Jan. 14, 1969 S. McLARTY 3,421,539

COMMODE VALVE ASSEMBLY

Filed Sept. 14, 1965

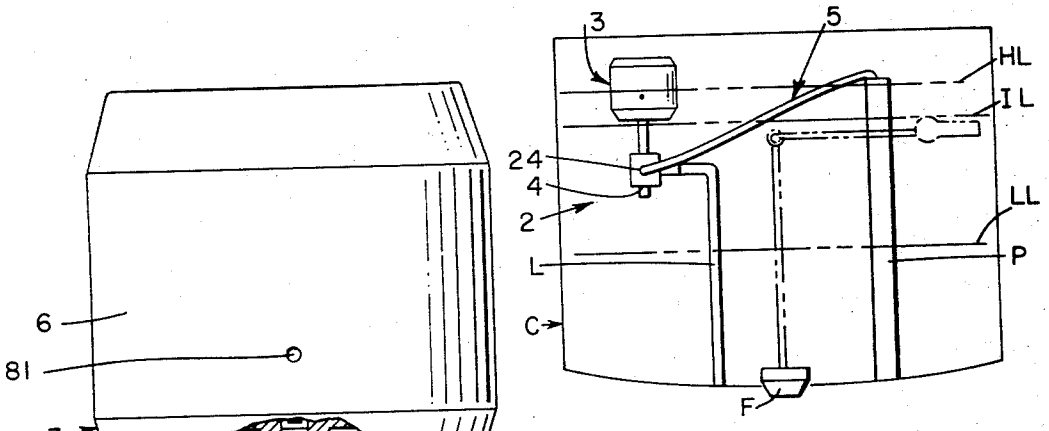


FIG. 1

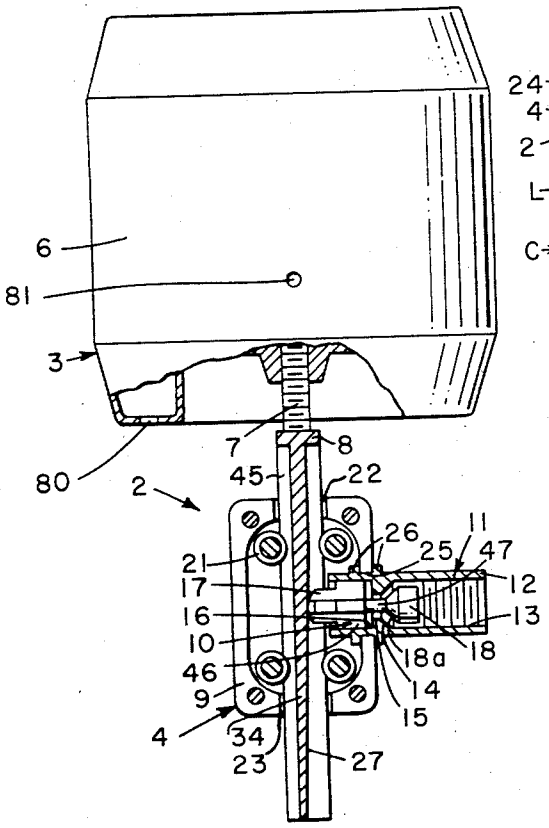


FIG. 2

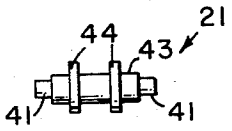


FIG. 3

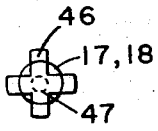


FIG. 4

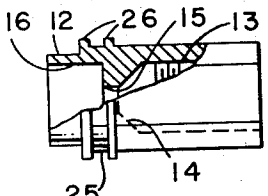


FIG. 5

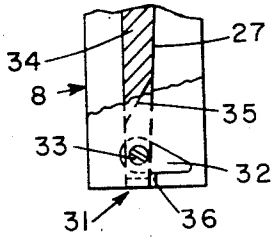


FIG. 2A

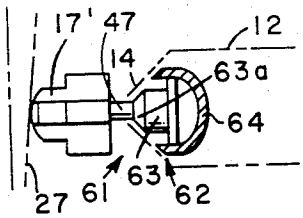


FIG. 7

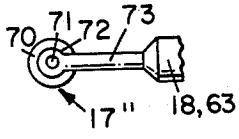


FIG. 7A

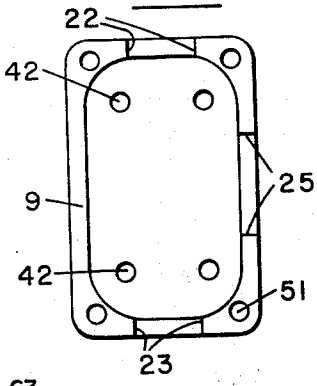


FIG. 6

United States Patent Office 3,421,539 Patented Jan. 14, 1969

3,421,539

COMMODE VALVE ASSEMBLY

Shirley McLarty, Dallas, Tex.
(303 Denton, P.O. Box 474, Hutchins, Tex. 75141)

Filed Sept. 14, 1965, Ser. No. 487,155
U.S. Cl. 137—427 10 Claims
Int. Cl. F16k 31/18; F16k 9/00; F16k 29/00

ABSTRACT OF THE DISCLOSURE

This invention relates to a water closet control valve assembly in which the control valve is located in the water inlet fitting and is controlled directly by an inclined plane that depends from and is integrally attached to the float itself, so that no pivotal leverages, linkages, arms or similar moving parts are required; the float being capable of both taking on and ejecting ballast water as needed during each operating cycle.

This invention relates generally to fluid valve mechanisms, and more particularly to the type used to control the water level in a commode or water closet.

A primary object of this invention is to provide an improved water closet control valve mechanism wherein the float is directly, vertically and integrally aligned with its functional element so that linkages, levers, and the like are eliminated.

Another object is to provide an improved water closet control valve wherein all the parts are constructed of noncorroding material, preferably plastic, so that an extended maintenance-free life will result.

A further object is to provide an improved, economical and extremely light weight water closet control valve.

An additional object is to provide a novel and useful float assembly for a water closet control valve that is extremely light in weight, but which acquires the additional weight during use that is necessary for its successful operation.

