March 17, 1964 N. L. KENDT 3,125,249

DISHWASHER WITH IMPROVED TREATING AGENT DISPENSER MECHANISM

Filed Nov. 3, 1961 3 Sheets-Sheet 1

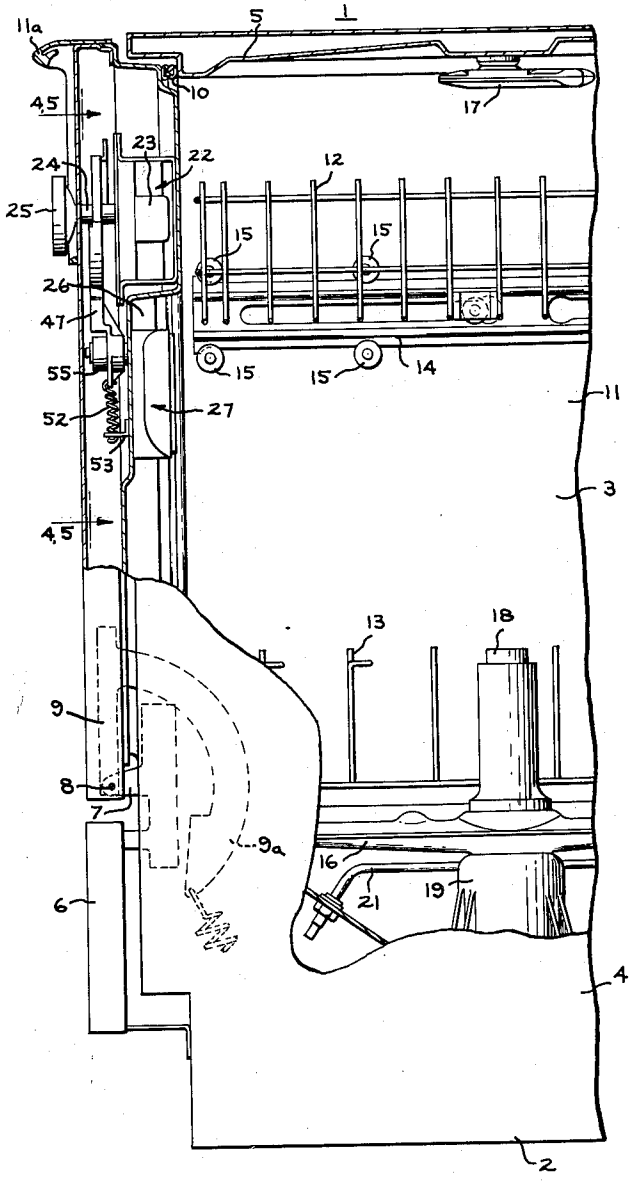
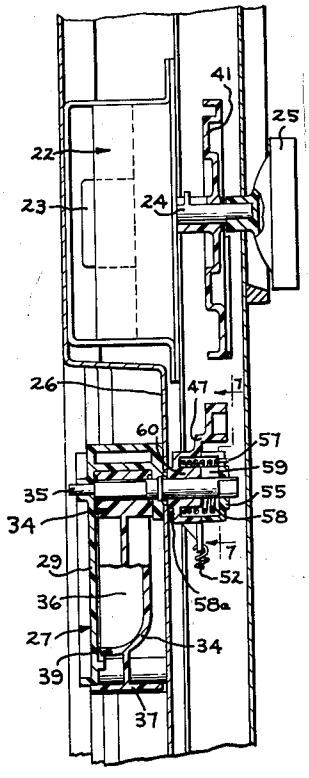


