

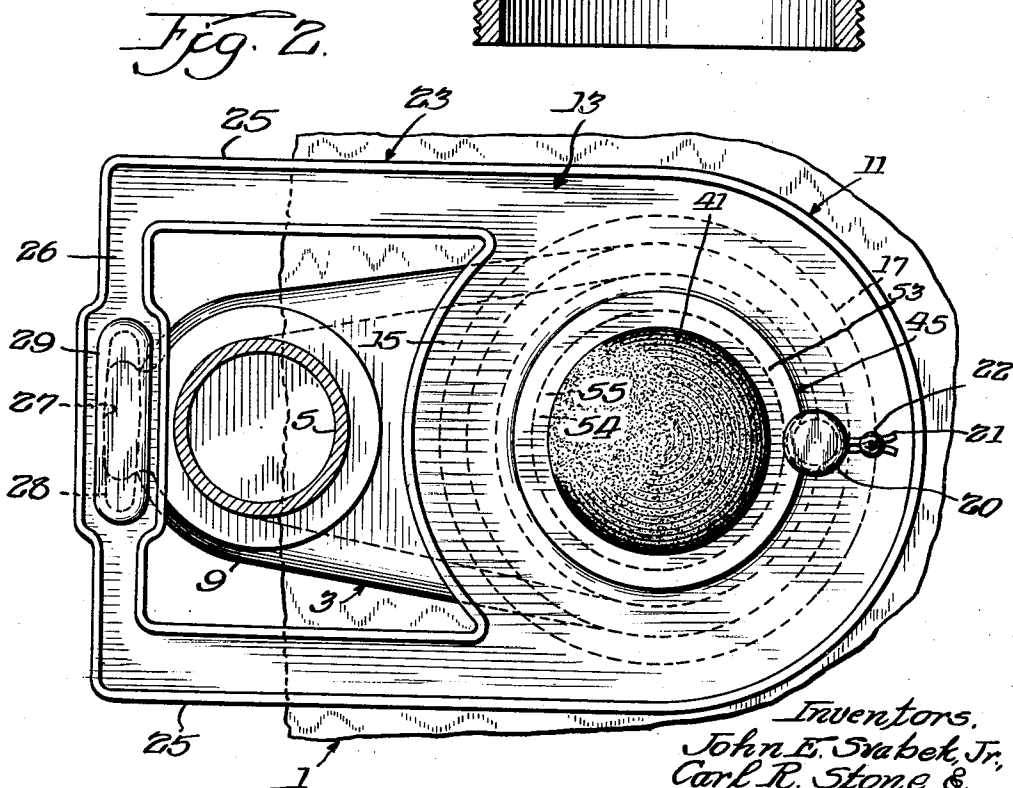
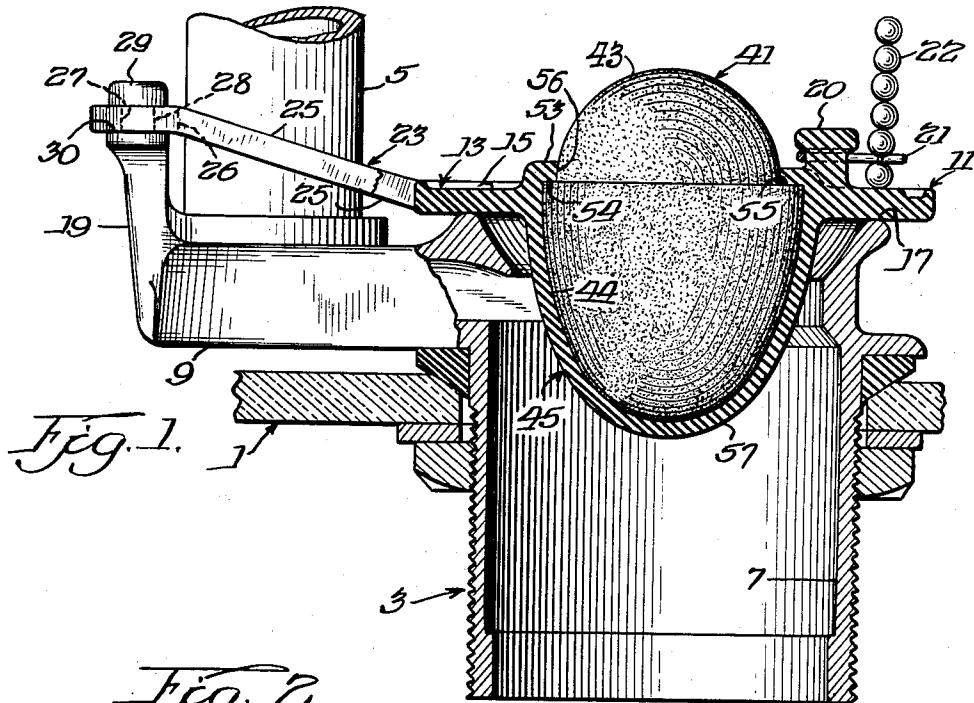
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FLAPPER FLUSH VALVE

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FLAPPER FLUSH VALVE

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Original application May 21, 1954, Ser. No. 431,435, now Patent No. 2,756,437, dated July 31, 1956. Divided and this application July 9, 1956, Ser. No. 596,694

6 Claims. (Cl. 4—57)

This invention relates generally to valves, and more particularly, it concerns discharge valve constructions for water storage tanks or the like, such as used in connection with the flushing water closets for instance.

