June 4, 1963 T. C. HIMMELRICK 3,091,775

DUAL STROKE TOILET FLUSH VALVE

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FIG. 1.

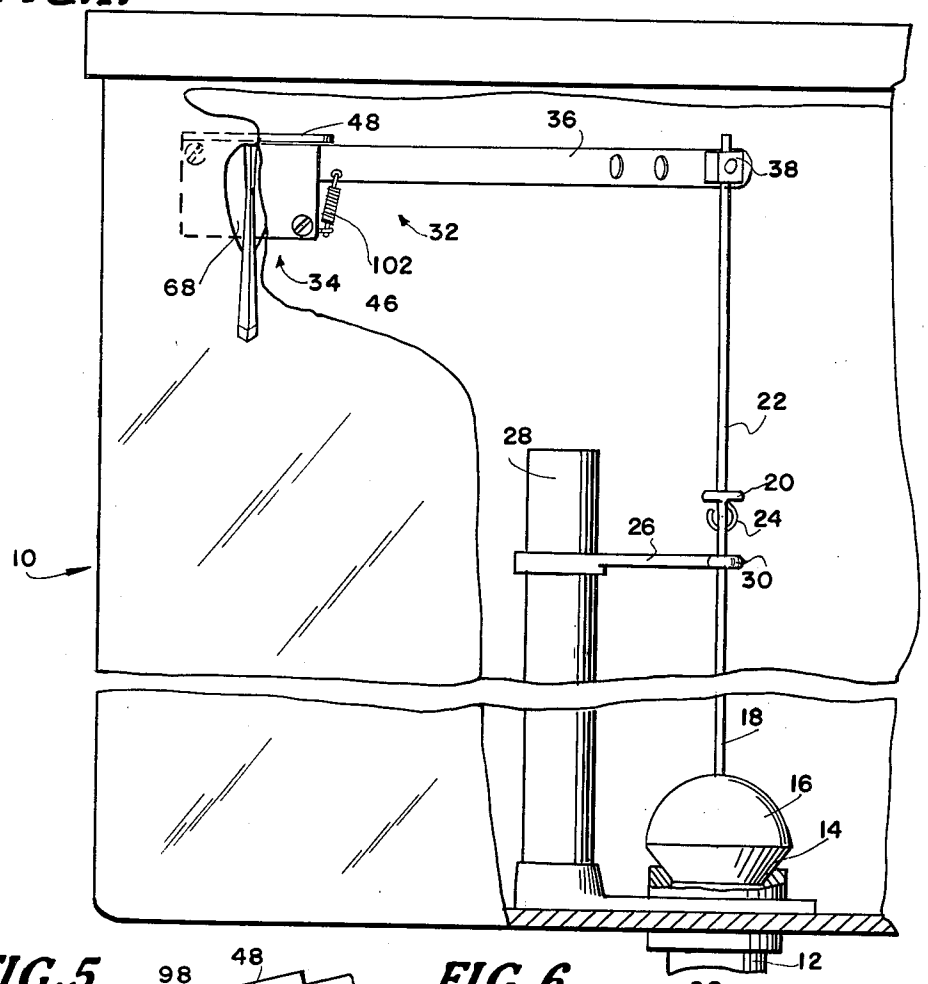


FIG. 5.

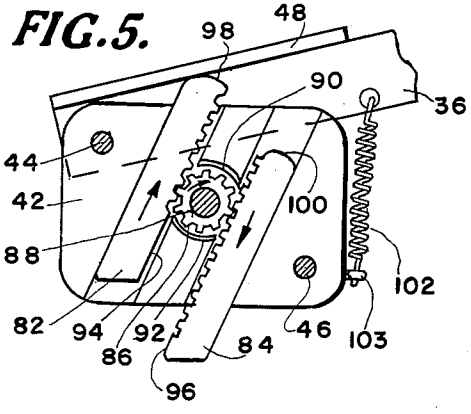
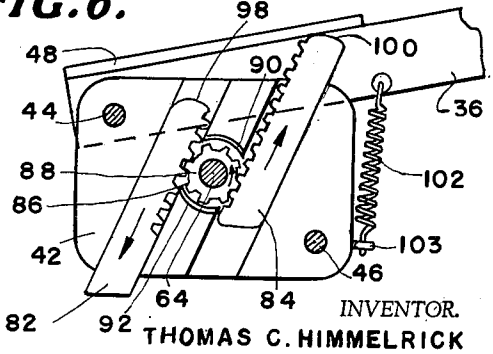


FIG. 6.



