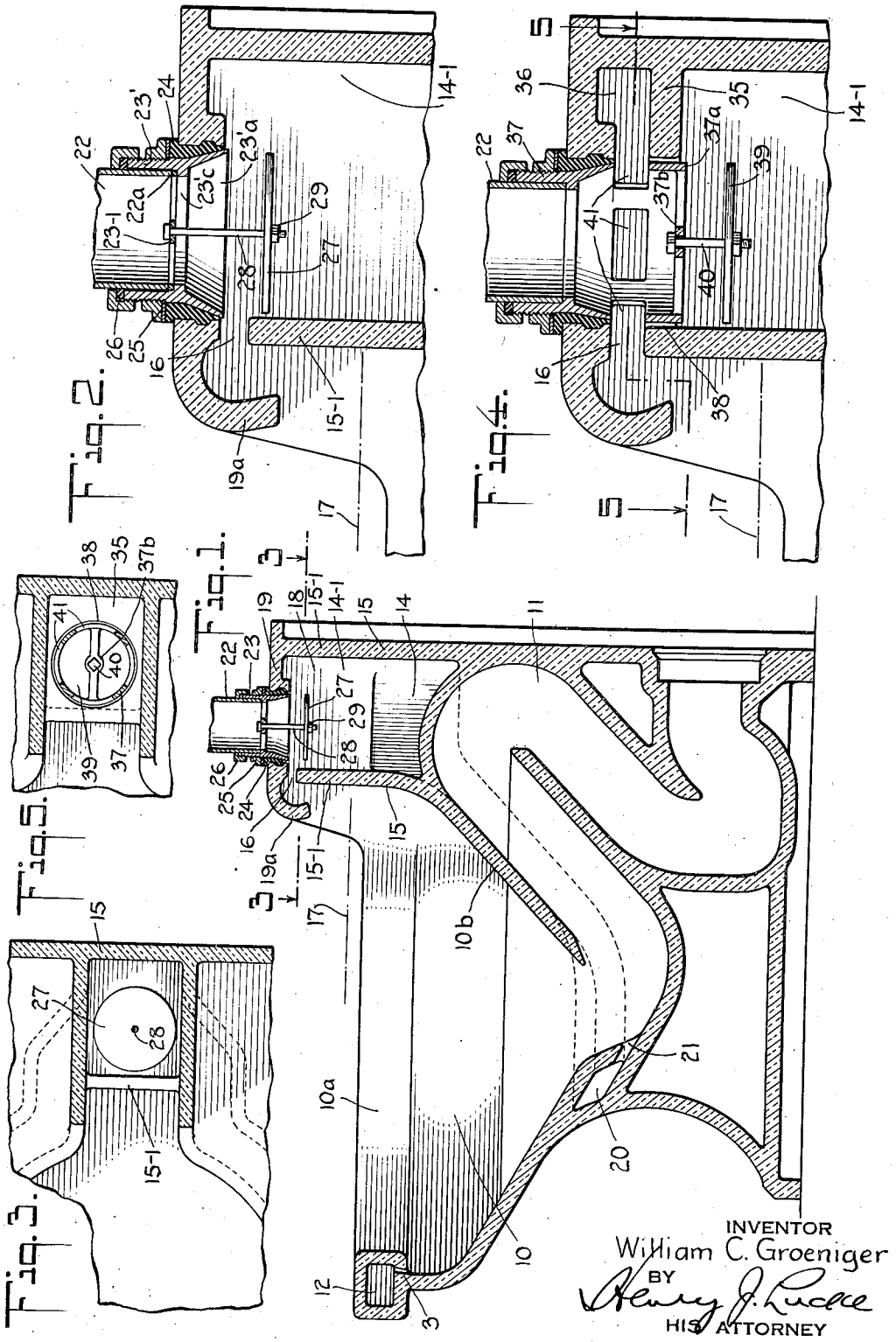
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SANITARY APPARATUS WITH AIR GAP

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SANITARY APPARATUS WITH AIR GAP

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8 Claims. (Cl. 4—69)

This invention relates to sanitary apparatus of the type embodying a receptacle and a system of piping for supplying water to the receptacle.

The invention is particularly directed to sanitary apparatus, of the specified type, wherein there is provided an air vent or gap for relieving any tendency toward the formation of a vacuum in the system of water supply piping.