The present application is a division of copending application Serial No. 431,435, filed May 21, 1954, now Patent No. 2,756,437, issued July 31, 1956.

The present invention, like the parent application is particularly directed to a light weight flapper type valve construction which will not increase perceptibly in weight in the course of valve operation. More particularly, as will be hereinafter apparent, the outlet spanning and sealing portion of the valve closure member is formed into a cavity or pocket preferably having a resiliently lipped or reduced mouth for interlocking, fluid sealed reception of a light weight, water impervious float element, such as a mass of foam polystyrene, the float element at least substantially filling the entire pocket to further reduce the likelihood of liquid absorption by eliminating as much as possible any space between the float element and said pocket in which entrapment of water or foreign material could occur.

It is an important object in the preferred form to provide a structure in which the cavity or pocket is upwardly opening with the fluid head of the tank augmenting the fluid sealing between the lip or reduced mouth portion and float element contained in the cavity.

Other objects and advantages will become more readily apparent and the invention will be more greatly appreciated by proceeding with the following description read in the light of the accompanying drawing, in which

Fig. 1 is a sectional view of a portion of a water closet flush tank to which a construction according to the present invention is applied; and

Fig. 2 is the top plan view of the same.

Referring in detail to the drawing figures, the numeral 1 designates a flush tank for a water closet or the like, shown fragmentarily, said flush tank having an outlet or discharge opening through the floor thereof and a seat surface around the opening at the inner or upper end of the same. In the construction illustrated, the seat surface, identified by the numeral 17, of the tank is on an outlet fitting 3, similar to that conventionally employed and mounted through the floor of the tank in the usual fluid tight manner, the water of the tank actually discharging through the port 7 of the outlet fitting. It should be understood of course that such an outlet fitting need not necessarily be employed but the seat surface may be on an integral portion of the tank or the part of the floor thereof adjacent of the outlet opening, the discharging water in this case coming in direct contact with the side of the opening.

As is usual, the outlet fitting shown includes a side extension 9 to which is connected an overflow tube 5. Also in the present construction, the outlet fitting is provided with an integral, upwardly extending portion 19 at the rear of the side extension 9 specially formed for

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engagement of the instant flapper type swinging valve member 11.

The details of the engagement or mounting of the closure member on the extension 17 does not form part of the present invention but constitutes the subject matter of copending application Serial No. 397,456, filed December 10, 1953, now Patent No. 2,774,972, issued December 25, 1956. Briefly, however, the closure member preferably comprises a single or unitary piece of material such as rubber possessing flexibility and resiliency, said member having rearwardly extending means 23 comprising spaced arms 25 and the crossbar 26 at the rear of the latter. The crossbar contains a transversely extended elongated opening or slot 27 for reception of a correspondingly elongated post projection 28 of the extending member 19. The post projection includes an enlarged, transversely elongated button-head 29 at the top thereof for retention of the closure member in mounted relation thereon. The closure member is accordingly retained between this button-head and a flat surface 30 of the member 17 extending around the post projection, as clearly shown. Because of the resiliency of the closure member including the crossbar, the latter part is conveniently distortable over the enlarged button-head and onto the reduced portion of the post therebelow for mounting of the closure.

The closure member further comprises a closure portion 13, extending across and sealing the top of the outlet opening in the closed valve position. The latter portion in turn comprises an annular, peripheral, substantially flat portion 15 for actual engagement with the seat surface 17 and a portion 45 closing and sealing the center of the peripheral portion.

According to the present invention, the central portion 45 is formed into an upwardly opening pocket or cavity 44 for reception of a float element 41, preferably constructed of a body or mass of light weight, sealed cellular, inherently impervious material such as foam polystyrene. The portion of the closure member forming the receiving pocket, as shown in the drawing, has a curved solid portion 57 forming the sides and bottom or back of the pocket of generally ovoid or egg shape, this portion extending within the outlet opening of the tank or in this case the port 7 of the outlet fitting in closed position of the valve. The central portion of the valve also is provided with an inwardly extending lip 53 at the top or open mouth portion of the pocket so as to reduce the size of that mouth opening. The lip portion preferably presents a downwardly facing flat annular shoulder 54 for a purpose to be made clear below. The float element as evident from Fig. 1, at least conforms to the inside configuration of the pocket 44 substantially filling the same. It is preferable, however, that the float element be slightly larger than the cavity into which it is placed, at least along certain dimensions or in certain regards. This will be explained below.

