Nov. 27, 1956 J. J. HOUGHTON 2,771,893

DISHWASHER

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FIG. 1

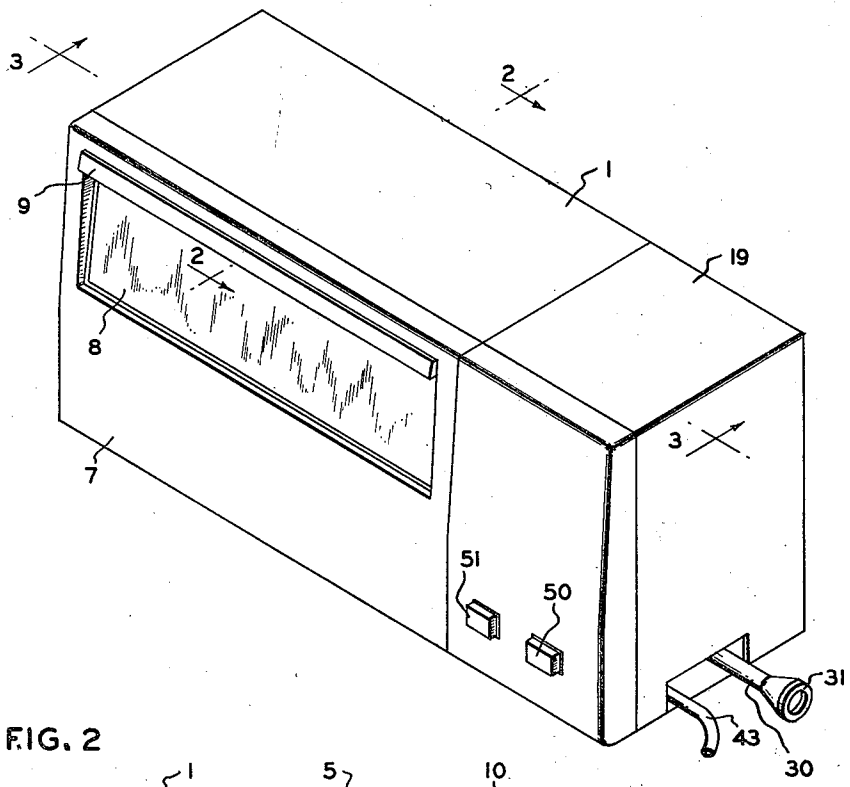
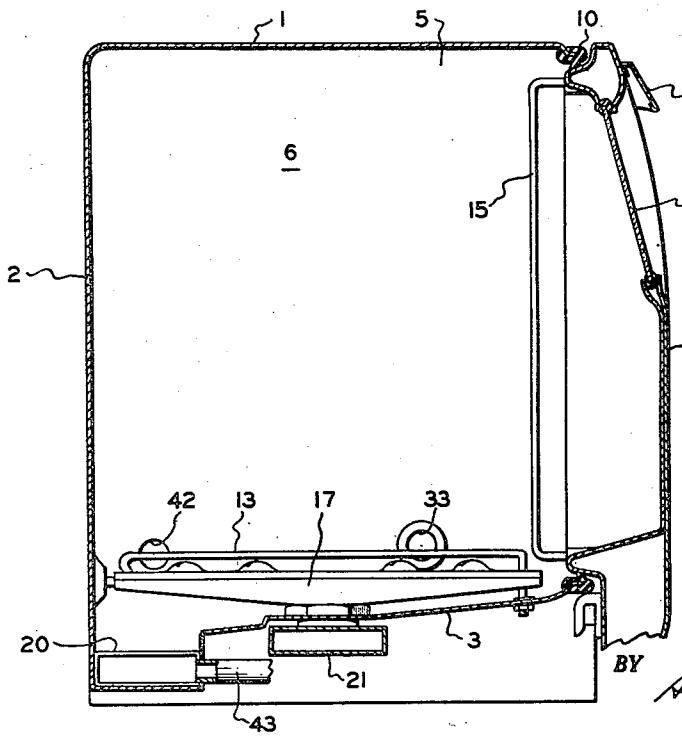