A piping system supplying water to several outlet devices for a variety of uses is many times called upon to deliver more water than is possible considering the flow capacity of the system. Under such or analogous conditions there arises in the system a tendency toward the creation of a vacuum, which, if not relieved, is likely to establish what is known in the sanitary art as a cross connection and to syphon polluted water, standing dormant in receptacles of certain types of the outlet devices, back into the supply piping. This intermingling of polluted water with potable water being supplied, is likely to endanger the healths of those using the system.

Variously arranged air vents and diaphragm air valves have heretofore been associated with the outlet devices of such a system, for breaking the syphon and safeguarding health.

In my copending application Serial No. 163,383, filed September 11, 1937, and entitled "Defecator with combined flushing jet and air break" there is disclosed an air vent or gap disposed well above the overflow spill level of a sanitary bowl or receptacle, in communication with the water supply inlet, and arranged in such manner as to pass a minor flow of the flushing water therethrough and into the receptacle in the form of an additional flushing jet.

The present invention was developed primarily as an improvement on the construction disclosed in my aforestated copending application, but in its more generic sense, is applicable to a variety of types of sanitary apparatus.

An object of this invention is the provision of means for positively diverting a minor portion of the inflow of water through the air vent or gap into the receptacle.

An object is the provision of valve means for absorbing the shock of suction in the water supply piping.

An object is the provision of valve means adapted to close when there is a suction effect exerted in the supply piping, but normally maintained open in a position to divert a minor portion of the inflow through the air gap as aforestated.

In the drawing:

Fig. 1 represents a vertical section taken centrally through a preferred type of sanitary apparatus embodying features of the invention.

Fig. 2 is an enlarged fragmentary view of the upper right hand portion of Fig. 1 illustrating a slightly different valve construction.

Fig. 3 represents a slightly enlarged fragmentary horizontal section taken on the line 3—3, Fig. 1.

Fig. 4 is a view similar to that of Fig. 2, but illustrating a different form of the invention.

Fig. 5 represents a horizontal section taken on the line 5—5, Fig. 4.

The embodiments illustrated in the drawing represent merely an example of types of sanitary apparatus incorporating features of this invention. They disclose defecator construction which is essentially similar to that set forth in my previously referred to copending application Serial No. 163,383.

With respect to Figs. 1 and 2, a defecator bowl 10 provides a waste receiving and discharging receptacle. An evacuator construction, indicated generally at 11, serves as the discharge passage for liquid and waste matter flushed from the bowl. As illustrated, the bowl 10 and the evacuator 11 may be formed integral with each other from vitreous china or other suitable material.

An important feature of the invention resides in the provision of an air vent or gap located well above the overflow spill level of the receptacle so that it is constantly open to the atmosphere beyond all possible flow communication with liquid contents of the receptacle, and, further, in the provision of a valved inlet adjacent the air vent or gap for the supply of flushing water to the apparatus from a water supply piping system. The air vent or gap preferably is so arranged as to direct a jet of water across inner surfaces of the bowl substantially unserved by flushing jets otherwise provided. The valve associated with the inflow is advantageously of a type which is normally maintained open by the force of gravity and which closes due to suction exerted within the confines of the water supply piping, thus absorbing the shock of sudden suction effects. The valve element advantageously acts as a distributor for the inflowing water, and positively directs a minor flow thereof out through the air vent or gap in the form of a flushing jet.

In the illustrated construction, the bowl 10 has a rim 10a which embodies a rim channel 12 and provides rim jets 13 at spaced intervals around

its length. The rim 10*a* does not completely encircle the bowl, but merges into the rear portion of the defecator at the lateral sides thereof, thus leaving a rear portion of the inner surfaces of the bowl 10, see 10*b*, unserved by rim jets 13.

A distributing chamber 14 is formed at the rear of the bowl by enclosing front and rear walls, indicated 15, 15.

For providing an air vent or gap 16 disposed well above the overflow spill level—indicated by broken line 17—the front and rear walls 15 are extended upwardly, as at 15—1 to join upstanding lateral walls 18, 18, and top wall 19, and thus to form an upper extension 14—1, of distributing chamber 14. For a purpose hereinafter made clear, upward extension 14—1 of the distributing chamber 14 is of comparatively narrow width. Air vent or gap 16 is formed between the upper part of front wall 15—1 and top wall 19, and advantageously extends across the width of the upper chamber 14—1. Top wall 19 is preferably curled downwardly at the front, see 19*a*, to provide a spout formation, for air vent or gap 16, which overhangs the bowl inner surface 10*b*.

