

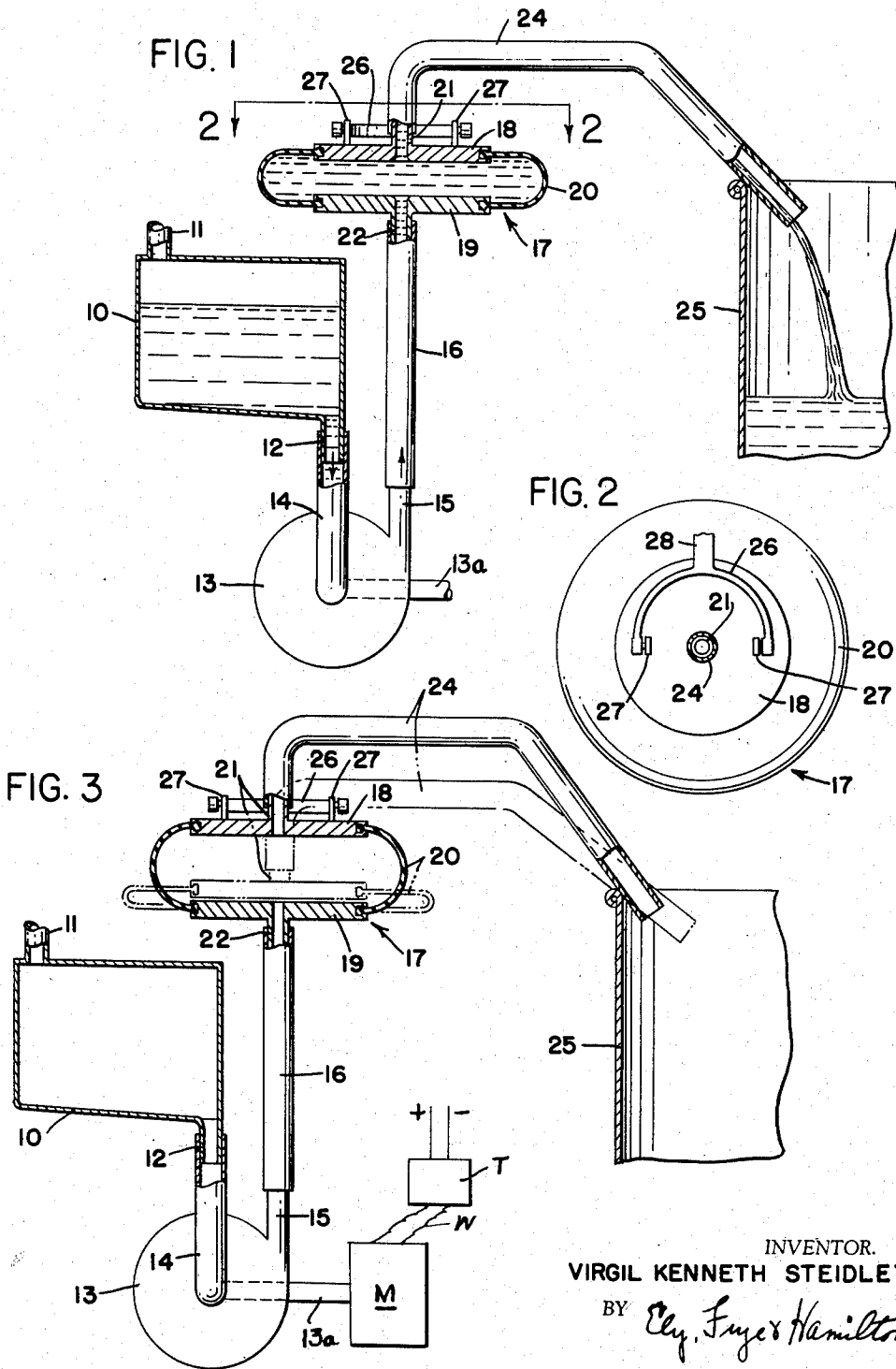
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ADJUSTABLE OVERFLOW LIQUID DISPENSING SYSTEM

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## ADJUSTABLE OVERFLOW LIQUID DISPENSING SYSTEM

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The invention relates generally to a system for dispensing a measured amount of liquid, and more specifically to a simple dispensing arrangement which can be easily adjusted at any time to vary the measured amount of liquid dispensed. The invention is particularly adapted for adding a predetermined amount of water softening compound or detergent to the rinse water or wash water of an automatic washing machine at a predetermined time during the operation cycle. Other applications of the invention will become apparent from the following specification.

