

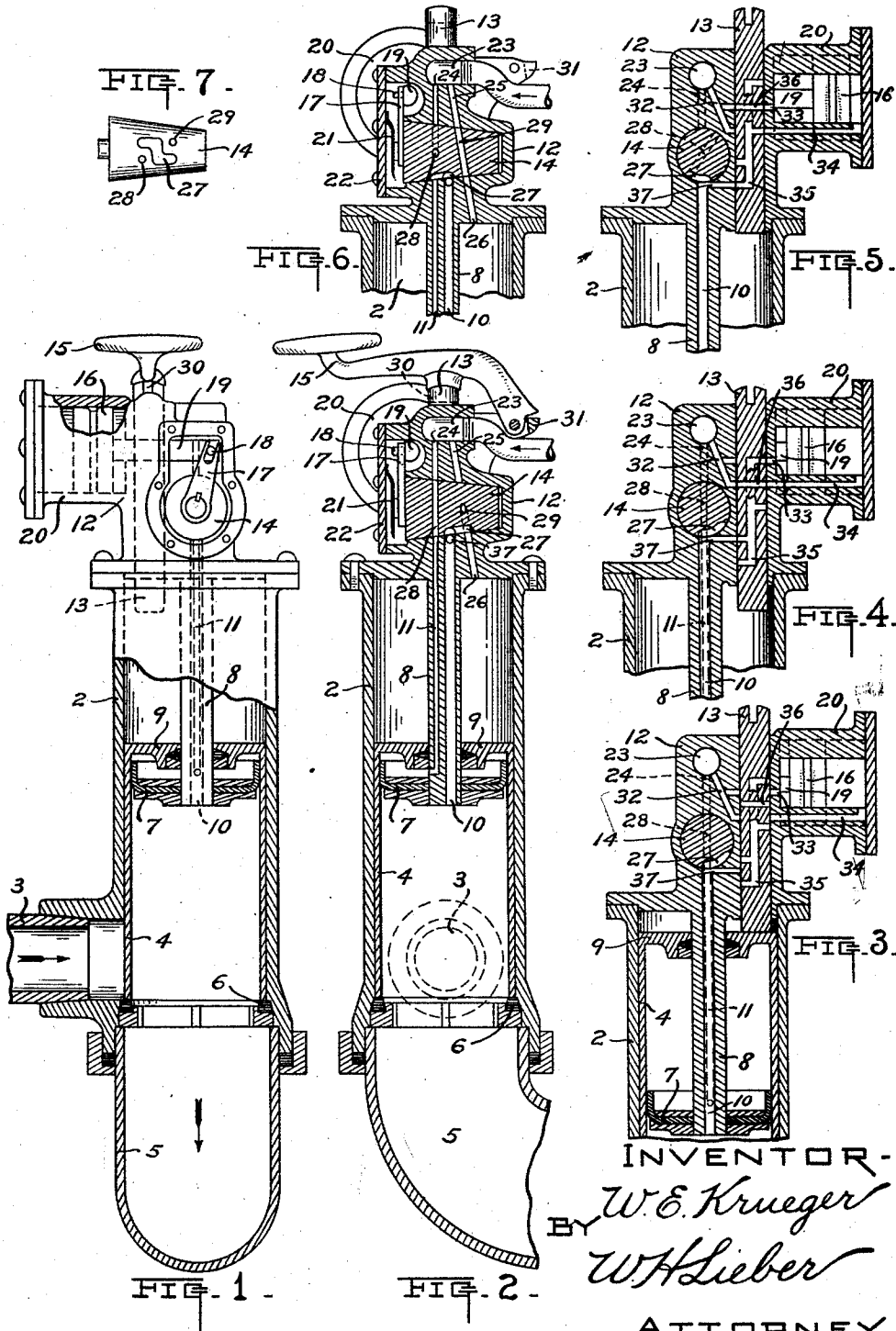
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W. E. KRUEGER

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VALVE

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UNITED STATES PATENT OFFICE.

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VALVE.

Application filed January 8, 1923. Serial No. 611,399.

To all whom it may concern:

Be it known that WILLIAM E. KRUEGER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Valve, of which the following is a specification.

This invention relates in general to improvements in the art of controlling the flow of fluids, and relates more specifically to improvements in the construction and operation of valve mechanisms and especially flush valve structures for water closets, urinals and the like.

An object of the invention is to provide a valve which is extremely simple and compact in construction and efficient in operation.

Some of the more important specific objects of the present invention are as follows:—

To produce a manually controllable flush valve which is especially adapted for installation in private dwellings of moderate value.

