

Aug. 1, 1967

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3,333,815

PUSH BUTTON DRAIN VALVE

Filed April 21, 1964

2 Sheets-Sheet 1

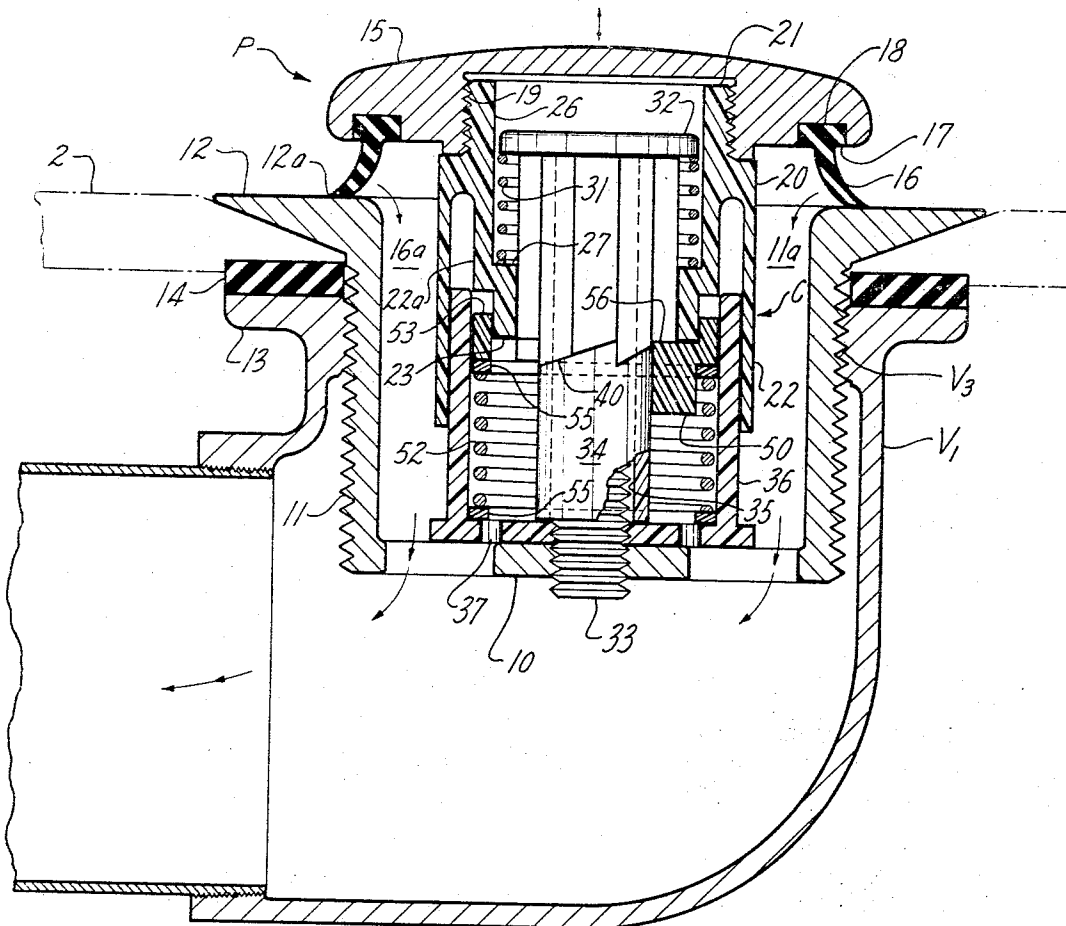


Fig. 1

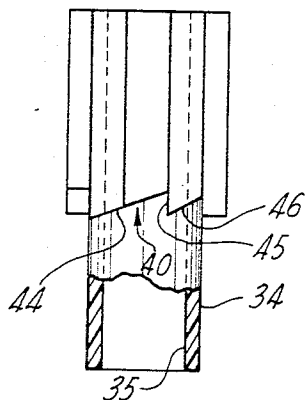


Fig. 2

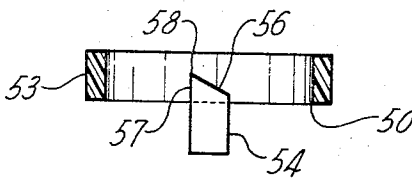


Fig. 3

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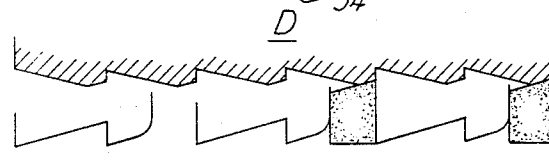
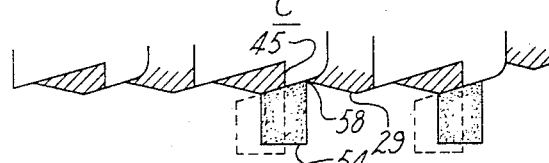
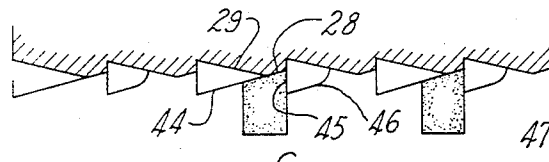
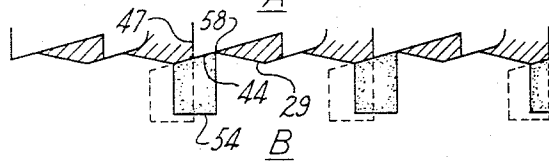
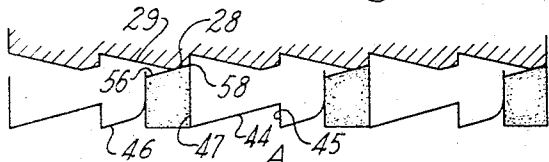
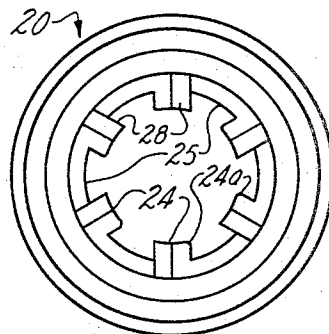
