Sept. 14, 1965 G. HATCH 3,205,910

ACCUMULATOR FOR A DISHWASHER OR THE LIKE

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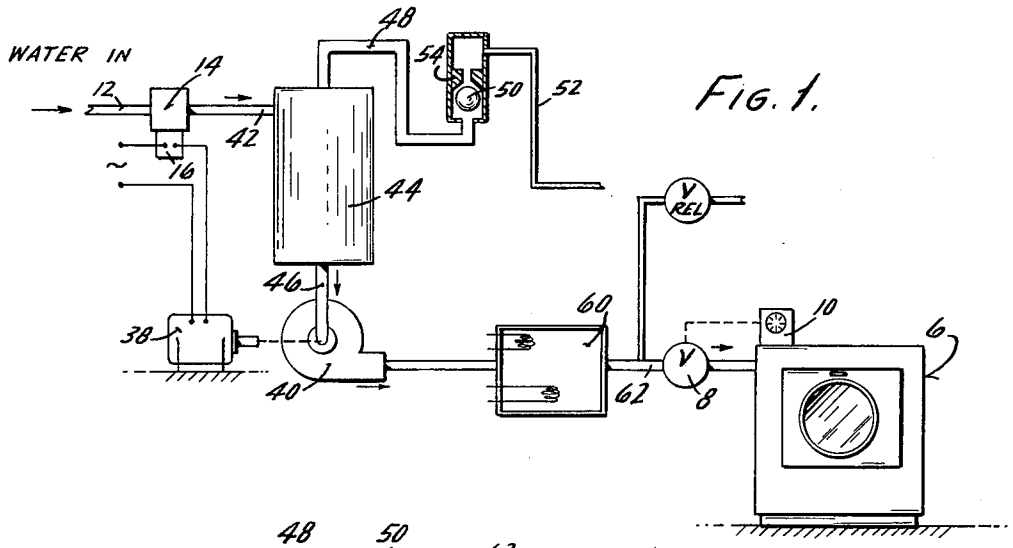


FIG. 1.

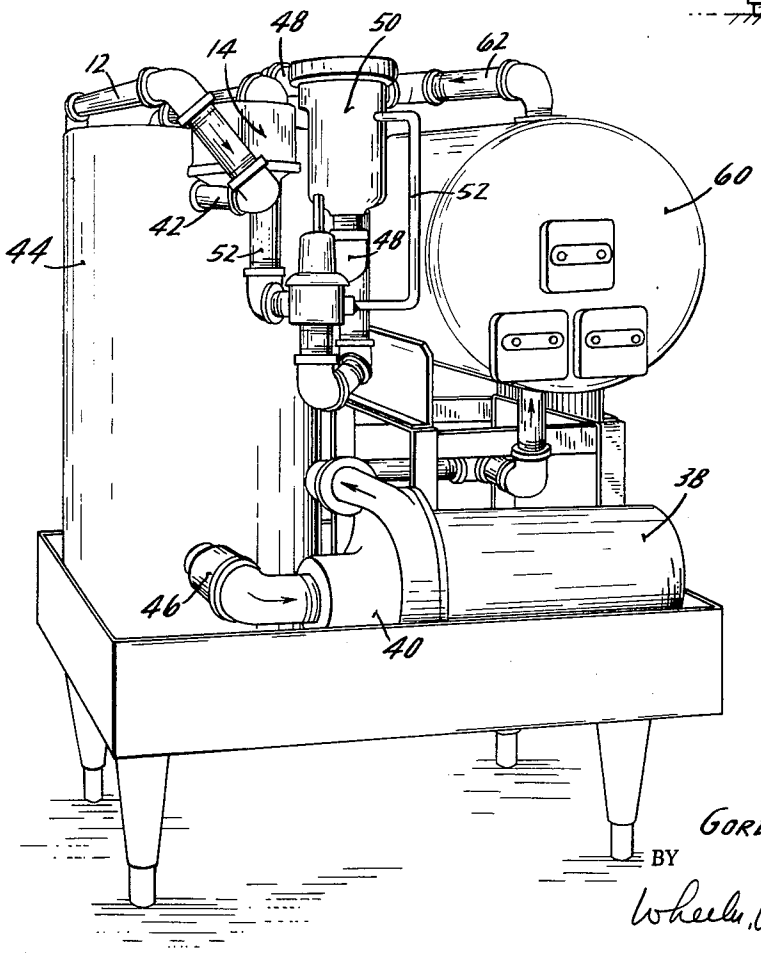


FIG. 2.

