

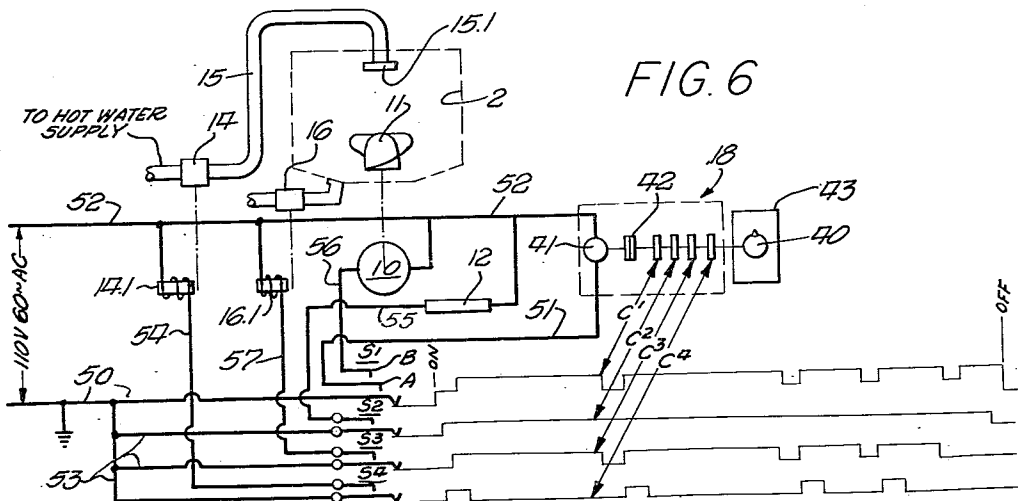
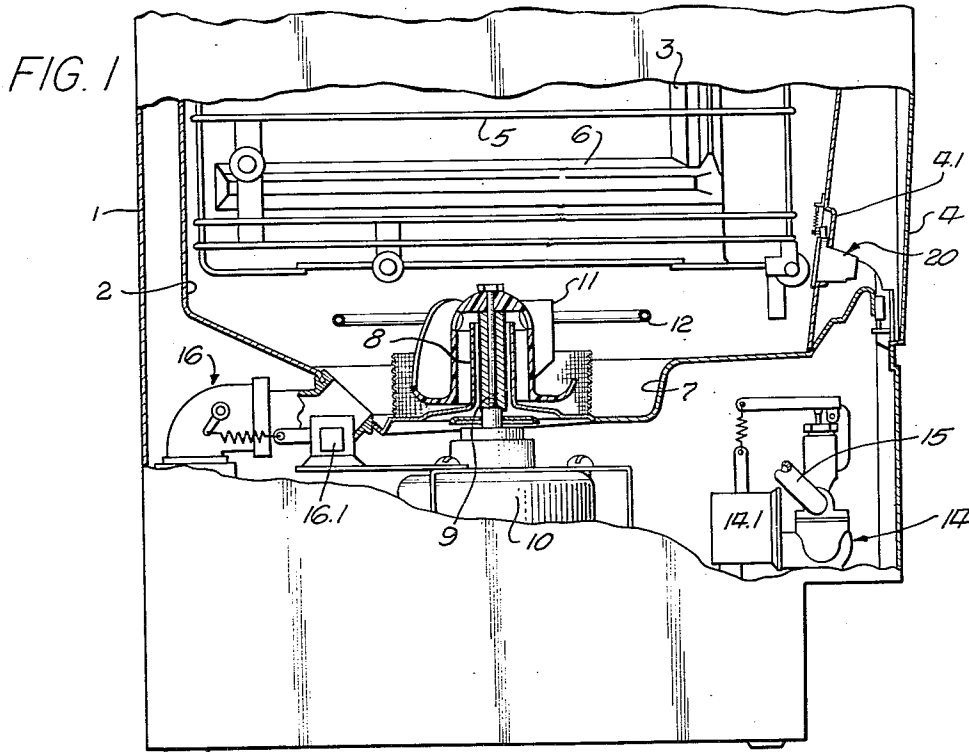
Oct. 15, 1957

