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DISHWASHER

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2 Sheets-Sheet 1

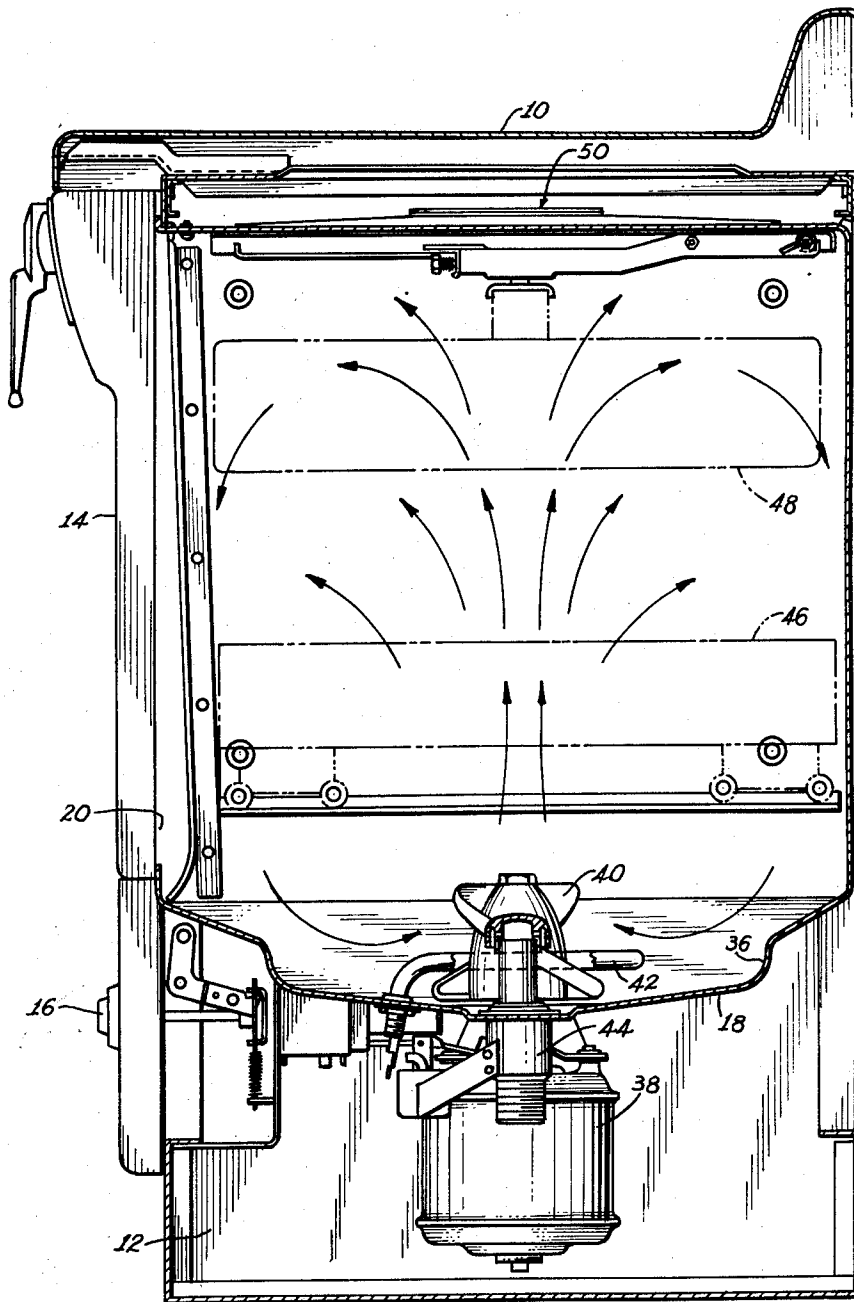


Fig. 1.

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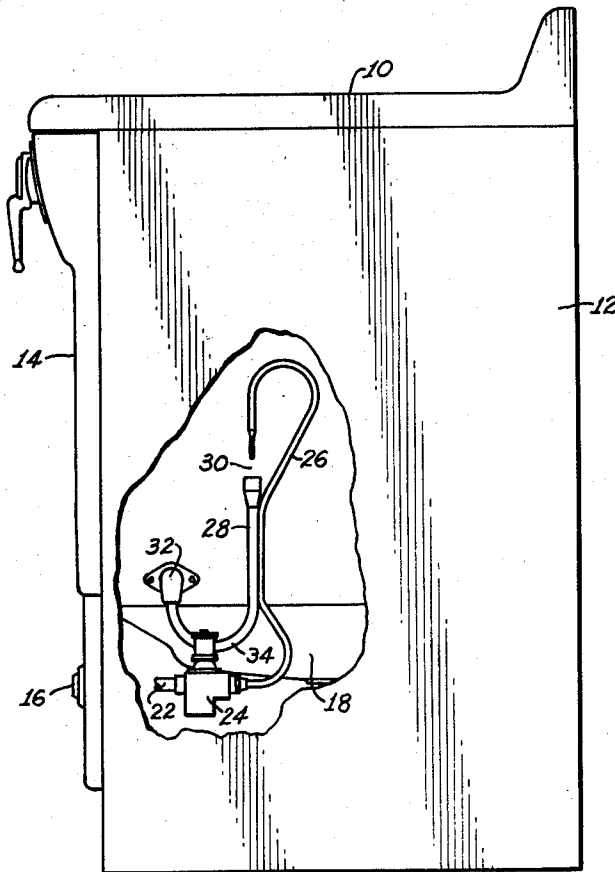


