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DISHWASHER HAVING IMPROVED VENT MEANS

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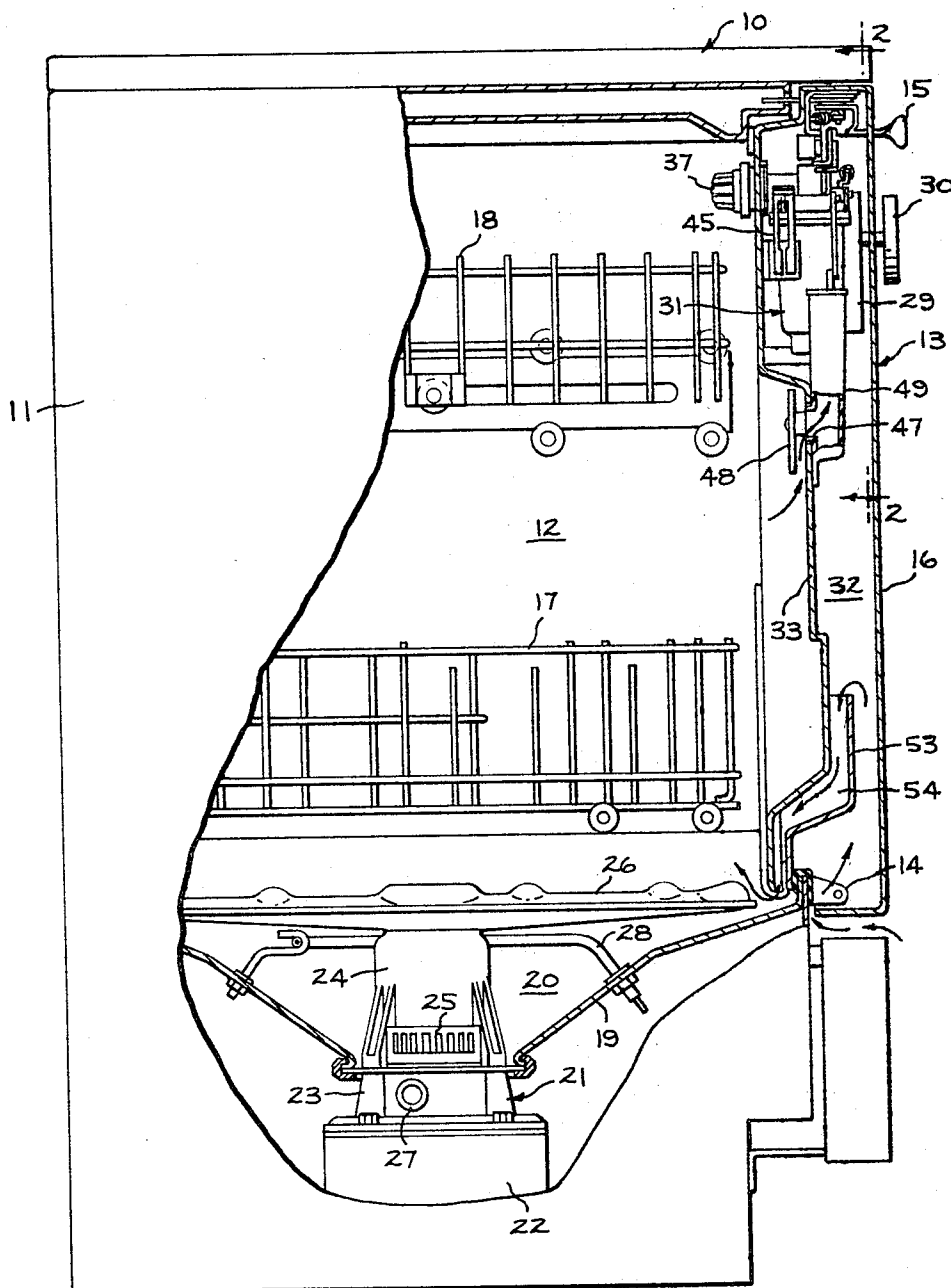


FIG. 1

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DISHWASHER HAVING IMPROVED VENT MEANS
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This invention relates generally to automatic dishwashers of the type used in the home and, more specifically, to an improved vent means to vent the dishwasher wash chamber during drying of the articles contained therein.