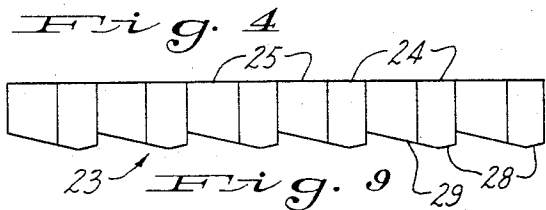
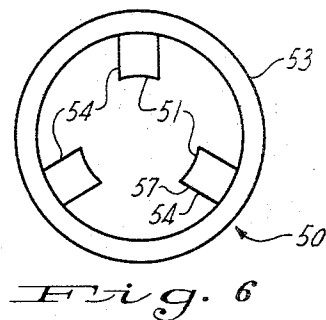
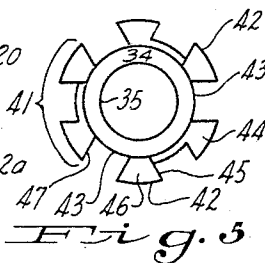
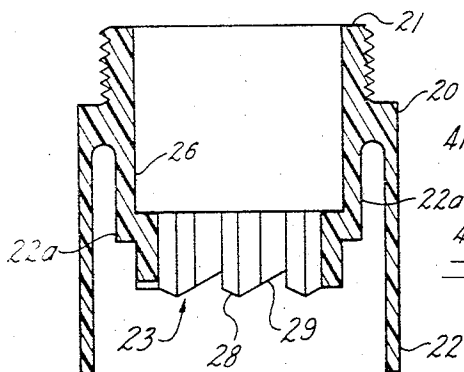


Fig. 10

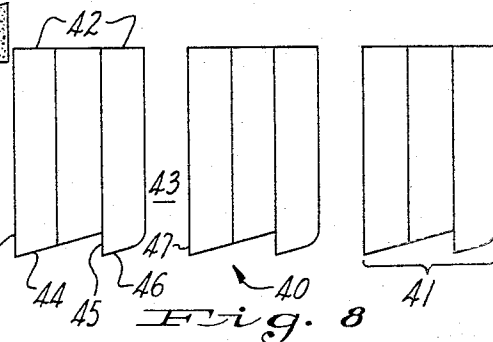


Fig. 8

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PUSH BUTTON DRAIN VALVE

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Filed Apr. 21, 1964, Ser. No. 361,501
14 Claims. (Cl. 251-263)

This invention relates to a two position drain valve for use in bathtubs, lavatories, and similar basins or vessels, and to operating mechanism therefor.

