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DISHWASHER WITH TIME CONTROLLED VENT

Filed April 12, 1962

2 Sheets-Sheet 1

FIG. 1

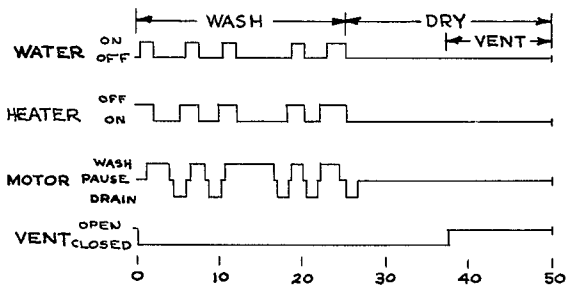
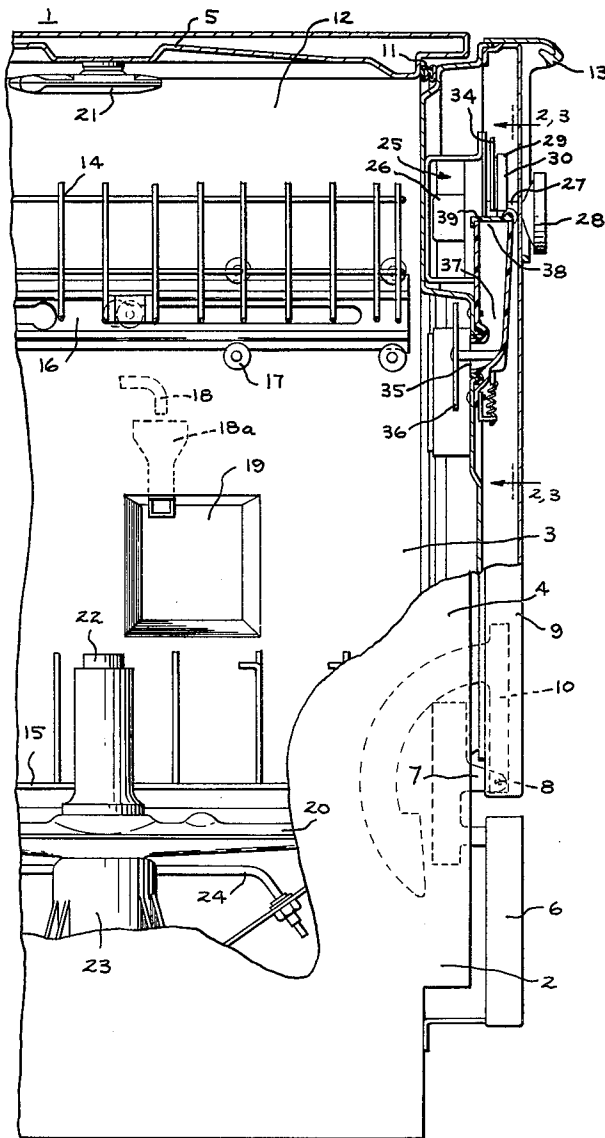


