Sept. 11, 1962 W. W. PALMER 3,053,419

LIQUID DETERGENT DISPENSER FOR DISHWASHER AND VALVE THEREFOR

Filed Dec. 22, 1960 2 Sheets-Sheet 1

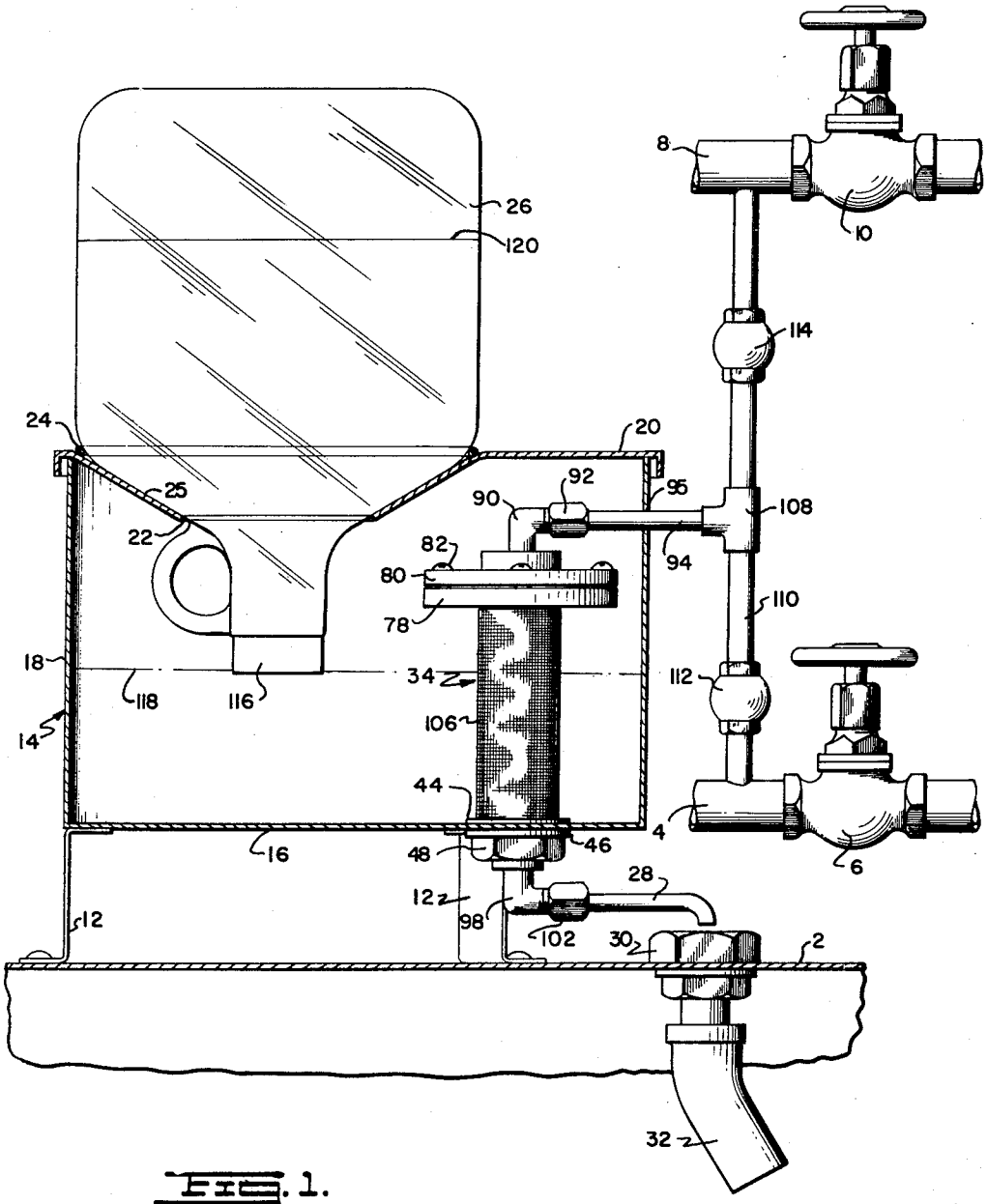


Fig. 1.