By the expression "well above the overflow spill level" is meant such a distance above the overflow spill level of the bowl as will preclude all possibility of liquid flow cross connection between the contents of the bowl—no matter at what level—and the air vent or gap. One and a half inches above is a safe minimum, but preferably the distance is even greater.

The bowl 10 may be provided with any preferred type of main flushing jet or jets. As illustrated, the main jet channels 20, 20 extend downwardly from communication with distributing chamber 14 at opposite sides of the bowl, and merge at the main jet opening 21.

For supplying flushing water to the distributing chamber portions 14 and 14—1, piping 22 leads downwardly into chamber upper portion, 14—1, through the top wall 19. The connection may be made in any suitable water-tight manner, but it is preferred to employ a spud connection comprising a downwardly flared coupling 23, whose lower circumferential rim forms an annular valve seat, see 23*a*, for a movable valve element. The annular valve seat, however, may be provided in a number of different ways obvious to those skilled in the art. The connection may be made water-tight in any suitable manner, as for instance by employing a rubber gasket 24 and associated ring nut and washer, indicated generally at 25. The ring nut and associated washer indicated generally at 26, may be provided as a water-tight capping for the connection.

Positioned in the coupling 23, and extending transversely of the passage therethrough, is a spider 23*b*, which may be integral with the abutment rim 23*c* of the coupling 23, as is illustrated in Fig. 1, or which may be secured therein in any convenient manner, as for instance as is shown in Fig. 2, between the received end 22*a* of piping 22 and the abutment rim 23'*c* of coupling 23'.

The movable valve element associated with the supply piping 22 is preferably a disk 27 slidably mounted on a slideway 28 passed through an aperture formed at the center of the disk. Slideway 28 may be conveniently provided by a relatively long bolt whose shank is unthreaded throughout the greater part of its length. The bolt is passed through a central perforation in the spider 23*b*, Fig. 1, or 23—1, Fig. 2, and is supported by contact of its head against the spider.

As is illustrated in Figs. 1 and 2, the slideway 28 is so disposed with respect to air vent or gap 16 that the zone of movement of valve element 27 is in substantially horizontal alignment with such air vent or gap 16. The movable valve element 27 is advantageously of such diameter as will extend across the greater part of the width of upper chamber 14—1. It is normally maintained upon, that is against the stop nut 29, by the force of gravity, and, thus, provides a table formation adapted to positively direct a minor portion of the inflowing water through air vent or gap 16 to form a flushing jet which scours the bowl inner surface 10*b*. The remainder of the inflowing liquid descends through chamber upper portion 14—1 to chamber lower portion 14, and thence, through the rim channel 12 and the main jet channels 20, into the bowl 10. Inflow of flushing water through supply piping 22 may be controlled by a flushometer of conventional type (not shown).

Should there be any tendency for a vacuum to arise in the supply piping 22, the suction effect created will draw movable valve element 27 upwardly against valve seat 23*a*, Fig. 1, or 23'*a*, Fig. 2. Thus, movable valve element 27, as it closes, absorbs the shock of the suction, and, coincidentally, air, for dissipating the vacuum conditions, is sucked in through air vent or gap 16.

In Figs. 4 and 5 is illustrated a slightly different embodiment of the construction illustrated in the prior figures. A wall 35 extends transversely across the upper part of chamber upper portion 14—1, just below the air vent or gap 16, to form an air inflow passage 36. The coupling, which connects supply piping 22 through top wall 19. has a depending skirt 37 passing through and across air passage 36 and down through a suitably provided aperture 38 in transversely extending wall 35. The lower rim 37*a* of depending skirt 37 forms a valve seat for a movable valve element 39.

The spider 37*b* is formed integral with the lower portion of the skirt 37 and serves to suspend the slideway 40 in a manner similar to that of the prior figures. Ports 41 are formed in the walls of skirt 37 in substantially horizontal alignment with the air passage 36.