FIG. 2



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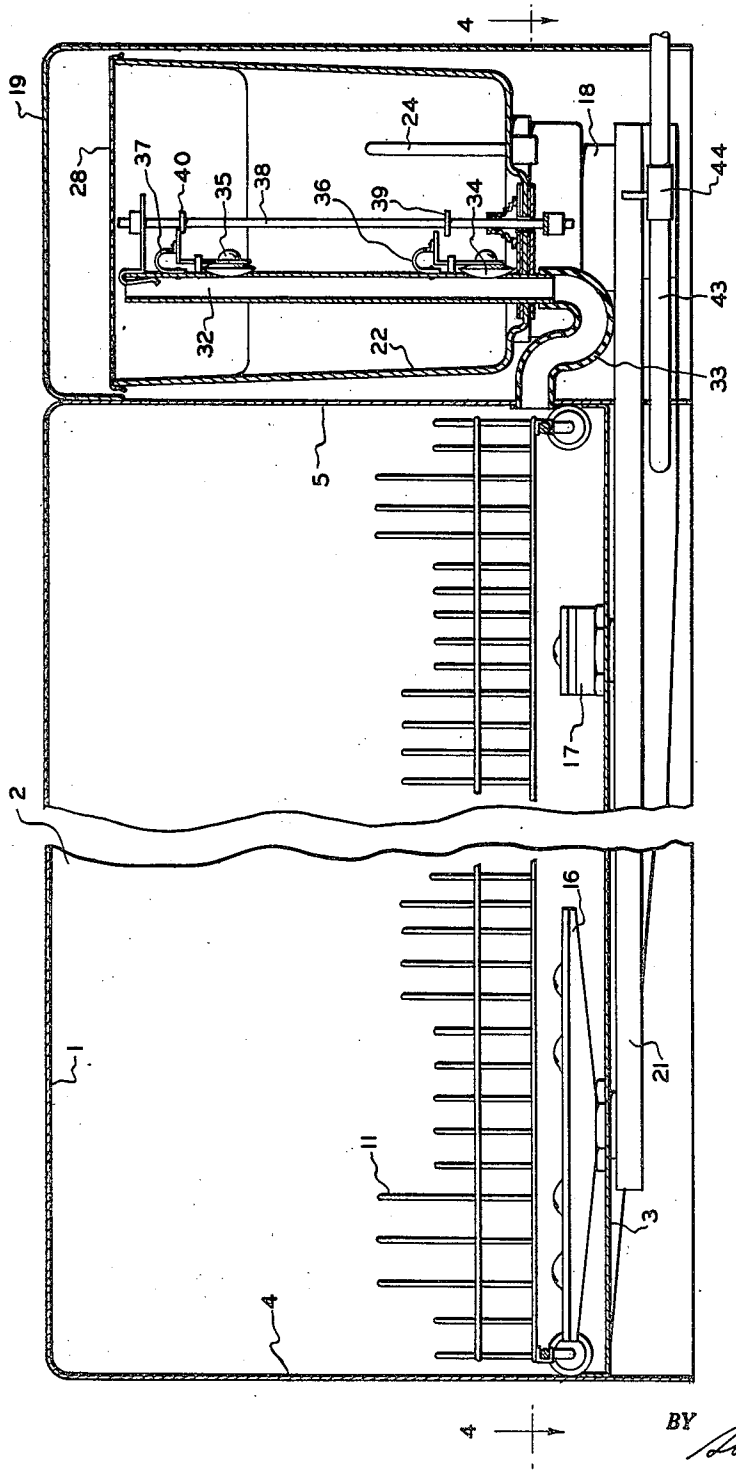