A still further object is to provide a novel and useful valve housing assembly that cooperates with the float assembly to provide an instantly installable combination that requires no attaching members.

And yet another object of this invention is to provide a valve assembly that comprises a vertically acting float assembly and a cooperating valve housing assembly wherein transfer of operating force from the float assembly to the valve unit in the valve housing assembly is done exclusively through the medium of an inclined plane.

And an object of a modified embodiment of the valve unit of this invention is to provide a two stage piston operated valve wherein a force is first applied to break the seal and an additional force is applied to fully open the valve.

These and other objects and advantages will be apparent from an examination of the following specification and drawings, in which:

FIGURE 1 represents a front elevational view taken inside a water closet and illustrating the installation and operation of the valve assembly of this invention.

FIGURE 2 is an elevational view in cross-section of the valve assembly of FIGURE 1.

FIGURE 2A is a fragmentary enlarged view of a modified embodiment of the drive member 8 of FIGURE 2.

FIGURE 3 is an enlarged detail side elevational view of the guide rollers shown in FIGURE 2.

FIGURE 4 is an enlarged detail end view of the valve unit shown in FIGURE 2.

FIGURE 5 is an enlarged detail side view of the water inlet fitting and valve seat shown in FIGURE 2.

FIGURE 6 is an enlarged detail plan view of one-half of the cover for the valve housing assembly shown in FIGURES 1 and 2.

FIGURE 7 is a detail view partly in schematic of a modified embodiment of the valve unit of this invention.

FIGURE 7A is a fragmentary detail view of a modified embodiment of the driven member 10 of FIGURE 2 and the member 61 of FIGURE 7.

Referring now more particularly to the characters of reference on the drawing, it will be observed in FIGURE 1 that the complete water closet control valve assembly 2 of this invention consists basically of a float assembly 3, disposed vertically above and cooperating with a valve housing assembly 4. FIGURE 1 illustrates this assembly in a typical installed and operating condition within a water closet tank C having a flush valve F, an overflow pipe P and a water inlet line L.