L. J. MARTINIAK  
DISHWASHING APPARATUS WITH AUTOMATIC  
DETERGENT-DISPENSING MEANS

2,809,648

Filed May 2, 1956

3 Sheets-Sheet 1



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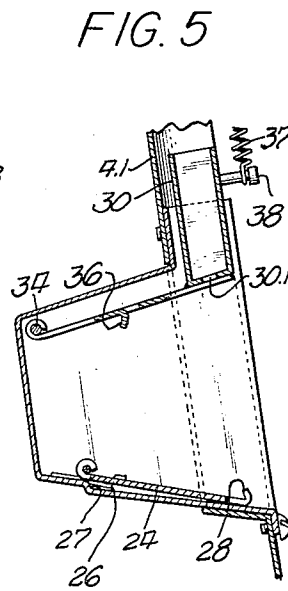
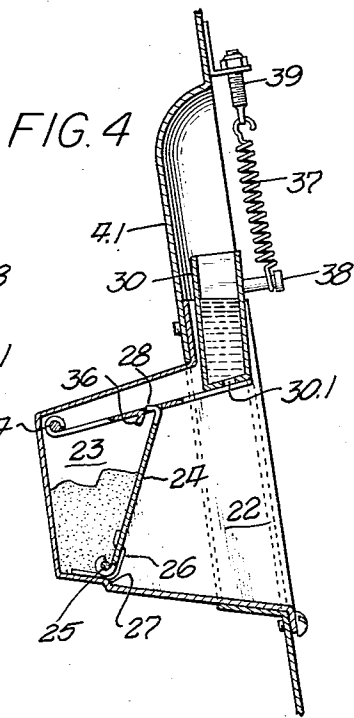
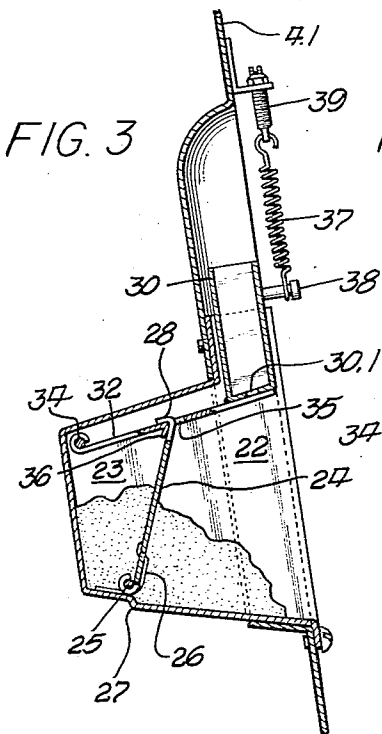
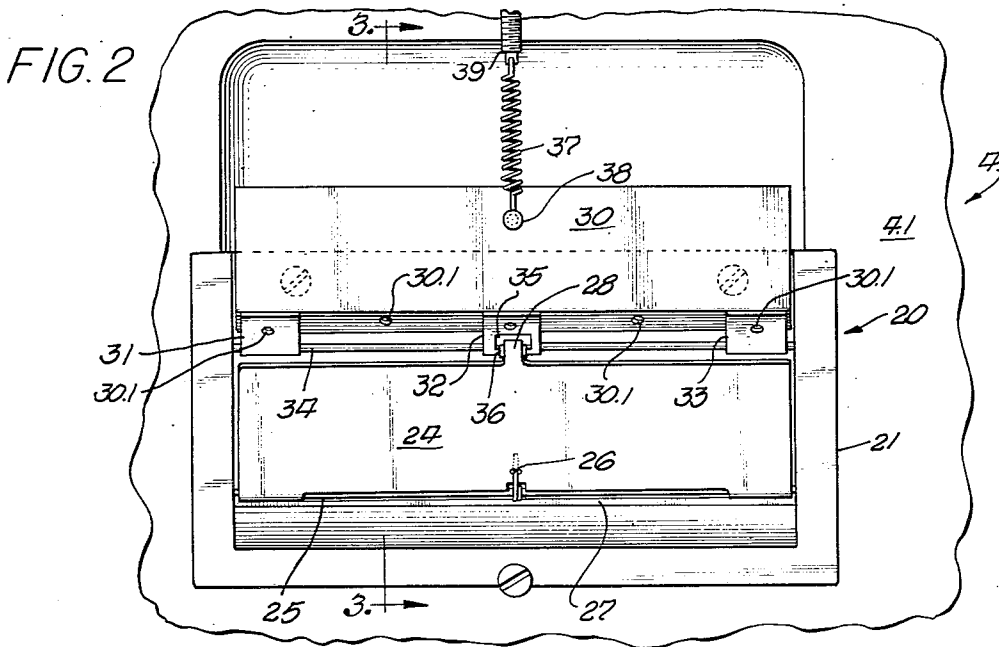
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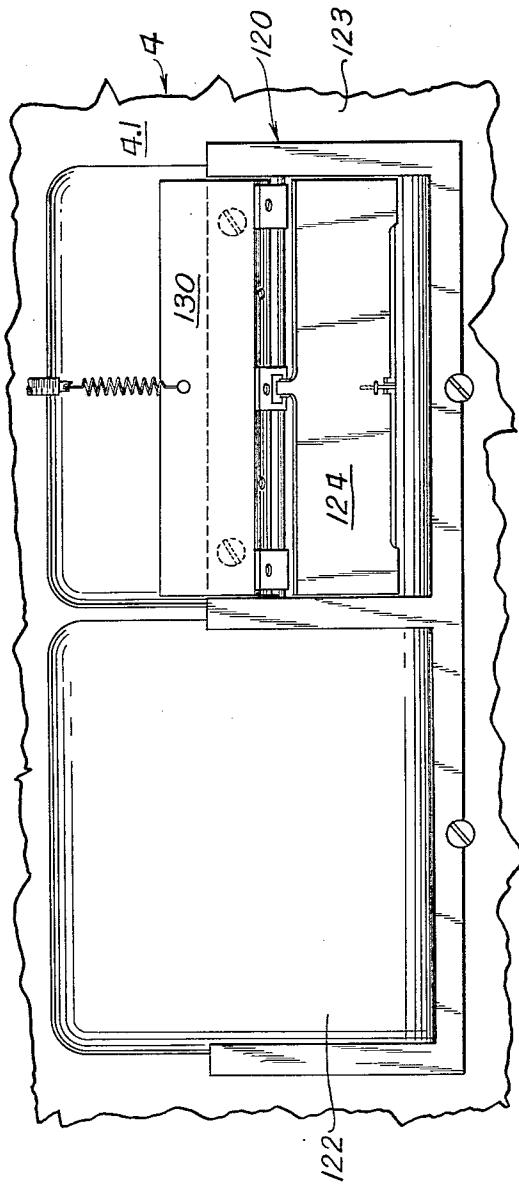
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FIG 7