FIG. 3

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DISHWASHER

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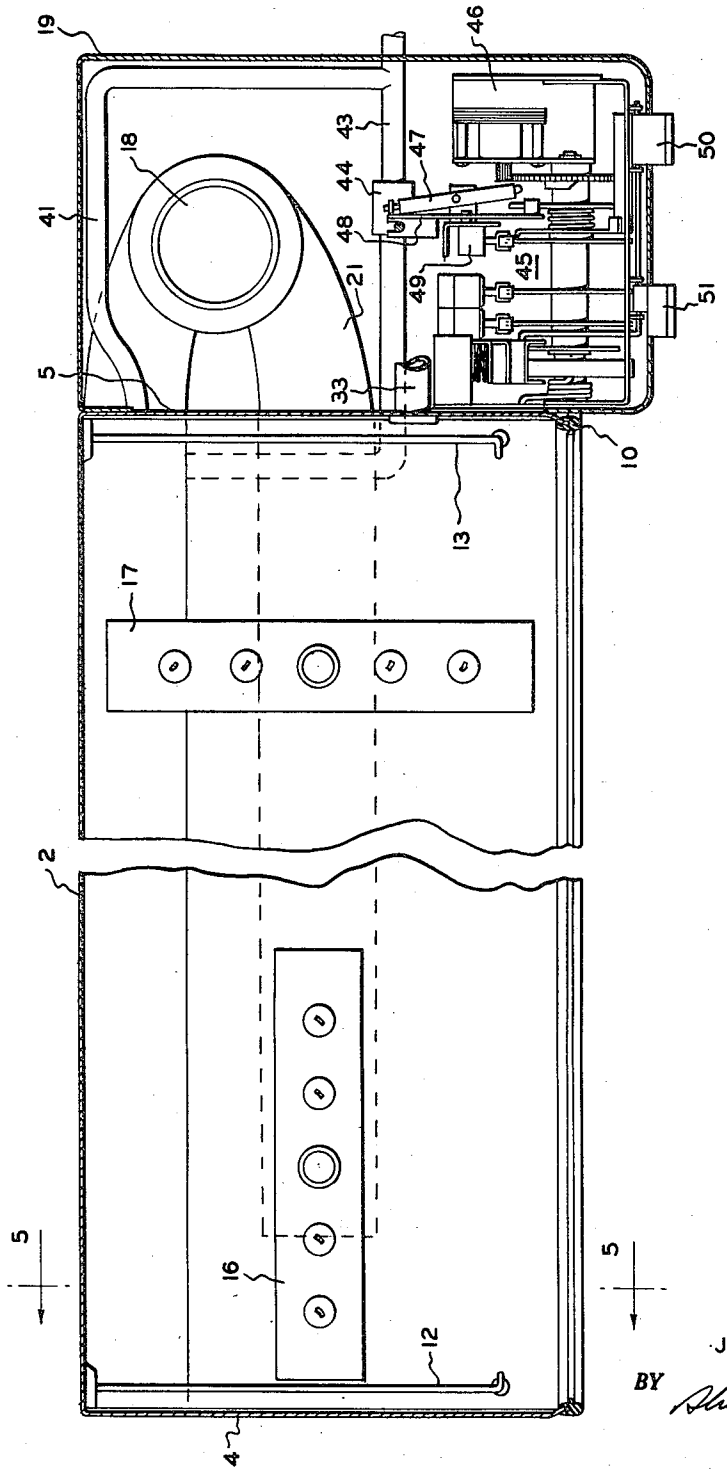


FIG. 4

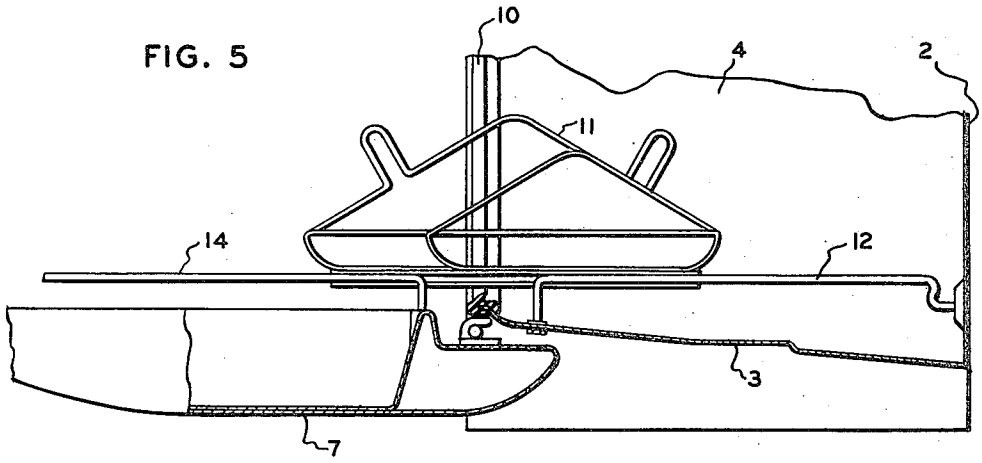
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DISHWASHER

