July 31, 1956 J. E. SVABEK, JR., ET AL 2,756,437

FLAPPER FLUSH VALVES

Filed May 21, 1954

Fig. 1.

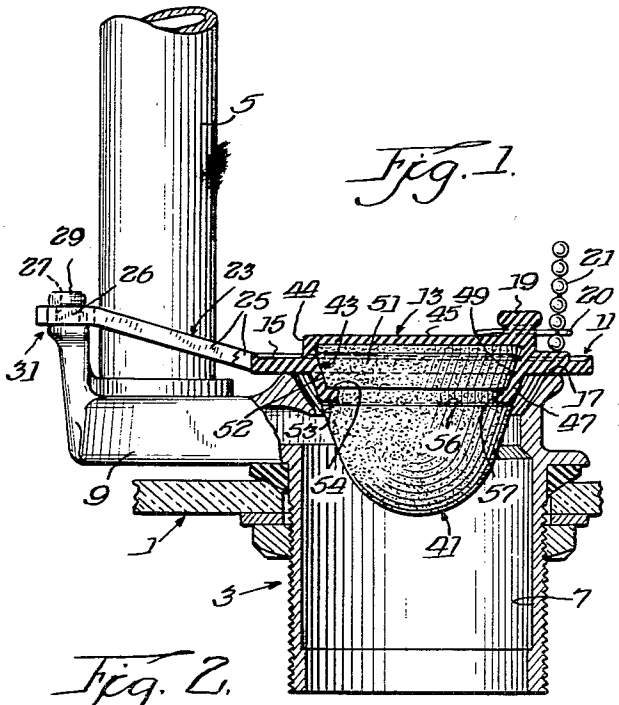



Fig. 3.

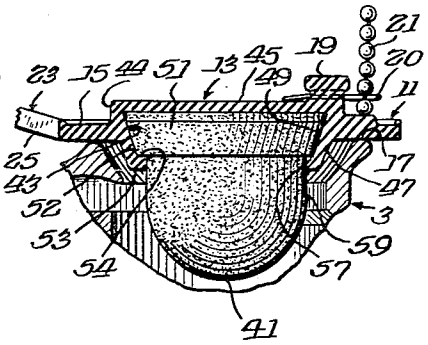



Fig. 2.

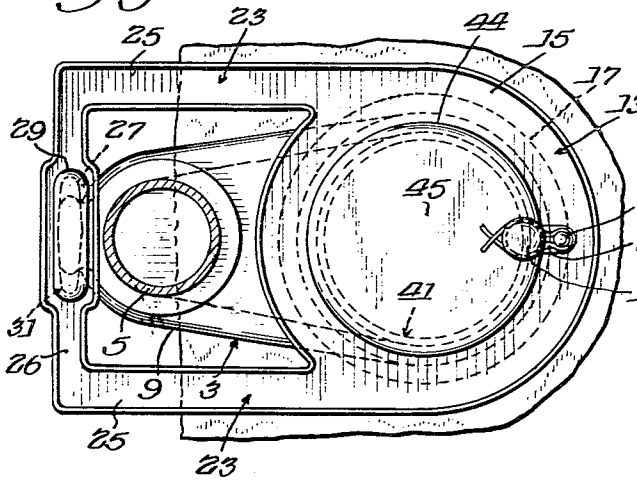
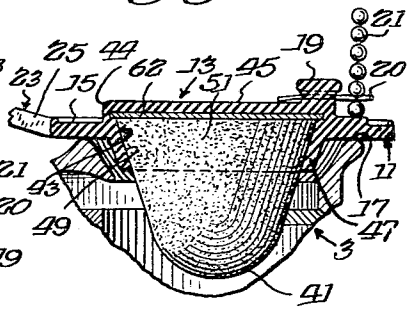



Fig. 4.




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# FLAPPER FLUSH VALVES

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Application May 21, 1954, Serial No. 431,435

3 Claims. (Cl. 4—57)

This invention relates generally to valves, and, more particularly, it concerns discharge type of valves such as the outlet valves employed for toilet bowl flush tanks or the like.