In the operation of an automatic washer, it is necessary for the housewife to add a measured amount of soap or detergent to the wash water at the start of the operation, and such measurement is apt to be inaccurately made or may in fact be forgotten. In localities where the water is relatively hard, it is desirable to add a measured amount of water softening compound to the rinse water during the last rinse before extracting the water from the clothes prior to drying. This addition may also be inaccurately made or completely forgotten.

The purpose of the present invention is to provide an improved dispensing system which can be operated at the proper time by the automatic timer of the automatic washing machine to dispense a measured amount of softening or detergent liquid into the washing machine tub from a supply reservoir, and which can be easily adjusted to dispense an amount properly proportionate to the particular kind of softener or detergent being used.

Other objects include the provision of a dispensing system which is extremely simple, compact and inexpensive, and which can be adjusted as to amounts dispensed without changing the setting of the timer or the operation cycle in any way.

These and other objects are accomplished by the improved system comprising the present invention which utilizes a centrifugal pump to deliver a predetermined amount of fluid from a supply reservoir to an elevated adjustable volume chamber from which it overflows to the main receptacle in an amount determined by the adjusted position of said chamber, and the fluid remaining in said chamber returns by gravity to the supply reservoir when the pump shuts off.

A preferred embodiment of the improved system is shown by way of example in the accompanying drawing and described in detail herein. Various modifications and changes in details of construction are embraced within the scope of the invention as defined in the appended claims.

In the drawings:

Fig. 1 is a schematic side view of the improved system showing the supply reservoir and adjustable volume chamber in cross section, and said chamber in an intermediate adjusted position.

Fig. 2 is a plan view of the adjustable volume chamber.

Fig. 3 is a view similar to Fig. 1 showing in full lines the adjustable volume chamber set to maximum volume,

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and in chain lines the chamber set to minimum volume.

In Figs. 1 and 3 the supply tank or reservoir for containing liquid to be dispensed is indicated at 10 and has a vented filling duct 11 in its upper wall and a discharge duct 12 in its lower wall. The intake of a conventional centrifugal pump 13 located below the reservoir is connected by a conduit 14 to the duct 12. The discharge duct 15 of the pump is connected by a conduit 16 to an adjustable volume chamber indicated generally at 17 and located above the reservoir 10. The pump 13 is connected to a drive motor M by a shaft 13a, and the operation of the motor M is controlled by an element of the automatic timer T to which it is electrically connected by wires W.

As shown, the adjustable volume chamber 17 may be collapsible, and preferably comprises upper and lower rigid end walls 18 and 19 connected by a tubular wall 20 of resilient or elastomeric material allowing the end walls to be moved toward and away from each other to adjust the volume of the chamber. The material of tubular wall 20 is selected to be resistant to any corrosive action by the liquid conducted from reservoir 10. If the liquid conducted is water softening compound or detergent, as in the case of an automatic washing machine, the material of wall 20 may be neoprene or other suitable plastic material.

The end walls 18 and 19 of the chamber 17 are provided with ducts 21 and 22, respectively, which are preferably axially aligned with each other in all adjusted positions of the end walls, including the fully expanded and fully collapsed positions of Fig. 3, and all intermediate positions such as the one shown in Fig. 1. The duct 22 is connected to conduit 16 from the pump, and an overflow conduit 24 is connected to duct 21 for conducting liquid in excess of the amount required to fill chamber 17 to a receptacle 25 which may be the tub of an automatic washing machine.

Means for collapsing the chamber 17 may comprise a yoke 26 pivotally connected to ears 27 on the upper end wall 18. A lever arm 28 is attached to the yoke, and the lever arm may be raised and lowered by suitable means (not shown) to adjust the volume of the chamber. When the system is used to dispense water softening compound in an automatic washing machine, the arm 28 may be operatively connected to a dial on the exterior of the machine showing different settings for different compounds, so that setting the dial will adjust the chamber to the proper volume for the particular compound being used.

In the operation of the improved system as applied to dispensing water softening compound in an automatic washing machine, for example, the automatic timer T of the machine is electrically connected to the motor M for pump 13 to start the pump during the last rinse in the washing cycle and run it for a predetermined time interval. The time interval is calculated so that the volume of liquid delivered exceeds the volume of chamber 17 in its fully expanded position, and the amount of the excess may be the amount required to be added of the type or kind of the most concentrated conventional compound available; in other words, the compound of which the least amount is required. In such case the pump delivers a measured amount of the compound from the reservoir 10 to the chamber 17 in the expanded full line position of Fig. 3, and after the chamber is filled the predetermined excess volume overflows through pipe 24 to the receptacle or tub 25.