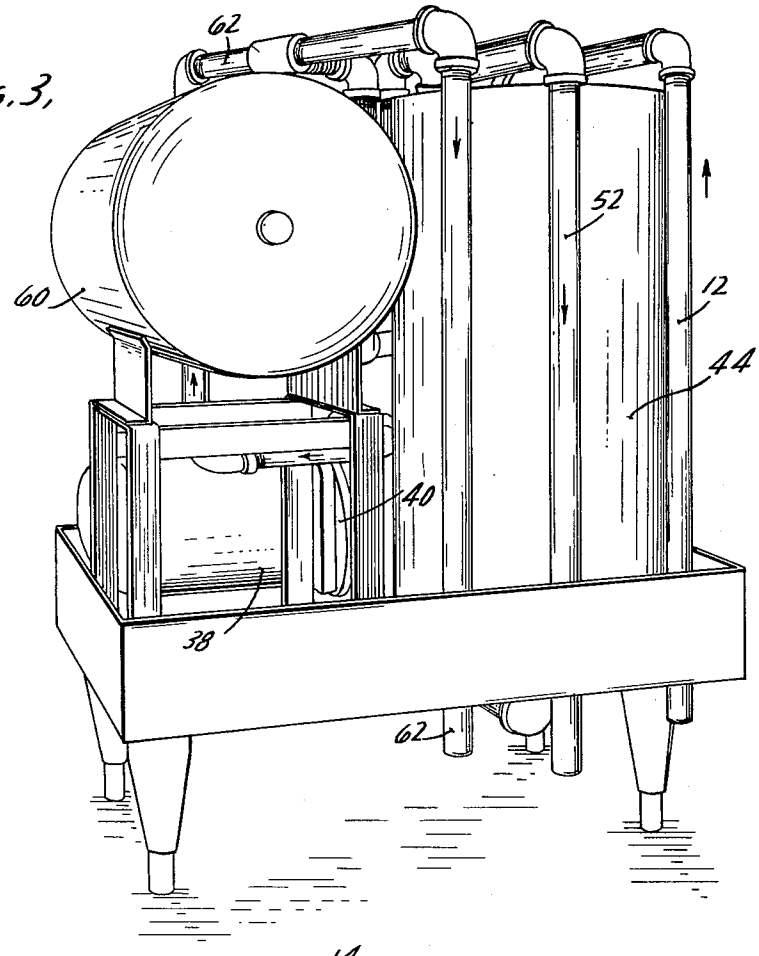
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FIG. 3,



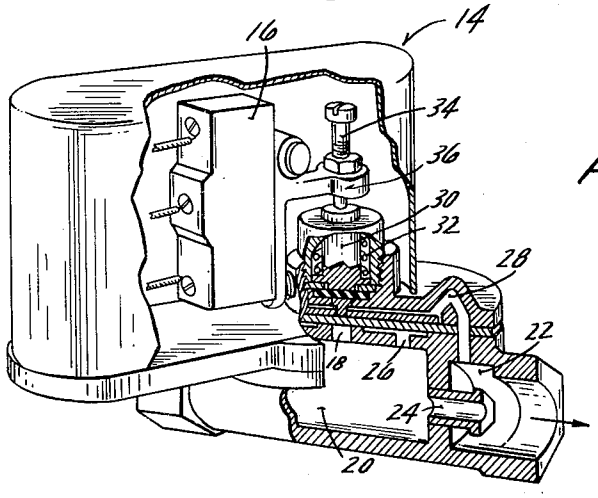


FIG. 4.