The valve of this invention includes integrally contained positioning mechanism that maintains the valve in either a flow-passing or a flow-stopping position as selected by a sequential depression and release of the push button on which the valving member itself is mounted. This invention is an improvement over the invention described and claimed in our copending application Ser. No. 144,931, filed October 13, 1961, and entitled, "Push Button Drain Valve," now abandoned in favor of continuation application No. 453,567 on which U.S. Patent No. 3,220,695 has issued.

In our prior application there was described a drain valve that included actuating mechanism for selectively holding a somewhat remote valve part in flow-preventing contact with a valve seat, or in a flow-permitting spaced relation as desired. A small push button, extending through a drain-opening-shielding protective cap, actuated the valve. The prior construction represents a substantial, commercially proven advance over the conventional drain valves previously known to the art; however, we have discovered improvements that tend to maximize the beneficial potential of the basic concepts.

Accordingly, it has been an object of this invention to more fully investigate the functional and aesthetic requirements of bathtub and lavatory drain valves to maximize the beneficial potential of the self-contained push button actuation concepts;

Another object of this invention has been to devise a drain valve having a self-contained positioning mechanism that is easily operated by persons of all ages simply by pressing on the valve member with the hand or foot as is convenient;

Another important object of this invention has been to devise a push button drain valve that is easy to clean and otherwise maintain in good sanitary operating condition;

A further object of this invention has been to devise a push button drain valve having an inherently tight sealing valve or flow preventing member;

A further important object of this invention has been to devise novel actuating mechanism for a push button drain valve that permits the foregoing objects of this invention to be practically and aesthetically embodied in a commercially acceptable push button drain valve;

These and other objects of our invention will become more apparent to those skilled in the art upon reading and understanding the following description of the inventive concepts on which our invention is based, a specific illustrative embodiment thereof, and the appended claims.

A phase or concept of this invention relates to a novel structural arrangement whereby the mating valve parts are located within the tub or basin so as to be freely accessible for cleaning or replacement. The novel construction includes a positioning or locating control mechanism that forms a selectively positioned abutment or stop. A push button or input directly carries a sealing valve member or output and is urged against the positionable stop to be located thereby in one of a plurality of valving positions. The sealing valve member is con-

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structed to seal with the water pressure so that the positive lock or holding action on the valve in the closed position is not required. The control mechanism includes a novel indexing mechanism that responds to depression and release of the push button to select an operative position for the abutment or stop.

Another phase of this invention relates to a novel construction whereby the mating valve parts are maintained in a fixed angular relationship so as to insure a continuous good mating fit.

These phases of our invention are exemplified and more fully explained in the following description of a specific illustrative embodiment of our invention wherein reference is made to the accompanying drawings of which:

FIGURE 1 is an enlarged, front cross-sectional view of a push button drain valve constructed in accordance with our invention;

FIGURES 2, 3, and 4 are vertical views, broken away where necessary, of three main operative elements in the drain valve shown in FIGURE 1;

FIGURES 5, 6, and 7 are respective top or plan views of the elements shown in FIGURES 2, 3, and 4;

FIGURES 8 and 9 are respective cam layout views representing the effective cam structures provided by each of the elements shown in FIGURES 2 and 4;

FIGURE 10 is a series of abstract layout views showing the superimposed progressive inter-action of the cam surfaces provided by the elements shown in FIGURES 2, 3, and 4.