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## DISHWASHING APPARATUS WITH AUTOMATIC DETERGENT-DISPENSING MEANS

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Application May 2, 1956, Serial No. 582,169

15 Claims. (Cl. 134—56)

The invention relates to dishwashing apparatus and in particular to means for automatically introducing detergent into the dishwasher vat at widely spaced intervals during the washing cycle, whereby the articles within the vat may be washed, rinsed and then washed again in order to remove all traces of food or other soil therefrom. This application is a continuation-in-part of the copending application of Leonard J. Martiniak, Serial No. 478,244, filed December 29, 1954, now abandoned.

Among the objects of the invention are: to provide a dishwasher detergent dispenser which may be easily loaded with a plurality of charges of powdered or granulated detergent; which will cause the respective detergent charges to be thoroughly mixed with the water in the vat at spaced intervals in the operational cycle of the machine, to create a detergent solution of necessary strength for each of a plurality of washing operations; and will operate in a consistent and trouble-free manner throughout a long, effective, life.

These and other objectives and operational features may be accomplished by the use of a detergent cup having a first compartment openly facing the dishwasher vat, and a second compartment arranged to be closed by a shutter which is spring or gravity biased to operate to a position exposing said second compartment. During the first washing operation, water entering the first compartment causes the first detergent charge to go into solution. Latch means are provided to hold the shutter in a position initially closing the second compartment, whereby its detergent charge is reserved for a subsequent washing action. Means comprising a water receiving cup operates to cock the latch in a "prepare to release" position, and then wholly releases the latch, whereupon the shutter opens to expose the second compartment to water action and thus makes the second charge of detergent available.

Other features and advantages of the invention will be apparent from the following description of a presently preferred embodiment read in connection with the accompanying drawings in which:

Fig. 1 is a fragmentary side elevation of the lower portion of a dishwasher to which an embodiment of my invention has been applied, said dishwasher being partly in section and with portions removed to disclose otherwise hidden structure;

Fig. 2 is a front elevation showing a portion of the dishwasher door liner with a detergent dispenser embodying the invention mounted thereon;

Fig. 3 is a side sectional elevation taken on lines 3—3 of Fig. 2 showing the detergent dispenser with both compartments charged with detergent and the shutter in closed position;

Fig. 4 is a view similar to Fig. 3 but showing an intermediate operational stage of the detergent dispenser with the forward compartment having been evacuated of its detergent charge and has the shutter in its "prepare to release" position;

Fig. 5 is a view similar to Fig. 3 but showing the shut-

ter in its released position and the second compartment having been evacuated of its detergent charge;

Fig. 6 is a schematic wiring diagram of the dishwasher; and

Fig. 7 is a front elevation of a modified form of the detergent dispenser also embodying the invention.

