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Johnstone et al.

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[54] **VALVE ASSEMBLY WITH AUTOMATIC DRAINING FEATURE**

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[51] **Int. Cl.** **F16g 11/02**

[58] **Field of Search** 137/625.22, 625.21, 137/637.3, 637.5, 614.12, 614.13, 616.7, 596.13, 596; 251/368, 314, 315

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[57] **ABSTRACT**

A rotatable valve with a self draining feature which allows water to drain from one side of the valve when the rotatable valve element is in the closed position. The valve has a housing with an element therein rotatably mounted about a central vertical axis and a subsidiary valve cooperating with the trunnion portion of the element which opens a drain passage when the element is in the closed position. Both the rotatable and subsidiary valves are operated from the same handle.

7 Claims, 2 Drawing Figures

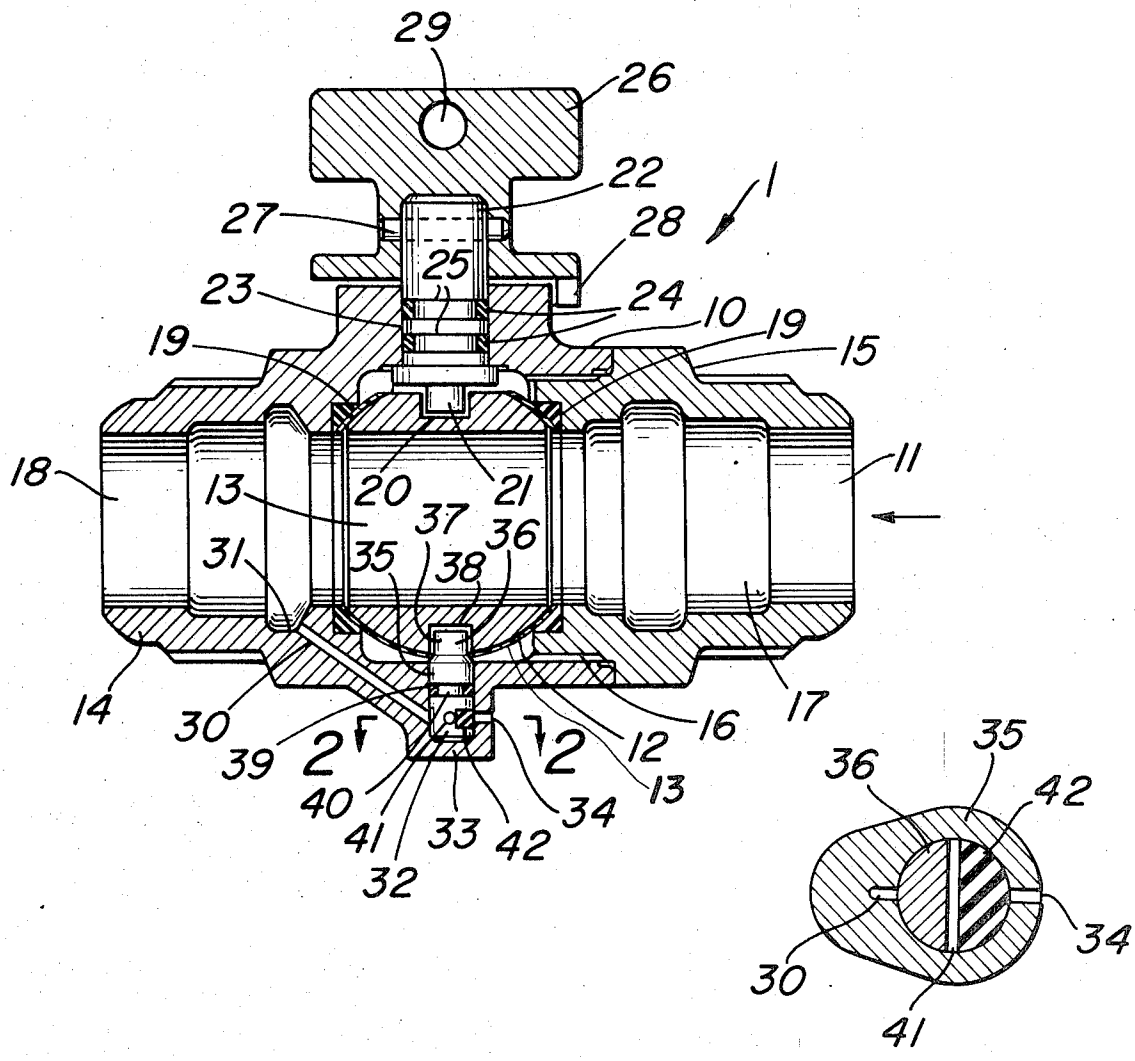

FIG.1

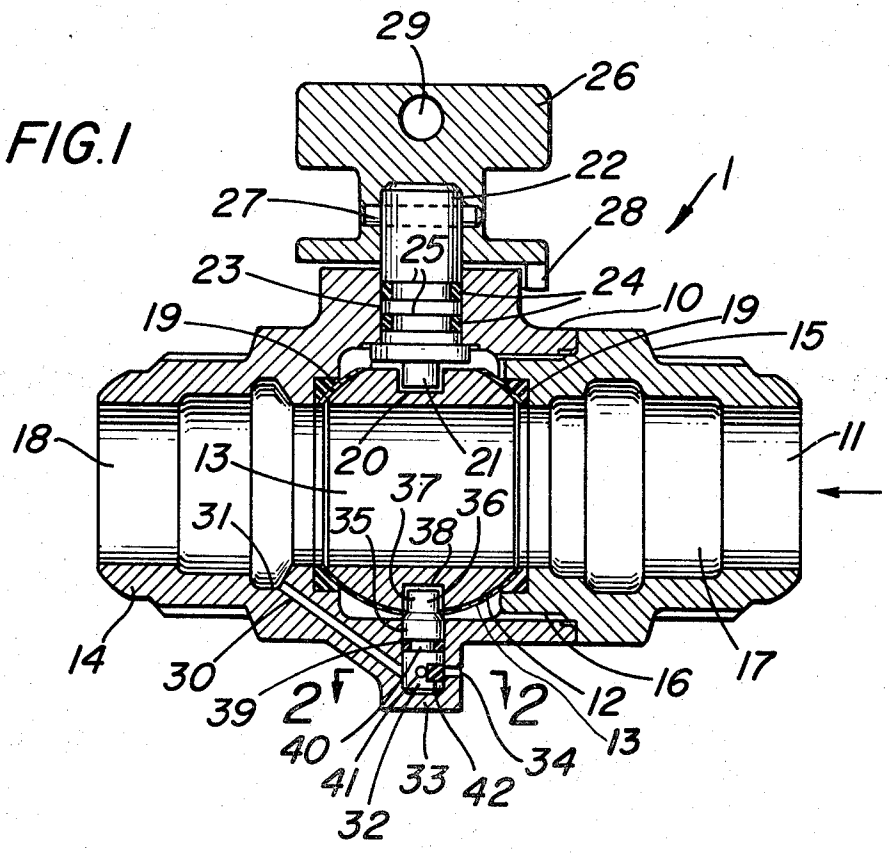
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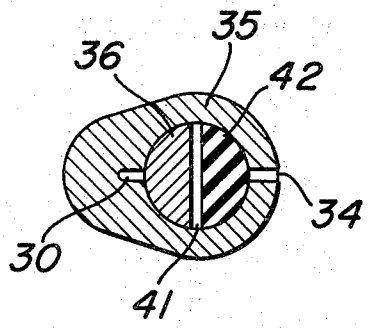
FIG.2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VALVE ASSEMBLY WITH AUTOMATIC DRAINING FEATURE

The present invention relates to valves and more particularly to valves commonly called corporation curb stop valve having a rotatable valve element and a self draining feature which allows water to drain from one side of the valve when the rotatable valve element is in the closed position.

A corporation curb stop valve is generally located below the frost level on a line dividing a house owner's or property owner's land from town or municipality land. The valve ls located on a water supply line to a house and may be turned off at the land dividing line if a house becomes vacant or if a lot is not yet built upon. In some cases when a house becomes vacant, the heat is turned off in the house and it is necessary to drain the water remaining in all the pipes above frost level. This may be achieved by having either a drain on the curb stop valve or a separate drain cock below the frost level on the water supply line to the house from the main water supply line in the town land.

