United States Patent

Maloney

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[54] DIVERTER VALVE

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[51] Int. Cl. F16k 11/02

[58] Field of Search 137/625.44, 612, 610, 112, 137/119, 467

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[57] ABSTRACT

Fluid pump-effluent is completely and instantaneously routed to one of two conduits in a system which includes a vertically extending main line, passing through a special valve, and a secondary line passing laterally from said valve. The valve includes a closure member pivotable around a pivot line through an arch which is upstream with respect to said pivot line, and generally below said pivot line, the pivot line being positioned at one side of said main steam above the secondary line, the closure member being seatable on both primary line, and secondary line, valve seats.

1 Claims, 6 Drawing Figures

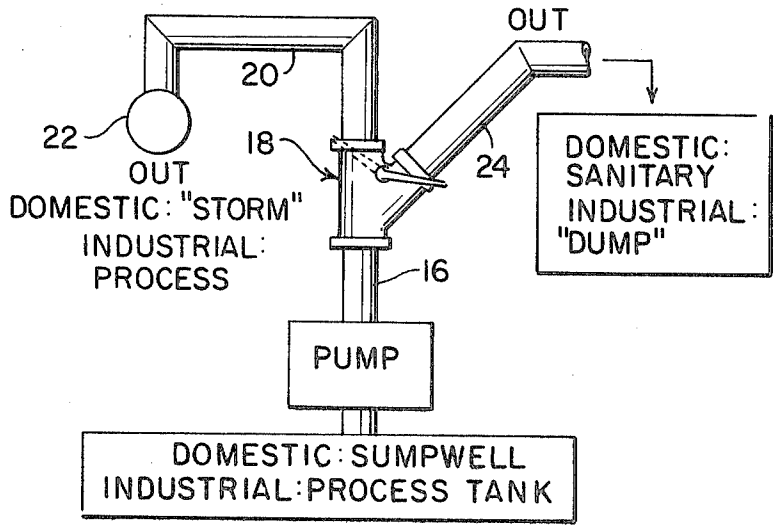
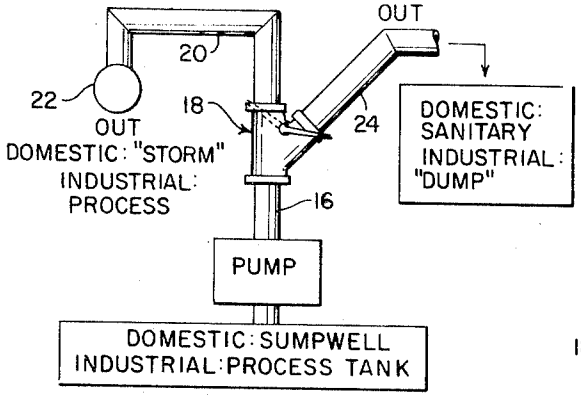