The invention is especially applicable to what is termed flapper type valves and when so applied it constitutes an improvement over co-pending patent application Serial No. 401,849, filed January 4, 1954. That application concerns the use of an especially lightweight float construction for flapper type valve closures and particularly recommends a sealed cellular construction of foam type or plastic, such as foam polystyrene. According to that application, a float element of proper construction is secured to the flexible flapper member by cementing although it is suggested that other suitable means not specified might be employed.

The present invention is directed to improved means for securing the float member to a closure especially of the flapper type and provides for a specially formed closure which is adapted to receive the float in interengaged relation for retention thereof. More particularly, the closure is shaped to form a cavity of substantial proportions into which the float element is slipped in assembly, the cavity being so shaped as to retain the float element when inserted and being deformable to permit such introduction.

The invention will be more easily appreciated by proceeding with the following description read in the light of the accompanying drawings, in which:

Fig. 1 is a sectional assembly view of a valve constructed in accordance with the present invention.

Fig. 2 is a top plan view.

Fig. 3 shows a fragmentary portion of the valve in which a modified float is employed.

Fig. 4 shows a fragmentary portion of another modified form of the valve.

Similar reference numerals refer to similar parts throughout the several views.

Referring in detail to Figs. 1 and 2, the numeral 1 designates a fragmentary portion of a flush tank as used with toilet bowls or the like, the tank being provided with a ported seat 17, which may either be integral with the floor of the tank, or as illustrated it may be used on a ported seat member 3 which forms an outlet through the bottom of the tank. The tank is also provided with the usual overflow means, in this instance, comprising the tube 5 attached to the seat member 3 and communicating with the port or flow passage 7 of the seat member through the recessed side extension 9 thereof. Attached for swinging movement to any suitable part of the tank, and here shown attached to the seat member 3 thereof, is a flapper member generally designated 11. The latter member comprises a closure portion 13 including an annular flat portion 15 for fluid sealing contact with the top of the valve seat 17 in the closed valve position. The front of the seat contacting portion is provided with a button-like projection 19 to which is connected a clip 20 attached in turn to a flexible chain 21 for lifting actuation of the flapper member by means of the usual tank operating handle and lever (not shown).



Extending from the rear of the closure portion and preferably along each side of the overflow tube 5 is an attachment portion 23, here illustrated as comprising a pair of spaced arms 25 and a cross-piece or end connecting element 26 at the rear thereof extending beyond the overflow tube 5 as shown. The latter piece is centrally recessed or apertured at 27 for reception of a button-like formation 29 of a positioning or mounting means 31 for connection of the flapper member to the tank or more particularly to the ported seat member 3 thereof. It will be understood that the recessed crossbar 26 is resiliently slipped over this button formation in mounting of the flapper member, the portion around the recess stretching or distorting for effecting admission of the large buttonhead as shown in Fig. 1. The flapper member is thus securely fastened for swinging movement into open and closed positions, the flapper member being formed of rubber or other flexible material or at least having flexible arms to permit such described movement of the valve member. In other instances (not shown) similar flapper members may be pivotally mounted for movement in the vertical direction, in which cases, the arm portions of the closure member need not flex for this movement, but may be constructed of other material. The flapper member of this invention is preferably constructed of resilient material throughout, however. To eliminate sidewise movement or rotation of the flapper member 11 about the point of attachment and for the purpose of keeping the closure portion 13 in substantial alignment with the ported valve seat for proper operation and uninterrupted service, the positioning means 31 is elongated near the top including the button 29 thereof. The recess 27 of the flapper member is correspondingly elongated for this purpose. The mounting of an identical closure member up to the present point of description is more specifically treated in and forms a part of the subject matter of co-pending application Serial No. 397,456, filed December 10, 1953. Other methods of mounting and positioning the flapper member for swinging movement both with and without special provisions for preventing sidewise movement are covered in the same application and also in co-pending application Serial No. 344,506, filed March 25, 1953, to which attention is directed. The particular method of mounting the flapper member is therefore not essential to the present invention so long as swinging movement of the member is effected by the construction. The closure member may also be attached to the overflow tube, as indicated by the above co-pending applications, or to some other part of the flush tank as for instance a post attached to or extending from the floor of the tank. The present invention therefore contemplates different specific modes of mounting the flapper member within the flush tank which does not form part of the actual invention.