It is quite important in flush valves for water closet tanks to provide as light weight a valve construction as possible so as to permit a maximum amount of water discharge through the outlet opening prior to closing of the valve. In line with this objective it is most desirable to supply a valve construction which will retain as nearly as possible its original light weight and prevent any absorption of water and other material which would add to its weight. In the present instance therefore where inherently impervious float material such as foam polystyrene has been employed for the float element, this float element entirely fills the cavity or pocket and engages the lip 53 in fluid sealed relation as will be brought out. Such arrangement of course prevents the introduction of fluid and other material into the cavity between the float element and receiving portion of the closure.

This arrangement therefore prevents any increase of weight tending to reduce buoyancy of the closure member. Also, by the use of a sealed cellular material which is inherently impervious, water logging of or absorption of water by the material itself will not take place.

Continuing further with the invention and as previously noted, the main portion of the closure member is constructed of flexible, resilient material such as rubber. The portion of the closure member forming the cavity or pocket is therefore distortable and stretchable, particularly because of its relatively thin section throughout the extent of the lower part 57 of the central portion of the closure member. In order to insure fluid tight sealing between the lip 53 and the annular flat shoulder 55 of the float element, it is preferable that the float element is somewhat larger in size than the cavity 44 prior to reception of the float element therewithin. When the float element is inserted within the cavity such somewhat larger size will tend to stretch or distort the relatively thin walled float receiving portion of the closure member therefor, especially when pressed downwardly by one's fingers to insure total reception during assembly, tending to draw the float element upwardly into tight resiliently urged contact with the shoulder 54 of the closure member for the fluid sealed engagement. It should be noted that slightly larger proportions of the float element either crosswise on the one hand or in length or depth on the other will have substantially the same effect in causing stretching of the curved lower portion 57 of closure member. Preferably, however, the increased size of the float element should be approximately uniform in both the cross direction as well as length. This is for the reason that any larger size crosswise or in transverse diameter tends to spread or expand the pocket away from the center of the cavity, which results in a certain expansion of the lip portion itself producing a larger size opening or mouth. Such expansion of the lip will accordingly tend to make the lip more rigid and less flexible than it would otherwise be, especially where there is any substantial expansion of the closure member pocket, which increased rigidity and tension would further tend to draw the lip itself against the shoulder 55 and also better retain or lock the float element within the cavity because of the greater firmness and rigidity of the lip. Of course expansion of the mouth and the size of the upper portion 43 can be taken into account in the matter of fit or the relationship between the inside surface 56 of the lip and the upper portion. It is desirable, again here, for the diameter of the upper portion 43 to at least slightly exceed the mouth of the pocket or space inside of the wall 56 of the lip portion prior to insertion of the float element whereby to provide for resilient fluid tight engagement of the upper portion of the float element by the inside surface 56 of the lip.

To complete the valve structure, an upstanding knob-like projection 20 is provided at the front of the valve member for attachment thereto of a wire connecting member 21 through which extends in attached relation a flexible chain 22 for actuation of the valve member by means of the usual lever (not shown). Although this particular means of chain attachment is shown, such chain could be attached by means of a simple loop of wire extending through an opening in the forward end of the closure, for instance in this case, the closure member could be mounted on the mounting post 28 either side up for an alternate or renewed seating engagement between the flat disc-like portion 13 and the seat surface 17. An inverted positioning of the closure member would be quite satisfactory as far as retention of the float element because of the rigidity of the lip portion 53 for retention of the same. Greater thickness of the lip or a firmer, less flexible consistency of rubber or the like may be employed for this portion.

Other modifications and forms are within contemplation, it therefore being desired that the claims be read and

restricted by their own terms read in view of the overall inventive concept and spirit in its various facets.

We claim:

1. In a valve structure having a port opening and a valve seat around the opening, a closure member mounted for swinging movement into the open and closed positions, said closure member comprising a peripheral flange portion extending over and engaging the valve seat in the closed valve position and an integral central portion closing and sealing the center of the peripheral portion, said central portion being formed into a substantially liquid impervious pocket having an open mouth, a substantially liquid impervious float element received within the pocket, said closure member including an annular portion extending inwardly from the side of the pocket at the mouth thereof whereby to reduce the size of the mouth opening, said float element being substantially rigid and provided with surface means snugly engaging the annular portion continuously therearound, said float element being of at least generally the shape of a substantial portion of an egg vertically disposed within said open pocket, said egg portion having circular sections normal to the long axis of the egg, said float element having an axis corresponding to the long axis of the egg which extends at least generally normal to the plane of the port opening when the closure member is closed, said pocket of the central portion of the closure member at least substantially closely conforming to the float element therewithin, at least part of said closure member immediately adjacent the inwardly extending portion being deformable and resilient for insertion of the float element within said pocket.