FIG. 1



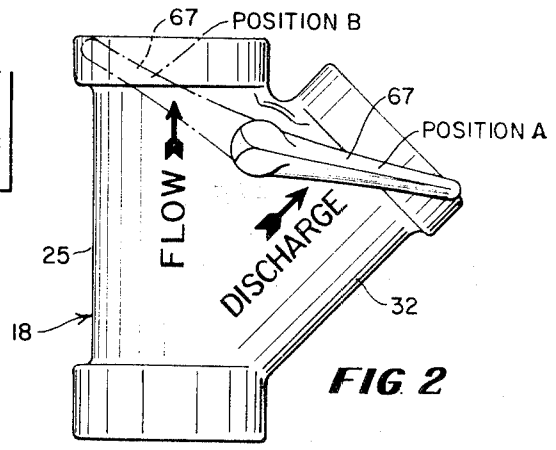


FIG. 2

FIG. 3

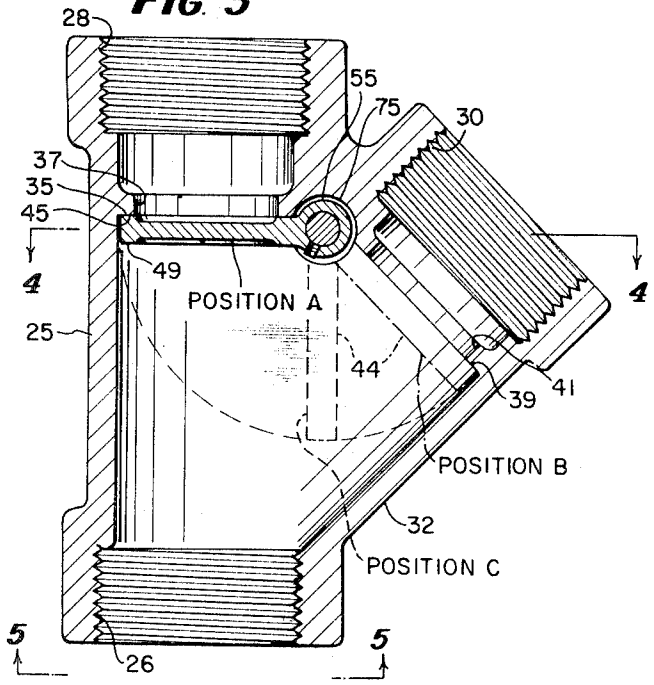
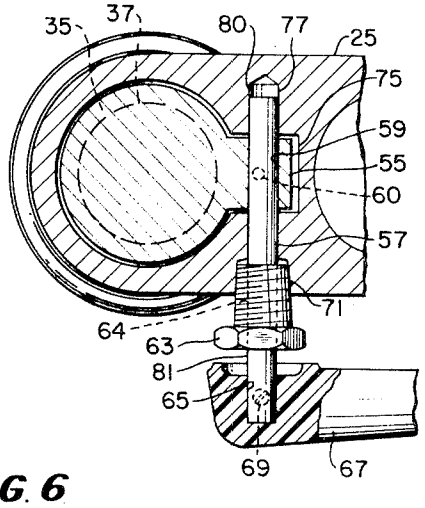


FIG. 4



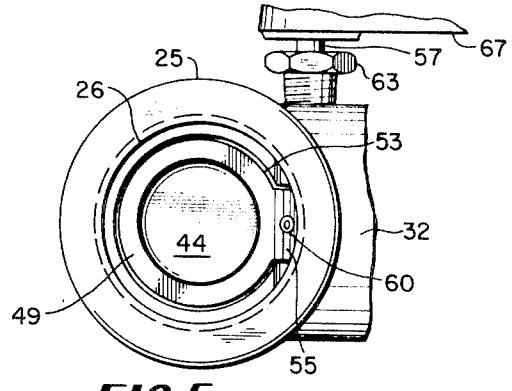
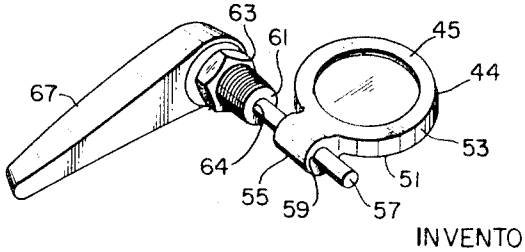


FIG. 5

FIG. 6



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DIVERTER VALVE

BACKGROUND OF THE INVENTION

In some municipalities sump pump wells in basements collect both sanitary line liquids and storm water seepage or backup. For example, these sump pump wells commonly collect washing machine effluent which is directed to the sanitary sewer or to a septic system, and at other times, particularly during heavy rain storms, these wells also collect a considerable amount of storm water seepage or backup. Many local ordinances require that these sump systems be equipped with proper valving and piping to direct the sump pump flow either into the sanitary system (such as into a septic tank or sanitary sewer), or to a storm water system (such as to a storm sewer or to a discharge point), on top of the ground.

Gate valves conventionally used in these systems usually require a relatively large number of turns, e.g., seven and one half turns, for complete opening of each valve. Since two lines are involved, two valves are conventionally required. Moreover, since many housewives are aware that some flow occurs at one or two turns, they frequently open each valve just a few turns. It is my observation, based on a large number of service calls to such installations that operation under such conditions generates excessive back pressure leading to premature pump and/or motor failure, and otherwise unnecessary servicing or replacing of sump components.