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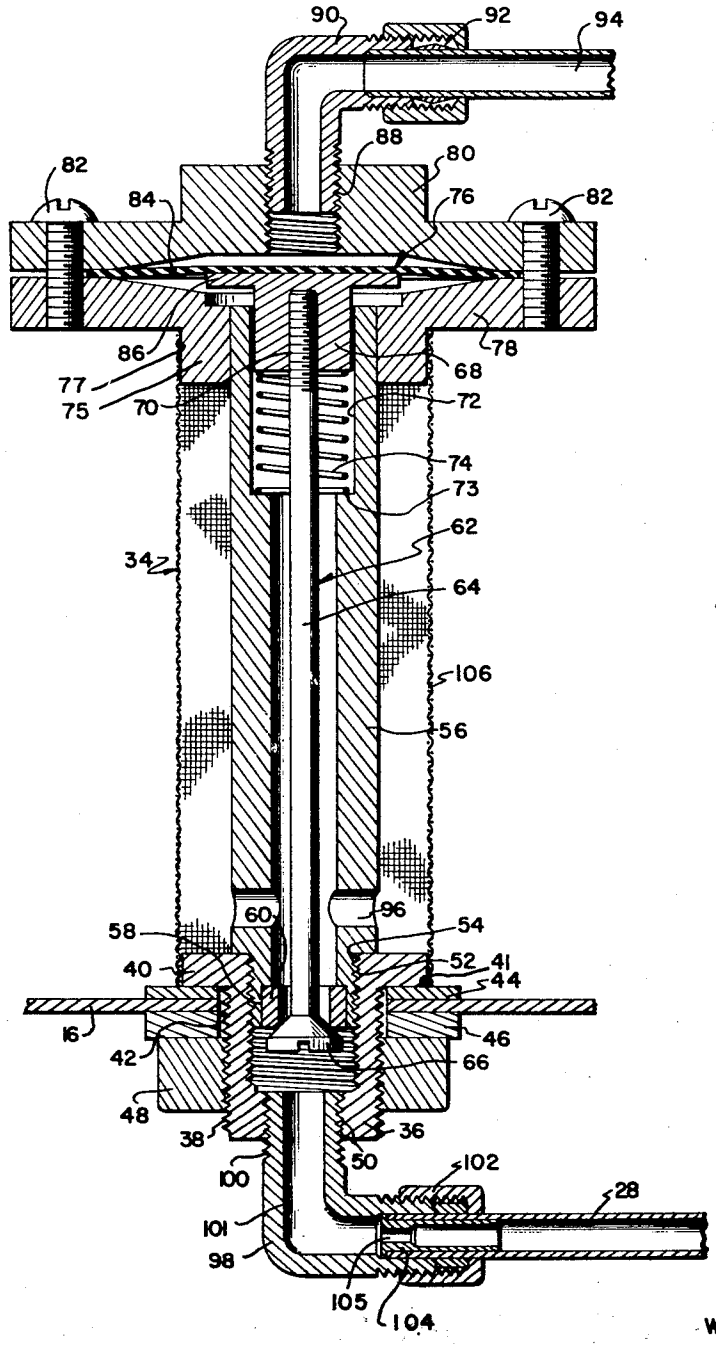


Fig 2.

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LIQUID DETERGENT DISPENSER FOR DISHWASHER AND VALVE THEREFOR

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This invention relates to dispensing mechanism and, more particularly, to a system, including control valves, and a dispensing valve, for dispensing liquid detergent in a dishwashing machine whenever water is fed into the machine.

One object of the invention is to provide a dispensing mechanism utilizing a barometric supply for a reservoir in which a dispensing valve is immersed so that the liquid to be dispensed, in this instance a liquid detergent, my be supplied from a standard glass jug. The available supply can thus be ascertained by observation.

Another object is to provide a dispensing valve opened hydraulically by line pressure whenever an associated water line is opened. As contrasted with Venturi type inject or valves wherein a chemical is induced or educted into a water stream as the result of water flowing through the valve, the present dispensing valve is opened by water line pressure, with no actual flow of water through the valve, nor is water mixed with detergent except in the sump. Thusly, certain problems, such as dribbling of concentrated detergent into the flow line and foaming of detergent in the reservoir or valve, are avoided. Certain potential advantages, such as precise proportioning of detergent to water are foregone in favor of the more arbitrary dispensing of detergent into the system at a predetermined rate whenever water flows into the apparatus. However, this is not a significant disadvantage in the subject apparatus which dispenses detergent in a dishwasher wherein two flow lines, one for filling the sump and the other for rinsing, are used. The object here is not to inject detergent into the flow lines but, rather, to dispense it directly into the dishwasher sump.