In previous designs of curb stop valves, self draining features have been provided but they are generally dependent on a separate lever or cock which must be operated to open the drain after the main valve is closed. Alternatively, in some types of ball stop and drain valves, special automatic draining features have been provided which automatically drain the downstream portion of the valve when the valve is in the closed position. This has been achieved by special drain holes or passages in the ball element itself. Thses passages line up with a drain outlet surrounded by a rubber seal in the body of the valve. However, this rubber seal presses aginast the side of the ball valve element at all times and tends to produce an eccentric loading on the ball valve element which leads to seal failure in a shorter space of time than is normally expected with modern day valves.

It is therefore an object of the present invention to provide a corporation curb stop valve having a draining feature which is associated with the trunnion whereby no eccentric loading is placed on the ball and which is actuated by the main handle or valve operator.

It is a further object of the present invention to provide a valve which automatically allows one side of the valve to drain when the valve is in the closed position.

It is a further object to provide a corporation curb stop valve having a simplified structure which requires no additional plugs or actuator mechanism.

These and other objects will become apparent by referring to the present invention which provides a valve assembly with an automatic draining feature, whereby an integral valve housing having a passsage extending therethrough has a valve element having an opening therethrough is disposed rotatably about a central vertical axis between an open position and a closed position. The usual seats are provided for a fluid type seal between the valve element and the valve housing. A drain passage from one side of the passage in the valve housing communicates with a drain outlet at the bottom exterior of the valve housing and a subsidiary valve means in the drain passage located on the central vertical axis below the valve element is adapted to open and close in conjunction with rotation of the valve element. The subsidiary valve means being open when the valve element is in the closed position and closed when the valve element is in the open position.

IN THE DRAWINGS

FIG. 1 is a sectional elevation of one embodiment of a valve assembly with an automatic draining feature of the present invention.

FIG. 2 is a cross-sectional elevation at 2—2 on FIG. 1.

Referring to the drawings, the corporation curb stop valve, generally indicated by reference numeral 1, has an integral valve housing 10 with a passage 11 extending therethrough. In the center of the housing 10 and in the center of the passage 11, a valve element 12 is located. In the drawings this element is illustrated as a spherical ball which is preferred. However, the automatic draining feature could also apply to a plug type valve, be it a tapered plug, or cylindrical plug, or any similar type element. The spherical ball element 12 has an opening 13 through its center which is cylindrical in shape and aligns itself with the passage 11 through the housing 10 when the valve element is in the open position as shown in FIG. 1. The valve housing 10 includes a body piece 14 which contains the valve element 12 and a tail piece 15 connected to the body piece 14 by a screw connection 16 having a sufficiently large diameter to allow the valve element 12 to be removed from the body piece 14 when the tail piece 15 is disconnected.

The flow of water through the valve is in the direction shown in the arrow in FIG. 1. The water enters the inlet portion 17 of the passage 11, passes through the opening 13 in the valve element 12 and enters the outlet portion 18 of the passage 11 before leaving the valve. Resilient annular seals 19 having a general rectangular cross-section with one corner removed and contoured to fit the spherical valve element 12 are located in the inlet portion 17 and the outlet portion 18 resting against the spherical valve element 12. A slot 20 in the top of the valve element 12 has a key 21 connected to a rotatable shaft 22 which projects through an aperture 23 in the body piece 14 located on a central vertical axis of the spherical valve element 12. Two O-ring type seals 24 fit in annular groove 25 in the shaft 22 to prevent water from leaking between the aperture 23 and the rotatable shaft 22. A key cap or actuator handle 26 is connected to the rotatable shaft 22 by a pin 27, as shown.

A lug 28 forms a part of the base of the actuator handle 26, and preferably rotates between two shoulders, not shown, which form a part of the upper body piece 14, to restrict the rotational movement of the said handle and valve element 12. In this manner the rotation of the valve element 12 may be restricted to 90°, which is preferable. An extension handle or some pivotal actuator rod, not shown, may be connected to the key cap 26 by means of the hole 29 to rotate the valve element 12.