It would be highly desirable to provide a two way valve for instantly, easily and completely opening one line or the other for directing fluid therethrough. A common example of this specialized use is the arrangement in which a line emptying an industrial processing tank, conveying process liquids to a next processing station, is fitted to divert rinse water to a water course or sanitary sewer. Because of operator error, in failing to close discharge or "dump" valves, streams are contaminated with concentrated process liquors, and valuable material is wasted when, after the rinsed or cleaned tank is filled with process liquor, and the liquor is charged into the valved conduit.

Another specialized valve requirement occurs in systems in which a stream normally passes through a first line, but occasionally is diverted to a second line. In such latter mentioned specialized requirement it is highly desirable that, after the rinse stream finishes passing into a second line such as a "dump" line, the valve automatically repositions itself so that the next cycle and subsequent cycles of process liquor again pass through the first, i.e., through the "process" line. It would be particularly desirable to provide a two way valve which, by simple adjustment, can be converted to manual operation, e.g., with a sump as described above, or to automatic operation, e.g., for use in the special requirement systems such as those described immediately above. Another important object of this invention is to provide a two way valve of the character set forth above in which the parts may be readily removed for repairing or replacement if necessary. However it is an equally important object of this invention to provide a valve of a design which virtually eliminates the need for repair or replacement of parts.

It is another object of this invention to provide a valve which is simple in construction, strong, durable, compact, of light weight, highly reliable and which can be manufactured at low cost, particularly because of low assembly costs.

SUMMARY OF THE INVENTION

An intermittent pump-delivery system including a special two way valve for delivering the pump discharge to one or two delivery points. The special two way valve includes a closure member, a pair of annular valve seats having an opening therethrough, the closure member being pivotable to seat at either of the closure members, means for pivoting the closure member around a pivot line through an arc, the arc being upstream with respect to said pivot line.

In a preferred embodiment the closure member is relatively heavy and the shaft supporting the closure member is relatively free swinging, the pivoting means is positioned at one side of a main stream line, and the main stream passes substantially vertically up through the valve, the secondary line passing laterally from the main stream. In this preferred embodiment the weight of the closure member across a first seat causes it to drop out of the vertical path of main-stream liquid into a position which partially obstructs the path of liquid which would pass through a second seat. Line pressure automatically seats the closure over the second opening, thereby converting the valve from a condition in which the first seat is obstructed to a condition in which the second seat is obstructed, the opening through the first seat being the opening through which the discharge is normally directed.

DESIGNATION OF THE FIGURES

FIG. 1 is a schematic illustration of two systems in which the special valve is used to particular advantage.

FIG. 2 is an elevational view of a valve of this invention.

FIG. 3 is a cross-sectional elevational view taken through a midplane of the valve illustrated in FIG. 2.

FIG. 4 is a fragmentary cross-sectional view taken approximately along the line 4—4 of FIG. 3.

FIG. 5 is a fragmentary view taken approximately along the line 5—5 of FIG. 3.

FIG. 6 is a perspective view of the handle-shaft-closure member assembly used in the valve illustrated in FIGS. 2–5.

DESCRIPTION OF PREFERRED EMBODIMENTS

Pump-discharge line 16 carries liquid at a relatively high rate to special valve, generally 18, from which it is carried through a first line 20, e.g., to sanitary sewer 22 or through a second line 24, e.g., to a storm sewer or to a discharge point for discharging the liquid on top of the ground. Lines 20 and 24 conventionally include check valve means for preventing flow in the reverse direction, but the check valve means, since not necessary for the understanding of this invention, are not illustrated. Valve 18 includes casing 25 which is fitted with threaded inlet opening 26, first threaded outlet opening 28, and second threaded outlet 30. First outlet 28 is positioned to permit fluid passing through inlet opening 26 to pass vertically through first discharge opening 28, discharge opening 30 being positioned across conduit 32 extending somewhat laterally from the vertical line of flow.