Turning now more specifically to FIGURE 1, there is shown a push button drain valve or flow control apparatus P constructed in accordance with our invention, mounted within a vessel for washing and the like having a wall that defines an upwardly open cavity such as a bathtub, other basin structure or vessel. The drain valve P is supported in a conventional drain conduit fitting V₁ that is mounted within a drain apparatus receiving open portion 2 in the wall of the vessel. The drain valve P includes a support means such as a strainer cup or drain housing fitting 10 having a threaded side wall 11 that cooperatively interfits with a threaded portion V₃ of the conduit fitting V₁. The side wall 11 defines a flow passageway 11a through the drain fitting 10. The drain fitting 10 further has an upwardly located, generally horizontally-extending mounting flange portion 12 that cooperates with an opposed flange portion 13 of the drain conduit fitting V₁ to securely grip the vessel adjacent its open portion 2. A packing or washer member 14 is usually included to insure a good seal. The flange portion 12 provides a valve seat 12a that surrounds the flow passageway 11a and is fully contained within the vessel to permit easy cleaning.

The drain valve P further includes external force receiving means such as a cap member or push button operating means 15 that is preferably just slightly larger in diameter than the flow passageway 11a, so as to comfortably distribute the actuating force over a larger area of a user's foot or hand. The push button 15 also constitutes the output of the mechanism in that it directly supports a valve member comprising a resilient sealing ring or annular vane 16 made of white natural rubber or a similar material. The valve member 16 includes an enlarged attaching portion 17 that is wedged or compressed into an annular cavity 18 within the push button 15. The valve member 16 diverges downwardly, toward the valve seat, so that when in the closed position shown, it is flexed outwardly. Water pressure within the tub or vessel, thus tends to increase the sealing connection between the valve member 16 and the valve seat 12a.

The push button 15 is mounted on valve position control means C for selectively locating the valve member 16

in one of its two operative positions. The control means C has a threaded movable end portion 21 which cooperatively receives a threaded bore 19 of the push button 15. The movable end portion 21 is an upper extension of a first actuating or front sleeve-like housing part 20 that has a protective outer sleeve or casing wall 22 and an inner body or sleeve wall that is spaced therefrom to define a guiding groove or track 22a. The actuating part 20 includes a downwardly upset cam 23 having a developed surface as illustrated particularly in FIGURE 9. The upset cam 23 defines, as shown in FIGURE 7, an internally facing contour including a plurality of equiangularly spaced inwardly projecting spline portions or axially elongated teeth 24 which are rounded or provided with a small radius 24a along their counter-clockwisemost, longitudinal inward edges. The spline portions 24 are separated by dovetail shaped longitudinally extending grooves 25. In its assembled position, the actuating part 20 is at all times urged downwardly by spring or resilient means 31 positioned in a hollow bore 26 thereof. The spring 31 engages an abutment portion 27 (see FIGURE 1) of the first actuating part 20 and a flange portion 32 of a stationary anchor bolt 33.

The anchor bolt 33 supports and secures a longitudinally extending, substantially cylindrical, stationary guide member or center post 34 that is more clearly illustrated in FIGURES 2, 5 and 8. The anchor bolt 33 passes through a central bore 35 in the center post 34 and threadably engages the drain fitting 10. The center post 34 supports a stationary locating cam member 40 that is preferably integral with the center post and is represented in FIGURE 8 in its developed form.

The locating cam member 40 includes a plurality of radially-outwardly-extending, projecting portions 41 as shown in FIGURE 5. The projecting portions 41 each include a pair of longitudinally extending tooth-like ribs or splines 42 that are assembled equiangularly about the center post 34 and are shaped to cooperatively interfit with the grooves 25 of the upset cam 23. The projecting portions 41 are separated by three equiangularly spaced slots or release grooves 43.

An indexing key member 50 is mounted on the center post 34 by cylindrical surface portion 51 (see FIGURE 6) for longitudinal and circumferential movement thereon. An upwardly urging resilient means or compression spring 52, that has a force factor significantly larger than that of the spring 31, effectively engages a guide ring portion 53 of the key member 50 and urges the key member into cooperative contact with the upset cam 23 and the locating cam member 40. A pair of spring bearing rings 55 provide solid, low friction, square seats between the spring 52 and its associated directly cooperating members.