FIG. 4

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FIG. 2

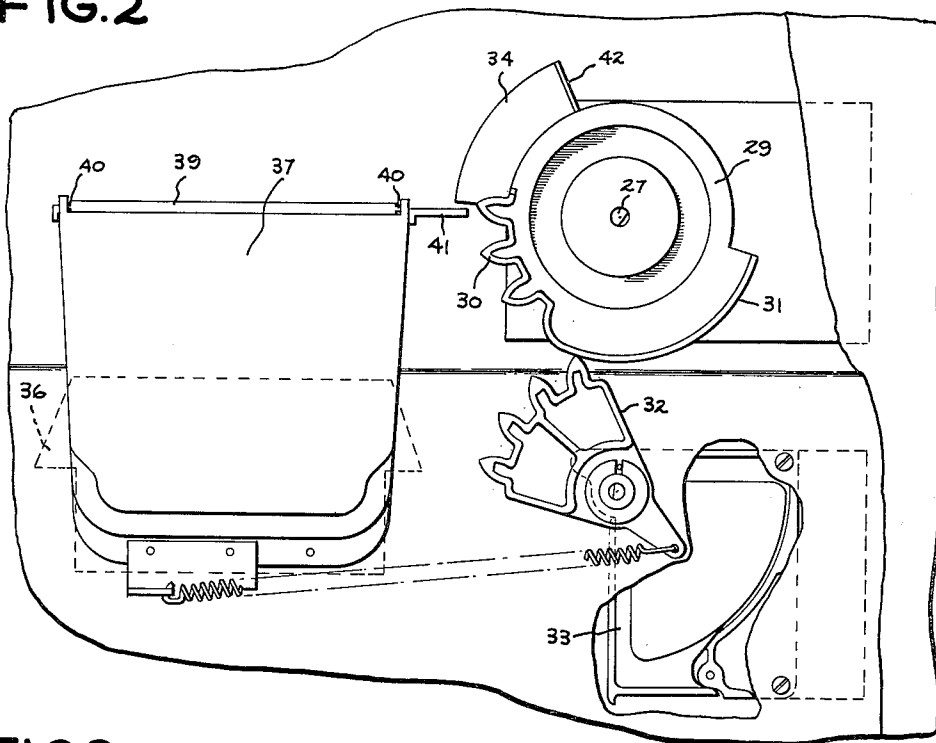
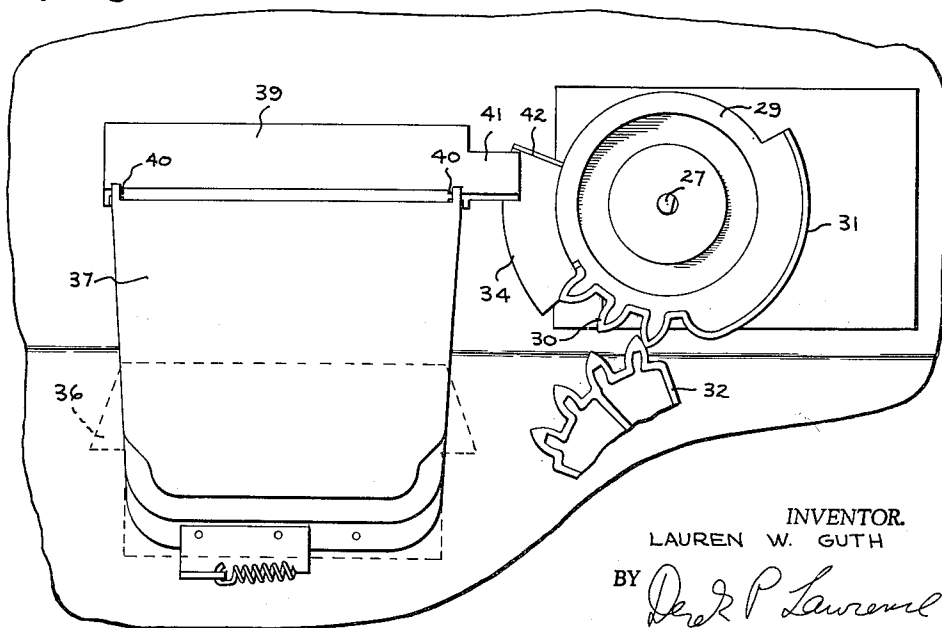


FIG. 3



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**DISHWASHER WITH TIME CONTROLLED VENT**  
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 Electric Company, a corporation of New York  
 Filed Apr. 12, 1962, Ser. No. 187,064  
 5 Claims. (Cl. 134—58)

This invention relates to a dishwasher having a drying cycle following a washing cycle, and more particularly to such a structure wherein an improved timed venting arrangement is provided in connection with the drying portion of the dishwasher cycle.

It is an object of my invention to provide a dishwasher of the type having a drying cycle following the washing cycle wherein venting means are opened by a timer substantially after the start of the drying cycle but prior to the end thereof.