Fig. 1 shows a conventional dishwasher in sufficient detail for establishing the objectives and functions of the invention. The illustrated dishwasher is of the general type shown in U. S. Patent No. 2,657,697, issued to Forrest A. Walker, November 3, 1953, and entitled "Dishwashing Apparatus and Cabinet Structure." It comprises an outer casing 1 within which is rigidly supported a tub or washing vat 2, having a base, side walls, and a top wall (not shown). The front of the side walls have peripheral flanges 3 which define a front opening arranged to be closed by a door 4 pivoted at its bottom for swinging between a substantially vertical closed position and a substantially horizontal open position. The door may be constructed and arranged according to the disclosure of the Frank D. Low Patent 2,573,798 which issued November 6, 1951, for "Interlocking Door Hinge."

A dish supporting rack structure 5 is mounted in guide rails 6 projecting from the side walls of the vat, and when the door 4 is in its horizontal loading position, the rack structure may be drawn outwardly onto the door, loaded with the dishes and other articles to be washed, and returned to the vat following which the door may be closed in preparation for the washing operation.

The bottom of the vat is formed with a sump 7 in the central portion of which is an upstanding tubular wall 8. This wall reaches above the level of water accumulating in the sump and prevents water from passing along the shaft 9 and reaching the motor 10 which is bracketed beneath the bottom of the vat. Fixed to said motor shaft 9 for rotation thereby is an impeller 11 which may advantageously be of the type disclosed in the Koertge U. S. Patent 2,422,022, dated June 10, 1947. Such an impeller forcefully circulates water throughout the vat to accomplish cleansing and rinsing of the articles therein and also effects a circulation of air within the vat during the later drying portion of the operation. The air enters the tub through the annular space about shaft 9. Also supported within the tub so as to encompass the impeller is a heating element 12 of the conventional sheathed resistance conductor type. This heating element is arranged to be energized during almost the entire operational cycle of the machine; during the water using portions of the cycle, the heating element maintains the water temperature and it assists in the final drying operation by raising the temperature of the incoming air.

Within the cabinet and below the vat are an electromagnetically controlled water inlet valve organization 14 which connects to the building water supply system (not shown) and controls flow through a tube 15 leading to a spray-type inlet fitting 15.1 (shown schematically in Fig. 6) at the top of the vat and an electromagnetically operated drain valve system 16 discharging through a conventional trap fitting (not shown) into the building plumbing waste system (not shown). The respective inlet valve and drain valve are controlled by solenoids 14.1 and 16.1 respectively. When solenoid 14.1 is de-energized, the inlet valve 14 (which is connected to a source of heated water) is closed; and when the solenoid 16.1 is deenergized, the drain valve 16 is in a draining position in which position it remains until the energization of solenoid 16.1 moves it to a non-draining position. The inlet valve 14 may be of any conventional type, but is preferably of the quick opening, slow closing type. The drain valve 16 may be of any suitable gate type.

The dishwasher is caused to operate automatically through a predetermined washing, rinsing, and drying

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cycle under control of a conventional time-cycle control switch 18, as later described in detail. For illustrative purposes, such time-cycle operation may comprise the following steps:

- (1) Open inlet valve system 14 (the drain valve is normally open), admitting water into the tub through the top-wall spray device 15.1, spray-rinsing the articles for about 45 seconds to remove loose soil which passes down the drain. Close heating element circuit.
- (2) After 45 seconds, but without interruption of water inflow, close drain valve, close motor circuit to operate impeller. Continue to admit water for a predetermined period.
- (3) Shut off inlet valve; maintain drain valve closed; maintain power on motor for approximately five-minute wash period. The first detergent charge will go into solution at this time.
- (4) Shut off motor; open drain valve for complete drainage of first wash water.
- (5) Idle interval.
- (6) Restart motor; close drain valve; admit water for predetermined water inlet period.
- (7) Close inlet valve and wash for second five-minute period. The second detergent introduction is made during this time.
- (8) Open drain valve; stop motor for complete drainage.
- (9) Close drain valve; start motor; admit water for two-minute rinse.
- (10) Stop motor; open drain valve.
- (11) Repeat 9 and 10 for a second two-minute rinse.
- (12) Stop motor and open drain for final drainage.
- (13) With drain valve open and water inlet valve closed, operate motor to circulate warm drying air within the tub.
- (14) Ten minutes before end of cycle open heating element circuit.
- (15) Everything off.