To provide a toilet flushing device which is extremely simple and rugged in construction, and which may be manufactured at minimum cost.

To provide an exceedingly compact flushing mechanism which is neat in general appearance and which may if desired be readily concealed within the wall of a toilet room.

To provide fluid flow control structure which performs its function effectively and which is noiseless in operation.

To provide a flush valve which is absolutely fool proof and which may be installed in connection with existing toilets.

To provide a valve mechanism all parts of which are conveniently accessible for inspection and cleaning, and which may be readily maintained in sanitary and operative condition.

To provide a manually controlled valve structure which is operable automatically by fluid under pressure and in which the use of springs is eliminated.

To provide flushing mechanism for water closets and the like, in which leakage and waste of water is avoided, and in which undesirable sweating of liquid containers is eliminated.

To provide other improvements in the details of construction and in the operation

of flushing devices and valve structures in general, whereby the efficiency of such devices is enhanced and the cost of construction and maintenance thereof is reduced to a minimum.

These and other objects and advantages of the present invention will be apparent in the course of the following description.

A clear conception of an embodiment of the invention and of the manner of manipulating and operating devices constructed in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a part sectional side elevation of a vertically reciprocable flush valve, showing the main valve in closed position.

Fig. 2 is a central vertical section through the improved flush valve structure, the main valve being in closed position.

Fig. 3 is a fragmentary central vertical section through the improved flush valve actuating mechanism, showing the same in a position corresponding to open position of the main valve.

Fig. 4 is a fragmentary central vertical section through the flush valve actuating mechanism, showing the manually operable control valve set for opening of the main valve.

Fig. 5 is a fragmentary central vertical section through the flush valve actuating mechanism, showing the elements in normal position with the main valve closed.

Fig. 6 is a fragmentary central vertical section through the flush valve actuating mechanism, showing the fluid distributing valve in normal position with the main valve closed.

Fig. 7 is a bottom view of the fluid distributing valve.

The improved flush valve structure comprises in general a main valve casing 2, a main sleeve valve 4 reciprocable within a bore of the casing 2, an auxiliary valve casing 12 secured to and forming an enclosing head for an end of the casing 2, a fluid distributing valve 14 rotatable within the casing 12, a servo motor 20 for operating the distributing valve 14, and a reciprocable control valve 13 slidable within a bore of the casing 12. While the main valve 4 has been illustrated as being vertically movable, it will be obvious that this valve

as well as the other structure may be disposed otherwise than as illustrated without departing from the present invention. The main valve casing 2 is provided with a main fluid or water supply 3 extending transversely of the direction of movement of the valve 4, and with a main fluid or water discharge 5 communicating with the interior of the valve 4 in the direction of movement thereof.

A removable valve seat 6 is clamped between the casing 2 and the discharge 5, and provides a seating for the valve 4 when closed.

The main valve 4 is formed as a sleeve the exterior of which snugly fits a bore of the casing 2 and the interior of which is bored to snugly fit the stationary partition 7. The partition 7 is stationarily supported from the auxiliary valve casing 12 by means of a rod like or tubular member 8. The upper end of the sleeve valve 4 is provided with an inwardly extending flange or end head 9 having a central bore which snugly fits and is slidable along the member 8. The head 9 is movable from the partition 7 to the auxiliary valve casing 12 during opening movement of the main valve 4.

The fluid distributing valve 14 is of the tapered rotary plug type and is mounted in a tapered bore in the casing 12, to rotate about an axis which intersects the central axis of the main valve 4. The larger end of the tapered valve 14 is provided with an actuating arm or lever 17 the upper end of which is bifurcated and engages a pin 18 projecting laterally from the servo motor piston rod 19. The valve 14 is normally retained within the tapered bore of the casing 12 by means of a leaf spring 21 carried by the cover plate 22; the valve 14 being readily removable upon removal of the plate 22 and spring 21. The valve 14 has a pair of straight through openings or passages 28, 29 which penetrate the valve 14 at different angles, and is also provided with an irregular peripheral port 27, see Fig. 7. These passages and ports are adapted to communicate with passages 26, 10, 11, the two latter of which extend through the tubular member 8. The passage 10 terminates in the space below the partition 7 while the passage 11 terminates laterally in the space between the valve head 9 and the partition 7. The passage 26 terminates in the space between the valve head 9 and the auxiliary valve casing 12.