Annular valve seat 35 having opening 37 therein is positioned as illustrated in FIG. 3 herein, to control the flow of liquid to opening 28 in casing 25. Annular valve seat 39 having opening 41 therethrough is positioned to control the flow of fluid to opening 30.

Closure member 44 includes sealing face 45 which seats on valve seat 35, and also includes sealing face 49 which sealingly opposes annular valve seat 39. In the illustrated embodiment closure member 44 includes substantially disc-shaped portion 51 having substantially round outer edge 53 from which boss 55 extends. Shaft 57 extends through opening 59 in boss 55 and is secured to closure member 44 by means of set screw 60. Shaft 57 likewise passes through packing 61, packing gland 63 and terminates in socket 65 in handle 67. Set screw 69 secures shaft 57 in handle 67. Casing 25 includes threaded opening 71 for receiving packing gland 63, internal well 75 for receiving boss 55, and opening 77 extending part way through entire casing 25 for loosely receiving shaft 57 therein.

ASSEMBLY

In preferred assembly of the valve of this invention casing 25 is inverted, closure member 44 is seated with face 45 opposing valve seat 35, and boss 55 extending into well 75. Shaft 57 is passed through well 71, and through loosely fitting opening 77 at the bottom thereof, and insertion of shaft 75 is continued until it passes through opening 59 in boss 55 and extends into the bed-end 80 of opening 77 which extends from the far side of well 75. Packing 61 and packing gland 63 are inserted around exterior portion 81 of shaft 57, and gland 63 is

threaded into threaded opening 71. Handle 67 is then fitted over exterior portion 81 of shaft 57 and, in the illustrated embodiment, is positioned to extend from shaft 57 in a direction generally opposite the direction in which closure member 44 extends. Set screws 60 and 69 are then tightened. Tightening of set screws 60, 69 fixes closure member 44 and handle 67 to the same shaft 57 whereby rotation of handle 67 from position A in FIG. 2 to position B indicated by dash lines of FIG. 2 causes rotation of closure member 44 from position A through the arc indicated by dashed lines of FIG. 3 to position B, as indicated by dashed lines in FIG. 3.

It is noted that the path or arc through which closure member 44 swings is upstream relative to axis of rotation of closure member 44 (i.e., upstream from shaft 57). In a preferred embodiment closure member 44 is relatively heavy, e.g., manufactured from brass or other suitable metal, and handle 57 is relatively light, e.g., manufactured from plastic or other suitable light material. In the illustrated embodiment pointing handle 67 toward one side or the other of valve 18 indicates the side through which the fluid stream passes. In the illustrated embodiment the sides are marked by indicia "flow" and "discharge." Hence in the illustrated embodiment the indicia, which is preferably embossed in casing 25 at time of casting of casing 25, not only assists the installing plumber in making proper connection to valve 18, but moreover assists the householder or industrial user of valve 25 in properly positioning handle 67.

It is preferred that opening 64 through packing gland 63 and opening 77 in casing 25 be slightly oversized with respect to the diameter of shaft 57 to permit shaft 57 to be loosely received therein. This facilitates proper seating of opposing sealing faces 45, 49 on their respective valve seats 35, 39. Also, the relatively loose fit referred to immediately above renders the pivotal assembly consisting of handle 67, shaft 57, and closure member 44 relatively freely pivotable through the arc indicated in FIG. 3. Consequently, in this freely pivotable condition, the assembly automatically pivots to bring relatively heavy closure member 44 into the position indicated as "Position C" on FIG. 3, whenever downstream pressure is removed. When closure member 44 is in "Position C" it will be appreciated that the vertical path through valve 18 is unobstructed by closure member 44, whereas most of the path through lateral conduit 32 is at least partially obstructed by closure member 44. Thus, with closure member 44 resting in "Position C" the next cycle in which liquid passes through opening 26 will automatically cause closure member 44 to pivot against seat 39. Consequently, in an intermittently used line, and in this free swinging condition, closure member 44 will automatically be positioned in the "Position B" (handle 67 being in "Position B") after an interruption in the pumping of liquid therethrough, and fluid will pass vertically through opening 28. However, should it be necessary or desirable that the fluid be diverted to the channel not normally used, i.e., through conduit 32 marked "discharge" in the illustrated embodiment, handle 67 is pointed in the direction towards the conduit bringing closure member 44 into "Position A."