Fig. 2.

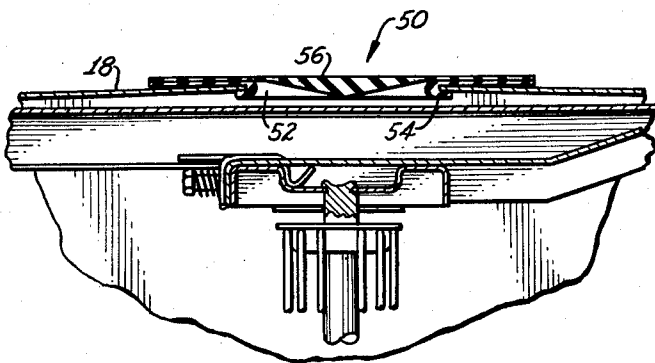


Fig. 3.

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DISHWASHER

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3 Claims. (Cl. 134—99)

This invention relates to washing apparatus, and more particularly to improved dishwashing apparatus having novel features of construction and operation making possible the elimination of normally open vent to the atmosphere and wherein the drying portion of the cycle of operations takes place within a sealed vat provided with means for relieving pressures which may be generated therein.

Most modern dishwasher constructions of the general character shown and described in the present application have been, heretofore, provided with a normally open vent to the atmosphere communicating with the interior of the washing vat. Such a vent is usually provided within or closely adjacent the top panel of the cabinet enclosing the operating mechanism. Such vent constructions have been found to have inherent objectionable features which have been substantially eliminated in the construction and operation of the machine disclosed in the present application.

Machines utilizing an open vent to the atmosphere in or adjacent the top panel have been subject to objection from the standpoint of being readily adaptable to so-called "built-in" installation. Such installations normally require removal of the top panel of the dishwasher and installation of the machine beneath an existing counter top within or adjacent a sink unit. Such installation, therefore, normally required the provision of a hole in the counter top communicating with the vent from the dishwasher vat thereby resulting in more expensive installation and marring the otherwise unbroken surface of the counter top.

The provision of an open vent to the atmosphere from the dishwasher vat is normally made to provide some means of discharging the vapor generated within the vat by evaporation of the water from the dishes during the drying portion of the cycle of operations. During the drying portion of the cycle a considerable amount of steam escapes through the vent and into the kitchen or other room wherein the dishwasher may be installed. Immediately the steam contacts some cooler surface within the room it begins to condense therein and creates a moisture problem which is unpleasant and sometimes damaging.

The structure herein disclosed provides for a sealed container with a relief valve operable to relieve excessive pressures thus eliminating the continually open vent, the relief valve being usually operable only after opening and subsequent closing of the door during the wash cycle when the hot water mixes with the cold air in the tub, the temperature rises rapidly, building up a pressure which is relieved through the pressure relief valve. During the drying cycle, however, moisture will evaporate and condense on the walls of the tub-chamber without venting to the atmosphere with objectionable condensation. It is important that such an arrangement will give satisfactory drying results without objectionable release of steam or necessity for providing a continually open vent.

It is a primary object of the present invention to pro-

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vide a method of operation for dishwashing apparatus wherein the drying cycle takes place within a sealed vat wherein moisture is evaporated from the dishes centrally of the vat and condensed on the side walls of the vat to be later drained from the bottom of the vat.

It is a general object of the present invention to provide dishwashing apparatus of the character described incorporating improved and simplified structure and operation in order to increase the efficiency of operation and to reduce the cost of manufacture.

Another object of the invention is to provide in washing apparatus including a cabinet housing a vat, an improved structure and operation making possible the elimination of a normally open vent to the atmosphere.

A further object of the invention is to provide a simplified arrangement in a washing apparatus which will be more readily adapted to "built-in" installation.