Domestic dishwashers have been provided with vent means prior to the present invention. For example, U.S. Patent No. 3,092,122, issued to L. W. Guth on June 4, 1963, and assigned to the General Electric Company, assignee of the present invention, discloses a vent means of the general character described herein. However, the vent means disclosed by Guth involves direct mechanical connection between a vent closure member and a sequence control means for the dishwasher. The sequence control means is normally driven by a synchronous electric motor which, although providing sufficient power to drive the required switch operating cams within the control means, may become overloaded when required to mechanically actuate an external element such as the vent closure means. This overloading can result in jamming of the entire sequence control means thus frustrating operation of the dishwasher.

It would be possible to provide separate electrical means to operate the vent closure member such as, for example, a separate solenoid or bimetal element; however, these means are expensive to provide. It would also be possible to provide a manually operable vent closure member but this would require the presence of the housewife to manually operate the closure member at the appropriate time thus compromising the automatic aspects of the dishwasher.

One other alternative is to provide a vent means without a closure member, i.e., a continuously open vent means. Such arrangement, however, may result in leakage of fluid from the wash chamber during wash and rinse operations due to the vigorous spray action generated therein. Also, the wash and rinse fluid is quite hot, preferably 140° to 180° F., which would create a continuous flow of moisture laden air from the wash chamber during wash and rinse operations.

Thus, it would be desirable to provide an improved vent means for an automatic dishwasher which retains the automatic aspect and other benefits of the type of vent means disclosed in U.S. Patent No. 3,092,122 while at the same time avoiding overloading of the sequence control means and which is relatively inexpensive to manufacture.

Accordingly, it is an object of the present invention to provide an improved vent means for an automatic dishwasher.

It is another object of this invention to provide a vent means for an automatic dishwasher which operates automatically at the desired time during the dishwasher cycle of operation.

It is another object of this invention to provide a vent means for an automatic dishwasher which does not increase the mechanical load imposed upon the sequence control means drive motor.

It is a further object of this invention to provide a vent means for an automatic dishwasher which is simple to operate and is relatively inexpensive to manufacture.

Briefly stated, in accordance with one aspect of the present invention, an automatic dishwasher is provided and comprises a wash chamber adapted to receive and contain articles to be washed and dried therein. Means

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are provided to wash and rinse articles within the wash chamber and heat drying means are provided to dry, by evaporation, articles within the wash chamber. Treating agent dispensing means are provided to dispense a treating agent into the wash chamber and include a movable member which moves as the dispensing means dispenses the treating agent. Vent means are provided and include a relatively small opening to vent the wash chamber to the atmosphere and a closure member is provided for the opening. Means interconnect the closure member and the movable member to open the closure member as the dispensing means dispenses the treating agent.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawing, in which:

FIGURE 1 is an elevational view, partially cut away and partially in section to show details, of an automatic dishwasher employing the present invention;

FIGURE 2 is a fragmentary view taken along line 2-2 of FIGURE 1; and,

FIGURE 3 is a view similar to FIGURE 2 but showing the vent means in a different condition of operation.

Referring now to the drawing, and initially to FIGURE 1 thereof, there is illustrated an automatic dishwasher 10 having an outer cabinet 11 defining therein a wash chamber 12. Cabinet 11 has a large access opening in one wall thereof and is provided with a closure member or door 13 to seal the access opening during operation of the dishwasher. Door 13 is pivotal about a hinge means 14 adjacent the bottom of the door. A door latch is provided to latch the door 13 in the closed position, as illustrated in FIGURE 1, and includes a latch operating handle 15 which projects beyond the outer wall 16 of door 13 for convenient manual manipulation by the operator of the dishwasher.