As pointed out before, the invention pertains to improved means for securing or attaching a float element or portion 41 of lightweight sealed cellular construction which is substantially impervious to fluid as specified in co-pending application Serial No. 401,849 of which this is an improvement.

Therefore, according to the preferred form of the invention, the float element is of generally conical or tapered form and adapted to be received within a specially formed cavity or recess 43 in the flapper member. This recess is formed by offsetting or raising the closure portion 13 upwardly at 44 to any desired height to form a flat topped central cap portion 45 extending over the top of the float and enclosing and sealing the center of the seat contacting portion 15. Projecting downwardly from the periphery of this offset or upwardly extending

portion is an annular depending skirt portion **47** forming conjunctively with the inner walls of the offset an inclined surface **49** of downwardly converging frusto-conical form. This inturned formation somewhat restricts or reduces the opening into the pocket or cavity as can be plainly seen. The dimensions of the cavity in the direction of the diameter is such as to snugly receive and conform to the enlarged end portion **51** of the float member with its frusto-conical surface **52**.

The lower part of the skirt is thickened or inwardly turned at its bottommost point to form an annular lip or bead **53**, preferably presenting an upper flat surface or shoulder **54**. The mouth or entrance to the cavity is thus further restricted or reduced. In this form, the float member is annularly grooved at **56** so as to receive the lip portion therewithin in mounted relation with the flapper, the flat surface **57** of the groove contacting the shoulder **54**. This in conjunction with the internal sloping surface **49** of the cavity presents positive means for retaining the float element in position within the cavity.

The flapper member is preferably of one-piece construction of rubber or the like, but essential to this invention is that the sides of the cavity at least be constructed of resilient material. The top of the cavity or cap portion **45** may therefore be of non-flexible material such as hard rubber.

The float element is very easily mounted within the receiving portion of the flapper member by mere stretching of the lip portion and side walls of the latter and inserting the enlarged end of the float therewithin. The lip easily snaps within the annular groove of the float when in proper position and prevents it from working loose during operation. The float may of course be as easily removed by the reverse process.

Another feature of this form of the invention is that the float is stepped or extends outwardly a greater distance immediately below the groove than it does immediately thereabove so as to form a continuous smooth conical surface in continuance of the outer surface of the skirt portion. This arrangement prevents possible lodging of an otherwise exposed bottom surface of the skirt on the edge of the valve seat **11** resulting in improper closing or sticking of the valve in an open position. For the sake of illustration, however, Fig. 3 shows the use of an alternate form of float element in which this feature has been eliminated, the float merely being relieved or reduced at **59** presenting the shoulder **57** for shouldered engagement with the upper annular surface **54** of the skirt.

Although it is preferred to employ the lip **53** or similar inwardly directed portion, such use is not absolutely necessary since the resilient skirt portion also engages the side of the tapered float for retention during usual working conditions. This skirt, of course, may extend farther down along the float element than is indicated in Fig. 1 for greater contact and retention. Moreover, the cavity need not necessarily extend above the seat contacting portion of the flapper member which in this case may be completely flat across the entire top with the float element being retained entirely within the depending skirt portion. Or, on the other hand, the cavity may be formed entirely in a raised position of greater height with no depending skirt employed at all, in which case the lip portion, if used, may be an extension of the bottom surface portion of the flapper member around the periphery of the cavity.

In instances in which no lip portion is provided and to some extent when one is provided, there is some tendency for the float element to work out of the cavity during operation as a result of water pressure exerted on the top of the flapper tending to deflect or press in the top at the center in combination with the flexing of the latter during the opening movement when the chain is pulled, to some extent spreading or opening the bottom of the skirt portion. Fig. 4 shows such a receiving portion of the flapper member in which no lip or shoulder is used and in which the tendency of the float element to work out during operation is prevented by the use of preferably an aluminum disc or reinforcing plate **62** which is molded or otherwise positioned across the top of the cavity or imbedded in the top of the closure portion. This construction has also produced excellent results along with that of Fig. 1, although it appears to be somewhat more expensive. The aluminum disc serves as reinforcement for preventing flexure of the central spanning portion of the closure and consequent pressing out of the float during valve opening. Obviously, other means of strengthening this portion or producing stiffness thereof may be employed such as the use of ribs arranged in various ways with or without metal rods, or by the use of a suitable material, for instance. Employment of a non-flexible material for the top of the cavity cap portion has already been suggested in connection with the Fig. 1 form. Such material may of course be employed in other forms as well for stiffening action.

