June 11, 1968 H. C. WILLIAMSON 3,387,388

SINGLE VENT SYSTEM FOR DISHWASHER

Filed Dec. 17, 1965

FIG. 1.

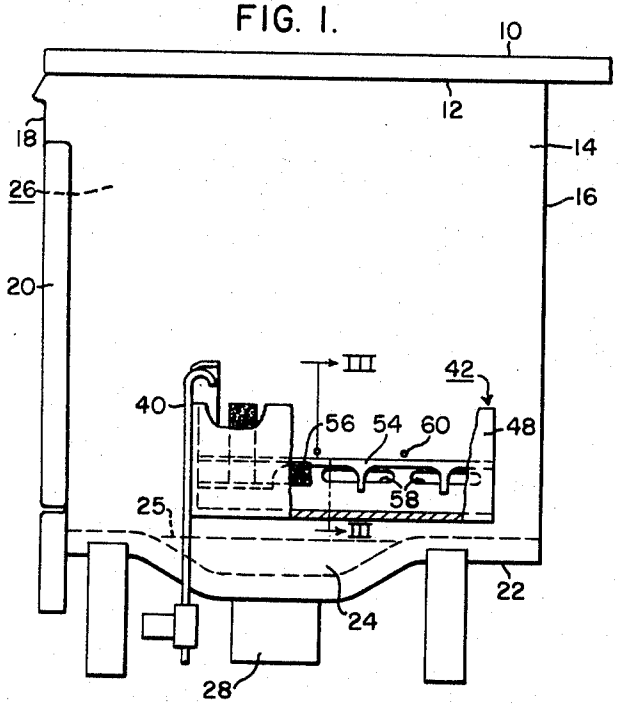
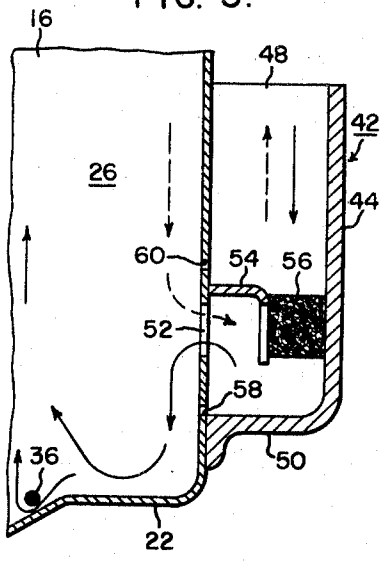


FIG. 3.



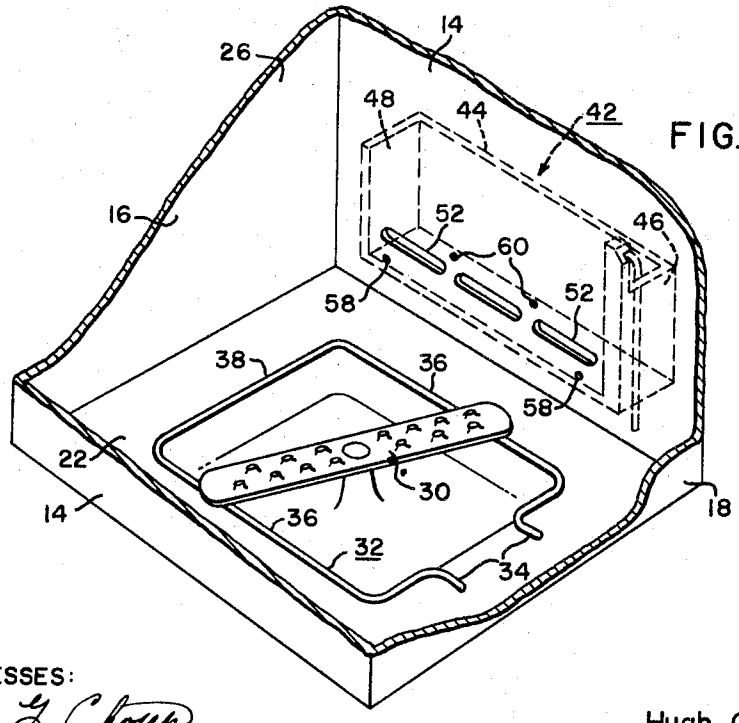


FIG. 2.