Disposed within wash chamber 12 are a pair of dish-supporting racks 17 and 18 each of which is adapted to receive and support articles to be washed, rinsed and dried within wash chamber 12. Although racks 17 and 18 do not form an important part of the present invention, and therefore will not be discussed in detail, it is to be understood that racks 17 and 18 are suitably supported within wash chamber 12 so that they may be at least partially withdrawn through the access opening when door 13 is in its open position. This withdrawal facilitates loading and unloading of the racks.

The lower extremity of wash chamber 12 is defined by a bottom wall 19 having a centrally depressed portion forming therein a sump 20. Disposed within sump 20, and supported by bottom wall 19, is a motor-pump assembly 21 comprising an electric drive motor 22, a drain pump 23 and a wash pump 24. Motor 22 is of the electrically reversible type and, in one direction of rotation of motor 22, pump 24 draws liquid through an inlet 25 and propels it upwardly into a reaction type spray arm 26. Spray arm 26 is provided with a plurality of orifices which direct a spray upwardly within wash chamber 12 to impinge upon articles supported by racks 17 and 18. Certain of these orifices are directed such that the reaction force of the liquid issuing therefrom causes spray arm 26 to rotate. In the opposite direction of rotation of motor 22, drain pump 23 draws liquid through inlet 25 and propels it outwardly through an effluent discharge 27 which is connected to the normal household sewer system (not shown).

A normal complete operational cycle for dishwasher 10 may include an initial admission of water to wash chamber 12 by means of a water inlet valve (not shown) followed by the energization of motor 22 in the direc-

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tion wherein pump 24 propels the water up through spray arm 26. This operation would comprise a pre-rinse and may last for two or three minutes. At this point, motor 22 would be de-energized and then re-energized in the opposite direction of rotation so that drain pump 23 would drain the liquid from sump 20 and pump it into the household sewer system. Following this, another charge of water would be admitted to wash chamber 12 and a detergent dispenser (not shown) would be energized to dispense a predetermined amount of detergent into the water and motor 22 would be energized in the direction to effectuate a wash action upon the articles within wash chamber 12. This operation, of course, would be the wash operation and may last for several minutes. Once again, motor 22 would be reversed to drain wash chamber 12. Following this, there would be at least one, and perhaps two, post-rinses identical to the aforescribed pre-rinse. After termination of the last post-rinse, an electrical resistance heating element 28 would be energized to facilitate drying of articles supported by racks 17 and 18 by evaporation of the liquid remaining thereon. The foregoing series of operations is conventional in all respects and, as is well known in the dishwasher art, a sequence control means 29 is provided to energize and de-energize the appropriate electrical elements of dishwasher 10 in a predetermined sequence. Control means 29 may include a synchronous electrical timer motor (not specifically shown) and a series of cam operated switches (not specifically shown). Such arrangement is well known in the dishwasher art and because of this, these elements are not described in detail herein. As is also conventional, a manually-operable knob 30 projects beyond outer wall 16 of door 13 so that control means 29 may be manually adjusted or started.

A treating agent dispensing means in the form of a rinse aid injector 31, best seen in FIGURE 2, is disposed within a chamber 32 defined by outer wall 16 and inner wall 33 of door 13. Rinse aid injector 31 includes a reservoir portion 34 capable of containing a supply of rinse aid sufficient to serve for several cycles of operation of dishwasher 10. A dispensing mechanism (not shown) is disposed within reservoir portion 34 and is adapted to pump or dispense a predetermined quantity of rinse aid into wash chamber 12 upon release of a trip mechanism 35. Trip mechanism 35 is biased toward the dispensing position by a spring 36. Rinse aid injector 31 dispenses a predetermined quantity of rinse aid to wash chamber 12 as trip mechanism 35 moves from the position illustrated in FIGURE 2 to the position illustrated in FIGURE 3, it being understood that additional mechanism within reservoir portion 34 (not shown) is mechanically linked to mechanism 35 to carry out the dispensing function as movement takes place. A cap 37 is disposed beyond wall 33 to cover an inlet through which rinse aid is admitted to replenish the rinse aid contained within reservoir portion 34. Except for the trip mechanism 35, which is to be discussed in greater detail hereinafter, rinse aid injector 31 may be substantially as described and claimed in U.S. Patent No. 3,198,387, issued to Norman L. Kendt and John A. Dicken, Jr., on Aug. 3, 1965, and assigned to the General Electric Company, assignee of the present invention.