More particularly, it is an object of my invention to provide such a structure wherein the venting means comprises an opening which is very small compared to the regular access opening to the dishwasher and which is separated therefrom.

In one aspect of my invention, I provide a dishwasher in which, in the usual way, there is provided a chamber with washing means and drying means therein. The chamber has a large opening to provide access thereto; this opening may be closed by the conventional closure means, the closure means being movable to an open position when access to the chamber is desired. The washing and drying means of the machine are controlled by sequence control means which operates to cause a timed operation of the washing means and then a timed operation of the drying means alone.

A vent structure is provided which has an opening very small compared to the relatively large access opening. The vent is closed by a separate vent closure member arranged so as to be movable by the sequence control means at least during the timed operation of the drying means. This vent closure member and the sequence control means cooperate to cause opening of the vent closure member substantially after the start and before the end of the timed operation of the drying means, and cause the vent closing member to close before the start of a subsequent drying operation. This closed condition of the vent during the initial part of drying permits retention of the heat at a period when the temperature is being raised to that which evaporates the water from the dishes. On the other hand, the removal of a substantial part of the hot steamy air is permitted by the opening of the vent substantially before the end of the drying cycle so that, when the operator opens the main closure member at the end of the cycle, there will not be an undesirable blast of hot steamy air.

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, both as to organization and method of operation, 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 side elevational view partly broken away and partly in cross-section to show details, of a dishwasher incorporating my improved invention;

FIGURE 2 is a view along line 2, 3—2, 3 in FIGURE 1 at a first time during the operation of the machine;

FIGURE 3 is a view along line 2, 3—2, 3 in FIGURE 1 at a second time during the operation of the machine; and

FIGURE 4 is a schematic diagram illustrating the sequence of operation of the various components of the ma-

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chine in the provision of the improved sequence forming part of the concept of my invention.

I have shown in FIGURE 1 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 closure surface 5, which are stationary. The front part of the dishwasher includes a base portion 6 having a projection 7 which carries a pin 8. A door member 9 is hinged along its bottom on pin 8 by means of members 10 secured to door 9 and arranged to extend through appropriate slots (not shown) so that each member 10 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 11, it fits against the other stationary parts of the dishwasher to complete an enclosure or chamber 12 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 13 and pivoted downwardly about pin 8 until it is substantially horizontal.

An upper rack 14 and a lower rack 15 are positioned within the chamber 12 so as to support the dishes during the dishwashing operation in the enclosure. When door 9 is in its horizontal position, it forms, in the conventional manner, a guide on which the lower rack 15 may be slid out for ready access in loading. When the door 9 is in its open position the upper rack 14 may also slide out on a track member 16. Track member 16 in turn is mounted to slide out on a number of roller members 17 so that rack 14 can be entirely outside the enclosure 12. In this manner, with door 9 open, both racks 14 and 15 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.

Continuing the description of dishwasher 1, suitable water providing means including an inlet conduit 18 may be provided. Conduit 18 discharges into a funnel 18a through an air gap, and the funnel connects with chamber 12 through a suitable baffling arrangement 19 so as to prevent splashing of water out of the chamber. When water is not being introduced to chamber 12 the air gap provides a connection for chamber 12 to atmosphere.

The washing means may include a lower rotatable water ejecting member 20 and an upper rotatable water ejecting member 21 secured to the surface of tub closure 5, together with a rotatable telescoping spraying member 22. All three members are fed from a combination pumping and motor structure 23 so that, once water is introduced into the machine through conduit 18, 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 23 may conventionally 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 24 is provided at the bottom of chamber 12.