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3,205,910 ACCUMULATOR FOR A DISHWASHER OR THE LIKE

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6 Claims. (Cl. 137—568)

This invention relates to the provision of an accumulator for a dishwasher or the like.

For the final sanitizing rinse of a mechanical dishwasher to be effective according to industry standards, the water required at the entrance of the dishwasher manifold must be 180° F. so that water issued from the spray nozzle will be no less than 170° F. The volume of rinse water must be sufficient to service the equipment throughout the entire rinse. This requires full pressure of 15 to 25 p.s.i.

If water pressures are lower than those prescribed by said standards, the amount of water delivered will be insufficient to rinse off detergents properly or to sanitize the dishes properly and glassware will be spotted and unsanitary. To achieve these standards without starving other water outlets in the case of low water pressure, I provide an accumulator in the form of a tank which can be filled gradually, and regardless of water pressure, the tank having a vent to atmosphere controlled by a check valve and provided at its inlet with a flow switch that causes a pump to go into operation whenever withdrawals from the tank through the booster heater or otherwise cause the flow switch to close the pump motor circuit.

The vent of the accumulator tank permits the level in the tank to be drawn down to any extent necessary to service the dishwasher properly and when the rinse cycle of the dishwasher terminates, the tank refills, the pump remaining in operation to prevent back pressure.

Even if the static line pressure is normally as high as 60 p.s.i., or more, with all of the water outlets turned off, nevertheless, due to inadequate supply lines, flow pressure may be as low as 3–5 p.s.i., thus making it impossible for a dishwasher or the like to function properly without a device embodying the present invention.

In the drawings:

FIG. 1 is a diagrammatic view of an installation embodying the invention.

FIG. 2 is a three-quarter front perspective view of an actual installation for servicing a dishwasher or the like in accordance with this invention, the jacket being removed.

FIG. 3 is a three-quarter rear perspective view of the device shown in FIG. 1.

FIG. 4 is an enlarged fragmentary detail view in perspective of one available flow switch for use in the system shown in FIG. 1 to FIG. 3.

In the diagram of FIG. 1, a dishwasher is conventionally illustrated at 6 as one example of an appliance with which this invention is adapted to be used. A rinse control valve 8 is shown on the outside of the dishwasher even though in practice it would normally be in the interior. The valve is controlled by a timer 10 which likewise would normally be in the interior but is shown for diagrammatic purposes on the outside of the dishwasher.

The water supply pipe 12 leads toward accumulator tank 44 through a flow switch 14 shown in detail in FIG. 4. The switch 16 is arranged to be opened and closed according to the pressure differential on a diaphragm 18 which is exposed to inlet water pressure in the pipe 20 and to discharge water pressure in the outlet pipe 22, there being an orifice nozzle 24 through which water will flow to establish a pressure differential as the flow passes

through the instrument. The port 26 places the pipe 20 in communication with the under surface of diaphragm 18 while the duct 28 places the discharge pipe 22 in communication with the upper surface of the diaphragm. Resting on the diaphragm is a follower 30 which is subject to the bias of compression spring 32 and which engages the set screw 34 in the switch actuating arm 36. When water is being withdrawn from the discharge pipe 22, the pressure on the upper side of the diaphragm is decreased in relation to the pressure on the inlet pipe 20 with the result that the diaphragm moves upwardly to close the switch 16 for energizing the motor 38 of pump 40.

When flow completely ceases, pressure builds up in the discharge pipe 22 to supplement the bias of spring 32 thereby restoring diaphragm 18 to its static position, whereupon the switch 16 opens.

