

Aug. 20, 1968

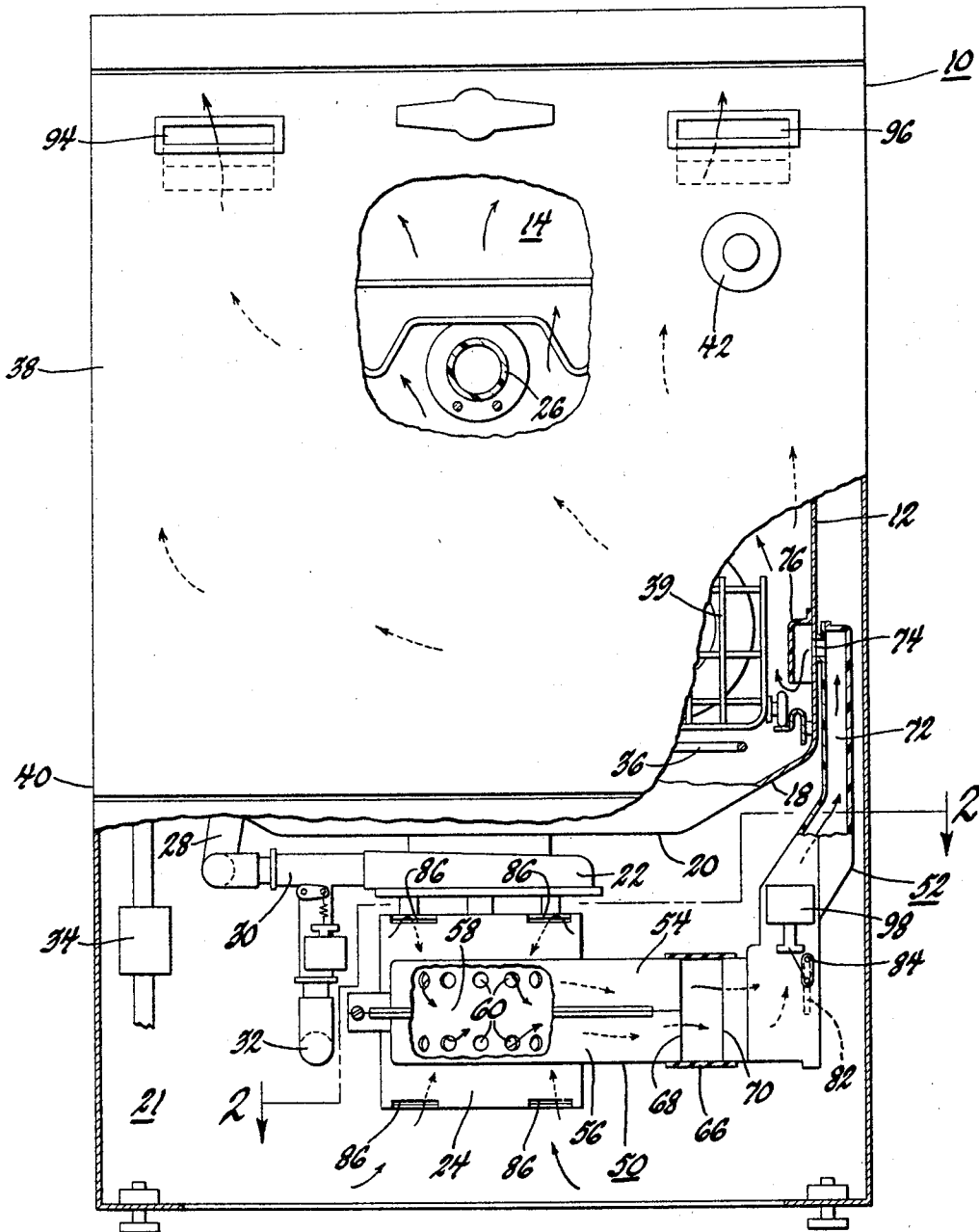
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3,397,708