In most dishwashing machines, there is a sump which contains a mixture of hot water and detergent. The mixture is pumped from the sump and sprayed over dishes for washing them. After washing, the dishes are rinsed by clear hot water sprayed over them at about 180° F., hot enough to kill bacteria. The detergent mixture is used over and over again, but becomes weaker because the clear rinse water drains off the dishes into the sump and dilutes the mixture. The object now is to provide a dispenser which will introduce detergent into a dishwashing sump whenever water flows in either the sump fill line or in the rinse line.

Still another object is to provide a barometric type detergent reservoir which may be filled easily and simply by inserting a standard-size jug into a socket opening provided therefor in the reservoir cover. By this arrangement, it is possible always to see that an adequate supply is present and, of at least equal importance, a constant hydraulic head is maintained in the reservoir. Thus, a constant gravity flow through the valve and associated conduits is maintained, even though the height of liquid in the jug varies.

Yet another object is to provide, in a dishwashing machine, a detergent dispenser having an outlet pipe which discharges visibly, preferably through open space, into a funnel leading into the sump. By mounting the funnel through an exterior wall, such as the top of the machine, it is possible always to see that the dispenser is working, and it is possible also to measure the rate of flow of dispensed detergent simply by catching the detergent in a separate container for a predetermined interval as it

flows from the dispenser discharge pipe. These latter features are of particular importance in commercial installations where public health is at stake, and where easy, sure and quick inspection by health officers as well as responsible management is vital.

These and other objects will be apparent from the following specification and drawings, in which:

FIG. 1 is a side elevation, partly broken away, illustrating the dispenser and associated essential parts of a dishwashing machine and water supply lines and valves; and,

FIG. 2 is an enlarged vertical sectional view of the dispenser valve.

Referring now to the drawings in which like reference numerals denote similar elements, the top 2 of a dishwashing machine is shown in part. The inner mechanism of the dishwashing machine is not important to the present invention, other than that it is one of standard type having a washing chamber, a sump with an overflow and the usual pump for circulating a mixture of detergent and water over dishes in the washing chamber during the washing cycle, and a rinse line for hot clear water which is sprayed over the dishes for rinsing. Both the mixture of water and detergent, and the hot clear rinse water drain into the sump. A sump fill line 4 controlled by a fill valve 6 feeds hot water directly into the sump from a suitable source of hot water, not shown, and a rinse water supply line 8 controlled by a rinse valve 10 supplies clear hot water for rinsing. The pressure of water supplied through fill and rinse lines 4 and 8 should be between 15 and 20 pounds according to standard recommended practices, although greater pressures have no effect on the valve incorporated in the invention.

Supported by bracket feet 12 on top 2 of the dishwashing machine, out in the open where it may be easily inspected, is a detergent reservoir 14 having a bottom 16, side wall 18, and a removable cover 20. A socket opening 22, preferably having gasket 24 is provided through cover 20 for supporting the shoulder 25 of an inverted transparent glass jug 26, the jug being of conventional shape and standard size, as for containing one gallon of liquid detergent. Leading off from reservoir 14 is a discharge pipe 28 which discharges into the open top of a funnel 30, the latter being connected by a pipe 32 to the dishwasher sump so that detergent emerging from the open end of pipe 28 falls through free space and thence through funnel 30 and pipe 32 directly into the sump.