FIG. 1

FIG. 6



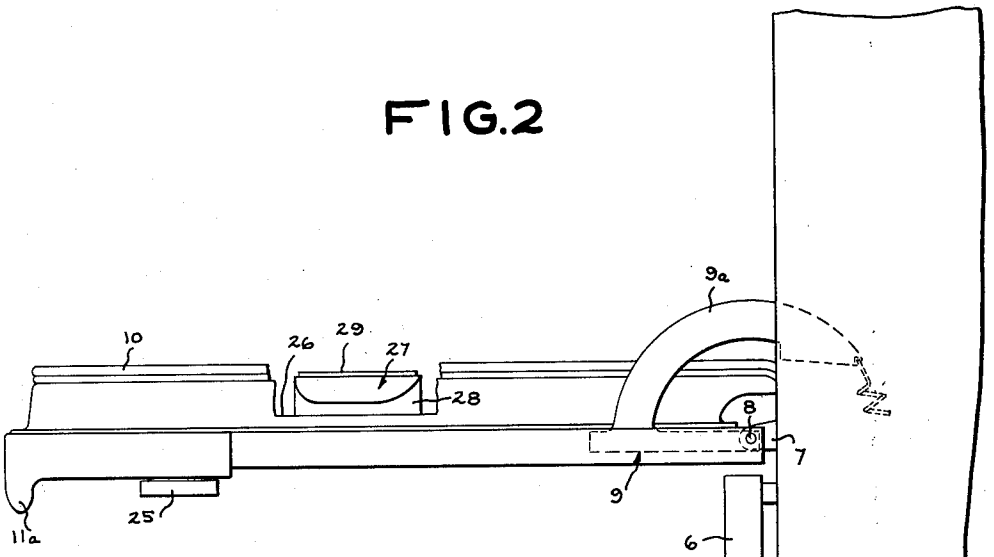
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DISHWASHER WITH IMPROVED TREATING AGENT DISPENSER MECHANISM