A drain passage 30 is provided in the body piece 14 of the valve housing 10. The entrance to the drain passage 30 is at the base of an annular groove 31 in the outlet portion 18 of the passage 11. In this embodiment, the drain passage 30 drains from the outlet portion 18 of the valve, which is the downstream side. However, in certain valves there is a requirement for a drain on the upstream side of the valve, and in this case the drain passage 30 would drain from the inlet portion

17. The drain passage 30 leads to a subsidiary valve 32 located in the lower portion 33 of the body piece 14. A drain outlet 34 extends from the outlet side of the subsidiary valve 32 through the wall of the lower portion 33 of the body piece 14 to the exterior. The subsidiary valve 32 includes a cylindrical housing 35 in the lower portion 33 of the body piece 14. Fitting into the cylindrical housing 35 is a cylindrical plug or trunnion 36 which is located on the axis of rotation of the spherical valve element 12 and is connected to the spherical valve element 12 by a key 37 on the cylindrical plug 36 fitting into a slot 38 in the bottom of the spherical valve element 12. Thus, the cylindrical plug 36 rotates with the spherical valve element 12. An O-ring 39 is contained in an annular groove 40 in the cylindrical plug 36 and stops any water leaking between cylindrical plug 36 and the cylindrical housing 35. A connecting passage 41 in the cylindrical plug 36 joins the drain passage 30 to the drain outlet 34 when the valve element 12 is in the closed position. This allows water in the outlet portion 18 of the valve housing 10 and in any piping connected to the outlet portion 18 to drain through the drain passage 30 to the drain outlet 34. When the spherical valve element 12 is rotated so that it is in the open position, the connecting passage 41 in the cylindrical plug 36 is turned preferably through 90°, and a wedge 42 of a resilient material aligns itself over the drain outlet 34 thereby sealing the outlet. When there is water pressure in the passage 11, the water tends to push the wedge 42 against the drain outlet 34 and thus aids in sealing the drain outlet 34 to stop water leaking from the valve. The size of the wedge 42 may be seen in FIG. 2 and is preferably semicircular in shape extending approximately halfway around the cylindrical plug 36. As may be seen from FIG. 2, when the wedge 42 is aligned directly over the drain outlet 34, the spherical valve element 12 is in the open position, and the element 12 may be turned 90° in either direction to close the spherical valve element 12 and open the drain passage 30 to the drain outlet 34. Stops are preferably placed to limit the rotation of the spherical valve element 12 and the cylindrical plug 36. However, positive stops 90° are preferred to insure that the valve is in the fully open or fully closed position. The slot 20 in the top of the valve element 12 and the slot 38 in the bottom of the valve element 12, both extend across the spherical face of the valve element 12 so that when the valve element 12 is in the closed position, the tail piece 15 may be disconnected from the body piece 14 and the valve element 12 removed from the body piece 14. The cylindrical plug 36 may then be lifted from the cylindrical housing 35 and removed. Similarly, the rotatable shaft 22 may be lowered from the aperture 23 and removed. In the reverse manner, the valve may be reassembled.

The materials of construction for a corporation stop valve are generally non-ferrous to avoid corrosion of the valve. However, a ball valve with the automatic draining feature of the present invention may be made from stainless steel or cast iron. A cast bronze is preferred for the body piece 14, tail piece 15, and key cap 26. The rotatable shaft 22 and the cylindrical plug 35 are preferably made from stock bronze. The seals are preferably made from nitrilebutadiene synthetic rubber or other suitable resilient material and the spherical valve element 12 is preferably made from bronze and may be sprayed with polytetrafluorethylene or other like coating 13 with a low coefficient of friction in order to reduce the opening and closing torque if so desired.

In operation, when water or liquid is flowing through the valve with the spherical valve element 12 in the open position, the drain outlet 34 leading from the subsidiary valve 32 is sealed off by the wedge 42 pressing up against the drain outlet 34. When the spherical valve element 12 is rotated so that the valve is in the closed position, the drain outlet 34 opens because the cylindrical plug 36 of the subsidiary drain valve 32 rotates with the valve element 12, and brings the connecting passage 41 in the cylindrical plug 36 in alignment with the drain outlet 34, thus allowing water in the outlet portion 18 of the valve to drain out through the drain passage 30 to the drain outlet 34.