The indexing key member 50 includes three camming teeth or longitudinally extending keeper parts 54 on which the cylindrical surface 51 is formed. The keeper parts 54 are shaped and spaced so as to cooperatively interfit between the splines 42 of the stationary locating cam member 40 so as to be aligned with the splined portion 24 of the upset cam 23. The key member 50 and its associated spring 52 are housed within an upwardly open base portion or inner mechanism or back sleeve-like housing 36 that is overlapped by the sleeve 22 of the actuating part 20. A pair of drain openings 37 are formed in the bottom of the upwardly open base portion 36 to permit drainage of any water that finds its way past the sleeve 22.

Turning now to the cam layouts of FIGURES 8 and 9 and the vertical cross-section of FIGURE 3, it will be seen that the stationary locating cam member 40 (FIGURE 8) comprises inclined transfer or guiding surface portions 44 that are inclined downwardly clockwise as viewed from the bottom. The transfer surface portions 44 terminate at their clockwise edges in holding shoulders or abrupt, circumferentially facing, radially outwardly

extending side walls 45 formed by an adjacent spline 42. Inclined return-transfer or guiding surface portions 46 lead to the slots 43. The clockwisemost portion of each slot 43 is provided with a second shoulder 47 formed by the adjacent spline 42.

The keeper parts 54 (FIGURE 3) of the indexing key member 50 have longitudinally upwardly or outwardly facing inclined-transfer surfaces 56 that cooperatively engage the transfer surfaces 44 and 46 of the locating cam member 40. The keeper parts 54 further have laterally or circumferentially clockwise facing abrupt shoulder portions 57 that cooperate with the holding shoulders 45 and the second shoulders 47 of the stationary locating cam member 40. The inclined transfer surfaces 56 and the shoulder portions 57 intersect and form a forward toe or wedging portion 58 which cooperates with the upset cam as hereinafter described.

Thus it will be seen that the projecting portions 41 of the locating cam member 40 define two stable longitudinal positions for the key member 50 thereon. One stable position results when the shoulder portions 57 of the keeper parts 54 are in engagement with the holding shoulders 45 and the inclined transfer surfaces 56 engage the transfer surface portions 44. The other stable position results when the shoulder portions 57 are in contact with the second shoulders 47 of the locating cam member 40 and the keeper parts 54 are thus free to move longitudinally in the slots 43.

The upset cam 23 (FIGURE 9) of the actuating member 20 comprises a plurality of angularly spaced inclined downwardly facing facets or lifting surfaces 28 which are formed on the spline portion 24 adjacent the clockwise edges thereof, see FIGURE 7. The lifting surfaces 28 are connected by oppositely inclined return wedging surfaces 29. The return wedging surfaces 29 are engaged by the toes 58 of the keeper parts 54 to transmit force from the spring 52 to the actuating part 20. As the spline portions 24 of the actuating part 20 interfit with the spline 42 of the stationary locating cam member, the lifting surfaces 28 will always be in longitudinal alignment with portions of the locating cam member adjacent to the holding shoulders 45 and the second shoulders 47, and thus adjacent to the stable positions established thereby.

The operation of the cam mechanism will be more clearly understood by reference to FIGURE 10 which shows the progressive movement of the keeper parts 54 as induced by relative movement of the upset cam 23 and the locating cam member 40. In FIGURE 10A the keeper parts 54 are shown in one of their stable positions within the slots 43. Consequently, the inclined transfer surfaces 56 are engaging the lifting surfaces 28 and holding the upset cam 23, and the valve member 16 which is attached thereto, in the up or flow-permitting position. When it is desired to prevent flow from the vessel, the push button 15 is moved downwardly, thus moving the upset cam 23 and the keeper parts 54 downwardly to the dotted line position shown in FIGURE 10B. As the keeper parts 54 clear the shoulders 47, the upward force from the spring 52 (see FIGURE 1) causes the keeper parts to slide along the transfer surface 44 and rotate around the center post 34 to the solid line position shown in FIGURE 10B. Release of the push button 15 permits the toes 58 of the keeper parts 54 to wedge against the return surfaces 29 of the upset cam 23 and force the cam 23 upwardly to the position shown in FIGURE 10C. The keeper parts 54 come to rest in their other stable position against the shoulder 45 on the locating cam member 40. In this position the valve 16 is held closed by the hold-down spring 31. When it is desired to permit flow out of the vessel, the push button 15 is again pressed, moving the keeper parts 54 downwardly to the dotted line position in FIGURE 10D where they clear the holding shoulder 45. The force of spring 52 causes the keeper parts to rotate and slide along transfer surface 46, thus bringing the toes 58 into wedging engagement with the return wedging surface