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FIG.2



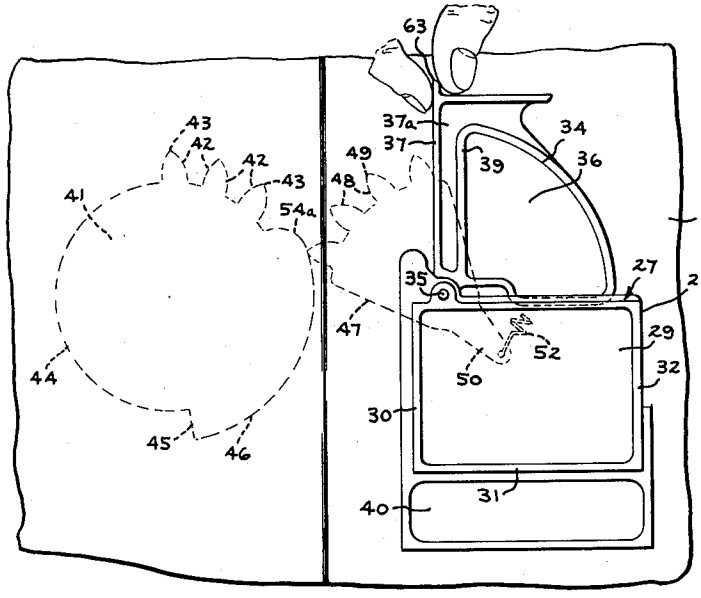


FIG.3

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DISHWASHER WITH IMPROVED TREATING AGENT DISPENSER MECHANISM

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FIG. 4

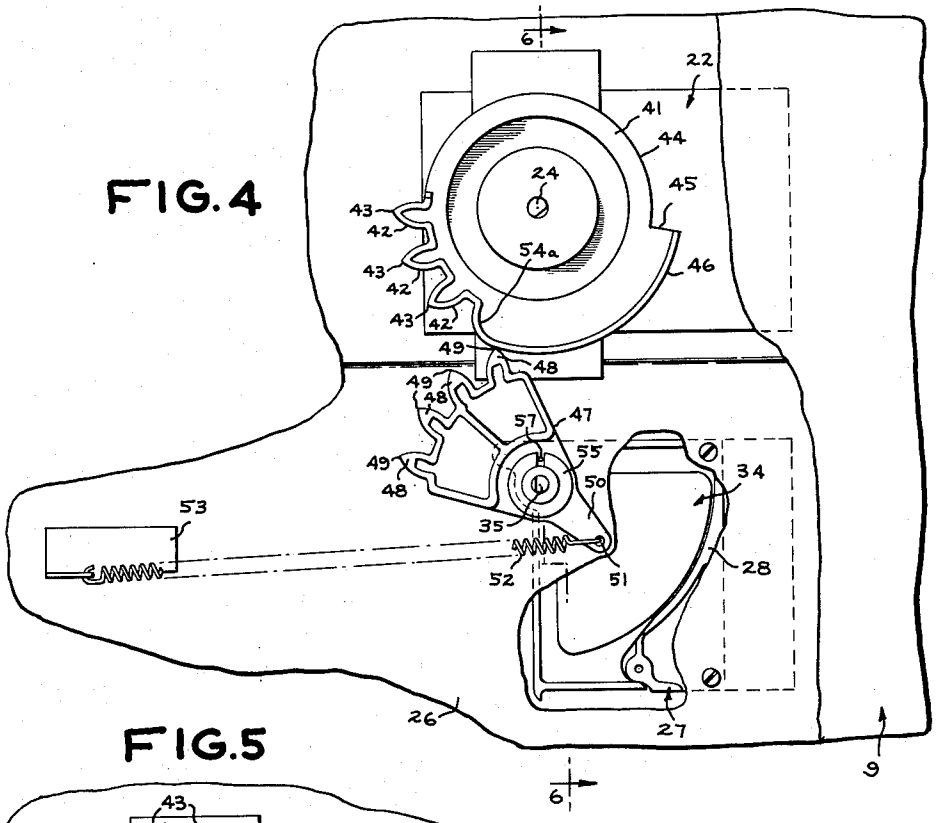


FIG. 5

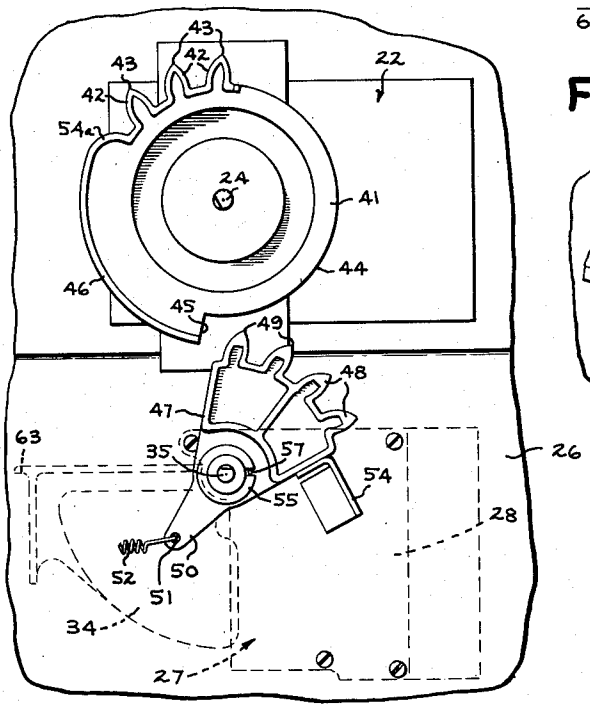
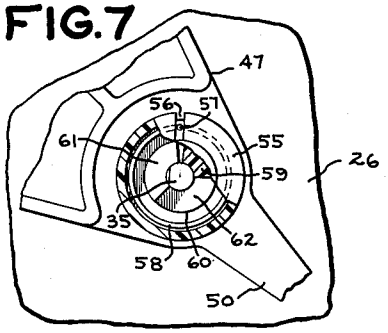


FIG. 7



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3,125,249

DISHWASHER WITH IMPROVED TREATING AGENT DISPENSER MECHANISM

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8 Claims. (Cl. 222—70)

The present invention relates to a dispenser mechanism for dispensing a treating agent such as detergent into dishwashers, and more particularly to such a mechanism for use in "drop-door" dishwashers wherein the access to the dishwasher is obtained by a front opening door which also forms part of the tub.

It is highly desirable in dishwashing machines to provide an automatic dispensing structure which will prevent dispensing of a treating agent such as detergent until the desired time, and then will provide complete dispensing of the detergent. Such structures may be operated by many different means, and in commercial practice various approaches such as the use of a solenoid, the use of the timer assembly, and the use of the weight of water have been used. I prefer, on the whole, to use the timer motor of the sequence control assembly to effect the detergent dispensing since this provides accurate timing for the dispensing operation, and also it eliminates the additional expense and hazard of another electrical component such as a solenoid.

It is accordingly an object of my invention to provide an improved detergent dispensing mechanism operated by the sequence control assembly motor of a dishwasher.

A further more specific object of my invention is to provide such a detergent dispenser which is intended for use in a drop-door dishwasher where the front door forms part of the tub and pivots about its lower horizontal edge to a horizontal open position when removal or loading of dishes is to be effected.

A further object of my invention is to provide such a detergent dispensing structure wherein precise timing of the dispensing operation is insured, and in addition the structure is such that no food particles can drop into the detergent dispenser during loading of the dishwashing machine.