Accordingly, during normal operation, a minor portion of inflowing water is directed through ports 41 for passage into the bowl, through air vent or gap 16, in the form of a flushing jet. When there is a tendency toward the creation of a vacuum, or when there is an actual vacuum present, in the piping 22, movable valve element 39 moves upwardly on a slideway into contact with valve seat 37*a*, thus absorbing the shock of the suction. Coincidentally, air is drawn through air vent or gap 16 and ports 41 to overcome the abnormal vacuum conditions in the supply piping.

While the present invention has been illustrated and described with respect to the sanitary apparatus of the type disclosed in my copending application Serial No. 163,383, it should be understood that, in its generic concept, it is applicable to many different types of sanitary apparatus. Further, various structural changes may be made in the specific embodiment of valve mechanism, and in its disposition relative to the air vent or gap, without departing from the spirit and scope of the invention as set forth herein and in the claims that follow.

I claim:

1. In combination with sanitary apparatus, a sanitary receptacle adapted to be flushed; a hollow upstanding portion extending well above the overflow spill level of the receptacle and forming a chamber for the distribution of flushing liquid to the receptacle; inflow means for flushing water communicating with said chamber at the top of said hollow upstanding portion and forming a valve seat thereat; an air gap formed in the upper part of said hollow upstanding portion and communicating with said chamber; and a valve element, normally maintained in open position by gravity, and adapted to seat over said inflow means by the force of suction effective through said inflow means.

2. In combination with sanitary apparatus, a sanitary receptacle adapted to be flushed; a hollow substantially closed upstanding portion extending above the overflow spill level of the receptacle and forming a substantially enclosed chamber for the distribution of flushing liquid to the receptacle; piping, for the supply of flushing liquid, communicating with said chamber through the closed top thereof; a valve seat associated with said piping adjacent its location of intersection with said closed top of the chamber; a valve element slidably mounted on substantially vertical slideway means, said slideway means being associated with said valve seat, whereby said valve element is normally held out of engagement with said valve seat due to gravity but is adapted to move into engagement with said valve seat due to suction when there is a vacuum in said piping; and an air vent disposed in the upper part of said upstanding portion and communicating with said chamber.

3. Apparatus, as recited in claim 2, wherein the air gap is disposed adjacent to and in substantially horizontal alignment with the zone of movement of the valve element, and wherein the valve element is so constructed and arranged as to direct a minor portion of the inflowing flushing water through the air gap.

4. In combination with sanitary apparatus, a sanitary receptacle adapted to be flushed; a hollow substantially closed upstanding portion extending above the overflow spill level of the receptacle and forming a substantially enclosed chamber for the distribution of flushing liquid to the receptacle; piping for the supply of flushing liquid, communicating with said chamber through the closed top thereof; a spud connection joining said piping with said closed top of the chamber and forming a valve seat thereat; a spider supported by said spud connection and extending across the opening thereof; a rod depending substantially centrally from said spider; a valve element slidably disposed on said rod in such manner as to be normally positioned adjacent the bottom end thereof due to gravity but capable of automatically moving upwardly into engagement with said valve seat when there is suction in said piping; and an air vent disposed in the upper part of said upstanding portion and communicating with said chamber.

5. Apparatus, as recited in claim 4, wherein the air gap is disposed adjacent to and in substantially horizontal alignment with the zone of movement of the valve element, and wherein the valve element is so constructed and arranged as to direct a minor portion of the inflowing flushing water through the air gap.

6. Apparatus, as recited in claim 2, wherein a substantially horizontal partition extends across the chamber immediately below the air vent, wherein there is an extension of the piping passing through the said partition, wherein the valve seat and the valve element are disposed below the said partition, and wherein there are ports formed in said extension of the piping and communicating with the air vent.

7. In combination with sanitary apparatus which includes a receptacle adapted to be flushed, inflow means adapted to connect with a piping system for the supply of flushing water to the receptacle, an air gap disposed well above the overflow spill level of the receptacle and establishing communication between the said inflow means and the atmosphere, and valve means associated with said inflow means, said valve means including a valve element normally maintained open by gravity but adapted to close by the force of suction operative within said piping system.

8. Apparatus as recited in claim 7 wherein the air gap is disposed adjacent to and in substantially horizontal alignment with the zone of movement of the valve element and is so constructed and arranged relative to the receptacle and to the inflow means as to be adapted to receive water from the inflow means and to direct a jet of the same over inner surface portions of the receptacle.

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