As is well known in the plumbing art, when the flush valve F is actuated, the high water level HL begins to drop as water exits from the closet tank C until it reaches a predetermined low water level LL. In order to maintain this range of water levels in the water closet some form of control valve is required to admit water through the water inlet line L only during the time necessary to resupply the water drained off during the flushing operation. The overflow pipe P is present to add a small additional quantity of water to the toilet bowl and trap after the flush valve is closed. Most conventional water closet control valves employ a round nonferrous metal float that is attached to the control valve operating unit by a long lever and one or more short links, bolts and/or other mechanisms. This is in marked contrast with the present invention which does not employ any connecting linkage and in fact need not even be physically fastened to the control valve operating unit.

In this invention the unattached float assembly 3 moves vertically through the open center of the valve housing assembly 4 and in so doing, opens the control valve unit within the assembly 4 at its lowermost position, and closes the valve unit at its uppermost position so that the water level range is accurately and positively controlled. The small flexible tube 5 from the valve housing assembly 4 to the overflow pipe is merely to provide an additional quantity of water into the toilet bowl after the flush valve is closed; this transfer is possible because of the pressure of the incoming supply.

Referring now to the details of construction employed in the complete valve assembly 2, it will be observed in FIGURE 2 that the float assembly 3 consists of a generally cylindrical float 6 threadedly attached to the upper end 7 of a vertically extending drive member 8. The valve housing assembly 4 includes a two piece cover 9 in which is installed a water inlet valve unit 11.

The operating valve member, also termed the driven member 10 is included in and is considered part of the water inlet unit 11. The unit housing 12 includes a threaded section 13 terminating at a tapered valve seat 14 which surrounds a central opening in section 15 that communicates with larger guide section 16. The valve member 10 operates in each of the three sections and is made up of a valve piston 17 and a small valve 18 attached thereto. The valve surface 18*a* on the small valve cooperates with the valve seat 14 of the housing 12 to open or close the flow of water into the valve housing 4 and thus into the water closet tank. The valve member 10 is generally cylindrical in construction and moves in a longitudinal direction between its opened and closed positions in the water inlet valve unit 11.

The valve cover 9 encloses four plastic guide rollers 21 located in pairs near the top opening 22 and bottom opening 23 of the cover 9 so as to rollingly guide the drive member 8 of the float assembly 3. In FIGURE 1 it is seen

that one half of cover 9 includes a small tube fitting 24 to receive flexible tube 5 at installation. The cover 9 also defines a side opening 25 to enclose over the external surface of housing 12 between the peripheral ridges 26 at assembly. The driven member 10 is so dimensioned and positioned in the housing 12, that the valve 18 will be fully closed against the valve seat 14 before the piston 17 engages the vertically extending inclined plane 27 of drive member 8 when the float is at the high water level position. And the valve member 10 is so dimensioned and positioned that the valve 18 will be moved away from valve seat 14 the maximum desired distance when the float is at the low water level position.

In the alternative, the lower end of drive member 8 may be equipped with a stop device 31 as shown in FIGURE 2A. This device will prevent the float assembly 3 from accidentally moving out of contact with the housing 4 and thus terminating the operation of the control valve assembly 2. The stop device 31 in this embodiment is comprised of a tear shaped lever 32 which is attached to member 8 by a screw 33 about which lever 32 is adapted to pivot. The vertical I section 34 of the drive member 8 which contains the inclined plane 27 is undercut at 35 to permit lever 32 to be automatically folded out of the way when member 8 is moving downward past driven member 10. However, the small stop 36 below lever 32 prevents the lever from pivoting more than 90° and this action insures that lever 32 will not permit member 8 to pass by member 10 when moving in an upward direction. The angle of undercut 35 and the weight of lever 32 combine to cause the lever to drop the required approximate 90° to act as a positive stop. When it is desired to remove float assembly 3 from assembly 4, the screw 33 is simply removed from its threaded socket in I section 34.

For examining the elements in more detail, reference is made to FIGURES 3–6. In FIGURE 3, the guide roller 21 is seen to include end shafts 41 that engage and rotate in openings 42 of cover 9. The larger center section 43 includes a pair of wheels 44 that are spaced apart sufficiently to permit them to ride between the flanges 45 of the I section 34 of member 8.