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FIG.2.

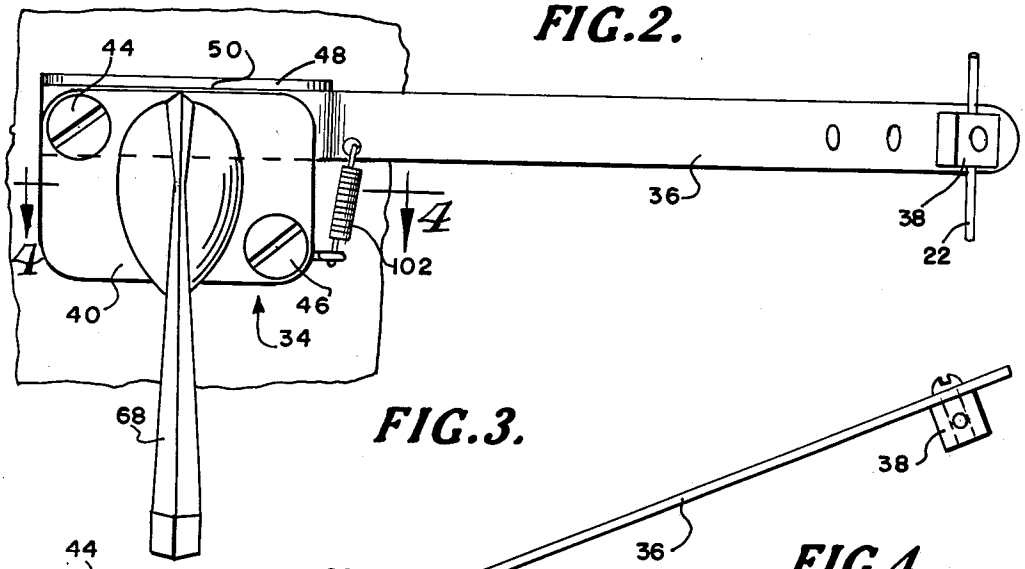


FIG.3.

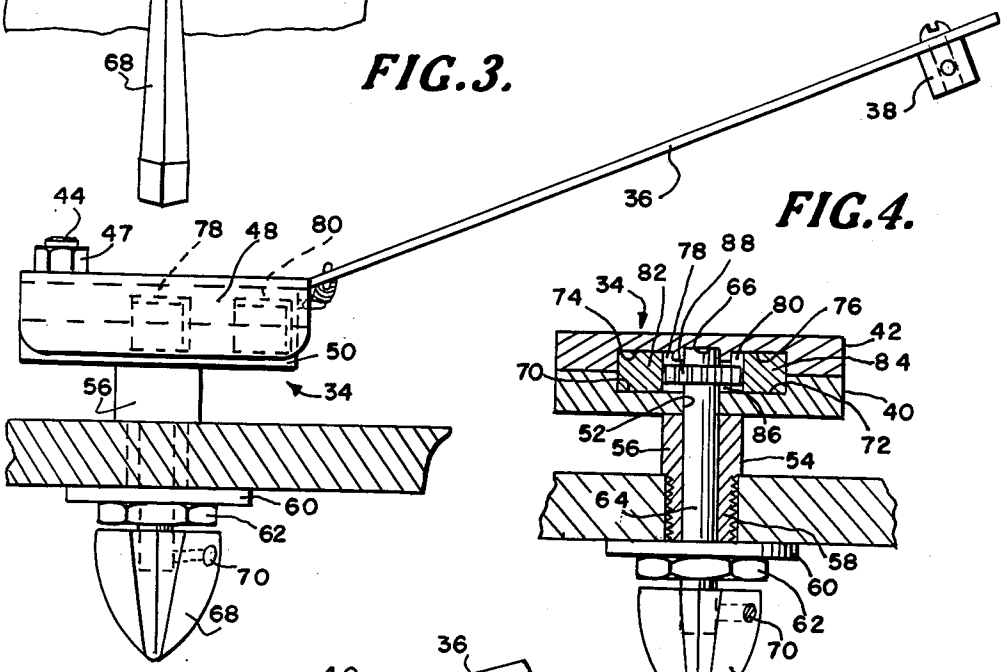


FIG.4.