In one aspect of my invention, I provide a dishwashing machine having a washing enclosure which includes a front closure member pivotable about its lower edge between a generally vertical closing position and a generally horizontal open position. In addition, as usual, a conventional sequence control assembly, including a timer motor, is provided for operating the machine to give a desired sequence of operation of the components of the machine. In this structure, I incorporate my improvement in treating agent dispensing systems. Cam means is secured to the timer motor for operation thereby, and this cam means operates cam follower means from a first position, to which the follower means is biased, to a second position. The treating agent container, mounted on the closure member, is also movable between first and second positions. In its first position the container is accessible for deposition of agent in the enclosure when the closure member is in its vertical position, and is accessible for filling when the closure member is in its horizontal position. In its second position, the container encloses the agent so as to isolate it from the enclosure.

A one-way clutch connects the follower means to the container, causing the container to be moved from its second position to its first position when the follower means is moved from its second position to its first position. However, at other times, when the follower means is in its second position, the container is yieldably retained by suitable spring means in its second position. In this manner, the structure is enclosed as desired to prevent foodstuffs from dropping into the container while loading dishes and to prevent contact of the treating agent by water until the appropriate time; but at the same time, the container may be opened since it is only yieldably retained in this position.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. My invention, however, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

In the drawings,

FIGURE 1 is a fragmentary side elevational view, with some of the parts broken away, of a dishwasher embodying my invention;

FIGURE 2 is also a fragmentary side elevational view of the dishwasher of FIGURE 1, with the front door open and substantially in full view rather than in cross section;

FIGURE 3 is a plan view, looking down at the inner surface of the open door as shown in FIGURE 2, showing my improved treating agent dispenser;

FIGURE 4 is a view along line 4, 5—4, 5 in FIGURE 1, showing the timer operated camming parts of my improved mechanism in a first position;

FIGURE 5 is also a view along line 4, 5—4, 5 in FIGURE 1 showing the timer operated camming parts in a second position;

FIGURE 6 is a view along line 6—6 in FIGURE 4; and

FIGURE 7 is a view along line 7—7 in FIGURE 6.

I have shown, in FIGURE 1 of the drawings, a dishwasher generally indicated by the numeral 1. Dishwasher 1 is of the type wherein a cabinet 2 is provided which includes, in the conventional manner, a back (not shown), side walls 3 and 4, and an upper closing member 5 which all are stationary. The front part of the dishwasher includes a base portion 6 having a projection 7. Projection 7 carries a pin 8 on which a door member 9 is hinged along its bottom by means of members 9*a* secured to door 9 and arranged to extend through appropriate slots so that each member 9*a* slides through its associated slot as door 9 is pivoted about pin 8. In the closed position the door is, as shown, upright in a substantially vertical position. In this position, because the door is provided with suitable gasketing such as that shown at 10, it fits against the other stationary parts of the dishwasher to complete an enclosure 11 within which the dishes are to be washed. In order to gain access to the enclosure, the door section 9 is grasped by an upper handle portion 11*a*, and pivoted downwardly about pivot pin 8 until it is substantially horizontal as shown in FIGURE 2.

An upper rack 12 and a lower rack 13 are positioned within the enclosure 11 so as to support the dishes during a dishwashing operation in the enclosure. When door 9 is in its horizontal position, it forms a guide on

which the lower rack 13 may be slid out for ready access and loading. When the door 9 is in its open position the upper rack 12 may also slide out; rack 12 slides on a track member 14 which in turn is mounted so that it can slide out on a number of roller members 15 so as to be entirely outside the enclosure 3. In this manner, with door 9 open, both racks 12 and 13 may be pulled out for loading and unloading and then pushed back into the position shown in FIGURE 1 when a dishwashing operation is to be provided.

Briefly continuing the description of dishwasher 1, it may incorporate suitable washing means such as a lower rotatable water ejecting member 16 and an upper rotatable water ejecting member 17 secured to the surface of tub closure member 5, together with a rotatable telescoping spraying member 18, all three members being fed from a combination pumping and motor structure 19 so that once water is introduced into the machine it is taken in by the pump-motor structure through suitable inlets (not shown) and is then ejected against the dishes with considerable force by the three water ejecting members so as to clean the dishes. The pump motor structure 19 conventionally may be of the type which, when rotated in one direction, provides the aforementioned cleaning action, and when rotated in the opposite direction passes the water out to drain (not shown).

For drying the dishes after they have been cleansed, a suitable electric heating element 21 may be provided, with the intent being that element 21 be energized at the end of the washing operation, and also during the washing operation if so desired to assist in heating water.