The present invention relates to the means for effecting the timed introduction of the detergent. Referring to Figs. 2 and 3, the detergent dispenser comprises a multiple compartment container 20, having the flange 21 by means of which the container may be attached to the inner panel 4.1 of the door 4, in a location in which water action within the tub during the periods the impeller 11 is being rotated will sweep into the detergent container. It should be understood that said door panel is formed with an aperture to receive the container and that a gasket or the like will be employed between the flange 21 of the detergent container and the door panel. The container is entirely open across its front and as best appears in Fig. 3, the bottom wall slopes at a relatively small angle from the horizontal to insure a complete washing out of the detergent charge therein, as later described.

The container is divided into two compartments 22 and 23, each of appropriate size, by means of a shutter 24 which extends substantially the full length of the container and is pivoted at its bottom edge by a suitable pivot pin or the like 25. Desirably, the shutter 24 is spring biased as by a mouse trap spring or the like 26 for positive operation to its open position, although it will be obvious that because of its arrangement within the container, it is inherently gravity biased for such operation to open position. It will be noted that the bottom wall of container 20 is formed with a step 27 immediately beneath the bottom edge of the shutter 24, whereby when the shutter drops it will in effect comprise a continuation of the floor of the rear compartment 23. At substantially its mid-point, the upper edge of the shutter is formed with a small rearwardly directed hook 28.

An open topped tank or cup 30 is provided with three support arms, respectively 31, 32, and 33, which extend rearwardly beneath the top wall of container 20. Arm 32 is a latching arm for controlling release of shutter 24. Said arms provide means for pivotally supporting the

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cup 30; a convenient method is by bending the ends of arms to form loops through which a pivot pin 34 passes. Latch arm 32 has a slot 35 which freely receives the hook 28 of shutter 24. The rear wall of said slot includes a downwardly struck finger 36. Cup 30 is biased for rotation counterclockwise of Fig. 3 by spring means such as the spring 37, engaging a pin 38 projecting from the forward wall of cup 30 and adjustably anchored to the door panel 4.1 as by the illustrated bracket and screw 39. Finally, the cup 30 is provided with a plurality of small openings 30.1 through its bottom wall.

Assuming that the dishwasher vat has been loaded with dishes and other articles to be washed and the door 4 is still in its horizontal or open position, it is apparent that the open front of the detergent container 20 will be facing upwardly. It is probable that the shutter 24 will be lying on the bottom of chamber 22. The user then places a quantity of powdered or granular detergent in chamber 23, raises the shutter 24, and latches the hook through the opening 35. The spring 37 will maintain the cup in a position in which the finger 36 of the support arm 32 of the cup will bear against the hook 28 and hold the shutter 24 in position. The user then places a quantity of the detergent in chamber 22, closes the door and starts the dishwasher operation by turning the knob 40 of the time cycle switch 18, thus initiating a series of operations to carry out the previously enumerated sequence by operation of the respective control devices schematically shown in the circuit diagram of Fig. 6.

In the schematically shown time cycle switch, cams C1 to C4 inclusive, respectively control switches S1 to S4 inclusive. Said switches may be of the spring-leaf contact type in which one of the contacts comprises a cam follower which follows the contour of its associated cam. The cams are driven at a controlled rate—for example, at the rate of one revolution per hour—by a conventional electric timer motor 41, usually through a slip clutch 42 which permits knob 40 to be rotated in a clockwise direction, as viewed in Fig. 6 without injury to the driving mechanism of the time-cycle switch.

In switch S1, contact "A" thereof will be made before contact "B" and said contacts will be released in the reverse order. When the knob 40 is moved to an "on" position, as indicated by suitable indicia (not shown) on the escutcheon plate 43, contacts "A" of switch S1 will be closed as its cam follower contact rises on an intermediate portion of cam C1, and the timer motor 41 will thereupon be energized through the circuit including line conductor 50, contact "A" of switch S1, conductor 51 and line conductor 52. Coincidentally therewith, solenoid 14.1 of hot water inlet valve 14 will be energized to open the valve for the admission of water to the dishwasher vat through conduit 15 and inlet fitting 15.1. The circuit path for solenoid 14.1 may be traced through line conductor 50, conductor 53, switch S4, conductor 54, solenoid coil 14.1 and line conductor 52. The drain valve 16 remains open because switch S3 which controls drain valve solenoid 16.1 remains open, to permit about a 45-second spray rinse to remove the loose soil from the dishes and pass it to the plumbing drain. Because of the open drain valve and the fact that contacts "B" of switch S1 which control the main drive motor 10 are not yet closed, there is no accumulation of water within the sump portion of the dishwasher vat and no water action which will reach the detergent in the open detergent cup 22 or cause water to enter cup 30 in appreciable quantity.