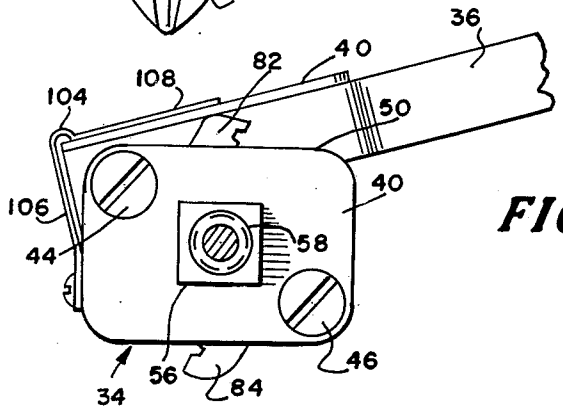


FIG.7.

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DUAL STROKE TOILET FLUSH VALVE

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13 Claims. (Cl. 4—67)

This invention has reference to a new and improved flush-valve actuating mechanism for toilet water closets and the like, the mechanism being operative to provide two selective flushing strokes for the water closet ball valve.

This invention contemplates the provision of a dual-stroke toilet flushing mechanism: one of the flushing strokes is relatively rapid, while the other flushing stroke is relatively slow for a given effort exerted on the handle. By virtue of this arrangement, a toilet advantageously can be flushed at a relatively rapid rate, e.g., during normal use, or a relatively slow rate, e.g., for cleaning purposes and the like.

According to this invention there is provided a mechanism of the character described which includes a housing operative to be mounted to the interior wall of a water closet. This housing pivotally carries a valve actuating lever, together with two gear racks for selective engagement with the lever at longitudinally spaced positions from its pivot axis to raise the lever for toilet flushing purposes. The gear racks are driven by an intermediate pinion which is rotated in either direction by a handle. By virtue of this arrangement, one or the other of the gear racks is operative to pivot the lever upwardly; and, by virtue of the fact the gear racks are longitudinally spaced from the lever pivot axis for different positions of engagement, the gear rack furthest from the lever pivot axis will render a slow flushing stroke due to the greater arc of travel necessary to raise the lever (and the ball valve) a given distance.

Further objects of this invention include the provision of a toilet flushing mechanism which is of notably simple and reliable construction, which incorporates a degree of adjustability, and which is relatively inexpensive to manufacture.

These and still further objects, advantages, and novel features of the present invention will become apparent in the specification and claims taken in connection with the accompanying drawings.

In the drawings:

FIGURE 1 is an elevation view, partially broken out, of a flushing assembly embodying the present invention;

FIGURE 2 is an enlarged elevation view of the valve actuating mechanism in FIGURE 1;

FIGURE 3 is a plan view of the mechanism in FIGURE 2;

FIGURE 4 is a section view taken along line 4—4 in FIGURE 2;

FIGURES 5 and 6 are elevation views of the mechanism at the extreme upward positions of each of the flushing strokes; and,

FIGURE 7 is an elevation view of a modified embodiment of the invention.

Referring now to the accompanying drawings, there is shown the usual toilet water tank 10 of generally rectangular construction having a lower discharge pipe 12 provided with an upper valve seat 14. A buoyant ball valve 16 normally contains the water within the tank 10, and the toilet bowl (not shown) is flushed by raising the ball valve 16 off the seat 14. The water in the tank 10 then drains with a rush through the pipe 12 to carry out the flushing operation. The ball valve 16 has an upstanding stem 18 and a sliding connection 20 with a lifting link 22, the latter having an enlarged lower end 24. Conveniently, the valve stem 18 is slidably maintained in an upright position by a transverse link 26 joined to the usual stand pipe 28 at one end, and to the stem 18 via a loop 30 at its opposite end.

When the lifting link 22 is raised, the ball valve 16 is raised off the seat 14 and the ball valve 16 tends to float while the water level recedes to a point where the ball valve 16 is again seated to stop the discharge of water. As is well known in the art, this closing operation is accomplished by suction of the outflowing water, the ball valve 16 then remaining seated by the water pressure above the ball valve 16.

According to this invention there is provided an actuating mechanism 32 operative to impart two selective upward strokes to the ball valve 16, as will now be explained. The mechanism 32 includes a housing 34 to which is pivotally mounted a lifting lever 36, in turn, connected to the upper end of the valve lifting link 24 at its opposite end, as by a locking screw assembly 38.