It will be understood that the water introducing mechanism (which is not shown), the motor of the pump motor assembly 19, and the heating element 21 are caused to operate by a suitable sequence control mechanism generally indicated by the numeral 22, so as to provide in sequence introduction of water, ejection of water through the three members 16, 17, and 18 into the enclosure 11 for a period of time, and draining of the water, to provide a first rinse; this is followed by as many rinses as desired, a washing operation, and further rinses, the operation being terminated with a heating step in which element 21 is energized in order to dry the dishes. The sequence control assembly normally includes a gear motor assembly 23 having an output shaft 24 on which a suitable number of cams (not shown) are provided for controlling the aforementioned elements of the dishwasher and the gear motor assembly 23 itself in the desired sequence. This type of structure is entirely conventional in the art and is for this reason not further described herein. Such a timing mechanism generally has connected thereto by a one-way clutch (not shown) a suitable manually operable dial 25 so that the cams may be turned to a preset position 26 in which the timer motor is energized continuously and the other elements are energized in the desired sequence; the timer motor then rotates the cams through a complete cycle of operations as briefly described hereabove.

It will be observed from FIGURE 1 that the upper portion of door 9 is relatively thick in order to accommodate the sequence control mechanism 22 therewithin. Directly therebelow however the door is made relatively thin so that its wall 26 provides in effect a recess in enclosure 11, and within this recess is a detergent dispensing assembly 27.

Detergent dispensing assembly 27 has a main stationary member 28 which is rigidly secured to the inner surface of door 9. Member 28 includes an outer cover 29 (FIGURE 3) together with side walls 30, 31, and 32. Together with the wall 26 to which it is secured, member 28 forms a complete enclosure except at one side which has an opening formed to receive the detergent container member 34 itself. As shown, the opening may extend over part of the side otherwise enclosed by wall 32, this being a conventional design feature usable where so desired for purposes of appearance, ease of manufacture, etc.

Member 34 is rigidly secured on a pin 35 pivotally mounted in the stationary member 28 of the detergent dispensing arrangement. The container member 34 has an inner compartment 36 separated from an outer wall 37 by a space 37*a*, the outer wall 37 forming the closure member for the container when the container is pivoted clockwise to a position where it is entirely within the member 28 beneath the cover 29. FIGURE 4 shows the detergent container assembly with the container member 34 pivoted to the closed position within member 28. As can be seen, the movement of the member 34 in the closing direction, as it moves within the member 28, is stopped at the appropriate place by engagement of wall 37 against the edges of walls 30 and 32. It will be understood that engagement of the outer wall 37 against the adjacent parts of member 28 is such that when member 34 is pivoted to its closed position, as shown in FIGURE 4, a substantially complete enclosure is provided for the detergent within enclosure 34.

In order to insure that the detergent in compartment 36 not be accessible to liquid until the desired time, the compartment is formed, in effect, by a second wall 39 spaced from wall 37 by space 37*a*. Thus, when the detergent container member 34 is in its closed position within the stationary frame 28, the actual container compartment 36 is protected by wall 39 so as to be in spaced relationship to all outer walls. In this manner, water cannot splash into the detergent compartment 36, nor is it likely to creep into the compartment by capillary action as may happen if the spacing is not provided.

In essence, then, the detergent dispensing structure itself includes a stationary frame member 28 with a cover 29 within which fits a movable structure 34, so that the movable structure is entirely closed and protected from water when it is within the member 28. When the movable structure is in the outwardly pivoted position, as shown in FIGURE 3, it may provide either one of two functions. When the door is in the position shown in FIGURE 2, the compartment 36 is available so that a suitable treating agent such as powdered detergent may be poured into it without spilling, with the member 34 then being returned to its closed position as will be more fully explained herebelow. On the other hand, when the door 9 is in its vertical position, as shown in FIGURE 1, the open position of the member 34, as shown in FIGURE 3, will cause the detergent within the compartment 36 to be thoroughly accessible to the water being sprayed within enclosure 11 so that all detergent will be removed from compartment 36 and used during the washing operation.

It will further be noted that the stationary frame member 28 includes an open recess 40 which may also be filled with detergent at the same time compartment 36 is filled, that is, when the door is in the position shown in FIGURE 2. It will readily be seen that when the door is pivoted upwardly to its closed position (FIGURE 1) the detergent in this open space will enter the enclosure 11 and thus be used during the first rinse operation. Thus, one load of detergent may, when so desired, be used for the first rinse, while the main load of detergent is retained within the member 34 until its use is desired for the wash operation, as will be more fully explained herebelow.