FORCED AIR DRYING SYSTEM FOR A DISHWASHER

Filed Feb. 1, 1966

5 Sheets-Sheet 1



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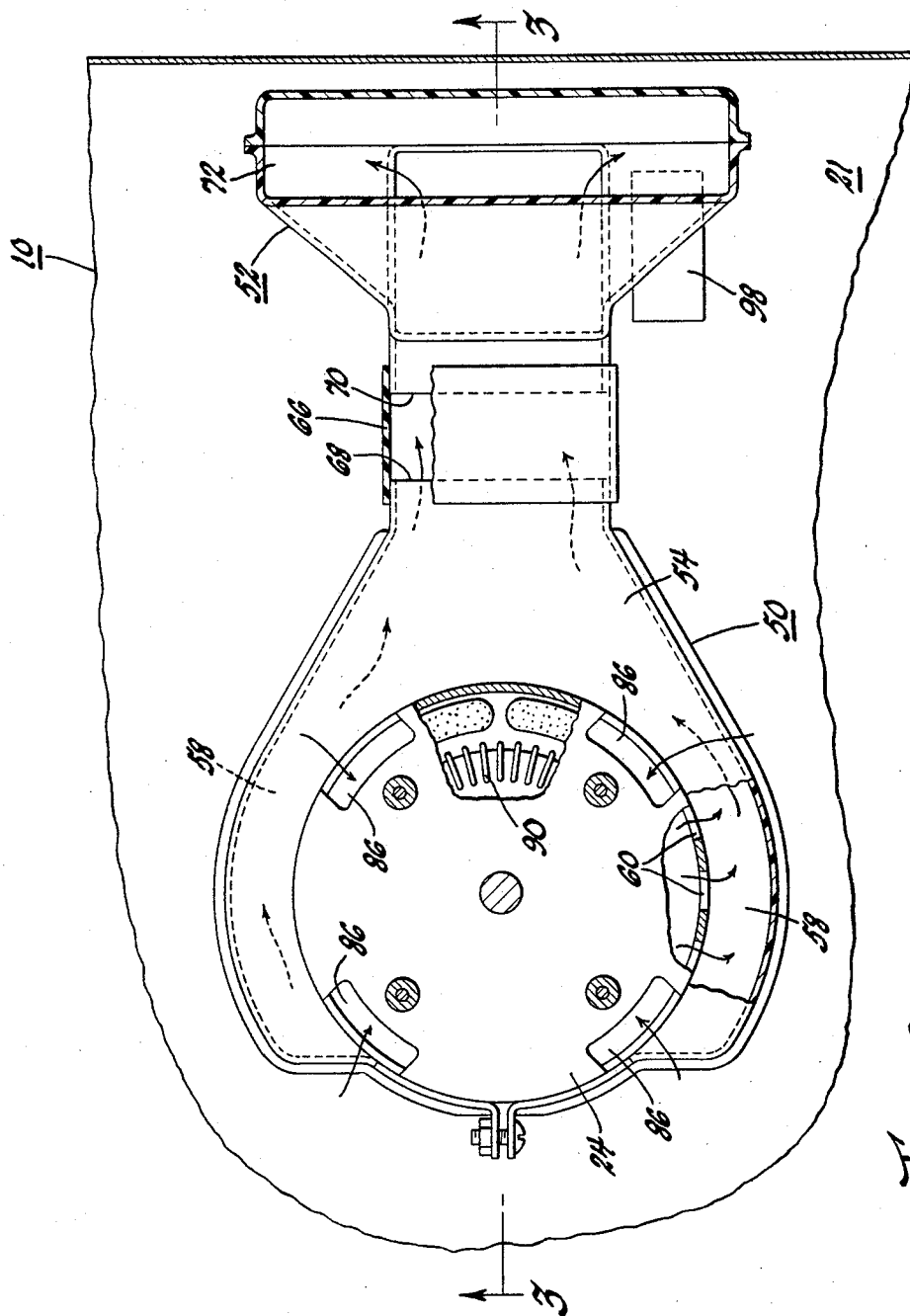