It is noted that the pivoting of handle 67 from "Position A" to "Position B" or vice versa, i.e., through only a short arc, causes complete opening of the unobstructed opening 37, 41. The valve of this invention lends itself to automation because of the short arc required for 100 percent conversion from "Position A" to "Position B" and vice versa.

It will be appreciated that upon completion of the pumping cycle in which fluid is passed through valve 18 with seat 44 occupying "Position A" closure member 44 will drop to "Position C" seat 44 to "Position B," the normal operating position upon resumption of the next cycle. Nonetheless, should the valve become stuck, the position of the closure member is immediately apparent because of the position of handle 67.

This is considered extremely valuable for use in conjunction with equipment which must be washed, rinsed or cleaned periodically and which involves pumping rinse water or the like from the equipment for discharge into a sewer or water course.

Process liquors are sometimes inadvertently discharged into a sewer or water course due to operator error in omitting to close and open valves in a system after rinsing equipment and after discharging rinse water into the sewer or water course. Use of the special valve of this invention in its free-swinging condition described above and in which the laterally projecting conduit 32 is connected to the discharge line virtually eliminates this inadvertent discharge of process liquids which should pass through the conduit marked "flow." Even in the event manual return is necessary, the changeover is almost instantaneous, and is complete.

Indeed, in some uses, it would be preferable that closure member 44 remained in position against one of the seats 35, 39 and it would be preferable that the change from "Position A" to "Position B" could only take place as a result of a manual pivoting of handle 67. The special valve 18 of this invention is readily converted to manual operating condition by tightening of packing gland 63 to such a point that shaft 57 is no longer freely pivotable. Generally speaking, I have found that most householders in using the special valve of this invention prefer the use of the valve in the manual condition. I believe this is because the wash load capacity of automatic washers is small enough that most housewives will use the sump for a number of washing cycles, rather than for one cycle. For this kind of use, therefore, it is preferable that the valve be maintainable in the discharge, i.e., sanitary sewer, position throughout the entire wash day period. Nonetheless, in some household uses the special valve of this invention is used in the free-swinging condition so that automatically the valve converts itself to the proper position for passing storm water, if and when it collects out into the storm sewers or above ground discharge. Moreover, it is apparent that the diverting of fluid from one channel to the other is accomplished by moving handle 67 through a very small arc, and this movement accomplishes complete opening of the discharge outlet. This has been found to completely eliminate the risk of operating the sump or other pump at high back pressure because of incompletely opened valve outlets, a problem commonly encountered in the use of gate valves.

Use of boss 55, extending from edge 53 of closure member 44 virtually eliminates cocking and distortion damage to the valve closure. This boss should extend from a portion of the circumference which is preferably between 30° and 55° of arc. Moreover, internal well 75 assists in stabilization of pivotal closure member 44, since it fits closely around the edges of boss 55, and provides that almost no portion of shaft 57 be unsupported, or free to be bent.

I claim:

1. A valve comprising:

a casing including an inlet and a pair of upwardly directed outlets, and including a vertical conduit connecting the inlet with a first of the upwardly directed outlets and an upwardly and outwardly extending conduit connecting the vertical conduit with the second outlet, annular valve seats at said first and said second outlets;

a closure member adapted to alternatively engage said valve seats to selectively close said first or said second outlet;

a shaft journaled in said housing for pivotally supporting the closure member about a horizontal axis located at the juncture of said conduits;

said shaft extending through said casing to an external portion thereof;

a handle-indicator fixed to said external portion of said shaft;

said shaft being free swinging and said closure member being heavy enough to swing to a position below said shaft when there is no flow of fluid to said valve at which position said first outlet is substantially open and said second outlet is partially closed whereby pressure exerted by upwardly flowing fluid within said valve casing moves said closure member to close said second outlet and to permit flow only through said first outlet, said handle-indicator being manipulatable to move said closure member to open said second outlet and close said first outlet.