Referring now primarily to FIGURES 4 and 5, there is secured to the timer output shaft 24, a member 41 which, while it is primarily a cam member and will be designated as such, also incorporates some aspects of a segmental gear in that it has three gear teeth 42. Teeth 42 depart from the conventional involute or epicyclic shape of gear teeth somewhat in that they are provided with pointed ends 43. Cam member 41 also includes a recessed portion which may be denoted as an idler segment 44. Segment 44 is separated by a drop-off 45 from a raised portion, or reset segment, 46. In other words, the

gear teeth 42 separate the idler segment 44 from the reset segment 46 on one side, and the drop-off 45 separates the two segments at the other side. Conventionally, the assembly 23 is set so that the shaft 24 passes substantially through a full circle during its complete cycle of operations which carries it from the beginning of a dishwashing operation through the position where it shuts itself off. Since cam member 41 is driven by shaft 24, it also necessarily passes through a full revolution for each dishwashing operation.

As can best be seen by reference to FIGURE 6, the pin 35 to which the detergent container member 34 is secured extends through the recessed wall 26 of the dishwashing enclosure 11. Rotatably mounted on pin 35 outside the dishwashing enclosure is a member generally indicated by the numeral 47. While the mounting of this member on pin 35 can best be seen in FIGURE 6, the member 47 itself, as to most of the features of its configuration, can best be seen by reference to FIGURES 4 and 5. Member 47 is, in essence, formed as a segmental gear rotatable about pin 35 and provided with four teeth 48 of a type similar to teeth 42 provided on cam member 41. As with teeth 42, teeth 48 preferably terminate substantially in points 49 for a purpose to be further hereinafter described. Member 47 has, on the end 50 opposite teeth 49, an opening 51 within which is secured one end of a spring 52. As shown in FIGURE 1, spring 52 is secured at its other end to a bracket 53 forming part of the door structure. The spring 52 pulls on the member 47 and biases it to the position shown in FIGURE 5, so that it rests against the stop member 54 mounted on the wall of the door.

What happens, in effect, is that the member 47 remains in that position during clockwise rotation of member 41, as the idler segment 44 of member 41 goes by. Then, when the gear teeth 42 come around, the teeth 48 are engaged by the teeth 42. As the slow rotation of member 41 continues in a clockwise direction, a counterclockwise motion of member 47 results against the biasing action of spring 52. After the three teeth 42 and curved surface 54*a* have moved past the member 47, as shown in FIGURE 4, the member 47 is in the position shown and is then retained in that position by engagement of one of the teeth 48 with the reset segment 46. In other words, the uppermost tooth 48 of member 47 now acts as a cam follower insofar as movement of member 47 is concerned.

Thus, the member 41 cooperates with member 47 in two different ways. First they cooperate with each other as gears so as to move member 47 to a new position with a minimum of torque being required. This is an important factor insofar as the small relatively weak timer motor is concerned, otherwise a larger more expensive motor would be required. Then, for holding the member 47 in position, a camming operation is provided. The member 47 is held in the position shown until reset segment 46 moves by the tooth 48. When the drop-off 45 is reached, the member 47 snaps, under the influence of spring 52 against stop member 54, in the position shown in FIGURE 5.

As an important feature of my invention, the member 47 is connected to the detergent dispensing container member 34 in such a manner as to actuate it when member 47 is moved. In order to effect this goal, a suitable clutch structure is provided which includes a member 55 (FIGURES 6 and 7) rigidly keyed to the pin 35. Member 55 is provided with a slot 56 in which one end 57 of a helical spring 58 is secured. The helical spring has its other end 58*a* (FIGURE 6) secured in the member 47.

Member 55 is provided with a dog 59 extending axially therefrom, and the inner portion 60 of member 47 also has a dog 61 which is arranged so as to be engaged by dog 59. It will be observed that there is a space 62 between the dogs, so that in effect the member 55 may be moved clockwise (FIGURE 7) without positively requiring movement of the member 47. The spring 58 is formed so as to bias the dogs 59 and 61 toward each other, but is yielding enough to permit the dog 59 to be moved clockwise away from the dog 61 through the space 62 when so desired.

