Oct. 6, 1942. A. P. RICARD 2,298,233

VALVE MECHANISM

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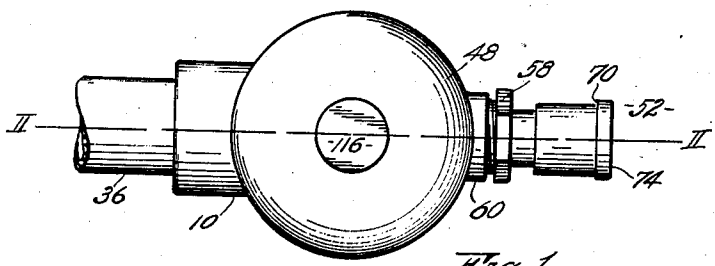


Fig. 1

Fig. 2

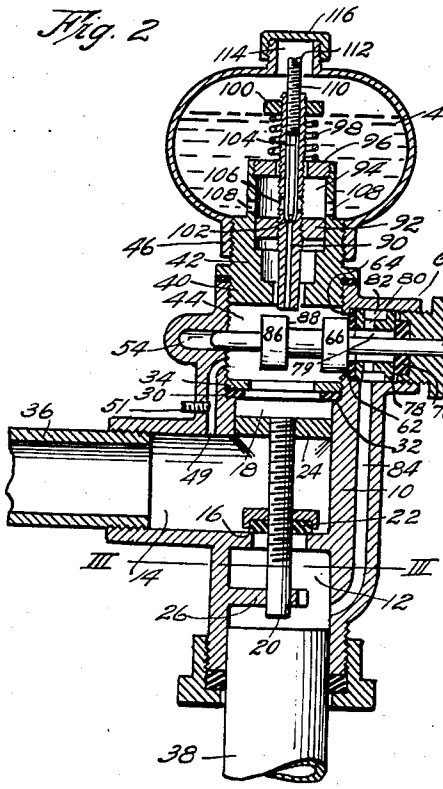
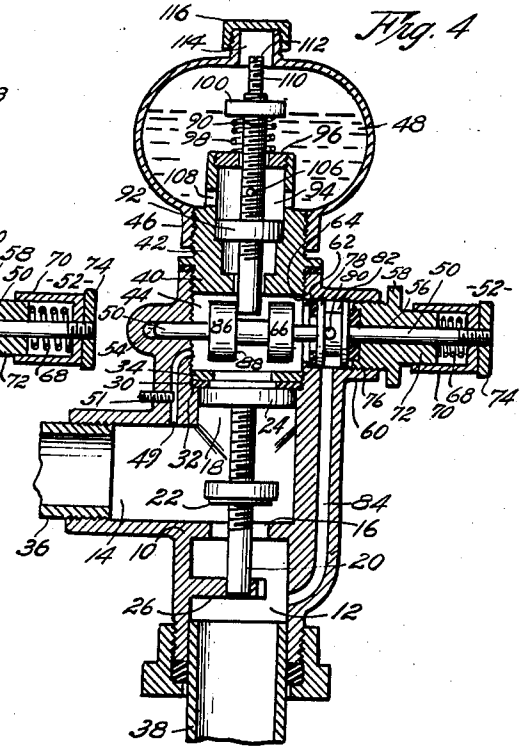


Fig. 4



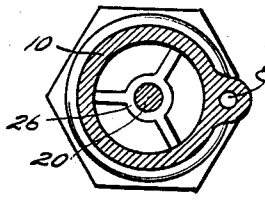


Fig. 3

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VALVE MECHANISM

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5 Claims. (Cl. 137—93)

This invention relates to improvements in valve mechanism particularly to inlet valve mechanism of the flush valve type suitable for delivering pre-determined quantities of liquid to a container.

The principal object of the present invention is the provision of an inlet valve mechanism having normal means for opening the valve and adjustable automatic means for closing the valve whereby a pre-determined amount of water is permitted to pass through said valve.

A further object of the invention is the provision of a valve mechanism that is adjustable to automatically deliver a pre-determined quantity of liquid to a container upon the manual positioning of the parts to open an inlet valve from a supply of liquid under pressure to said container.