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SINGLE VENT SYSTEM FOR DISHWASHER

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ABSTRACT OF THE DISCLOSURE

Domestic dishwasher venting arrangement in which the heating element for drying is disposed relative to slot means in the lower portion of a side wall to induce air flow through the slot means during the drying cycle, the slot means constituting the sole vent means for the dishwasher chamber.

This invention relates generally to domestic dishwashers and in particular to a vent system therefor.

Venting a dishwasher during the drying operation is important to speed the drying of the dishes and reduce the operating time of the cycle. One of the more favored types of venting systems to expedite the drying operation includes air inlet means located near the bottom of the washing chamber, and outlet means near the top of the washing chamber so that a continuing flow of air through the inlet and out of the outlet can take place, with the energized heating element aiding the flow of air through the chamber by setting up convection air currents in the chamber.

However, not all machines use the principle of circulating air through the washing chamber. In a condensate drying arrangement there is little if any interchange of air between the interior and exterior of the washing chamber. In this system, a substantially centered and relatively small heating element at the bottom of the chamber sets up a mushroom-shaped circulation pattern in the chamber. Air rises in the center of the chamber as it is heated by the element, is cooled as it picks up moisture from the dishes to be dried, and then flows down along the sides of the chamber where the moisture condenses upon the side walls of the chamber. With the condensate drying system, there may be only a single vent provided since the interchange of air between the interior and exterior of the washing chamber during drying is of relatively little importance. However, the drying time of a condensate drying system is typically materially longer than with a continuous air flow through the machine.

One object of this invention is to provide a vent system of the single vent type, but which is of comparable effectiveness with those of the through circulation type.

Another object is the provision of a vent system adapted to be installed in its entirety on a single side wall of the washing chamber and which also lends itself to incorporating a water fill arrangement therewith.

In accordance with my invention, I provide the vent ports for the machine in a single location on a lower part of one of the side walls of the washing chamber, and in association with the water fill housing. The vent openings serve as the inlets for admitting water from the housing to the wash chamber during fill portions of the operating cycle, and also serve as both the inlet and outlet for air during drying. The concentration of all the washing chamber openings which function during an operating cycle in a single location yields a simplified construction, as well as other desirable results, and with an arrangement having the structure and structural relationships now to be described, the drying time required is acceptably short.

The invention will be further described in connection with the accompanying drawing showing a dishwasher incorporating the principles of the invention by way of example, and wherein:

FIGURE 1 is a partly-broken side view of an undercounter type of dishwasher to which the invention is applied, this view omitting some structural details which do not bear on the inventive concept;

FIG. 2 is a fragmentary, isometric view of the interior of the dishwasher and illustrating the relative positions of the vent system and the heating element; and

FIG. 3 is a vertical sectional view corresponding to one taken along the line III—III of FIG. 1.

The dishwasher in FIG. 1 is shown mounted in a cavity below the counter top 10 and has the conventional overall rectangular box-shape defined by a top wall 12, opposite side walls 14, rear wall 16, front wall 18 including an access door portion 20, and a bottom wall 22. The various walls are formed with appropriate embossments for strength and other purposes, but such details of configuration are not illustrated except for the bottom wall sump 24 to which draining water gravitates through an overlying screen section 25 for recirculation or to be discharged to the drain.

The interior washing chamber of the machine, generally designated 26, is provided with the usual open work dish supporting racks (not shown) at a lower and upper level. The dishes and other articles to be washed may be inserted from the front of the machine when the access door 20 is open. A pump motor 28, diagrammatically shown in FIG. 1, furnishes power to draw washing and rinsing water from the sump 24 and forcibly throw it about the washing chamber through means of one or more revolving spray arms 30 (FIG. 2), and to force the used water out to a drain at the proper time of the cycle.