If the dial on the machine is set for a water softening compound which is required in greater volume, the chamber 17 is collapsed to an intermediate position such as shown in Fig. 1, so that the amount of excess or overflow is increased to the predetermined amount required.

The maximum amount which can be dispensed is equal to the total amount delivered by the pump 13 when the chamber is fully collapsed to zero volume, as indicated in chain lines in Fig. 2, which permits the maximum amount of liquid dispensable to be predetermined as a function of pump flow rate for a fixed pumping time interval.

At the end of the pumping time interval, the pump is shut off by the timer, and the liquid in the chamber 17 returns by gravity into the pump conduit and reservoir system. Hence each time the pump is started the chamber 17 is empty and must be filled at its predetermined setting or adjustment before the measured amount of excess is dispensed. By locating the pump below the reservoir 10, the pump is maintained full of liquid at all times.

Obviously, each time the pump is started the liquid level in tube 16 will vary somewhat according to the liquid level in reservoir 10, but by making the tube 16 of relatively small diameter, this variation is substantially negligible.

The improved dispensing system is simple, compact and inexpensive to construct and install. As applied to an automatic washing machine, it can be easily adjusted as to amounts of liquid dispensed to suit various kinds of compounds, without changing the setting of the time or the operation cycle of the machine in any way.

What is claimed is:

1. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir containing liquid to be dispensed, an adjustable volume chamber positioned above said reservoir, a pump connected to said reservoir and chamber for delivering liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount in excess of the volume of said chamber for any adjusted position of said chamber, and overflow means connected to the top of said chamber for conducting the overflow liquid from said chamber to said receptacle.

2. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir containing liquid to be dispensed, an adjustable volume chamber positioned above said reservoir, a pump positioned below said reservoir having its intake connected to the bottom thereof and its discharge connected to the bottom of said chamber, said pump being adapted to deliver liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount in excess of the volume of said chamber for any adjusted position of said chamber, and overflow means connected to the top of said chamber for conducting the overflow liquid from said chamber to said receptacle.

3. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir containing liquid to be dispensed, an adjustable volume chamber positioned above said reservoir, means for adjusting the volume of said chamber to a selected amount, a pump connected to said reservoir and chamber for delivering liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount in excess of the volume of said chamber for any adjusted position of said chamber, and overflow means connected to the top of said chamber for conducting the overflow liquid from said chamber to said receptacle.

4. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir containing liquid to be dispensed, an adjustable volume chamber positioned above said reservoir, means for adjusting the

volume of said chamber to a selected amount, a pump positioned below said reservoir having its intake connected to the bottom thereof and its discharge connected to the bottom of said chamber, said pump being adapted to deliver liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount in excess of the volume of said chamber for any adjusted position of said chamber, and overflow means connected to the top of said chamber for conducting the overflow liquid from said chamber to said receptacle.

5. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir for containing liquid to be dispensed, a collapsible chamber positioned above said reservoir and having opposed upper and lower end walls at least one of which is movable toward and away from the other, said end walls having aligned ducts therethrough, a pump connected between said reservoir and the duct in said lower end wall for delivering liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount exceeding the volume of said chamber in fully expanded position, and an overflow conduit for conducting overflow liquid from the duct in said upper end wall to said receptacle.

6. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir for containing liquid to be dispensed, a collapsible chamber positioned above said reservoir and having opposed upper and lower end walls at least one of which is movable toward and away from the other, said end walls having aligned ducts therethrough, means for moving one end wall toward the other with said ducts in alignment, a pump connected between said reservoir and the duct in said lower end wall for delivering liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount exceeding the volume of said chamber in fully expanded position, and an overflow conduit for conducting overflow liquid from the duct in said upper end wall to said receptacle.

7. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir for containing liquid to be dispensed, a collapsible chamber positioned above said reservoir, a pump connected to said reservoir and chamber for delivering liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount exceeding the volume of said chamber in fully expanded position, means for collapsing said chamber to adjust its volume, and an overflow conduit for conducting overflow liquid from said chamber to said receptacle.

8. In a system for dispensing a measured amount of liquid into a receptacle, a supply reservoir for containing liquid to be dispensed, a collapsible chamber positioned above said reservoir, a pump positioned below said reservoir having its intake connected to the bottom thereof and its discharge connected to the bottom of said chamber, for delivering liquid from said reservoir to said chamber during a predetermined operating time interval in a measured amount exceeding the volume of said chamber in fully expanded position, means for collapsing said chamber to adjust its volume, and an overflow conduit for conducting overflow liquid from said chamber to said receptacle.

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