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FIG. 5



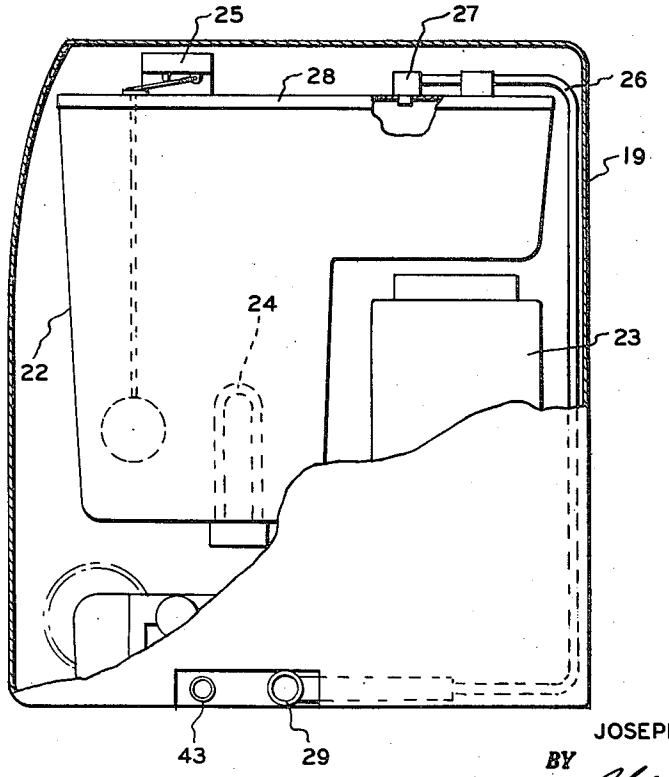


FIG. 6

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DISHWASHER

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Application December 3, 1954, Serial No. 472,943

1 Claim. (Cl. 134—57)

This invention relates to dishwashing machines, and more particularly to portable dishwashers intended for domestic use.

Automatic dishwashers of the portable type (i. e., those which are temporarily connected to the domestic plumbing system in preparation for or during operation as opposed to those machines having permanent plumbing connections) heretofore developed fall into two general categories; those which are connected to a faucet during operation by a hose and connector adapted to withstand water line pressure, and those having a built-in water tank which need be connected to the faucet only long enough to fill the tank and do not require pressure type hoses or faucet connections. While dishwashers in the latter category have certain advantages over machines of other types, difficulties have been encountered in providing sufficient water storage capacity in a cabinet of limited size, and also in insuring that the stored water is maintained at the relatively high temperature necessary for washing and rinsing operations.

A principal object of the present invention is to provide an automatic portable water storage type dishwasher of small size having adequate hot water storage capacity for a complete dishwashing operation.

Further objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Briefly stated, in accordance with one aspect of my invention I provide a dishwashing machine in which the water required for the first washing cycle is immediately admitted to the washing compartment after a heated tank for storing water needed for subsequent cycles is filled by gravity flow. Means are provided for limiting the water levels in the washing compartment and the tank, and for transferring measured quantities of water from the tank to the compartment so as to supply the quantities of water needed during each cycle of operation.

My invention will be better understood from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a perspective view of a dishwashing machine incorporating my invention.

Fig. 2 is a cross sectional view taken in a vertical plane substantially on the line 2—2 in Fig. 1.

Fig. 3 is a cross sectional view taken in a plane substantially on the line 3—3 in Fig. 1.

Fig. 4 is a sectional view with some of the parts removed taken along the line 4—4 in Fig. 3.

Fig. 5 is a fragmentary partly in section of the dishwasher shown in Fig. 1.

Fig. 6 is an end view partly in section of the dishwasher shown in Fig. 1.

Referring now to the drawings, there is shown a dishwasher of generally rectangular configuration having a top wall 1, rear wall 2, bottom wall 3 and end walls

4, 5 defining a front opening dishwashing compartment 6 closed by a door 7 provided with a window 8 and a handle 9. To prevent the escape of water from washing compartment 6 during dishwashing operations the front edges of walls 1, 3, 4 and 5 carry a door gasket 10 which engages door 7 in sealing relation. To support dishes and other articles to be washed in compartment 6 I provide a rack 11 supported therein by rails 12 and 13 secured adjacent to and parallel with side walls 4 and 5. Door 7 also carries a pair of rails 14 and 15 which when the door is in the open position as shown in Fig. 5 are aligned with rails 12 and 13 respectively, thus permitting rack 11 to be pulled out on the door to facilitate loading. Suitable means are of course required for circulating washing liquid or water throughout compartment 6 and for this purpose spray devices in the form of a pair of rotating spray arms 16 and 17 are mounted on bottom wall 3 so as to direct sprays of water upwardly on the articles held in rack 11.

Water is circulated in compartment 6 by a motor driven pump 18 mounted at one end of the dishwasher adjacent wall 5 of the washing compartment and enclosed by a housing 19. The inlet of pump 18 is connected to the lowermost portion of compartment 6 by means of a rectangular conduit 20 while the outlet of the pump is connected to spray devices 16 and 17 by means of a rectangular conduit 21 extending below bottom wall 3 of compartment 6. Thus during operation of the machine a measured quantity of water is constantly recirculated within compartment 6, being withdrawn from the lowermost portion thereof by the pump and returned to the compartment by spray arms 16 and 17.