The valve member 10 is seen in FIGURE 4 to include a generally cylindrical piston 17 having fluted guide section 46 and a tail shaft 47 to which the small valve 18 is attached.

The water inlet housing 12 is seen in greater detail in FIGURE 5. However, since the structural portions have been previously identified, no further description will be necessary at this point. Similarly, the parts of cover 9 in FIGURE 6 have been previously described in detail, with the exception of threaded holes 51 which receive mounting screws (not shown) at assembly to attach the two almost identical halves of cover 9 together. The holes 51*a* of the mirror half (to that shown in FIGURE 6) need not be threaded, and the fitting 24 is only required on one half.

A modified embodiment 61 of the valve member is shown in FIGURE 7. In this embodiment, the piston 17′ is substantially the same as that in valve member 10. The small rigid plastic valve 18 is not present as such in member 61, but rather a two-piece valve 62 is formed of a rubber or other flexible material valve 63 which is attached inside a rigid cover 64. The surface 63*a* of valve 63 engages the seat 14 of housing 12 in the same manner as member 10. However, cover 64 almost engages seat 14 at the same instant. The flexible valve 63 will be compressed first in such a way that piston 17′ merely compresses the flexible material and does not have to open against the full back pressure acting on cover 64 until after the seal is broken. The high back pressure of the incoming water supply does not directly engage the rubber valve 63, so that when piston 17′ is moved to release valve 63 from seat 14, it does not have to overcome a high back pressure to break the seal. For example if the water supply pressure acting on the rigid cover is 80 p.s.i., the force necessary to compress rubber valve 63 sufficient to break the seal may be as little as 5 p.s.i. After the seal is broken, the force of the inclined plane 27 acting against piston 17′ is easily sufficient to move cover 64 rearward and fully open the valve unit.

In the alternative the driven means 10 may be made in the form of the modified embodiment shown in FIGURE 7A. In this embodiment, the piston member 17″ is comprised of a Teflon or other plastic material roller 70 that is journalled about shaft 71 in the enlarged fork end 72 of shaft 73.

The intermediate water level IL of FIGURE 1 indicates a position at which the float assembly 3 will pause before it rapidly advances or "jumps" to another height. This action is caused by the use of a single small hole 80 in the bottom of float 6 and another small hole 81 in the side of the float. When the float assembly 3 is at its lowermost position and the water in tank C is at the low level LL, all of the water has drained out of float 6 by way of hole 80. When the water level has built up toward the intermediate level IL, water will enter float 6 by way of hole 80 until it reaches hole 81, at which point it can flow out again until the water level is higher than the hole. But the presence of water in the float 6 tends to keep it from rising until it displaces more weight of water than the water inside plus the weight of the float and the attendant friction forces. When these forces are all overcome, the float surges up and the water then rises and carries the float to the high water level HL. When the water in the tank C rapidly recedes, as when the flush valve F is opened, the extra weight of the water inside float 6 assists in causing the float to drop rapidly. Only one hole at 80 and 81 are shown, but these may be elongated holes or slits, or there may be several holes in the bottom and several in the side.

By the proper choice of holes and by the use of the roller embodiment of FIGURE 7A, the jumping action described may be virtually eliminated.

The stop means shown in FIGURE 2A may be operated by hand to permit the float assembly 3 to be completely removed from the valve inlet housing. This is done by folding the tear shaped lever 32 upward until it rests against the undercut 35 and held there by hand or with a small rigid member until the lever 32 has passed upward beyond the piston 17.

All of the operating parts except the flexible valve 63 may be made of durable, non-corrosive plastic material such as polystyrene, polypropylene, butyrate, propionate, "Delrin" (Dupont trademark), polycarbonate, "Lexan" (General Electric trademark), polyurethane, Teflon, nylon, or other formable plastic materials.

In one embodiment of the float 6, the bottom hole 80 includes a flapper valve (not shown) that permits water to enter the interior of the float until it reaches the level of the first of a plurality of side holes 81. Due to turbulence and other factors, the trapped water would be replaced or replenished from time to time.