Switch S2 closes simultaneously with the closing of switch S4 and through the circuit including conductors 50, 53, 55, and 52, the heating element 12 becomes energized and remains energized until about ten minutes before the time cycle switch returns to its "off" position.

After the approximately 45-second rinsing period, contacts "B" of switch S1 close energizing the drive motor 10 through the circuit comprising conductors 50, 56, and 52. The impeller 11 then begins operation. Simulta-

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neously therewith, solenoid 16.1 becomes energized to close the drain valve 16; the circuit comprises conductors 50, 53, switch S3, conductor 57, solenoid 16.1 and conductor 52.

After a time interval calculated to introduce the full quantity (usually about 12 pints) of hot water into the vat, switch S4 opens to de-energize solenoid 14.1 and shut off the water supply. All of the other switches remain closed. Impeller 11 circulates the water at high velocity throughout the vat and in so doing causes the water to enter the detergent compartment 22, whereupon the detergent charge thereof mixes with and becomes dissolved in the water to form the first detergent solution for the washing operation. The washing operation continues for about five minutes, following which contacts "B" of switch S1 open to interrupt the circuit to motor 10. Substantially simultaneously, contacts S3 open to de-energize solenoid 16.1 and permit valve 16 to return to its open or draining position. After a brief idle or quiescent interval to permit the complete drainage of the spent washing liquid from the vat, contacts "B" of switch S1 again close to energize motor 10; contacts S3 close to energize solenoid 16.1 and operate valve 16 to non-draining position; and contacts S4 close for a second introduction of approximately 12 pints of hot water.

During the first washing action, cup 30 of the detergent cup mechanism became filled with water and its weight overcame the spring 37. It will be understood that so long as the impeller is operating during the washing cycle, water accumulates in cup 30 faster than it can escape from said cup through openings 30.1. The cup 30 moves downwardly as shown in Fig. 4 and partially releases the finger 28 of the shutter 24. However, the shutter remains held in its substantially closed position because of the engagement with the edge of the finger 28 with the forward edge of the opening 35 in the cup support arm 32. This is the "prepare to release" position. During the quiescent period following the washing operation, the impeller 11 ceases operation and drainage valve 16 assumes its draining position, and the water accumulated in cup 30 drains through the openings 30.1. Spring 37 thereupon becomes effective to lift cup 30 to its original position and in so doing the latching arm 32 of cup 30 disengages from the locking tab 28 of shutter 24. Said shutter drops to the floor of compartment 22, and thus exposes the detergent charge in compartment 23 of the detergent container 20. As above stated, it is not until there is no further water action that the escape of water through the openings 30.1 becomes effective to lighten the cup 30 sufficiently to permit spring 37 to raise the cup and thus release shutter 24. Following the short drainage interval, the drain valve is again closed, water in suitable quantity is introduced into the vat through valve 14 and inlet fitting 15.1, and the impeller 11 started, all as shown in Fig. 6. During the ensuing water action within the vat, the water forcefully enters detergent compartment 23 and removes the detergent therefrom, thus forming the second washing solution. It may be noted here that the second detergent charge may be less than that of the first charge in view of the fact that a very large portion of the soil was removed from the articles during the first washing action and it is therefore not necessary to have as concentrated a detergent solution for the second washing operation.

Following the second washing operation, the impeller is stopped and the drain valve opened, as indicated in the circuit diagram, and the operational cycle thereupon proceeds with the two rinsing periods and the final drying operation pursuant to the obvious operation of the control elements as dictated by the cams.

Referring now to Fig. 7, a modified form of the detergent dispenser 120, also embodying the features of the present invention, is illustrated that comprises structure defining the two detergent-containing chambers 122 and 123 in side-by-side relationship upon the inner panel 4.1