29. When the push button 15 is released, the spring 52 will urge the keeper parts 54 and the upset cam 23 upwardly overpowering the spring 31 and permitting the keeper parts 54 to rise into the release grooves, thus returning them to the position of FIGURE 10E, compare FIGURE 10A.

Those skilled in the art will appreciate that we have devised new and improved drain valve apparatus that is easy to install, use and maintain. While a preferred embodiment of our invention is shown herein for purposes of illustration, it is to be understood that various changes may be made in this construction by those skilled in the art without departing from the spirit and disclosed concepts of the invention as particularly pointed out and defined in the appended claims.

We claim:

1. A push-actuated drain valve device for opening and closing-off fluid flow through an open drain portion which comprises, a housing fitting for mounting in the open drain portion, said fitting having an open inlet portion for receiving fluid to be drained and having an open outlet portion to deliver the drained fluid, an annular seating flange defining a valve seat about the opening to said inlet portion, a centrally-positioned mount carried by said outlet end portion, a cooperating pair of sleeve-like front and back housing parts for relative longitudinal sliding movement with respect to each other within said fitting, means cooperating with said back housing part for securing said housing parts on said mount in a spaced relation within and along said fitting to define a drain passageway therewith that extends from said seating flange and connects said open inlet and outlet portions, said front housing part having a front end portion projecting longitudinally-outwardly beyond said seating flange, push button operating means mounted on said front end portion, resilient valve means positioned beneath said push button operating means for movement with said front end portion into and out of seating engagement with said seating flange to open and close-off fluid flow through said drain passageway, and control means operatively carried by said pair of housing parts to, on a first depression and release of said push button means, move said valve means from an initial position out of seating engagement with said seating flange into a seating position in engagement with said seating flange and, on a subsequent depression and release of said push button operating means, to return said valve means to its initial position out of seating engagement with said seating flange.

2. A push-actuated drain valve device as defined in claim 1 wherein, said valve means has a radially-outwardly projecting flap body, and said control means has parts operatively-carried by said pair of housing parts for, on the first depression and release of said push button operating means, retaining said push button operating means in a backward position at which said valve means is in seating engagement with said seating flange and, on the subsequent depression and release of said push button operating means, returning said push button operating means to a forward position at which said valve means is out of seating engagement with said seating flange.

3. A push-actuated drain valve device as defined in claim 1 wherein said means for securing said housing parts on said mount is a stem projecting backwardly from said back housing part and having threaded engagement with said mount.

4. A push-actuated drain valve device as defined in claim 3 wherein said stem projects centrally-forwardly along and within said pair of housing parts and is constructed to removably-secure said pair of housing parts in a slidable assembled relation with each other.

5. A push-actuated drain valve device as defined in claim 1 wherein said push button operating means is of disc-like shape and projects radially-outwardly in an overlapping relation with respect to said seating flange, said push button operating means and said front end portion

have cooperating means for removably-securing said push button means on said front end portion, and said resilient valve means is of disc-like shape and has a flap body projecting radially-outwardly in a spaced relation beneath said push button operating means towards said seating flange.

6. A push-actuated drain valve as defined in claim 1 wherein said control means is operatively-positioned within said pair of sleeve-like housing parts.

7. A push-actuated drain valve device as defined in claim 6 wherein said push button operating means and said valve means have cooperating portions removably-securing an inner portion of the latter to an underside of the former.