Referring particularly to FIG. 2, the details of a dispensing valve 34 are illustrated. Starting at the bottom of the valve assembly there is a thimble 36 having external threads 38 and a head flange 40. The thimble engages through an opening 42 in reservoir bottom 16 and is sealed by washers 44, 46, which are clamped over and under reservoir bottom 16 by a lock nut 48. The upper face of washer 44 also functions to prevent downward movement of a filter screen or strainer 106 to be further described, as best seen in FIGURE 2. Thimble 36 also has sets of internal threads 50, 52 the latter being engaged by external threads 54 on the lower end of a hollow cylindrical valve body 56. Head flange 40, it will be noted, extends outwardly beyond the radial limits of valve body 56 and constitutes a lower enlargement having a circular peripheral wall 41 which engages and aids in securing strainer 106 around and in spaced relation to valve body 56, as will be further described. Thus, as shown in FIGURE 2, the function of flange 40 is twofold since it both aids in mounting the valve body on the tank and the strainer around the valve body. Within the lower end of body 56 is an annular recess 58 accommodating a washer 60 which constitutes a valve seat.

The valve plunger assembly denoted generally at 62 includes an elongate stem 64 coaxially disposed in body 56, the stem projecting through the valve seat and having a valve head 66 on its lower end engageable with seat washer 60. A cylindrical stem guide 68 is threaded at 70 on the upper end of valve stem 64, and slidably engaged within a cylindrical recess 72 which extends inwardly from the upper end of valve body 56 and terminates in a radial shoulder 73. A valve spring 74 under compression between the lower end of a cylindrical recess 72 and the lower end of stem guide 68 normally biases stem 64 upwardly so as to hold head 66 closed against seat washer 60.

A diaphragm chamber 76 is formed by an outwardly flanged collar, composed of an annular collar portion 75 which is tightly secured around the upper end of valve body 56 and an annular flange portion 78 which is integral and coaxial with and extends radially outwardly from and beyond the upper and outer part of collar 75, and a cap plate 80 held on by screws 82. Collar portion 75, it will be noted, extends outwardly beyond the radial limits of valve body 56 and constitutes an upper enlargement having a circular peripheral wall 77 which engages and aids, in conjunction with the lower enlargement, flange 40, in securing strainer 106 around and in spaced relation to valve body 56. The periphery of a resilient diaphragm 84 is sealingly clamped between opposed outer peripheral portions of flanged collar 78 and cap plate 80, the central portion of diaphragm 84 being engaged, on its underside, by an enlarged platform 86 on the top of stem guide 68. Threaded as at 88 into a central opening in cap plate 80 is a pipe fitting 90 coupled at 92 to a pipe 94 which leads out through a suitable opening indicated at 95 in FIG. 1 through the upper portion of reservoir side wall 18.

Inlet ports 96 are provided through valve body 56, and an outlet fitting 98 is connected by threads 100 engaging with threads 50 within thimble 36, the bore of fitting 98 constituting the outlet port 101 of the valve. A coupling 102 connects discharge pipe 28 with outlet fitting 98, and a removable reducing sleeve 104 having an orifice 105 is provided, it being understood that sleeves with various size orifices may be utilized for pre-determining the rate of flow through the discharge pipe. Surrounding valve body 56 is the cylindrical strainer or filter screen 106 which is secured to valve 34 since the top of the strainer surrounds and engages the peripheral wall 77 and is restrained from upward movement by the lower side of the flange portion 78 and the bottom of the strainer surrounds and engages the peripheral wall 41 and is restrained from downward movement by the top of washer 44. Thus, strainer 106 filters the detergent inflowing to inlet ports 96, strainer 106 preferably being of plastic screen material and providing multiple small flow paths into ports 96 for the surrounding detergent in reservoir 14 in which the valve and its surrounding filter are immersed.

Reverting to FIG. 1, pressure pipe 94 is connected by a T-coupling 108 to a cross pipe 110 connected to fill and rinse lines 4 and 8, respectively, on the downstream sides of fill and rinse valves 6 and 10. A check valve 112 in cross pipe 110 permits water to flow from fill pipe 4 towards T-coupling 108 while blocking nearly all of the flow in the opposite direction. Another check valve 114 in cross pipe 110 between rinse line 8 and T-coupling 108 permits water to flow from rinse line 8 towards T-coupling but blocks nearly all the flow in the opposite direction. Thus when fill valve 6 is opened, there is ample back pressure in fill line 4 so that water flows through the lower portions of cross pipe 110 through check valve 112 and thence through T-coupling 108, pressure pipe 94 and into chamber 76 on the upper side of diaphragm 84. Check valve 114 prevents any substantial flow of water through cross pipe 110 from fill line 4 to rinse line 8. Likewise, when rinse valve 10 is opened, water under back pressure from fill line 8 flows through the upper portion of cross pipe 110, and through check valve 114, T-fitting 108, pressure pipe 94 into diaphragm chamber 76 on the upper side of diaphragm 84. Only about 1 to 1½ pounds per square inch of water pressure on the upper side of diaphragm 84 is needed to force the valve plunger assembly 62 downwardly against the pressure of spring 74 so as to open the valve. When fill and rinse valves 6 and 10 are both closed, the normal leakage through check valve 112 and 114 is sufficient for the water trapped in the upper side of diaphragm chamber 76, fitting 90, pressure pipe 94 and the central portions of cross pipe 110 to bleed out with sufficient rapidity to permit valve spring 74 to close the dispensing valve promptly.