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of the door 4, the chambers 122 and 123 openly facing the vat 2 independently of each other. Of course, the chamber 123 is provided with the shutter 124 and the associated operating mechanism, including the cup 130, all of the construction and arrangement previously described. In this arrangement, it will be understood that the first charge of detergent is placed in the open chamber 122 and that the second charge of detergent is placed in the open chamber 123, with the shutter 124 in its released or open position. Thereafter the shutter 124 is manually operated into its closed or latched position (in the manner of the shutter 24 shown in Fig. 3); whereby the subsequent release of the shutter 124 is placed under the control of the cup 130, all in the manner previously described.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. In a washing apparatus having a washing vat and means for forcefully circulating water among the contents of said vat during each of two washing periods separated by a quiescent period, the improvement in means for introducing detergent into said vat during each of said washing periods, comprising a first detergent compartment within said vat and openly facing said vat to receive water therefrom in sufficient quantities during a first of said washing periods to evacuate the detergent content of said container into said vat, a second detergent compartment within said vat and openly facing said vat, a shutter movably mounted relative to said second detergent compartment for closing said second detergent compartment to protect the detergent content thereof against inflow of water during said first washing period, means for urging said shutter into movement exposing said second compartment to water action within said vat, latch means for releasably holding said shutter in compartment closing position, cup means carried by said latch means within said vat for accumulation of water during said first washing period, means responsive to an accumulation of water within said cup means during said first washing period to operate said latch to a "prepare to release" position, means for draining said cup means during the quiescent period following said first washing period, and means responsive to the reduction in weight of said cup means resulting from drainage of liquid therefrom to operate said latch means to release said shutter for movement thereof to open said second compartment to subsequent water action within said vat.

2. In a washing apparatus having a washing vat and means for forcefully circulating water throughout said vat during each of two periods separated by a quiescent period, means for introducing detergent into said vat during the second of said water circulation periods, comprising a detergent compartment openly facing said vat to expose the contents thereof to water action during said period, whereby said detergent may be mixed with said water and flow into said vat, a shutter for closing said compartment against said water action, means for biasing said shutter for movement exposing said compartment, latch means for releasably holding said shutter in compartment-closing position, a cup operatively associated with said latch means, said cup being arranged to accumulate water during said first water circulation period, means responsive to the resultant increase in weight of said cup to operate said latch means to a "prepare to release" position, means for draining water from said cup during said quiescent period, and means responsive to the lightening of said cup to operate said latch means to release said shutter for movement to its compartment-exposing position.

3. In a washing apparatus having a washing vat and means for forcefully circulating water among the contents

of said vat during each of two washing periods separated by a quiescent period, the improvement in means for introducing detergent into said vat during each of said washing periods, comprising a detergent container disposed within said vat and having a first detergent-receiving compartment openly facing said vat to admit water in sufficient quantities during a first of said washing periods to mix with said water to form a detergent solution, a movable shutter forming a wall of said first detergent compartment, a second detergent compartment disposed behind said shutter, means for urging said shutter into movement exposing said second detergent compartment to water action within said vat, means for releasably latching said shutter in a position closing said second compartment to water action, means disposed within said vat to accumulate a quantity of water during said first washing period, means responsive to the increase in weight of said water-accumulation means to operate said latch means to a "prepare to release" position, means effective during said quiescent period to drain said water accumulation means, and means responsive to the reduction in weight of said water-accumulation means to operate said latch means to release said shutter, whereby to expose said second detergent compartment to water action during the next washing period.

4. Apparatus according to claim 3, in which said shutter forms a rear wall of said first detergent compartment.

5. In a washing apparatus having a washing vat, a door for said vat operable between a vertical closed position and a horizontal open position and means for subjecting the contents of the vat to forceful water action during each of two water action periods separated by a quiescent period, the improvement in means for introducing detergent into said vat by water action during said second water action period, comprising a detergent compartment disposed within said vat and openly facing said vat to expose the detergent content thereof to evacuation by water action, a shutter pivotally mounted relative to said compartment and arranged to close said compartment against any substantial amount of water entry during said first water action, means biasing said shutter to open position, an arm member pivotally mounted relative to said shutter, latching means interposed between said arm member and said shutter to releasably hold said shutter in closed position, a cup disposed within said vat for accumulation of water during said first water action period, means for draining said cup during said quiescent period, means for operating said arm member by said cup to establish said latching means in a "prepare to release" position upon accumulation of water in said cup, and means for operating said arm member to cause said latch member to release said shutter upon drainage of water from said cup.

6. Apparatus according to claim 5, in which said detergent compartment is mounted on an inner panel of said door.

7. Apparatus according to claim 5, in which said cup is carried by said arm member.

8. Apparatus according to claim 5, in which said last-named arm-member operating means comprises a spring which yields under the combined weight of the cup and its contents to permit said arm member to establish said "prepare to release" position and reacts as said cup lightens upon drainage therefrom to operate said arm member to full release position.

9. Apparatus according to claim 5, in which the cup has an opening in its bottom wall, through which water drains continuously at a lower rate than the entry of water into said cup during the said first water action period.

10. Apparatus according to claim 5, in which the plane of the opening of said detergent container is substantially parallel with the plane of the inner face of said door whereby said detergent container looks upwardly when said door is in open position.