The housing 34 is of generally rectangular construction, being formed by two plates 40 and 42. The plates 40 and 42 are joined together by any suitable means, such as upper and lower countersunk machine bolts 44 and 46, respectively. In this regard, the upper bolt is threadably carried at the corner of the housing 34 remote from the ball valve 16, and extends inwardly beyond the plate 42 within the tank a sufficient distance to pivotally receive the adjacent end of the lever 36. A connection to the lever 36 is maintained by a nut 47. Thus, the lever 36 may take the shape, for example, of a flat plate, and suitably bent for necessary alignment with the ball valve 16. The lever 36 also has an upper horizontal flange 48 which overlays the top surface 50 of the housing 34, as best shown in FIGURE 3, to thereby limit the downward movement of the lever 36.

The housing plate 40, positioned adjacent the wall of the tank, has a central aperture 52; and carried in alignment therewith is a transversely extending boss 54 having a rectangular head 56 and a threaded free end 58. The boss 54 passes through the tank wall, and is rigidly fixed within the tank 10 via a washer 60 and a nut 62. A shaft 64 passes through the boss 54 and the plate aperture 52, its inner free end being received in an aligned recess 66 in the inner surface of the housing plate 42. The shaft 64 carries a handle 68 at its outer free end which is fixed to the shaft by a set screw 70, or the like.

The contiguous surfaces of the plates 40 and 42 have aligned spaced apart recesses 70, 72 and 74, 76, respectively, defining rectangular passages 78 and 80 which pass completely through the housing 34. These passages 78 and 80 are symmetrically positioned relative to the axis of the shaft 64, are parallel to one another, and are inclined relative to the top housing surface 50 adjacent the upper bolt 44. The passages 78 and 80 carry gear racks 82 and 84 respectively, the teeth of which face one another. The plates 40 and 42 also have formed in their contiguous surfaces a cylindrically recessed area 86, coaxial with the axis of the shaft 64. This recessed area 86 receives a pinion 88, fixed to the shaft 64. The pinion 88 is adapted to extend into the passages 78 and 80 to thereby drivingly engage the adjacent teeth of the gear racks 82 and 84. To facilitate proper alignment of the recesses, the plate 40 carries a peripheral boss (not shown) for engaging alignment with upper and lower recesses 90 and 92 peripherally surrounding the cylindrical gear receiving recess 86, as best shown in FIGURES 5 and 6.

The gear rack 82 bottom portion has a relatively long, flat surface area 94 adjacent its teeth; the gear rack 84 has a relatively short, flat surface area 96 along its bot-

tom portion in a similar fashion. Conveniently, the upper ends 98 and 100 of the gear racks 82 and 84 are smoothly curved to facilitate engagement with the flange 48.

The lever arm 36 is biased downwardly, so that the flange 48 normally rests on the top housing surface 50. To this end, there is shown a coil spring 102 joined to the housing 34 at its lower end by an extending threaded pin 103, and joined to the lever arm 36 at a longitudinally spaced position from the upper bolt 44. In the embodiment of the invention shown in FIGURE 7, a leaf spring 104 performs this same function: the leaf spring 104 has an upright leg 106 bolted at its lower end to the housing 34, and has an integral upper leg 108 abutting the top surface of the flange 48 to bias the same in a downward direction.

In operation, a dual-stroke flushing action is advantageously provided, depending on the direction of rotation of the handle 68. When the handle 68 is rotated in a clockwise direction (FIGURE 5) the gear rack 82 is moved upwardly via the shaft 64 and the pinion 88, the upper end 98 of this gear rack engaging the flange 48 at a point relatively close to the pinion axis of the lever 36. During this movement, the gear rack 84 moves downwardly, out of the bottom end of the housing 34. It should be noted that the flat surface area 94 limits the upward movement of the gear rack 82 when the teeth of the pinion 88 abut this surface at the extreme end of the stroke.

Conversely, when the pinion 88 is rotated in a counterclockwise direction (FIGURE 6) the gear rack 82 moves downwardly while the gear rack 84 moves upwardly, engaging the flange 48 at a position longitudinally distant from the gear rack 82, as described. The extreme end of the stroke is again limited by the provision of the flat surface area 96 on the bottom end of the gear rack 84.