From the foregoing description it will be readily seen that there has been produced a device which substantially fulfills the objects of this invention as set forth herein. The invention is not limited to the exemplary construction herein shown and described, but may be made in many ways within the scope of the appended claims.

What is claimed is:

1. A water closet control valve assembly located internally in a water closet, comprising:
   (a) the combination of,
   (b) a valve housing assembly, comprising:
   (c) a housing,
   (d) a water inlet valve unit; and
   (e) a separable integral vertically guided float assembly, comprising,
   (f) a vertically movable float, and

(g) an inclined plane drive member projecting vertically downward from said float and through said valve housing assembly;
(h) said water inlet valve unit comprising:
(i) a water inlet housing, including
(j) a water inlet fitting section,
(k) a valve seat section, and
(l) a guide section;
(m) a driven valve member moving longitudinally in said water inlet housing and engaging said drive member, and including
(n) a guide piston located in said guide section,
(o) a valve located adjacent said valve seat section and attached to said piston;
(p) said piston and said valve being so dimensioned that a force applied to said piston in one longitudinal direction will move said valve away from said valve seat, and a force applied to said valve in the other longitudinal direction will move said valve into engagement with said valve seat, and
(q) said inclined plane member applying the force in said one longitudinal direction when said float is moving downward and the inlet water pressure applying the force in the other longitudinal direction.

2. A water closet control valve assembly, as in claim 1 wherein said inclined plane drive member is an I-shaped member, and wherein said I-shaped member includes an inclined I-section.

3. A water closet control valve assembly, as in claim 1, wherein said valve housing defines a space between said housing and said inclined plane member to permit passage of the incoming water from said valve housing.

4. A water closet control valve assembly, as in claim 2, wherein said valve housing defines a space between the I section of said inclined plane drive member and the housing to permit passage of the incoming water from said valve housing.

5. A water closet control valve assembly, as in claim 1, wherein said driven valve member includes a fluted guide piston engaging said inclined plane member substantially perpendicular thereto.

6. A water closet control valve assembly, as in claim 1, wherein said water inlet unit and its included driven member projects horizontally into said housing and said drive member extends non-tiltably through said housing in a guided vertical direction in a manner to engage the driven valve member and wherein horizontally and vertically spaced rollers are provided in said housing to guide said drive member.

7. A water closet control valve assembly, as in claim 1 wherein said driven valve member comprises a two piece valve formed of a flexible material valve and an attached rigid cover that shields the flexible valve when the valve member is seated against the valve seat, said rigid cover being positioned so as to engage said valve seat section substantially simultaneously with the engagement of said driven valve member.

8. A water closet control valve assembly, as in claim 1, wherein said float defines a hollow shell and said inclined plane drive member comprises an I member that threadedly engages the control bottom portion of said shell and depends vertically therefrom to a point below the bottom of said valve housing.

9. A water closet control valve assembly, as in claim 1 wherein said float defines a hollow shell having an opening intermediate the height of the shell and an opening in the bottom of the shell to permit water in the water closet to enter and exit from the interior of said shell during each operation of said control valve assembly.

10. A water closet control valve assembly, as in claim 1, wherein said float assembly defines a float and a vertically depending drive member extending therefrom and extending through said valve housing, and wherein said drive member includes means at its lower end to permit said drive member to automatically pass completely through said valve housing in a downward direction but to prevent said drive member from automatically passing through said valve housing in an upward direction.

References Cited

UNITED STATES PATENTS

930,454	8/1909	Bernesser et al.	137—443
2,013,188	9/1935	Reinhardt	137—416
2,841,169	7/1958	Martin et al.	137—421 X
2,976,010	3/1961	Huthsing	251—333
1,114,019	10/1914	Morris	137—429 X
2,809,656	10/1957	Goldtrap	137—432 X
2,986,155	5/1961	Doyle	137—442 X
3,057,370	10/1962	Hamilton	251—368 X
3,115,153	12/1963	Delamater	137—432 X
3,194,258	7/1965	Grant	137—432 X

WILLIAM F. O'DEA, *Primary Examiner.*

DAVID R. MATTHEWS, *Assistant Examiner.*

U.S. Cl. X.R.

137—416 429, 443; 251—251, 333