Also enclosed within housing 19 is a water storage tank 22 having an inset lower rear wall (see Fig. 6) to accommodate the electric motor 23 which drives pump 18. Storage tank 22 is provided with an electric heating element 24, the energization of which is controlled by a float operated switch 25 so that heater 24 is energized whenever tank 22 contains a predetermined minimum quantity of water.

Filling of tank 22 is accomplished by means of a fill conduit 26 having one end portion 27 mounted in a downwardly directed position on cover 28 of the tank and its other end portion 29 extending through housing 19 and connected to a hose 30 having an enlarged end 31 adapted to engage a sink faucet.

Mounted in tank 22 is a vertical overflow pipe or conduit 32 having an open upper end terminating below the top of the tank and its lower end extending below the bottom wall thereof. It will be noted that the upper end of overflow pipe 32 is below the water inlet opening in end portion 27 of fill conduit 26, and hence tank 22 is provided with an air gap which prevents back siphoning into the water supply system. The lower end of pipe 32 communicates with washing compartment 6 by means of a U-shaped conduit 33 which functions as a suds trap, preventing suds from being forced back up through pipe 32.

In accordance with my invention tank 22 is arranged to contain all of the water required for a complete washing operation with the exception of the water required for the first washing cycle, and accordingly I provide means for admitting successive separate charges of water from the tank 22 into compartment 6. As best shown in Fig. 3, overflow pipe 32 is provided with two vertically spaced valve openings or apertures normally closed by valve elements 34 and 35, it being noted that valve 34 cooperates with an opening in pipe 32 adjacent the bottom of tank 22 and that valve 35 cooperates with an opening arranged to drain approximately half the water in the tank, it being remembered that the tank is of irregular shape as shown in Fig. 6. Valves 34 and 35 are

maintained in closed position by springs 36 and 37 respectively, but may be opened by an actuating rod 38 having collars 39 and 40 positioned thereon so as to engage valve elements 34 and 35 respectively. As shown in Fig. 3, limited upward movement of actuating rod 38 is sufficient to open valve 35 without disturbing valve 34. Further upward movement of rod 38 also opens valve 34 and thus it will be seen that approximately one-half of the water in tank 22 is drained therefrom through pipe 32 when valve 35 is opened and the remaining portion is drained by the opening of valve 34.

To limit the quantity of water which may be contained in dishwashing compartment 6 an overflow conduit 41 communicating with an overflow opening 42 in compartment 6 is provided. It will be noted that the bottom wall of storage tank 22 is slightly above overflow opening 42 and hence the water level in compartment 6 cannot rise above the bottom wall of the tank. To provide means for draining compartment 6 a drain conduit 43 which enters the lowermost portion of compartment 6 and extends through the end wall of housing 19 adjacent inlet 29 is provided. Drainage through the drain conduit 43 is controlled by a drain valve 44 automatically actuated at appropriate times during washing operations by means hereinafter described.

The energization of electric motor 23 which drives pump 18 and the operation of valves 34, 35 and drain valve 44 are controlled by a timing device generally designated by the numeral 45. Timing device 45 is driven by a constant speed timer motor 46 and is provided with a group of cams mounted on a common shaft and arranged to actuate lever 47 of drain valve 44, lever 48 which operates actuating rod 38, switch 49 which controls motor 23. Control of timer 45 is accomplished by a pair of pushbuttons 50 and 51 mounted on the front wall of housing 19, and arranged so that the timer is energized by operation of pushbutton 50, and is de-energized along with motor 23 by operation of pushbutton 51. Timing device 45 operates in a conventional manner and is arranged to energize pump motor 23 for a predetermined period of time at the beginning of a washing operation, open drain valve 44 at the end of the first washing cycle, actuate rod 38 so as to open valve 35 after all of the water has drained from compartment 6 so as to permit a charge of water for the second operating cycle to enter compartment 6, and then repeat these steps in the same order until the last washing cycle has been completed.