A still further object of the invention is to provide a novel construction and operation of a dishwashing apparatus which will eliminate the venting of great amounts of steam into the room wherein the machine is installed; thus, solving the moisture problem.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification and by reference to the accompanying drawings forming a part hereof, and wherein:

Figure 1 is a vertical sectional view taken substantially centrally through a dishwashing apparatus embodying the present invention;

Figure 2 is a side elevation of the apparatus partly broken away, showing the general arrangement of fluid inlet structure; and

Figure 3 is an enlarged fragmentary sectional view of the upper central portion of the washing vat showing the general construction and arrangement of a pressure relief valve.

With particular reference to Figure 1, it will be noted that the type of dishwasher there shown and in which the present invention may be applied is of the cabinet type having a coved top 10, outer cabinet 12, and a front access door 14 hinged for opening and closing movements about its lower edge. A timer control is provided at 16 to regulate the operation of the dishwasher. It will be noted that a washing vat 18 is provided within the cabinet and defines a front access opening 20 sealed by the door 14 during the operation of the machine.

Water is introduced into the dishwasher by an inlet pipe 22 (Fig. 2) passing through a solenoid operated valve 24 and a delivery tube 26. Water from the delivery tube 26 is directed into a receiving tube 28 across an air gap 30 serving as a vacuum breaker which is normally provided in machines of this type in order to satisfy the requirements of most municipal plumbing codes. Water from the receiving tube 28 passes directly into the vat 18 through a connection 32 provided at the lower portion thereof. It should also be noted that the receiving tube 28 is provided at a point intermediate its ends with a depending portion 34 defining a trap to hold a small amount of water thereby to maintain a sealed condition of the vat 18 with respect to the atmosphere when the door 14 is closed during operation of the machine.

The water can collect in the lower portion of the vat 18 by virtue of its pan formation 36 in the lower wall. The lower wall also supports a driving motor 38 having a vertically disposed shaft to which is attached an impeller 40.

When motor 38 is in operation the impeller 40 is driven at high speed and throws the water, which tends to collect in the pan formation 36, up through the interior of the vat 18. A heating coil 42 is provided for heating the water, if necessary, while it is being circulated, and also to heat

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the air within the vat 18 during the time that the dishes are being dried.

A solenoid operated drain valve 44 is provided to drain the water from the vat 18 at predetermined times during the complete cycle of operations, such operations being under control of the timer 16.

It is possible to utilize several different types of operating cycles in dishwashers. It has been found particularly convenient to provide a pre-rinse during which the drain valve 44 is open and incoming water is impelled throughout the vat 18 to rinse small food particles from the dishes. After the pre-rinse, the drain valve 44 is closed and water is introduced to fill the pan formation 36 while the impeller 40 is operated. When a suitable quantity of water has collected, the water supply is cut off by de-energization of the valve 24 and the motor 33 continues to operate the impeller 40 for a period of approximately ten minutes during which the water is thrown violently up through the vat 18 to provide a thorough washing action. At the completion of this washing operation, the motor 38 is de-energized and the drain valve 44 is opened to drain the wash water from the dishwasher. Since this wash water normally contains a high concentration of detergents, it is desirable to rinse the dishes with clean water after the washing operation. After rinsing, the dishes are dried by circulation of air from the impeller 40 through energization of the motor 38, the circulated air being heated by the coil 42.

To hold the dishes within the vat 18 during the rinsing, washing and drying operations, a pair of dishracks, generally designated 46 and 48, are provided.

As previously discussed the construction and operation of the present invention, as applied to a dishwasher of the general type described in the foregoing, has particular novelty and advantages during the drying portion of the cycle of operations. The structure and operation of the machine comprising the present invention differs primarily from the prior dishwashers in that the drying cycle takes place within a sealed vat having no normally open vent to the atmosphere for circulation of large quantities of air.

In the present machine, the only air which is circulated within the vat 18 is that which is charged into the vat 18 at atmospheric pressure when the door 14 is opened for the insertion of dishes to be treated. During the drying portion of the cycle of operations, the impeller 40 circulates and recirculates the same air over and over again through the vat 18 in a path substantially as indicated by the arrows in Figure 1. The circulated air is heated by the coil 42. As the heated air passes over the dishes in the racks 46 and 48 it will pick up retained moisture therefrom and carry same into the flow stream.

It should be here noted that, contrary to the construction of most prior dishwashers, the external surface of the vat 18 is devoid of insulation. In prior machines the outside of the vat has been insulated to restrict the loss of heat through the walls of the vat thereby to effect a more economical operation. By not insulating the outside walls of the vat 18 in the present machine, the heat within the vat 18 is allowed to be dissipated through the walls. It therefore follows that the walls of the vat 18 will be cooler than the central portion thereof. As the hot moist air circulating over the dishes within the vat 18 comes into contact with the cooler walls of the vat 18, the moisture therein will condense upon the walls and drain by gravity into the lower pan formation 36. This arrangement operates very much like a closed secondary refrigerant system wherein evaporation occurs at the hottest portion of the system and condensation occurs at the coolest portion. In an atmosphere of 100% humidity, moisture will evaporate from the hot surfaces and condense on the cooler surfaces. Since the vat 18 is not provided with the customary vent to the atmosphere as hereinbefore discussed, the only heat loss from the vat will be through the walls thereof which are at a lower temperature than

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the dishes and, of course, the absence of insulation on the vat walls will facilitate the flow of heat therethrough.