Other objects are simplicity of construction, efficiency of operation and adaptability for use where measured quantities of liquid are desirable.

With these as well as other objects which will appear during the course of the specification, in view, reference will now be had to the drawing wherein:

Figure 1 is a plan view of a valve mechanism embodying this invention.

Fig. 2 is a central sectional view of the valve mechanism taken on line II—II of Fig. 1 with the valve shown in the closed position.

Fig. 3 is a cross sectional view taken on line II—II of Fig. 2.

Fig. 4 is a sectional view similar to that shown in Fig. 2 with the valve shown open, and certain of the parts shown in elevation.

Throughout the several views like reference characters refer to similar parts and the numeral 10 designates a valve body of hollow construction having a vertically disposed passageway 12 and a transverse inlet opening 14 communicating therewith. A valve seat 16 is formed in passageway 12 below opening 14 and a cylinder 18 is formed thereabove in concentric relation with said valve seat. A valve stem 20 carrying valve 22 in operative relation with valve seat 16 and a piston 24 which is slidably mounted in cylinder 18 is held in axial alignment by spider 26. When valve 22 is raised from seat 16, as shown in Fig. 4, piston 24 rests against a rubber stop ring 30 which is held in position against shoulder 32 by means of an externally threaded ring nut 34. A pipe 36 communicates with inlet opening 14 and is supplied with a liquid under pressure from a water system or any other supply of liquid under pressure.

The vertically disposed passageway 12 communicates at its lower extremity with a pipe 38 through which the liquid is conducted to any desired container, not shown.

The upper extremity of body 10 is threaded to receive the threaded lower extremity 40 of tubular member 42 to form an intermediate chamber 44 above piston 28. The intermediate portion of member 42 is externally threaded to receive the internally threaded neck 46 of the bowl 48 which serves as a pressure chamber as hereinafter described. A by-pass 49 of relatively small bore leads from the passageway 12 below piston 28 to the intermediate chamber 44. Mounted transversely in chamber 44 is push rod 50 which is adapted to be manually operated by means of a push button 52 which is positioned outside the valve body 10. This push rod is supported at its inner end in a tubular recess 54 found in valve body 10 and adjacent its outer end in a bearing opening 56 formed through bearing nut 58 which closes the hollow boss 60 protruding transversely from adjacent the upper extremity of valve body 10. A valve seat 62 made of rubber, or some other suitable material, rests at its outer edge against a shoulder 64 formed in valve body 10 and is disposed in axial alignment with push rod 50.

A valve 66 integral with push rod 50 is adapted to be normally urged against seat 62 by the action of compression spring 68 which is positioned under compression between nut 58 and the push button 52. The push button 52 comprises a cup-shaped member 70 threaded on to push rod 50 with its open end telescoping over the outer cylindrical end 72 of nut 58, and a lock nut 74 which also screws on push rod 50 to press tightly against member 70. The inner end of nut 58 is recessed to receive a washer 76.

Between washer 76 and valve 66 is a hollow spool 78, which is spaced apart from push rod 50 to form a passageway 79 therebetween. The body of the spool is provided with openings 80 which communicate with the outer chamber 82 formed by the spool with the inner wall of the hollow boss 60. This chamber 82 communicates with passageway 12 below valve seat 16 through duct 84 so that when valve 66 is moved away from valve seat 62 liquid from intermediate chamber 44 will pass through valve seat 62, a spool 78, openings 80, passageway 82 and duct 84 to passageway 12. Push rod 50 is also provided with a ring flange 86 to form an annular shoulder 88 which is normally positioned in the path of travel of longitudinally slidable tubular valve

member 90 which is axially disposed in valve body 10 to intersect the axis of push rod 50.

The rate of flow of liquid through passageway 49 can be varied by means of screw 51. The tubular valve member 90 is provided intermediate its ends with a piston 92 which is adjustable therealong. This piston is slidably mounted in an annular chamber 94 formed in the upper end of member 42 for limited movement. The upper end of member 42 is closed by externally threaded ring member 96 through which tubular valve member 90 is adapted to slide. A spring 98 positioned about valve member 90 is disposed between ring member 96 and a nut 100 which is adjustably carried by the valve member 90, serves to normally support the valve member 90 so that its lower end will be slightly above ring flange 86.