The flow from pipe 22 passes through pipe 42 into the accumulator tank 44. The outlet pipe 46 from the accumulator 44 leads into the inlet of pump 40. The top of accumulator tank 44 communicates through pipe 48 with a ball check relief valve 50 which has a vent at 52 to the atmosphere. Valve 50 normally seats to close port 54 to preclude escape of water to the atmosphere. When the pressure in tank 44 drops, the valve 50 opens to admit air to the top of tank 44 so that the contents of the tank can be withdrawn freely by pump 40.

The pump 40 delivers water from accumulator 44 to the heater. In practice, this normally comprises a closed storage tank 60 which is conventional and has, in this instance, electrical heating elements. These are not specifically described, it being immaterial how the water in tank 60 is heated. The discharge from tank 60 leads to pipe 62 subject to the control of the valve 8 into the dishwasher or other appliance 66, flow occurring whenever valve 8 is opened either manually or by timer 10, or otherwise.

The operation is as follows: As soon as the valve 8 opens to initiate the rinse cycle of the dishwasher 6 or the like, hot water flows from the heater into the dishwasher under such static pressure as is imposed on water stored in the accumulator 44. Flow occurs through the initially stationary pump 40, since the pump is a centrifugal pump which does not prevent flow when the pump is at rest. Thus water commences to flow into the accumulator tank under static pressure of the supply line 12 through the flow switch mechanism 14. As soon as such flow commences, a pressure drop will occur across the discharge nozzle orifice of the flow switch mechanism with the result that switch 16 will be closed to energize the pump motor 38, whereby water will be pumped under adequate and substantially constant pressure from the accumulator to the tank 60 to the appliance.

Since the installation of the device presupposes that the requisite amount of water cannot be supplied by the line 12, the level of water in the accumulator 44 will be progressively reduced by the pump during the time that valve 8 remains open. This is permitted by the admission of air through the ball check valve 50 and the vent line 52.

On the conclusion of the rinse cycle, the timer 10 shuts the valve 8, thus terminating delivery of water into the appliance 6 from pump 40. However, the pump remains in operation while the flow through the valve mechanism 14 continues from line 12 into accumulator 44 until the accumulator tank has been refilled. It is desirable that the pump continue in operation to prevent any possible back pressure on the line 12 from the heater storage tank or other parts of the system which may be at the same or higher level. As accumulator tank 44 is refilled from the line, the air which was admitted to the top of the tank escapes through the valve 50 until the ball seats upon the filling of the tank. At this time, pressure across the

diaphragm 18 becomes equalized and the switch 16 is opened to terminate operation of pump motor 38.

In the device shown in FIGS. 2 and 3, the heater tank is illustrated as part of the equipment. It will, of course, be understood that in many installations the washer or other appliance may have its own heating tank. Moreover, an instant heater rather than a storage heater might be used. The tank, therefore, is not an essential part of the present invention. It is described particularly because, whether or not it is included as a part of the unit sold commercially, it exemplifies one possible source of back pressure which might reach the supply line, contrary to the plumbing codes, if the pump 40 did not continue in operation until the accumulator has been completely refilled.

Normally, the device will maintain constantly available the pressure required for optimum operation of an intermittently used appliance. In appliances of the type having a door which is opened from time to time to empty and replace the contents of the washer, the time required for the removal of the washed goods and their replacement with goods to be washed will normally be adequate for the refilling of the accumulator in order that all of the washing and rinse cycles can be effected with full water pressure, notwithstanding any deficiencies in supply line pressure.

I claim:

1. In a device of the character described, the combination with an accumulator tank having an inlet pipe provided with a flow switch, of a discharge pipe leading from the accumulator tank, a pump having an inlet communicating with the tank discharge pipe and having an actuating motor operatively connected with the pump, and a circuit for said motor which includes the flow switch, the withdrawal of water through the discharge pipe causing the flow switch to close and to actuate said pump, the pump being of a type which will permit flow past it regardless of whether it is in operation and the circuit being constructed and arranged in such manner that the pump motor is energized upon sensing flow by the flow switch and is de-energized upon sensing termination of flow.