The chamber 26 also contains a sheathed resistance heating element 32 (FIGS. 2 and 3) extending generally in a horizontal plane closely adjacent the bottom wall 22 of the chamber to add heat to the wash and rinse water as necessary, and to provide heat during the drying cycle. The element 32 is generally rectangular in outline and includes terminal portions 34 which project down through the bottom wall 22 of the washing chamber adjacent the front wall 18 of the washer, opposite side legs 36, and a rear leg 38.

The wash and rinse water for the machine is supplied to the washing chamber through a solenoid-valve controlled pipe 40 which discharges into the fill housing 42 mounted against the exterior face of the lower portion of one of the side walls 14. This fill housing is formed by outer wall 44, end walls 46 and 48 and horizontal bottom wall 50. The inner edges of the end walls and bottom wall abut the side wall 14 of the washing chamber in sealed relation to form the upwardly-open pocket into which fill water is supplied, and from which it flows into the washing chamber through the horizontal slots 52 mainly. As shown, the fill housing has substantial length in a front-to-rear direction along the wall 14, and is of relatively limited height and thickness. It is not centered on the side wall 14 in a front-to-rear direction, but is offset toward the rear wall 16.

The fill housing 42, in addition to serving as a plenum through which fill water is supplied, serves as part of the vent system for the washing chamber. As such, it provides a vertically-extending passage in communication at its lower end with the interior of the washing chamber, principally through the slot means 52, and in communication at its upper, open end with the atmosphere exterior of the washing chamber.

A baffle 54 (FIGS. 1 and 3) extends from front-to-rear between the opposite ends of the fill housing with its inner edge abutting and sealing against the side wall 14 of the washing chamber. Its outer side projects downwardly and

cooperates with the outer wall 44 of the fill housing to support a highly-porous, cellular, water and air separating pad 56. The baffle 54 and pad 56 serve partly as a seal during washing and rinsing operations of the machine to prevent water from being thrown upwardly out of the housing 42, and also, as explained in my copending application Ser. No. 514,640 entitled "Dishwashing Machine Vent System" filed contemporaneously herewith, dampen any explosion effect which sometimes occurs in dishwashing machines.

In addition to the horizontal slots 52 in the wall 14 of the tub, drain holes 58 are provided in the wall 14 adjacent the bottom wall 50 of the fill housing. Also, several pressure relief holes 60 are provided in the wall 14 above the level of the baffle 54. The drain holes 58 permit the water which accumulates in the fill housing and which cannot exit through the slot means 52 to drain into the washing chamber. The function of the holes 60 is to prevent the buildup of undue pressure in the washing chamber during water fill periods since the space below baffle 54 is usually flooded during the fill.

The present invention is concerned, however, with the venting of the washing chamber during the drying cycle of the machine when substantially all of the water in the sump has been drained. The heating element 32 is energized to promote the drying of the dishes. The washing chamber is substantially sealed except for the slot means 52, and the holes 58 and 60. The open area of these holes 58 and 60 is negligible as compared to the open area of the horizontal slots 52.

In a currently preferred embodiment of the invention, in which the machine is about two feet square in plan, the total open area of the horizontal slots 52 approximates 6 square inches, the combined length of the three slots shown being about 12 inches, and each slot being about ½ inch wide. The slots are about 4 inches above the bottom wall 22 of the dishwasher, and the heating element leg 36 which generally extends along a portion of the slot length, is located about 4 inches in toward the center from the side wall 14. These dimensions are not to be taken as limiting in any sense, but rather as examples of an embodiment which is known to perform satisfactorily and is accordingly currently preferred. It is also noted that by design the slots 52 are located closer toward the rear of the machine than toward the front. This disposition of the slots is based upon the view that more heat is produced by the solid rear leg 38 than the front portion of the element which includes the terminal portions 34.