8. A push-actuated drain valve device as defined in claim 6 wherein, said control means has indexing means cooperating with said front and back housing parts for holding said valve means in its seating position and for subsequently releasing said valve means, and said control means also has spring means for, on release of said valve means, moving said valve means forwardly to its initial position out of seating engagement with respect to said seating flange.

9. A push-actuated drain device as defined in claim 6 wherein said securing means is a center post threadably-secured within said mount and extending centrally-forwardly along and within said back and front housing parts and wherein said control means comprises, an indexing key part mounted on said post for relatively longitudinal and circumferential movement with respect thereto, said key part having a circumferentially facing abrupt shoulder and a longitudinal facing and an inclined transfer surface adjacent said shoulder, a locating cam part mounted on said post and having operative portions that establish at least two stable positions for said key part, said locating cam part having inclined surface portions connecting said operating portions that establish the stable positions and provide a transfer path therebetween for cooperating with said transfer surface of said key part, resilient means urging said key part towards cooperative engagement with said locating cam part, an upset cam carried by said front housing part for movement therewith and positioned adjacent said locating cam part for longitudinal-reciprocal movement with respect thereto, said upset cam having lifting surfaces for moving said key part out of one of its two stable positions and on said inclined surface portions of said locating cam part; whereby a depression of said push button operating means will move said upset cam and said key part out of one of said stable positions and on an adjacent inclined surface portion of said locating cam part, and a release of said push button operating means will cause said key part to complete its movement along the inclined surface portion of said locating cam part to the second stable position established thereby.

10. A push-actuated drain valve device as defined in claim 6 wherein said front housing part has an inner sleeve wall adapted to slide along the inside of said back housing part and has an outer sleeve wall adapted to slide along the outside of said back housing part.

11. A push-actuated drain valve device as defined in claim 10 wherein said control means comprises, an annular indexing key part operatively-positioned within said back housing part and between said inner and outer sleeve walls of said front housing part, a locating cam part operatively-positioned within said back housing part on said securing means for cooperating with said indexing key part, and a cam portion on said inner sleeve wall of said front housing part for cooperating with said locating cam part.

12. A push-actuated drain valve device as defined in claim 11 wherein said control means also comprises, spring means positioned within said pair of housing parts for holding said indexing key part, said locating cam part and said cam portion in an operating relation with respect to each other and for normally urging said front end

portion of said front housing part and said valve means forwardly away from said seating flange.

13. An improved valve construction for opening and closing-off fluid flow through an open flow portion of a vessel or the like which comprises, a fitting for mounting within the open flow portion, a housing, means for securing said housing within said fitting to define a fluid passageway therebetween, said fitting having a valve seat portion open to and surmounting said passageway, push button means operatively-carried by said housing to project axially therefrom and having a radially-outwardly extending push head portion positioned above said valve seat portion, resilient valve means carried by said push button means underneath said push head portion for movement inwardly into and outwardly out of engagement with said valve seat portion, control means carried by said housing and cooperating with said push button means for selectively locating said valve means in and out of closing-off engagement with said valve seat portion; said control means having spring means for urging and normally retaining said valve means out of closing-off engagement with said valve seat portion, and having means for holding said valve means in closing-off engagement with said valve seat portion against the urging of said spring means upon a depression and release of said push button means.

14. An improved valve construction for opening and closing-off fluid flow to an open drain portion which comprises, an annular fitting for mounting within the open drain portion, a sleeve-like housing, means for securing said housing within said fitting to extend therewith and to define an annular fluid passageway therebetween, a radially-outwardly extending valve seat flange about a

forward end of said fitting and open to said passageway, push button means operatively-carried by said housing and having a housing sleeve part projecting axially-backwardly for slidable movement along and with respect to said housing, resilient annular valve means carried by said push button means backwardly thereof adjacent said valve seat flange and projecting radially-outwardly with respect to said passageway, control means operatively-positioned between said housing sleeve part and said housing for selectively-retaining said push button means in a forward position whereby said valve means is out of engagement with said valve seat portion, and for retaining said push button means in a backward position in which said valve means is in sealing engagement with said valve seat flange, and said control means being actuated to open and close said valve means in accordance with axial reciprocating movement of said push button means.

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