2. In a device for supplying water from a low pressure line to an appliance, the combination with an accumulator tank having an inlet pipe communicating with a low pressure line and provided with a flow switch, the accumulator tank having a vent and a check valve controlling the vent and constituting means for admitting air to the accumulator tank and for precluding loss of water therefrom, of a pump having its intake connected with the accumulator tank and having a valve-controlled discharge line, the pump being of a type adapted to permit flow whether or not the pump is in operation, and a pump actuating motor having a circuit controlled by the flow switch, the circuit being so constructed and arranged that upon sensing of flow into the accumulator tank the flow switch closes the circuit to operate the pump motor for the discharge of the contents of the accumulator under pressure of the pump, and upon sensing cessation of flow into the tank the flow switch opens to deenergize the pump motor.

3. A device according to claim 2 in further combination with valve means for initiating flow from the accumulator under such static pressure as has been derived thereby from said line, the said pump comprising a centrifugal pump for accommodating such flow whether or not the pump is in operation.

4. For supplying hot water under pressure to a dishwasher for the rinse cycle therein, an assembly comprising an accumulator tank having an input pipe equipped with a flow switch, a vent opening from the tank and controlled by a check valve constituting means for admitting air to the tank and for precluding the escape of water therefrom, a centrifugal pump through which water can flow whether or not the pump is in operation, said pump having its inlet communicating with a lower portion of said accumulator tank and provided with a driving motor circuit means responsive to the flow switch for controlling the driving motor, a heater comprising a storage tank and means for heating water therein, said storage tank having a supply connection with the outlet of the pump, and a discharge pipe from the heater storage tank having valve means for controlling a period of discharge of heated water from the tank, the opening of said last valve means permitting flow to occur from the hot water storage tank and the accumulator tank under line pressure, the flow switch, circuit means and motor being so constructed and arranged that the initiation of flow into the accumulator tank closes the flow switch to energize the motor for driving the pump, the pump thereupon supplying requisite pressure on the water of the heater storage tank by drawing from water in the accumulator tank at a rate in excess of that at which the accumulator tank is refilled from the line, air being admitted to the accumulator tank from said vent, the closing of said valve means shutting off the withdrawal of water from the accumulator tank and permitting the accumulator tank to refill from the line while discharging air through said check valve, the said motor continuing in operation until the accumulator tank is filled, the construction and arrangement of the switch, circuit means and motor being such that upon cessation of flow in the input the flow switch reopens to de-energize the pump motor.

5. In a device of the character described, the combination with an accumulator tank having an inlet pipe provided with a normally open flow switch constructed and arranged to close when flow occurs into the tank through the inlet pipe, of a discharge line leading from said tank and including a pump and a flow controlling valve and so constructed and arranged that flow may occur through said line and pump and valve when the valve is open whether or not said pump is in operation, said line constituting means for effecting flow from the tank and from the inlet pipe into the tank when the valve is open regardless of the operation of said pump, an actuating motor for said pump having a controlling circuit which includes the flow switch, the said motor being inoperative to actuate the pump when the flow switch is open and operative to actuate the pump when the flow switch is closed, the opening of said valve causing withdrawal of water from the tank through said line whereby to close the flow switch and to actuate said pump for subjecting to pump pressure the water withdrawn from the tank and discharged through said line, means for stopping the filling of the tank at a predetermined level and means for venting the tank to allow water delivery therefrom through said discharge line at a rate faster than the rate at which water is supplied through said inlet pipe, whereby the water of the tank may be stored below said level, the vent comprising means for permitting the escape of air from the tank when the level is re-established by flow through the inlet line, the closing of said valve stopping the withdrawal of water from said tank but allowing the pump to continue in operation until the flow switch opens consequent upon the completion of the refilling of the tank to said predetermined level.

6. A device according to claim 5 in which the tank venting means aforesaid includes check valved vent means for admitting air to the accumulator tank during the pump-induced withdrawal of water from the tank and for precluding loss of water consequent upon the refilling of the tank.

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