While it is difficult to state exactly what circulation takes place during drying, my beliefs based upon observation will be given.

In FIG. 3, the flow path of air entering the chamber for purposes of promoting the drying is indicated by the solid line arrows, while the exiting air is indicated by the broken line arrows. Observation suggests that during certain periods there is a circulation of air into and out of the washing chamber in a more or less continuous flow, while at other times the flow apparently stops for short periods and a pulsing or breathing action of the chamber takes place. When the heating element 32 is energized, a rising air current is established, and as this takes place additional air is drawn into the chamber through the fill housing and slot means 52 as indicated in FIG. 3. This entering air flows partly over to the leg 36 and rises upon being heated, while another part of it is induced more directly upwardly. As this air rising picks up moisture from the dishes and cools, it falls and exits in part through the slots 52. Tests have also indicated that the hot heating element 32 sets up some turbulence of flow closely thereabout, and part of the air which enters the washing chamber seems to follow along the length of the heating element some distance before rising.

At times during the drying cycle, the continuous flow of air into and out of the washing chamber seems to stop, and the system then seems to go into a pulsing or breathing type of operation for a period. Apparently at these times the pressure in the chamber first builds up and then exhausts through the vents.

It is believed proper to comment on the difference between this invention and my contemporaneously filed application relating to explosion control. The essence of this invention is the provision of a vent section incorporated in the chamber housing side at a single location, the chamber being devoid of other vents. For proper operation, it requires the disposition of the venting apertures relative to the heating element so that an interchange of air takes place between the inside and outside of the washing chamber. By providing a vent system as illustrated and described, the fill housing may serve as a part of the vent system in providing an upwardly open passageway which gives something of a chimney effect. There is no need to provide additional apertures in the chamber or in the door which serve as either an inlet or an outlet. The flow of air through the vents in the single location, and its distribution, is adequate to prevent overheating of the plastic coated bottom rack, and is also adequate to dry the dishes in a reasonably short period, and with sufficient uniformity.

I claim as my invention:

1. A dishwasher comprising:
means forming a washing chamber including a plurality of fixed vertical side walls;
means forming an upwardly-open housing attached on the exterior face and lower portion of one of said side walls;
said side wall carrying said housing including generally horizontally extending slot means placing the lower part of said housing in communication with the interior of said washing chamber;
a heating element to promote drying of articles in said chamber, said element being located in the bottom portion of said washing chamber, and disposed with a sufficient portion of its length extending generally along, and sufficiently close to, at least a portion of the length of said slot means to induce substantial air flow through said slot means during the drying portion of an operating cycle;
said slot means constituting substantially the entire vent opening means in said chamber and inducing both the admission and discharge of air during the drying portion of an operating cycle.

2. A dishwasher according to claim 1 wherein:
said heating element is of substantially rectangular shape with terminal portions thereof located adjacent a side wall other than said one side wall provided with said slot means.

3. A dishwasher according to claim 1 wherein:
said slot means comprises a number of individual slots.

4. A dishwasher according to claim 2 wherein:
said terminal portions of said heating element are disposed adjacent the front of said washing chamber; and
said slot means is disposed in a side wall of said chamber.

5. A dishwasher comprising:
a generally rectangular box-shaped washing chamber including means substantially sealing said chamber against air circulation into and out of said chamber during normal washing and rinsing operations;
a heating element, adapted to be energized for a drying operation, disposed generally horizontally adjacent the bottom wall of said chamber;
vent means located in the lower portion of one of the vertical walls of said chamber;
an upwardly-open housing mounted on the outside face of said one vertical wall to overlie said vent means;
said vent means comprising the sole passage for air entering and leaving said chamber during a drying operation; and
said heating element is generally rectangular in outline and includes one leg thereof extending generally par-

allel to said one wall having said vent means, said leg being located closer to the side of said washing chamber having said vent means than to the center of said washing chamber.

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