It will be recalled that the pin 35 is secured to the member 34; a projection 63 may be provided on member 34 so that member 34 may readily be grasped and rotated in a clockwise direction, as viewed in FIGURES 4 and 5. Thus, when member 34 is in the closed postiion, it may be opened without regard to the position of member 47, because the dog 59 is moving through the space 62. Of course, the spring 58 provides a force tending to return the member 34 to the closed position when this occurs, but none the less an operator may, by a small force on projection 63, retain member 34 in the open position as shown in FIGURES 3 and 5.

With the foregoing structure in mind, the operation of my invention will be explained. It will be understood that, just before the beginning of a cycle of operation, the cam 41 is at the position shown in FIGURE 4, that is, with member 47 held in cocked position by reset segment 46. It will further be understood that with the member 47 in this position the spring 58 urges dog 59 against dog 61 and also urges the container member 34 to its position within frame 28, that is, its closed position. Thus, the container 34 is resiliently held in its closed position by spring 58 and, when door 9 is opened as shown in FIGURE 2 and soiled dishes are loaded into the dishwasher, there is no danger of any of the soil dropping off the dishes to foul the interior compartment 36 of member 34. As shown in FIGURE 7 with member 34 in closed position and member 47 in the cocked position of FIGURE 4, a small clearance space may exist between dogs 59 and 61. This clearance space is provided purely for manufacturing convenience, to ensure that dog 59 may move to the position where member 34 is entirely closed without requiring very close tolerances on the different cooperating parts.

It is a simple matter for the operator to open the member 34 by manipulating handle projection 63 (as shown in FIGURE 3) and to hold the member 34 in the open position while loading detergent into the compartment 36. When the full load of detergent has been poured into compartment 36, the operator may then permit the spring 58 to return member 34 to the closed position within frame 28. It will thus be seen that although, as will be more fully explained hereinbelow, the opening of member 34 is completely controlled by the timer operated mechanism so as to open at an exact desired time in a sequence of operations, it may readily be opened by the operator without any need for manipulation of the timer control dial 25.

To start a dishwashing operation, the operator, with the member 34 in its closed position, closes the door 9 and turns the dial 25 very slightly so that the segment 46 moves a short distance along and in engagement with tooth 48. Accordingly, the washing sequence starts with a first rinse. As previously described, during this first rinse, if the open receptacle 40 has been filled with detergent, a washing action will be provided; otherwise, the first rinse merely provides for removal of particles of soil from the dishes by the force and the dissolving action of the water alone.

During the initial rinses, the timer output shaft 24 rotates cam 41 and finally, when the time for the washing operation to be provided is reached, the cam 41 has rotated to the point where the tooth 48 in engagement with segment 46 reaches the end of the segment, that is, the drop-off 45. At this time, which may be carefully selected so as to be exactly appropriate, the spring 52 snaps the member 47 to the position shown in FIGURE 5. At the same time, the positive engagement of dog 61 moving clockwise against dog 59 snaps the member 34 from its closed position to its open position. In this position, a mapor part of the detergent falls out of compartment 36 because it is on the door 9, and the door is in the

vertical position during use of the machine. The remainder of the detergent is very quickly removed by the water splashing into the open container. The container then remains open during the period of rotation of cam **41** during which idler segment **44** is moving past the member **47**. This includes the end of the washing operation, all subsequent rinses, and preferably at least part of a drying operation so as to dry completely the surface of the compartment **36**. At this point, it may be noted that, because the opening to the interior of member **28** extends along part of wall **32**, water may readily enter the stationary member **28** during a washing operation so as to clean it out.

After a suitable period has elapsed to allow drying of the container **36**, the member **41** has rotated to a position where the teeth **42** engage the teeth **48**. At this point, it should be stated that both sets of teeth are pointed so that in case of any misalignment of the teeth, that is, if the tips of the first two teeth should engage each other rather than the sides of the teeth, they will tend to slide off to one side or the other because both teeth are pointed. This is an important feature where the motivating power is obtained by a small timer motor (such as that generally commercially provided) where little power is available and the motor is readily stalled if two of the gear teeth should happen to jam against each other.

The teeth thus engage each other, and the member **47** is slowly moved to the position shown in FIGURE 4. As the member **47** moves to that position, the spring **58** drives member **55** counterclockwise; thus, the member **34** returns to its closed position as the member **47** moves to the position of FIGURE 4.

At the end of the complete operation, the member **47** has returned to the position shown in FIGURE 4 and the member **34** has returned to its closed position with, however, the important feature that it may readily be opened by the operator simply by manipulation of projection **63**, without any need of manipulation of control dial **25**.