Terms such as "upwardly" or "depending" are of course relative and not to be construed in a narrow sense, inasmuch as valves employing the present invention may be mounted for closure in planes other than horizontal.

The above description and drawing are only illustrative of the invention which should be limited only by the appended claims falling within the broad spirit of the invention.

We claim:

1. In a valve structure having a port into which liquid is flowable and a seat surface around the port, a closure member mounted for swinging movement into the open and closed positions, said closure member comprising a peripheral portion extending over and engaging the top of the seat surface 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 pocket open at the bottom and solid across the top, said pocket having a frusto-conical side surface extending from at least adjacent the bottom of the pocket substantially the entire extent of the side of the pocket, said frusto-conical side surface converging towards the bottom, a substantially liquid impervious rigid float element received within the open pocket, said float element being shaped to conform to the inside configuration of the pocket in relatively snug reception therewithin substantially filling the entire pocket, said float element having a frusto-conical surface engaging the entire frusto-conical surface of the said pocket whereby to retain the float element in substantially firm abutting contact against the top of the pocket, said frusto-conical surfaces of the pocket and float element engaging each other in continuous annular contact providing liquid sealing therearound against the introduction of liquid between the float element and pocket, the portion of said closure member forming the side of the pocket being of material such as resilient rubber deformable for the insertion of the said float means within the said pocket.

2. In a valve structure having a port into which liquid is flowable and a seat surface around the port, a closure member mounted for swinging movement into the open and closed positions, said closure member comprising a peripheral portion extending over and engaging the top of the seat surface 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 pocket open at the bottom and solid across the top, said pocket having a frusto-conical side surface portion converging towards the bottom and producing a reduced annular opening into the pocket, said central portion having an inwardly directed annular portion at the bottom of the pocket to further reduce the opening in the bottom, a substantially liquid impervious float element received within the open pocket, said float element being shaped to conform to the inside configuration of the pocket for relatively snug reception therewithin

to fill the entire pocket, said float element having a frusto-conical surface engaging substantially the entire frusto-conical surface portion of the pocket whereby to retain the float element in abutting contact with the closed top of the pocket, said float element being in substantially continuous contact with the side limits of the pocket from the inwardly directed annular portion to substantially the upper limits of the side converging with the said top of the pocket, said float element being relieved for the inwardly directed annular portion of the closure member, said float element having surface means for continuous engagement with the said inwardly directed annular portion of the closure member, said closure member being at least partly deformable for insertion of the float means within the said pocket.

3. In a valve structure having a port into which liquid is flowable and a seat surface around the port, a closure member mounted for swinging movement into the open and closed positions, said closure member comprising a peripheral portion extending over and engaging the top of the seat surface 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 pocket open at the bottom and solid across the top, said pocket having a frusto-conical side surface converging towards the bottom to effect a reduced opening into the pocket, said central portion having an inwardly directed annular portion at the bottom of the pocket to further reduce the opening into the pocket, said frusto-conical side surface of the said pocket extending substantially along the entire side of the pocket from the inwardly directed annular portion to substantially the upper limits of the side, a liquid impervious rigid float element received within the open pocket, said float element being shaped to conform to the inside configuration of the pocket in at least relatively snug reception therewithin to substantially fill the entire pocket, said float element having a frusto-conical surface engaging the entire extent of the said frusto-conical surface of said pocket, said float element being relieved for engagement with the inwardly directed annular portion of the closure member, said float element having surface means engaging the inwardly directed annular portion of the closure member in substantial liquid sealed relation therewith, the portion of said closure member forming the top of the pocket being relatively inflexible while the portion forming the side of the pocket being of flexible, resilient material deformable for insertion of the float means within the said pocket.



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