Tubular valve member 90 is provided intermediate its ends with a valve seat 102 and a needle valve 104 which is adjustable to regulate the flow of liquid through the member 90. An opening 106 formed through the wall of tubular member 90 communicates with chamber 94, which in turn communicates with pressure chamber 48 through openings 108. The threaded end 110 of needle valve 104 extends beyond the upper end of valve member 90 and is slotted at 112 to receive a screw driver for adjustment through openings 114 formed in the upper portion of bowl 48 and normally covered by screw cap 116. The lower end portion of valve member 90 passes loosely through opening 116 to permit the liquid to pass to the under side of piston 92.

The operation of the valve is as follows:

The position of the parts in Fig. 2 are normal with the liquid pressure from the supply pipe 36 filling chamber 12 above valve 22 the intermediate chamber 44 and a portion of the pressure chamber bowl 48 so that the pressure in the various valve chambers is equalized.

It will be noted that the pressure on each side of piston 24 is equal thereby causing valve 22 to be closed by the water pressure and gravity since there is no pressure in pipe 38.

When the valve parts are in the position as shown in Fig. 2 it will be impossible to obtain any water through the valve until the push button 52 is operated inwardly to move valve 66 thereby permitting a flow of water from the intermediate chamber 44 through valve 62, spool 78, duct 84, to chamber 12, below valve seat 16. As soon as the differential on opposite sides of the piston 24 reaches a given point the piston 24 will be forced upwardly against stop 30 and valve 22 will be raised from seat 16 thereby opening the valve and permitting a flow of water into pipe 38.

As the pressure in intermediate chamber 44 decreases, the pressure on the lower side of piston 92 will also be decreased and the pressure thereabove will force the tubular valve member downwardly to the position shown in Fig. 4 to engage the shoulder 88 of the ring flange 86 thereby maintaining the push rod in the valve releasing position. It will be noted that the water passageway 49 to the intermediate chamber 44 is much smaller in area than the water passageway leading from chamber 44 through duct 84 thereby insuring a rapid release of the pressure in the intermediate chamber.

As the water flows through the valve with the parts in the position shown in Fig. 4 the pressure in the pressure tank 48 will tend to equalize with that in the intermediate chamber by the passage of water from chamber 48, through openings 108, through port 106, past valve seat 102 into intermediate chamber 44. The flow of liquid from pressure chamber 48 will continue until the pressure has been reduced sufficiently to permit spring 98 to move tubular valve member upwardly to its normal position thereby releasing push rod 50 so that spring 68 will expand to force valve 66 to the closed position against valve seat 62.

When this has been accomplished the flow of water through passageway 49 will again build up a pressure in the intermediate compartment 44 and the pressure chamber 48 so that it will be equal to the water pressure in chamber 12. As soon as the pressure in intermediate chamber 44 is sufficiently increased piston 24 will be forced downwardly so that valve 22 will close against valve seat 16 thereby shutting off the water flow.

When this has been accomplished the valve mechanism will again be in the same position as shown in Fig. 2, when the operation may be again repeated by simply pressing the push button 52 inwardly to sufficiently move valve 66 away from its valve seat 62.

The time period required to sufficiently reduce the pressure in pressure chamber 48 to permit the release of push rod 50 depends entirely upon the rate of flow of water from pressure chamber 48 past the valve seat 102. By adjusting the valve member 106 the rate of flow may be varied so as to definitely determine the amount of water delivered from pipe 36 to pipe 38 during any one operation.

With the mechanism just described the quantity of water delivered at each operation may be varied from an extremely small amount to several gallons, dependent upon the amount required.

Various changes might be made in the sizes and relative positioning of the various parts of the device without interfering with its general method of operation. It is quite apparent that it might be constructed for use on a straight-away valve. Furthermore, the push button and pressure chambers might be differently situated relative to the valve body proper since the only connection therebetween is the passageway for the liquid flow.