In each instance, of course, the ball valve 16 is raised upwardly, allowing water to flow out through the pipe 12; however, the clockwise movement in FIGURE 5 provides a relatively rapid stroke as compared to the FIGURE 6 arrangement due to the fact that a greater arc length is transversed by the gear rack 84 as compared to the gear rack 82 to move the lever 36 through a given angle. The lever 36 is then biased downwardly upon release of the handle 68 by the coil spring 102 (or the leaf spring 104).

Also, the stroke can conveniently be adjusted simply by removing the plate 40 and selectively positioning the gear racks 82 and 84 within the recess so that the stroke is controlled. Thus, for example, if it is desired to provide the gear rack 82 with a relatively short stroke, the rack 82 is positioned within the recess 90 with the surface area 94 relatively close to the pinion. Thus, upon rotation of the pinion 88 in the clockwise direction, a relatively short stroke is provided due to the engagement with a small number of teeth carried by the rack 82.

From the foregoing description of the various embodiments of this invention, it is evident that the objects of this invention, together with many practical advantages are successfully achieved. While preferred embodiments of my invention have been described, numerous further obvious modifications may be made without departing from the scope of this invention.

Therefore, it is to be understood that all matters herein set forth are shown in the accompanying drawings are to be interpreted in an illsutrative, and not in a limiting sense.

What is claimed is:

1. Flush valve actuating mechanism for a toilet water tank comprising: a housing; means for connecting said housing to a toilet water tank, a toilet valve actuating lever pivotally at one end connected to said housing for movement in transverse relationship thereto from a downward position to an angularly upward position; first and second gear racks carried by said housing in longitudinally spaced relationship relative to the pivot axis of said lever and in operative alignment with said lever; pinion drive means carried by said housing in cooperative driving engagement with both gear racks operative to selectively move one of said gear racks to thereby pivot said lever to said upward position.

2. Mechanism defined in claim 1 wherein said housing includes spaced apart passages therein slidably receiving said gear racks, and said pinion drive means includes a pinion carried within said housing between said gear racks.

3. Mechanism defined in claim 1 including spring means for biasing said actuating lever to said downward position.

4. Mechanism defined in claim 1 wherein said actuating lever is pivotally connected to a side of said housing and including a transversely extending flange carried by said actuating lever in alignment with the top surface of said housing, said flange being positioned adjacent said top surface when in said downward position, and said gear racks are operatively positioned in alignment with said flange to raise said actuating lever upon upward movement thereof.

5. Mechanism defined in claim 1 wherein said gear racks are operatively positioned to raise said lever through different angles.

6. Mechanism defined in claim 1 wherein said gear racks are positioned for movement in parallel paths, said parallel paths being acutely inclined relative to the portion of said actuating lever extending from the pivot axis thereof to the axes of said paths.

7. Mechanism defined in claim 1 wherein said housing includes two plates mounted in coextensive relationship to one another, said actuating lever being pivoted to said housing to one of said plates at the end thereof remote from the opposite free end of said lever, a transversely extending flange carried by said actuating lever in alignment with the top surface of said housing, at least one of said plates having spaced apart passages communicating with said top surface, gear racks carried in each of said passages, the teeth thereof facing one another, a shaft carried within said housing in symmetric relationship to said gear racks, said pinion drive means constituting a pinion carried on said shaft operative to selectively move one of said gear racks upwardly to engage said flange and raise said actuating lever.

8. Mechanism defined in claim 7 including a boss-and-recess connection between the contiguous surfaces of said plates to provide alignment thereof.

9. Mechanism defined in claim 7 wherein the gear rack adjacent the pivot axis of said actuating lever has teeth therealong which terminate a relatively long distance from the bottom thereof, said gear rack remote from said pivot axis having teeth which terminate at a relatively short distance from the bottom thereof relative to said first-mentioned rack, the gear rack surfaces extending downwardly from the lowermost teeth in said racks being operative to limit rotation of said pinion.

10. Mechanism defined in claim 9 including a compression coil spring connected to said housing and said actuating lever to bias said actuating lever toward said housing top surface.

11. Mechanism defined in claim 9 including a leaf spring connected to said housing and extending over the top surface of said flange to bias said actuating lever towards said housing top surface.

12. Mechanism defined in claim 9 including machine bolts joining said plates together with one of said bolts also pivotally carrying said actuating lever.

13. Mechanism defined in claim 9 wherein the top ends of said gear racks are smoothly curved.

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