The fluid pressure actuated servo motor 20 comprises a piston 16 reciprocable horizontally within a bore of the casing 12, and a piston rod 19 secured to the piston and connected to the valve 14 by means of the pin 18 and lever 17. The manually movable servo motor control valve 13 is vertically slidable within a bore of the casing 12 by means of an actuating lever 15 having a projection 30 fitting a slot in the upper end

of the valve 13. This coaction between the lever 15 and the valve 13 prevents rotation of the valve. The lever 15 is pivotally supported by the casing 12 which provides a limit stop 31 for the lever. The valve 13 is provided with independent ports or passages 35, 36, the former of which extends both longitudinally and transversely within the valve 13 and the latter of which extends transversely directly therethrough. The servo motor control ports 33, 34 extend through the casing 12 from opposite sides of the piston 16 to the control valve 13. A port 37 extends through the casing 12 from the valve 13 to the exhaust port 10. The casing 12 is also provided with an actuating fluid supply chamber 23 from which fluid distributing ports 24, 25 extend through the casing 12 to the plug valve 14, while a port 32 extends from the chamber 23 through the casing 12 to the control valve 13. The control valve 13 is formed of sufficient length so that when the valve is moved downwardly as shown in Figs. 1 and 4, the lower extremity of the valve 13 depends into the chamber or space between the valve head 9 and the casing 12.

During normal operation of the improved valve mechanism, and assuming it to be desirable to open the valve 4 as when it is desired to flush a toilet or a urinal, it is necessary only to depress the lever 15 to move the valve 13 from the position indicated in Fig. 5 to the position indicated in Fig. 4. When the valve 13 is thus moved, the space to the left of the servo motor piston 16 is thrown into communication with the exhaust passage 10 through the ports 33, 35, 37 and the space to the right of the piston 16 is simultaneously brought into communication with the fluid supply chamber 23 through the ports 34, 36, 32, as shown in Fig. 4. Fluid under pressure is then admitted through the ports 32, 36, 34 to the right of the piston 16 causing the piston and the rod 19 to move rapidly toward the left as viewed in Fig. 4 and to position the distributing valve 14 as shown in Figs. 2, 3 and 4. With the valve 14 thus positioned, the through port 28 establishes direct communication between the pressure supply chamber 23 and the space between the valve head 9 and partition 7, through the ports 24, 28, 11. The peripheral port 27 of the distributing valve 14 simultaneously connects the space above the valve head 9 with exhaust through the ports 26, 27, 10 thereby permitting the gradual accumulation of fluid under pressure below the valve head 9 through the ports 24, 28, 11, to slowly raise and open the main valve 4, see Fig. 1. As the main valve 4 reaches the upper limit of its travel, the moving end head 9 directly engages the depressed lower end of the control valve 13

as indicated in Fig. 3, and automatically moves the valve 13 upwardly to the position indicated in Fig. 5. When the valve 13 is returned to its upper or normal position, the space to the right of the servo motor piston 16 is automatically connected with exhaust through the ports 34, 35, 37, 10, while the space to the left of the piston 16 is simultaneously connected with the fluid pressure supply 23 through the ports 32, 36, 33, see Fig. 5. The servo motor piston 16 then moves rapidly toward the right as viewed in Fig. 5 and to position the distributing valve 14 as shown in Figs. 5 and 6. With the valve 14 thus positioned, the through port 29 establishes direct communication between the pressure supply chamber 23 and the space above the valve head 9 through the ports 25, 29, 26. The peripheral port 27 of the distributing valve 14 simultaneously connects the space between the valve head 9 and the partition 7 with exhaust by connecting the port 11 with the exhaust port 10, thereby permitting the gradual accumulation of fluid under pressure above the valve head 9 to slowly lower and close the main valve 4. When the main valve 4 has been fully closed, the various valves and levers are in position for subsequent opening thereof by merely depressing the lever 15.

It will be obvious that the quantity of water permitted to flow from the supply 3 to the discharge 5 during one operation of the main valve 4 is readily controllable by varying the cross-sectional areas of the fluid supply and discharge ports. For ports of predetermined area and with constant pressure in the supply 3, the quantity of fluid passing the main valve 4 during opening and closing thereof will always be constant. The apparatus has been found especially applicable as a toilet and urinal flushing device which may be readily substituted for the cumbersome flush tanks now universally used. The structure is extremely simple, rugged and inexpensive in construction and may be manufactured and installed at relatively moderate cost. When installed in private bath rooms, the mechanism may be readily concealed in the wall to leave only the lever 15 projecting. The apparatus is moreover practically noiseless in operation and the various valves are conveniently accessible and removable. In constructing the mechanism, the various parts should be properly fitted and packed to avoid leakage and to maintain operation at maximum efficiency.