What I desire to secure by Letters Patent is:

1. A valve of the character described comprising a hollow body member having an inlet and an outlet, a pressure controlled valve positioned in said body member between said inlet and outlet, an intermediate chamber formed in said body member and communicating with the inlet side of said hollow body member through a relatively small by-pass, a relatively large duct leading from said intermediate chamber to said hollow body member at the outlet side of said pressure controlled valve, a manually controlled valve operable to control the flow of liquid from said intermediate chamber through said duct, a piston operable by the differential of pressure in said intermediate chamber and said hollow body member to operate said pressure controlled valve, automatic pressure operated means whereby said manually controlled valve is maintained in the opened position for a pre-determined length of time to maintain a sufficient differential of pressure in said hollow body member and said intermediate chamber to open said pressure controlled valve and permit a flow of liquid through said hollow body member, and a manually adjustable

valve to regulate said automatic pressure operated means to vary the time of release of said manually controlled valve.

2. A valve mechanism comprising a hollow valve body having an inlet and an outlet, a valve controlling the flow of liquid to said outlet, an intermediate chamber communicating with said casing at the inlet side of said valve by a small passageway and with the outlet side of said valve by a relatively large valve-controlled duct, manually operable means to open said duct valve, a pressure chamber connected with said intermediate chamber by a passageway, a valve to vary the size of said passageway, means controlled by the differential of pressure in said intermediate chamber and said pressure chamber whereby said duct valve is maintained open for a selective predetermined period of time, and a piston interposed between said intermediate chamber and said hollow valve body operable by the differential of pressure in said intermediate chamber and said valve body during the time that said duct valve is maintained in the open position, to maintain said liquid flow control valve in the open position.

3. A valve mechanism comprising a hollow valve body having an inlet and an outlet, a valve controlling the flow of liquid to said outlet, an intermediate chamber communicating with said hollow valve body at the inlet side of said valve by a small passageway of variable cross sectional area and with the outlet side of said valve by a relatively large valve-controlled duct, manually operable means to open said duct valve, an automatic pressure controlled means including a pressure chamber communicating through an adjustable valve controlled passageway with said intermediate chamber whereby said duct valve is maintained open for a selective pre-determined period of time, and a piston interposed between said intermediate chamber and said hollow valve body operable by the differential of pressure in said intermediate chamber and said valve body during the time that said duct valve is maintained in the open position, to maintain said liquid flow control valve in the open position.

4. A valve mechanism comprising a hollow valve body having an inlet and an outlet, a valve controlling the flow of liquid to said outlet, an intermediate chamber communicating with said hollow valve body at the inlet side of said valve by a small passageway and with the outlet side of said valve by a relatively large valve-controlled duct, manually operable means to open said duct valve, a pressure chamber communicating with said intermediate chamber through a movable tubular valve member, an adjustable valve to vary the flow of liquid through said tubular valve member, a piston carried by said tubular valve member operable by the differential of pressure in said pressure chamber and said intermediate chamber to force said tubular valve member to position to secure said manually operable means in the valve opening position, and means interposed between said intermediate chamber and said hollow valve body operable by the differential of pressure therein to secure said liquid flow valve in the open position so long as said duct valve is maintained in the open position.

5. A valve mechanism comprising a hollow valve body having an inlet and an outlet, a valve controlling the flow of liquid to said outlet, an intermediate chamber communicating with said hollow valve body at the inlet side of said valve by a relatively large valve-controlled duct, manually operable means to open said duct valve, a pressure chamber communicating with said intermediate chamber through a movable tubular valve member, an adjustable valve to vary the flow of liquid through said tubular valve member, a piston carried by said tubular valve member operable by the differential of pressure in said pressure chamber and said intermediate chamber to force said tubular valve member to position to secure said manually operable means in the valve opening position, resilient means to normally support said tubular valve member in the non-securing position, and means interposed between said intermediate chamber and said hollow valve body operable by the differential of pressure therein to secure said liquid flow valve in the open position so long as said duct valve is maintained in the open position.

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