2. In a valve structure having a port opening and a valve seat around the opening, a closure member mounted for swinging movement into the open and closed positions, said closure member comprising a peripheral flange portion extending over and engaging the valve seat in the closed valve position and an integral central portion closing and sealing the center of the peripheral portion, said central portion being formed into a substantially liquid impervious pocket having an open mouth, a substantially liquid impervious float element received within the pocket, said closure member including an annular portion extending inwardly from the side of the pocket at the mouth thereof whereby to reduce the size of the mouth opening, said float element being substantially rigid and provided with surface means engaging the annular portion continuously therearound at an inner peripheral corner portion, said float element being of cross section over at least a substantial portion thereof of increasing size towards the mouth of said pocket, said pocket at least substantially closely conforming to the float element therewithin, at least part of said closure member being deformable and resilient at said peripheral corner portion for insertion of the float element within said pocket.

3. In a valve structure having a port opening and a valve seat around the opening, a closure member mounted for movement into the open and closed positions, said closure member comprising a peripheral flange portion extending over and engaging the valve seat in the closed valve position and an integral central portion closing and sealing the center of the peripheral portion, said central portion being formed into a substantially liquid impervious pocket having an upwardly extending open mouth, a substantially liquid impervious float element received within the pocket, said closure member including an annular portion extending inwardly at the mouth of the pocket whereby to reduce the size of the mouth opening, said float element being substantially rigid and provided with surface means for centering the float element in the pocket and engaging the annular portion continuously therearound, said pocket of the closure member at least substantially closely conforming to the float element therewithin, at least part of said pocket and said annular por-

tion being elastically deformable for insertion of the float element within said pocket, said float element being somewhat larger within said pocket than is the pocket prior to reception of the float element therewithin during assembly for stretching of at least a portion of said pocket to maintain the float element in substantially liquid tight abutting contact with said annular portion of the closure member.

4. In a valve structure having a port opening and a valve seat around the opening, a closure member mounted for swinging movement into the open and closed positions, said closure member comprising a peripheral flange portion extending over and engaging the valve seat in the closed valve position and an integral central portion closing and sealing the center of the peripheral portion, said central portion being formed into a substantially liquid impervious pocket having an open mouth, a substantially rigid and substantially liquid impervious float element received within the pocket, said float element being at least partly defined within said pocket by a surface of revolution providing circular sections at least generally parallel to the plane of the port opening when the closure member is in the closed valve position, said pocket of the closure member at least substantially closely conforming to the float element therewithin so as to be at least essentially entirely filled by said float element, said central portion of the closure member also being formed so as to provide a reduced mouth of the open pocket, said float element being provided with annularly offset surface means on an upper portion thereof engaging at least the portion of the central portion in the region of the reduced mouth continuously therearound for substantially liquid tight sealing therewith, at least part of said closure member adjacent the mouth being resiliently deformable for insertion and resilient retention of the float element within said pocket.

5. In combination with a fluid vessel or the like having a port opening through which fluid in the vessel is flowable and a valve seat around the opening, a closure member mounted for movement into the open and closed positions, said closure member comprising a peripheral flange portion extending over and engaging the valve seat in the closed valve position and an integral central portion closing and sealing the center of the peripheral portion, said central portion being formed into a substantially liquid impervious limitedly elastic pocket having

an open mouth facing in the opposite direction to that of the fluid flow through said port opening, a substantially liquid impervious float element received within the open pocket, said pocket of the closure member when stretched predeterminately at least substantially conforming to the float element therewithin, said pocket extending continuously around said float element and being resilient in the region of the open mouth thereof to hold said float element in substantially liquid sealed relation therewith.

6. In combination with a fluid vessel or the like having a port opening through which fluid in the vessel is flowable and a valve seat around the opening, a closure member mounted for movement into the open and closed positions, said closure member comprising a peripheral flange portion extending over and engaging the valve seat in the closed valve position and an integral central portion closing and sealing the center of the peripheral portion, said central portion being formed into a substantially liquid impervious pocket having an open mouth facing in the opposite direction to that of the fluid flow through said port opening, a substantially liquid impervious float element received within the open pocket, said closure member including an annular portion of flexible resilient material such as rubber extending inwardly at the mouth of the pocket whereby to reduce the size of the mouth opening, said float element having downwardly projecting annular surface means snugly engaging the annular portion of the closure member continuously therearound, said float element being at least partly defined within said pocket by a surface of revolution providing circular sections at least generally parallel to the plane of the port opening when the closure member is in the closed valve position, said pocket of the closure member for its full depth at least substantially closely conforming to the float element therewithin.

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