Means are provided to automatically cock or energize rinse aid injector 31. The means include a link 38 which is secured at one end to latch operating handle 15 so that as handle 15 is moved between the latched position of FIGURE 2 and an unlatched position, wherein handle 15 is moved far to the left as viewed in FIGURE 2, link 38 moves therewith. The other end of link 38 is provided with an elongated slot 39 which receives a pin 40. Pin 40 is rigidly secured to trip mechanism 35 and loosely fits within slot 39 so that it is free to move, relative to link 38, an extent equal to the length of elongated slot 39.

Trip mechanism 35 is pivotal about a pin 41 carried by the body of rinse aid injector 31. A small projection

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42 is adapted to engage a stop 43 whereby movement of trip mechanism 35, in the clockwise direction as viewed in FIGURES 2 and 3, is limited by engagement between projection 42 and stop 43. The distal end of trip mechanism 35 includes a catch 44 which engages a U-shaped current-responsive bi-metal element 45 when trip mechanism 35 is rotated in the counterclockwise direction. Catch 44 has a beveled surface 46 which cams element 45 out of the way so that catch 44 may pass down into the element 45 and be retained in the position shown in FIGURE 2 by the bifurcation of the bimetal element 45.

With the foregoing arrangement, each time handle 15 is moved from the latched position to the unlatched position, which must occur each time door 13 is opened, link 38 is moved from the position shown in FIGURE 2 to a position wherein pin 40 rests at the other extreme of slot 39. If trip mechanism 35 has been released, or tripped, prior to the movement of handle 15, link 38 will engage pin 40 and rotate trip mechanism 35 to the cocked position of FIGURE 2 as handle 15 is moved to the unlatched position. During subsequent movements of handle 15 between the latched and the unlatched positions, trip mechanism 35 will remain cocked due to engagement between element 45 and catch 44, and link 38 will simply move relative to pin 40 due to the elongation of slot 39. When handle 15 is in the latched position of FIGURE 2, trip mechanism 35 is free to move from the cocked position to the uncocked position of FIGURE 3 since pin 40 is free to slide the length of elongated slot 39.

As described in the aforementioned U.S. Patent No. 3,198,387, and as is otherwise well known in the dishwasher art, sequence control means 29 is programmed to cause rinse aid injector 31 to dispense the predetermined amount of rinse aid into wash chamber 12 during the last post-rinse. This is accomplished in the structure illustrated in the drawings by causing current to flow through element 45 which causes flexing of element 45 to the position illustrated in FIGURE 3. As the bifurcation of element 45 passes beyond the end of catch 44, spring 37 moves trip mechanism 35 to the position of FIGURE 3 thus effectuating dispensing of the rinse aid into wash chamber 12.

In accordance with the present invention, means are provided to automatically vent wash chamber 12 during the drying portion of the operational cycle of dishwasher 10. It is to be understood that the drying operation immediately follows the final post-rinse. The vent means of the present invention includes an opening 47 in wall 33 having a baffle 48 disposed thereover but spaced therefrom to minimize escape of wash fluid from wash chamber 12 through opening 47. Disposed within chamber 32, opposite opening 47, is a housing 49 which has an open top provided with a closure member 50. Closure member 50 is pivoted to one edge of housing 49 by a hinge 51. A link 52 interconnects closure member 50 and trip mechanism 35 such that when trip mechanism 35 is in the cocked position illustrated in FIGURE 2, closure member 50 is closed and, when trip mechanism 35 is in the tripped position of FIGURE 3, closure member 50 is opened.