It will be clear to those skilled in the art that the embodiment shown does not limit the scope of the present invention. Although only a spherical valve element has been shown it may well be substituted by a cylindrical or conical type plug valve. Furthermore, the details of construction of the valve, whether it be a spherical type valve or plug type valve, may be varied from that shown in these embodiments. Similarly, the detail of the subsidiary drain valve need not be precisely as shown in the embodiment, but must operation in conjunction with the rotation of the valve element on the axis of rotation. Whereas, the use of this valve has been discussed herein specifically for a corporation curb stop valve, the design of the valve may be put to other uses where this particular draining feature is a requirement. Additionally, the drain feature may be placed on the top portion of the valve for use as a venting means whereby fluid trapped between the valve closure member and body may be vented or released to atmosphere to relieve internal pressures which might be created within the valve due to temperature expansion.

We claim:

1. A valve assembly with an automatic draining feature comprising: an integral valve housing having a passage extending therethrough; a ball shaped valve element located within the valve housing having a cylindrical opening through said element adpated for alignment with the passage extending through the valve housing, the valve element disposed rotatably about a central vertical axis between an open position and a closed position; annular resilient sealing means in the passage extending through the valvehousing, said sealing means located between the valve element and the valve housing adapted to provide a fluid type seal between the valve element and the valve housing; a drain passage from one side of the passage in the valve housing to a drain outlet at the bottom exterior of the valve housing; a subsidiary valve means in the drain passage located on the central vertical axis below the valve element adapted to open and close in conjunction with rotation of the valve element, the subsidiary valve means being open when the valve element is in the closed position and closed when the valve element is in the open position.

2. A valve assembly with an automatic draining feature comprising: an integral valve housing having a passage extending therethrough; a valve element located within the valve housing having an opening through valve element adapted for alignment with the passage extending through the valve housing; the valve element disposed rotatably about a central vertical axis between

an open position and a closed position; annular resilient sealing means in the passage extending through the valve housing, said sealing means located betwen the valve element and the valve housing adapted to provide a fluid type seal between the valve element and the valve housing; a drain passage from one side of the passage in the valve housing to a drain outlet at the bottom exterior of the valve housing; a subsidiary valve means in the drain passage located on the central vertical axis below the valve element adapted to open and close in conjunction with rotation of the valve element, said valve element having a top slot and a bottom slot, the top slot adapted to mate with the first key to rotate the valve element to the bottom slot adapted to mate with a second key connecting the valve element with the subsidiary valve means, the subsidiary valve means being open when the valve element is in the closed position and closed when the valve element is in the open position.

3. The valve assembly according to claim **2**, wherein the valve element is disposed rotatably between an open position and a closed position and is restricted to approximately 90° rotation.

4. The valve assembly according to claim **3**, wherein the drain passage passes through the integral valve housing to the subsidiary valve means.

5. The valve assembly according to claim **1**, wherein the subsidiary valve means includes a cylindrical plug connected to the base of the valve element, the plug disposed rotatably and having the same axis of rotation as the valve element, a cylindrical housing surrounding the plug forming part of the valve housing, an O-ring seal between the plug and the cylindrical housing, a drain outlet in the side of the cylindrical housing, a connecting passage in the plug adapted for alignment between the drain passage from the outlet portion of the passage in the valve housing and the drain outlet in the side of the cylindrical housing when the valve element is in the closed position, and a wedge of resilient material in one side of the plug adapted to seal the drain outlet when the valve element is in the open position.

6. The valve assembly according to claim **1**, wherein the materials of construction are bronze, the seals are of nitrile butadiene synthetic rubber and the ball shaped valve element is coated with polytetrafluorethylene.

7. A valve assembly including: a valve housing having a passage therethrough, a valve element located within said housing having an opening through the valve element adapted for alignment with the passage extending through said housing, said element separating the downstream from the upstream sides of said housing, trunnion means supporting said valve element for rotation about a central vertical axis; annular resilient sealing means in the passage extending through the valve housing, said sealing means located between the valve element and the valve housing adapted to provide a fluid type seal therebetween, a drain passage in the downstream side of said valve housing extending to an outlet at the bottom of said housing, a subsidiary valve means positioned in said passage, said subsidiary valve means including a passage in one of said trunnion means adapted to communicate with said drain passage when said valve element is in a closed position.

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