The mechanism for introducing water through conduit 18 (which mechanism is not further shown), the motor of the pump motor assembly 23, and the heating element 24 are controlled by a suitable sequence control mechanism generally indicated by the numeral 25. As schematically shown in FIGURE 4, the sequence control mechanism provides for a timed washing operation during which the water is turned on five different times to provide water within chamber 12. After each introduction

of water, the motor of the pump motor assembly is caused to first provide a washing action and then drain the water out. It can be seen that this also occurs five times, following each introduction of water so that there are provided, in effect, a number of rinses (usually the first and second introductions of water), then a wash (the third water introduction) followed by two more rinses. It can further be seen that the heater may be energized during the introduction of water in order to heat the water to a high temperature for maximum washing effectiveness.

Following the end of the wash operation, that is, after the last washing action of the motor has terminated, the heater is energized continuously for a predetermined period of time which constitutes the drying operation in order to vaporize the moisture from the dishes so that they are dry when the operator removes them from the dishwasher.

Sequence control assembly 25 normally includes a gear motor assembly 26 having an output shaft 27 on which a suitable number of cams (not shown) are provided for effecting the afore-mentioned control of the dishwasher elements 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 28 so that the cams may be turned to a pre-set position in which the timer motor is energized continuously and the other elements are energized, as mentioned, in the desired sequence. The timer motor then rotates the cams to effect a complete cycle of operations as briefly described hereabove.

Also secured on the shaft 27 of sequence control assembly 25 is an extra cam-type member 29 which may best be seen in FIGURES 2 and 3, together with FIGURE 1. The member 29 has teeth 30 and a raised portion 31 which cooperate with a member 32 to effect the appropriate operation of a soap dispenser 33. The cooperation is such as to cause the apparatus to dispense detergent into the chamber 12 during the wash step, that is, after the third introduction of water. In this connection, the structure and functioning of the detergent dispensing apparatus are fully described and claimed in application Serial No. 149,891, filed on November 3, 1961, by Norman L. Kendt, and assigned to General Electric Company, assignee of the present invention. For this reason the detergent dispensing arrangement is not further described herein.

It is to be noted that member 29, in addition to the portions 30 and 31 arranged to cooperate with member 32, includes a raised section 34. Section 34, as can best be seen in FIGURE 1, is axially offset from member 32 so that during the rotation of member 29 the member 34 does not have any cooperation at all with member 32. Section 34 is thus entirely independent of the detergent dispensing arrangement, except for the fact that it is made a part of the same rotatable member 29 on which parts 30 and 31 are formed.

A vent opening into chamber 12 is formed, as shown in FIGURE 1, at 35 and is covered by a shield or baffle 36 so as to prevent liquid from splashing out through the vent opening. In order to further insure that liquid will not pass out through vent opening 35, a conduit 37 forming a vent passage then extends around the corner and upwardly, terminating in an opening 38 closed by a lid 39 which is mounted on hinges 40 as best shown in FIGURES 2 and 3.

It will be observed from FIGURE 1, together with FIGURES 2 and 3, that part 34 of member 29, as the member 29 rotates, will engage extension 41 of lid 39. This engaging relationship is best shown in FIGURE 3 wherein it can be seen that the lid 39 is raised by the engagement of member 34 with extension 41, and is otherwise closed by gravity. In effect, FIGURE 2 shows part 34 of member 29 in the position for starting a washing and drying cycle, it being understood that the cam 29 rotates clockwise as viewed in FIGURES 2 and 3. The

lid 39 remains closed during a substantial period, as the cam member 29 rotates through the period when the timer 25 is causing the washing operation and the initial part of the drying operation to be provided.

At an appropriate instant in the timed drying operation, which is preferably somewhat after the half-way point, the leading edge 42 of part 34 engages extension 41 and raises the lid 39. This opens the vent outlet 35 to atmosphere through an opening which is entirely independent of the closed condition of door 9 and which is, of course, substantially smaller than the opening provided by door 9. This open condition of the vent continues until part 34 moves entirely past extension 41, at which time the lid 39 swings closed by gravity. Control 25 causes the end of the timed drying operation to be reached so that the machine shuts off all components. Preferably, although the control may cause lid 39 to be closed at the same time that the drying operation ends, lid 39 is kept open by extension 41 at the end of a cycle, and is reclosed only when a subsequent washing cycle is started by operation of dial 28. This permits airing out of the interior of the machine between uses, while nonetheless ensuring closure of lid 39 before the next drying operation (and preferably before the next washing operation). Thus, the vent is open only during the last part of the timed drying operation and is closed during the initial part of each drying operation.