11. In a dishwashing apparatus having a washing vat,

means for arranging dishes and the like within said vat, and means for forcefully impelling water throughout said vat to impinge upon the contents thereof during each of two water action periods separated by a quiescent period, the improvement in means for introducing detergent into said vat during the second of said two water action periods, comprising a detergent container disposed within said vat and openly facing said vat to expose the detergent content thereof to evacuation into said vat by water action, a shutter pivotally mounted relative to said compartment and arranged to close said compartment against any substantial entry of water during the first of said water action periods, means for biasing said shutter into movement to open position, an arm member pivotally mounted relative to said shutter, said arm member having an aperture, a hook member fixed to said shutter and extending therefrom through said aperture with the free end of said hook member overlying said arm member, the length of said aperture being such that upon rotation of said shutter toward open position said hook member end portion may disengage from said arm member to be entirely within the aperture as the opposite end of said hook member comes into engagement with an edge of said aperture to interrupt said movement of said shutter and thereby maintain the same in compartment closing position, spring means to rotate said arm member in a first direction to a position in which said arm member and said hook member end portion are pressed into mutual engagement to retain said shutter in said closing position, a cup member mounted on said arm member within said vat and arranged to accumulate a sufficient weight of water during said first water action to cause said spring means to yield under rotation of said arm member in a second direction disengaging from said hook member end portion while placing said aperture edge in position to interrupt the movement of said shutter to open position, and means for draining said cup during said quiescent period to lighten said cup sufficiently for said spring means to rotate said arm means in the first-named direction to release said hook member, whereby said shutter may move to open position exposing the detergent content of said container to the ensuing water action.

12. Apparatus according to claim 1, in which said first and second detergent compartments are arranged in side-by-side relation and openly facing said vat independently of each other.

13. In a washing apparatus having a washing vat and means for forcefully circulating water throughout said vat during each of two periods separated by a quiescent interval; equipment for introducing detergent into said vat during said second water circulation period, comprising first structure defining a compartment having an opening facing said vat and adapted to receive a charge of detergent, a cover pivotally mounted upon said first structure and movable between closed and open positions with respect to said opening, said cover being manually movable from its open position into its closed position after the placement of a charge of detergent in said compartment, said cover in its closed position protecting the detergent in said compartment against the water action in said vat and in its open position exposing the detergent in said compartment to the water action in said vat, second structure defining a cup adapted to accumulate water during said first water circulation period, means for draining at least some of the water from said cup during said quiescent interval, an element operated in response to the drainage of at least some of the water from said cup following the accumulation of the water therein, and means responsive to the operation of said element for moving said cover from its closed position into its open position.

14. In a washing apparatus having a washing vat and means for forcefully circulating water throughout said vat during each of two periods separated by a quiescent interval; equipment for introducing detergent into said vat during said second water circulation period, comprising

first structure defining a compartment having an opening facing said vat and adapted to receive a charge of detergent, a cover pivotally mounted upon said first structure and movable between closed and open positions with respect to said opening, said cover being manually movable from its open position into its closed position after the placement of a charge of detergent in said compartment, said cover in its closed position protecting the detergent in said compartment against the water action in said vat and in its open position exposing the detergent in said compartment to the water action in said vat, second structure defining a cup adapted to accumulate water during said first water circulation period, means for draining at least some of the water from said cup during said quiescent interval, an element conditioned for operation during said first water circulation period but restrained from operation by the weight of the water in said cup and subsequently operated in response to the loss of weight of the water in said cup incident to the drainage of at least some of the water therefrom, and means responsive to the operation of said element for moving said cover from its closed position into its open position.

15. A detergent dispenser for washing apparatus having a vat within which articles are subjected to periods in which washing liquid is forcefully circulated throughout the vat, said periods being separated by a relatively quies-

cent interval to permit drainage of liquid from the vat; comprising a detergent container having an opening facing said vat, a cover member pivotally mounted relative to said container and having a first position substantially closing said container to entry of liquid during a water circulation period and a second position exposing the interior of said container for evacuation of the detergent content thereof into said vat, said cover member being movable by gravity to said second position, structure defining liquid receiver means and pivotally mounted relative to said vat and open to the water action therein to accumulate liquid during a liquid circulation period and having means for the drainage of said liquid during said quiescent interval, means establishing a first position of said structure when said liquid receiver means has accumulated a quantity of liquid and a second position thereof when a quantity of the liquid has drained from said liquid receiver means, and means on said cover member engaging with said structure to maintain said cover member in its said first detergent container closing position while said structure occupies its said first position and disengaging therefrom to cause said cover member to assume its said second container exposing position upon movement of said structure to its said second position.

No references cited.