While the mechanism has been described more or less in detail and with the aid of specific terms, it should be understood that it is not desired to limit the invention to the exact details of construction and of operation herein shown and described for various

modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:—

1. In combination, a main valve, an auxiliary valve for controlling the movement of said main valve, and a primary control valve manually operable to effect movement of said auxiliary and main valves in one direction and operable by said main valve to effect movement of said auxiliary and main valves in the opposite direction.

2. In combination, a casing, a reciprocable fluid pressure actuated main valve for controlling the flow of fluid through said casing, a rotary auxiliary valve for controlling the operation of said main valve, a reciprocable fluid pressure actuated servo motor for operating said rotary valve, and a manually operable valve for controlling the operation of said servo motor.

3. In combination, a casing, an annular valve reciprocable within said casing to control the flow of fluid therethrough, a rotary valve for controlling the movement of said annular valve, a reciprocable servo motor for operating said rotary valve, and a manually operable valve for controlling the operation of said servo motor.

4. In combination, a main valve, an auxiliary valve for controlling the opening and closing movement of said main valve, and a primary control valve manually operable to effect movement of said auxiliary valve to open said main valve and operable by the opening movement of said main valve to effect movement of said auxiliary valve to close said main valve.

5. In combination, a main valve movable in opposite directions by fluid under pressure, an auxiliary valve for controlling the flow of actuating fluid to move said main valve in opposite directions, and a primary control valve manually operable to move said auxiliary valve to effect movement of said main valve in one direction and operable by the movement of said main valve to move said auxiliary valve to effect movement of said main valve in the opposite direction.

6. In combination, a main valve movable to open and closed positions by fluid under pressure, an auxiliary valve for controlling the flow of actuating fluid to open and close said main valve, and a primary control valve manually operable to move said auxiliary valve to open said main valve and operable by the opening movement of said main valve to move said auxiliary valve to close said main valve.

7. In combination, a casing having a bore and a stationary partition cooperating with said bore to provide an annular space, a valve having an annular side wall fitting said bore and slidable through said space and having an end wall cooperable with

said partition to form a closed chamber, and means for admitting fluid under pressure to said chamber to open said valve.

8. In combination, a casing having an end wall and an intermediate partition suspended from said wall by means of a tubular member, said casing cooperating with said wall and said partition to form a chamber, a sleeve valve having an inwardly extending flange, slidable along said member and movable along said casing between said wall and said partition, and valve means for controlling the flow of fluid under pressure to said chamber on opposite sides of said flange through said member.

9. In combination, a slidable sleeve valve having an annular inwardly projecting end flange, a stationary piston coacting with the interior of said valve and having a tubular member cooperating with said flange, and valve means for controlling the flow of fluid under pressure through said member to the space between said piston and said flange to operate said valve.

10. In combination, a reciprocable cylindrical sleeve valve having an annular inwardly projecting end flange, a stationary piston fitting the bore of said valve and having a tubular member coacting with a bore of said flange, and valve means for controlling the flow of fluid under pressure through said member to the space within said valve between said piston and said flange to open said valve.

11. In combination, a casing having a bore, a sleeve valve having a bore and being slidable within said casing bore, a partition rigidly attached to said casing and coacting with said valve bore, said valve having a head which provides two segregated chambers adjoining said casing and said partition respectively, and valve means for alternately admitting fluid under pressure to said chambers to move said valve in opposite directions.

12. In combination, a reciprocable sleeve valve having an end head, a distributing valve for alternately admitting fluid under pressure to opposite sides of said end head to move said sleeve valve in opposite directions, a servo motor for operating said distributing valve, and a control valve for operating said servo motor.

13. In combination, a reciprocable sleeve valve having an end head, a distributing valve for alternately admitting fluid under pressure to opposite sides of said end head to move said sleeve valve in opposite directions, a fluid pressure actuated servo motor for operating said distributing valve, and a control valve manually operable to produce operation of said servo motor in one direction and operable by said sleeve valve to produce operation of said servo motor in the opposite direction.

14. In combination, a reciprocable main valve alternately movable in opposite directions by fluid under pressure, a distributing valve for controlling admission of actuating fluid to said main valve, a fluid actuated piston for operating said distributing valve, and a control valve manually operable to produce movement of said piston in one direction and operable by said main valve to produce movement of said piston in the opposite direction.

15. In combination, a casing having a bore and a stationary partition cooperating with said bore to provide an annular space, a valve having a tubular side wall snugly fitting and slidable through said space and having an end wall cooperable with said partition and with said casing to form opposed chambers, and means for alternately admitting fluid under pressure to said chambers to open and close said valve.

In testimony whereof, the signature of the inventor is affixed hereto.

WILLIAM E. KRUEGER.