By keeping the vent closed during washing and the initial part of drying, it makes it possible for heater 24 to heat up the air within chamber 12 much more rapidly than would be the case if the vent were open all the time. On the other hand, after a certain amount of water has been vaporized from the dishes, it is desirable to permit replacement of some of the air within chamber 12 by fresh air and this can be done without too much loss of heat when the vent is opened relatively late in the drying cycle as provided by my invention. A further advantage achieved is that, by making the opening entirely independent of the regular access opening, the size of the vent opening may be controlled precisely so that it provides optimum results. Yet a further advantage is that by having the vent let out a substantial part of the steamy air prior to the end of the cycle, the operator of the machine does not have all this steamy air blow out straight at him when the access opening is uncovered.

It will be recalled that the water inlet opening is open to atmosphere. This is considered desirable in order to permit equalization of the air pressure within and outside the chamber 12. It will be understood in this connection that it is only when the second opening, i.e., the vent opening, provides a connection between the chamber and atmosphere, that a flow of air out of the chamber occurs.

It will be seen from the foregoing that my invention provides a timed venting system wherein, as an important feature, I provide no venting during the initial part of a timed drying operation, but I vent substantially before the end of the operation through an opening which is entirely independent of the regular access opening of the machine.

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. A dishwasher comprising:
  - (a) a chamber having a large opening to provide access thereto;
  - (b) closure means for said opening arranged to close said chamber during operation of said dishwasher and to be moved to open position when access to said chamber is desired;
  - (c) washing means for washing and rinsing dishes in said chamber;
  - (d) heat drying means for drying by evaporation dishes in said chamber;

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- (e) sequence control means controlling said washing means and said drying means, said control means causing timed operation of said washing means and then timed operation of said drying means;
- (f) a member movable by said sequence control means at least during timed operation of said drying means; 5
- (g) vent means including an opening very small relative to said large opening; and
- (h) a closure member for said vent means;
- (i) said vent closure member and said member movable by said sequence control means being cooperable to cause opening of said vent closure member substantially after the start and before the end of said timed operation of said drying means and to cause closing of said vent closure member prior to the start of a subsequent timed drying operation. 10 15
2. The apparatus defined in claim 1 wherein said vent closure member is a lid biased by gravity to a closed position, said member movable by said sequence control means being engageable to raise said lid to cause opening thereof. 20
3. The apparatus defined in claim 1 wherein another opening to atmosphere is provided into said chamber whereby there is circulation of air through said chamber when said vent closure member is opened. 25
4. The apparatus defined in claim 1 wherein said sequence control means causes said member movable thereby to open said vent closure member after substantially more than half the timed drying operation has elapsed.
5. A dishwasher comprising: 30
- (a) a chamber having a large opening to provide access thereto;
- (b) closure means for said opening arranged to close said chamber during operation of said dishwasher and to be moved to open position when access to said chamber is desired; 35

- (c) washing means for washing and rinsing dishes in said chamber;
- (d) heat drying means for drying by evaporation dishes in said chamber;
- (e) sequence control means controlling said washing means and said drying means, said control means causing timed operation of said washing means and then timed operation of said drying means;
- (f) a member controllable by said sequence control means so as to be moved during timed operation of said drying means;
- (g) vent means including an opening very small relative to said large opening; and
- (h) a closure member for said vent means;
- (i) said vent closure member and said member controllable by said sequence control means being cooperable to cause opening of said vent closure member substantially after the start and before the end of said timed operation of said drying means and to cause closing of said vent closure member prior to the start of a subsequent timed drying operation.

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