As the air circulating within the vat 18 is heated by the coil 42, it naturally will expand thereby creating a certain amount of pressure within the vat. Should the pressure become too great, it is quite possible that the water retained in the trap 34 of the water inlet line could be forced out through the air gap 30 thereby breaking the sealed condition of the vat with respect to the atmosphere. In order to prevent such an occurrence some means must be provided to regulate the amount of pressure which might be generated within the vat and to maintain such pressure below an amount sufficient to displace the water from the trap 34.

In the present invention means for accomplishing the above stated function is provided in the form of a pressure relief valve 50 located at the top of and centrally of the vat 18. The construction of the relief valve 50 is best shown in Figure 3. As may be seen, the relief valve 50 is constructed of rubber or other suitable resilient material and is made in two pieces. The lower member 52 of the valve 50 is generally thin and annular in form and is made with a flanged rim 54 adapted to fit securely into an opening in the top of the vat 18. The upper member 56 of the valve 50 is generally circular in form having an outside diameter equal to the outside diameter of member 52. Members 52 and 56 are bonded together by cementing, or in any other suitable manner, at spaced points near the largest diameters thereof to provide a unitary structure. The construction is such as to provide spaced points about the periphery thereof for the escape of air under pressure from within the vat 18. When the air pressure within the vat 18 reaches a certain predetermined amount the upper member 56 of the valve 50 will be urged upwardly at its centermost portion and the air will force its way between the members 52 and 56 finding an exit at spaced points between the bonded areas of the two members. When the pressure has been relieved the valve members 52 and 56 due to the resilient nature thereof will return to their normal unstressed condition providing a seal for the vat 18. It should be noted that the valve members 52 and 56 are normally biased together in such a manner as to maintain a certain amount of pressure within the vat 18. Such pressure, however, must be less than what would be required to force the water from the trap 34 in the water inlet line.

As previously stated, it is possible to utilize several different operating cycles for dishwashers; however, in the present invention it has been found particularly advantageous to provide that during the drying cycle the vat should be as nearly completely sealed from the atmosphere as possible. To this end it has been found desirable to maintain the solenoid operated drain valve 44 in a closed position through most of the drying cycle. Open periods of approximately one minute at the beginning of the cycle and the last one-half minute of the drying cycle to drain the collected water from the vat 18 has been found to produce quite satisfactorily results.

Although the invention has been described by reference to structure found practical in actual operation, it is contemplated that various modifications may be made therein within the skill of the art and it is not intended to limit the scope of the invention other than by the terms of the following claims.

I claim:

1. A dishwashing and dish drying apparatus comprising, in combination, a closed vat having uninsulated side walls, dish-receiving racks disposed within said vat for supporting dishes to be washed and dried, an access opening for said vat, a door sealing said opening, fluid circulating means within said vat for circulating water during the washing cycle and air during the drying cycle, a heating element disposed within said vat for heating water and air during the time when each such fluid is circulated, a drain at the bottom of the vat for draining water from

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said vat, and means for sealing said vat during the drying cycle whereby the same air circulated by said fluid circulating means is recirculated to pick up moisture from the wet dishes and condense the same on the relatively cooler interior uninsulated walls of the vat and the condensed moisture drains by gravity into said drain opening. 5

2. An apparatus according to claim 1 including a pressure relief valve in said vat operable only on the opening or closing of said door during the wash cycle to relieve the air pressure within the vat caused by the initial mixing of hot water with cold air in the vat. 10

3. A dishwashing apparatus comprising, in combination, a vat closed to the outer atmosphere, said vat having side walls in direct contact with the outside atmosphere, dish-receiving racks disposed within said vat for supporting dishes to be washed and dried, an access opening for said vat, a door sealing said opening, fluid circulating means within said vat for circulating water during the washing cycle and air during the drying cycle, a heating element disposed within said vat for heating water and air during the time when each such fluid is circulated, a drain 15 20

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at the bottom of the vat for draining water from said vat, and means for sealing said vat whereby the same air circulated by said fluid circulating means during the drying cycle is recirculated to pick up moisture from the wet dishes and condense the same on the relatively cooler interior uninsulated walls of the vat and the condensed moisture drains by gravity into said drain opening.

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