At the bottom of wall 33, a vent plate 53 is secured thereto and defines a passageway 54 leading from chamber 32 into wash chamber 12. The purpose of vent plate 53 is to prevent escape of fluid from wash chamber 12 into chamber 32. Passageway 54 allows air to enter from the atmosphere in the manner illustrated by the arrows in FIGURE 1. When closure member 50 is opened, air leaves wash chamber 12 through opening 47 and housing 49 to enter chamber 32 at the upper portion thereof. From the upper portion of chamber 32, the moisture laden air can escape through the openings provided for handle 15 and knob 30. Additionally, if desired, other openings may be provided. As mentioned earlier, during the drying portion of the operational cycle, heating element 28 is energized thus heating the air in the lower portion of

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wash chamber 12. As this air is heated, it rises and flows over the articles contained in racks 17 and 18, picking up moisture as it does so, and then egresses through opening 47. The air within wash chamber 12 is replenished by relatively dry air entering through passageway 54.

Thus, it can be seen that the present invention provides an improved vent means for an automatic dishwasher which retains the automatic aspects and other benefits of the type of vent means disclosed in U.S. Patent No. 3,092,122 while at the same time avoiding overloading of the sequence control means and which is relatively inexpensive to manufacture. Overloading of the sequence control means is avoided since spring 36 provides the force to open closure member 50 and the energy stored by spring 36 is transferred thereto by manual manipulation of handle 15. The relatively inexpensive aspects of the present invention are obvious from the fact that only link 52 is required to realize the benefits of the present invention inasmuch as trip mechanism 35 and the other elements associated therewith are required in order to carry out the rinse aid injection operation.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of construction of the example illustrated, and it is contemplated that various other modifications or applications will occur to those skilled in the art. It is therefore intended that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of the invention.

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

1. An automatic dishwasher comprising:
 - (a) a wash chamber adapted to receive and contain articles to be washed and dried therein,
 - (b) means to wash and rinse articles within said wash chamber,
 - (c) heat drying means to dry by evaporation articles within said wash chamber,
 - (d) treating agent dispensing means to dispense a treating agent into said wash chamber,
 - (e) said treating agent dispensing means including a movable member which moves as said dispensing means dispenses said treating agent,
 - (f) vent means including a relatively small opening to vent said wash chamber to the atmosphere,
 - (g) a closure member for said opening, and
 - (h) means interconnecting said closure member and said movable member to open said closure member

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as said dispensing means dispenses said treating agent.

2. The invention of claim 1 wherein said treating agent dispensing means further includes an energy storing device and said movable member is moved by said energy storing device.

3. The invention of claim 1 wherein said treating agent dispensing means comprises a rinse aid injector controlled to dispense rinse aid during the step of operation of the dishwasher immediately preceding operation of said heat drying means.

4. An automatic dishwasher comprising:

- (a) a wash chamber adapted to receive and contain articles to be washed and dried therein,
- (b) means to wash and rinse articles within said wash chamber,
- (c) heat drying means to dry by evaporation articles within said wash chamber,
- (d) treating agent dispensing means to dispense a treating agent into said wash chamber,
- (e) said treating agent dispensing means including a trip mechanism having a tripped position and a cocked position,
- (f) vent means including a relatively small opening to vent said wash chamber to the atmosphere,
- (g) a closure member member for said opening, and
- (h) means interconnecting said closure member and said trip mechanism to open said closure member as said mechanism moves from said cocked position to said tripped position.

5. The invention of claim 4 wherein said trip mechanism includes a pivotal member spring-biased toward said tripped position and a bimetal element to maintain said pivotal member in said cocked position and to release said pivotal member when electrical current passes through said bimetal element.

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