In using the dishwasher disclosed herein it is commonly placed on a kitchen counter top adjacent the sink so that fill conduit 31 may be conveniently attached to the sink faucet and drain conduit 43 may be placed so as to drain into the sink. After the dishes have been loaded in the rack 11, detergent deposited in the lower portion of the washing compartment 6 and door 7 closed, water is admitted through fill conduit 30. As water enters the dishwasher, tank 22 is filled first and when the water level therein reaches the open upper end of overflow pipe 32 water passes into compartment 6 through conduit 33, filling the washing compartment to the level of overflow opening 42. As water continues to enter the machine, the water in compartment 6 overflows through overflow conduit 41 and thus flows out of the drain opening 43 inasmuch as conduit 41 joins drain conduit 43 as shown in Fig. 4. The appearance of water draining from conduit 43 indicates to the operator that both the tank 22 and the compartment 6 are filled with the proper quantities of water and that the dishwasher is ready for operation. Accordingly fill conduit 30 is disconnected from the sink faucet and thereafter need not be connected, thus leaving the faucet free for other uses. The washing operation is started by depressing start button 50 which energizes the timer motor 46 and closes the electric circuit through heater 24 and float switch 25, which is of course closed since tank 22 is filled with water. After a very short interval switch 49 is closed by the cam cooperating therewith, motor 23 is energized and the washing cycle is begun. Rotating spray devices 16 and 17 circulate the washing fluid throughout the compartment 6 and against the dishes supported by rack 11 for a predetermined number of minutes after which the timing device 45 stops pump motor 23 and opens drain valve 44 permitting the washing liquid to drain by gravity from compartment 6. After the valve 44 has been opened long enough to completely drain the compartment it is again closed and the timing device actuates rod 38 so as to open valve 35 permitting a second charge of water to enter compartment 6. Thereafter pump motor 23 is again energized and the dishes in the washing compartment are rinsed for a suitable period of time after which drain valve 44 opens, motor 23 is de-energized and then the drain valve is again closed so as to prepare the machine for a third cycle of operation. The third cycle is initiated by further upward movement of rod 38 by the timing device so as to open valve 34, thus draining all of the water in tank 22 into the washing compartment. During this last cycle the dishes are finally rinsed and at the end of a period of time determined by the position of the cams in timing device 45 the pump motor 23 is again de-energized and drain valve 44 is opened. If desired timing device 45 may be provided with means for opening door 7 so as to promote rapid drying of the dishes or a signal device such as a bell or light (not shown) may be energized to indicate to the operator that the washing cycle has been completed.

From the foregoing it will be observed that by providing means for storing the first charge of water used during a dishwashing operation in the washing compartment, the size of the storage tank for the remaining water to be used may be reduced by one-third if two additional cycles of operation are contemplated, thus effecting a substantial reduction in the over-all size of the machine. Furthermore, this smaller quantity of water stored in the tank may be more easily maintained at the desired high temperature by a heating element located therein and thus the over-all washing efficiency of the dishwasher is improved.

It will be understood that my invention is not limited to the specific embodiment herein illustrated and described, and that the following claim is intended to cover all changes and modifications which do not depart from the true spirit and scope of the invention.

What I claim is:

An automatic dishwashing machine comprising a dishwashing compartment adapted to receive separate charges of water for each of a plurality of sequential washing operations, an overflow conduit communicating with an overflow opening in said compartment limiting the water holding capacity thereof to one of said charges of water, a drain conduit communicating with the lowermost portion of said compartment, a drain valve in said drain conduit, a water storage tank adjacent said compartment having its bottom wall located above said overflow opening in said compartment, an electric heater in said tank, float operated switch means for controlling the energization of said heater in accordance with the water level in said tank, a conduit having one end adapted to receive water from a water faucet and the other end connected to the top of said tank, a vertical overflow pipe mounted in said tank and extending below the bottom wall thereof, said pipe having an open upper end terminating below the top of said tank, a first valve aperture in said pipe located adjacent said bottom wall of said tank, a second valve aperture in said pipe located between its open upper end and said first valve aperture, a pair of valve elements normally seated in said apertures but movable to open positions by an actuating rod arranged to sequentially engage said valve elements so as to open said second aperture before opening said first aperture, a conduit connecting the lower end of said pipe and said

compartment whereby water entering said pipe from said tank flows into said compartment, a spray device in said compartment, a recirculating motor driven pump having its inlet connected to the lowermost portion of said compartment and its outlet connected to said spray device, and a timing device arranged to operate said drain valve, actuating rod, and pump in sequence whereby articles placed in said compartment may be initially rinsed by a charge of water stored in said compartment, and thereafter washed and rinsed by two separate charges of water

sequentially admitted to said compartment from said tank through said first and second apertures in said overflow pipe.

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