It will be seen from the foregoing that my invention provides an improved timer controlled detergent dispensing mechanism, particularly suitable for a drop-door type dishwasher where the detergent dispenser is mounted on the door. The arrangement provides the advantage of accurate timing of the detergent dispensing without need for additional electrical devices. In addition, my invention provides a positive drive for causing the container to be opened to dispense detergent at the appropriate time, and a yieldable closed position so that the operator may open the container for the purpose of inserting detergent easily and quickly between cycles. At the same time, the normally closed position of the member **34** means that the member is open only for providing detergent therewithin and will not be affected by food particles from the dishes dropping onto the dispenser. A further important point is that the timer motor cannot be stalled even if an improperly placed dish should either prevent the member **34** from opening or jam it in its open position: in the latter event, member **34** will merely remain open, much as if it were being pulled to open position as shown in FIGURE 3; in the former event, member **47** will merely stay in that position of FIGURE 4, or close to that position, even though drop-off **45** is reached.

While I have shown and described a particular embodiment of my invention, I do not desire the invention to be limited to the precise construction disclosed, and I intend by the appended claims to cover all modifications which fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a washing machine having a washing enclosure including a closure member pivotable about its lower edge between a substantially vertical closing position and a substantially horizontal open position, and a sequence control assembly including a timer motor for operating said assembly, the improvement in treating agent dispensing systems comprising: cam means secured to said timer motor for operation thereby; cam follower means; means biasing said cam follower means to a first position, said cam follower means being movable by said cam means to a second position; a treating agent container mounted on said closure member and movable between first and second positions, said container in its first position being accessible to sprayed water within said enclosure for deposition of agent in said enclosure when said closure member is in its vertical position and for filling when said closure member is in its horizontal position, said container in its second position enclosing the agent therein and isolating it from said enclosure; a one-way clutch connecting said follower means to said container, said clutch being arranged to drive said container from its second position to its first position when said follower means moves from its second position to its first position; and spring means arranged to yieldably retain said container in its second position when said follower means is in its second position.

2. In a washing machine having a washing enclosure including a closure member pivotable about its lower edge between a substantially vertical closing position and a substantially horizontal open position, and a sequence control assembly including a timer motor for operating said assembly, the improvement in treating agent dispensing systems comprising: cam means secured to said timer motor for operation thereby; cam follower means; biasing means biasing said cam follower means to a first position, said cam follower means being movable by said cam means to a second position; a treating agent container assembly mounted on said closure member, said container assembly including a stationary cover member secured to said closure member and a container member movable between first and second positions, said container member in its first position being spaced from said cover member whereby it is accessible to sprayed water in enclosure for deposition of agent in said enclosure when said closure member is in its vertical position and for filling when said closure member is in its horizontal position, said container member in its second position being beneath said cover member and closed thereby so as to be isolated from said enclosure; a one-way clutch connecting said follower means to said container member, said clutch being arranged to drive said container member from its second position to its first position when said follower means moves from its second position to its first position; and spring means arranged to yieldably retain said container member in its second position when said follower means is in its second position.

3. The improvement defined in claim 2 wherein said container member includes a treating agent containing portion having two spaced walls separating it from said enclosure thereby to prevent capillary movement of water from said enclosure to said containing portion prior to movement of said container member to its first position.

4. The improvement defined in claim 2 wherein said container member includes a pin pivotably mounted to provide for pivoting motion of said container member, said container member pivoting between its first and second positions.

5. The improvement defined in claim 1 wherein said cam follower means comprises a pivoted member having gear teeth, and said cam means has gear teeth in at least one place around its periphery, said cam means gear teeth and said pivoted member being arranged so that said cam means gear teeth move said pivoted member to its second position against the biasing action thereon by said biasing means, said cam means having a first segment adjacent said gear teeth positioned to retain said pivoted member in its second position, said cam means also having a sudden drop-off from said first segment thereby to permit said pivoted member to be rapidly returned to its first position by said biasing means.

6. The improvement defined in claim 5 wherein the

gear teeth on both said cam means and said pivoted member have pointed ends to prevent stalling of said timer motor if the teeth of said cam means and said pivoted member should engage each other incorrectly.

7. The improvement defined in claim 1 wherein said clutch includes a first dog connected to said container and a second dog connected to said follower means, said follower means dog engaging and driving said container dog upon rotation in one direction but not in the other direction.

8. The improvement defined in claim 7 wherein said spring means comprises a spring connected to said dogs arranged to urge them together.

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