Detergent reservoir 18 is charged by inverting the transparent glass jug 26 into socket opening 22 so that the shoulder of the jug seats in gasket 24. When so positioned, the mouth 116 of the jug is spaced above reservoir bottom 16 and also above inlet ports 96. As is the case with other barometric supplies such as used in chicken watering devices and kerosene stoves, the contents of jug 26 will gurgle downwardly into the reservoir until the level of the liquid in the reservoir, denoted by the broken line at 118, rises up and closes the jug mouth 116. The heighth of the liquid detergent standing in reservoir 14, and hence the hydraulic head and, in turn, the rate of gravity flow of detergent through the valve and orifice 105 is, for all practical purposes, substantially independent of the prevailing liquid level denoted, for example, at 120 and jug 26. The amount of detergent reservoir in jug 26 may be readily ascertained by observation, as can the flow of detergent from outlet pipe 28 into funnel 30. All parts, including the dispensing valve, may easily be disassembled for inspecting and cleaning, and the entire assembly may easily be mounted on the existing dishwashing machinery by elementary drilling and pipe fitting procedures.

In practice, it has been found that check valve 114 may be dispensed with. When the sump is filled, some water will flow through cross pipe 110 from sump fill line 4 to rinse line 8, then through the rinse jets and thence into the sump. This presents no problem, because the object then is to obtain enough water in the sump to fill it, and it makes no particular difference whether the sump water flows in through the sump fill line or through the rinse line. Where check valve 114 is eliminated, there is still enough back pressure in the upper portion of cross pipe 110, rinse line 8 and associated rinse jets to open valve 34. Check valve 112, which may be a gravity operated ball check without a spring, should be retained so as to prevent water from rinse line 8 from flowing freely into sump fill line 4.

The invention is not limited to the details illustrated and described herein, but is intended to cover all substitutions, modifications and equivalents within the scope of the following claims:

I claim:

1. In a dispenser for liquids, a tank adapted to contain a liquid to be dispensed, said tank having a bottom and sides, said bottom having an opening therethrough, a liquid dispensing valve comprising an elongated hollow upright cylindrical body having an open lower end constituting an outlet port, means mounting the lower end of said body on the bottom of the tank with the lower end of the body extending through the opening, a valve seat within the lower end of the valve body, an elongated valve stem movable lengthwise in said body, a valve head on said stem engagable with said seat, fluid motor and spring means on the upper end of said body for moving said stem whereby to open and close said valve head away from and against said seat, inlet port means extending through the cylindrical body above the bottom of the tank, a cylindrical hollow open-ended filter screen, and

means mounting said filter screen around said body in such manner that liquid entering said valve body must first filter through said screen, said means mounting said filter screen around said valve body comprising upper and lower enlargements secured relative to the upper and lower ends of the valve body adjacent the respective ends thereof, said enlargements each being of appreciably greater diameter than the outer diameter of said body and terminating in a circular peripheral wall, said filter screen also being of appreciably greater diameter than the valve body and having upper and lower ends, respectively, snugly engaged around the peripheral walls of said upper and lower flanges whereby the screen is spaced outwardly from the valve body.

2. The combination of claim 1 including first means at the upper end and extending radially beyond the peripheral wall of said upper enlargement for preventing upward movement of said screen, and second means at the lower end and extending radially beyond the peripheral

wall of said lower enlargement for preventing downward movement of said screen.

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