Fig. 2

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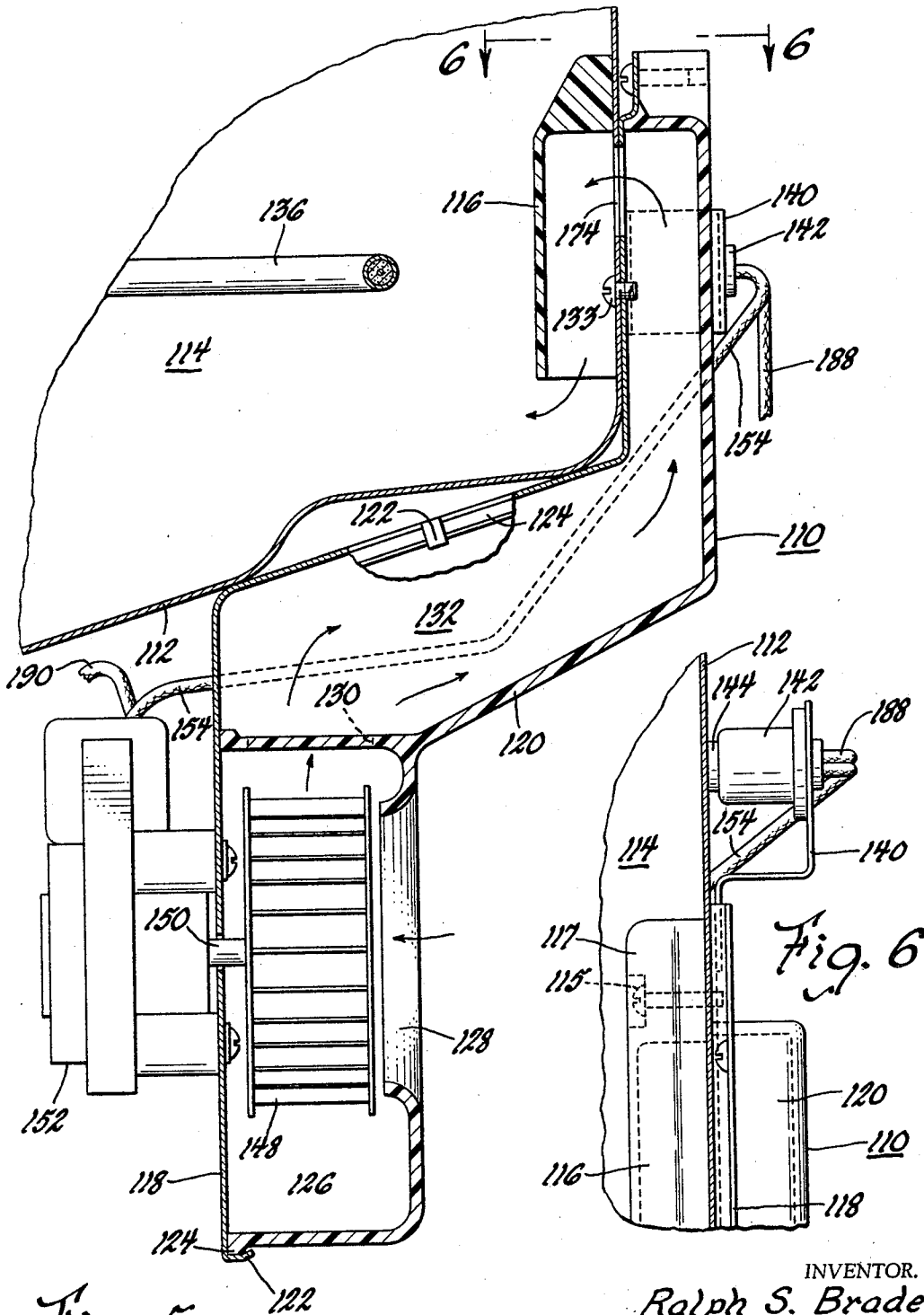


Fig. 5

Fig. 6

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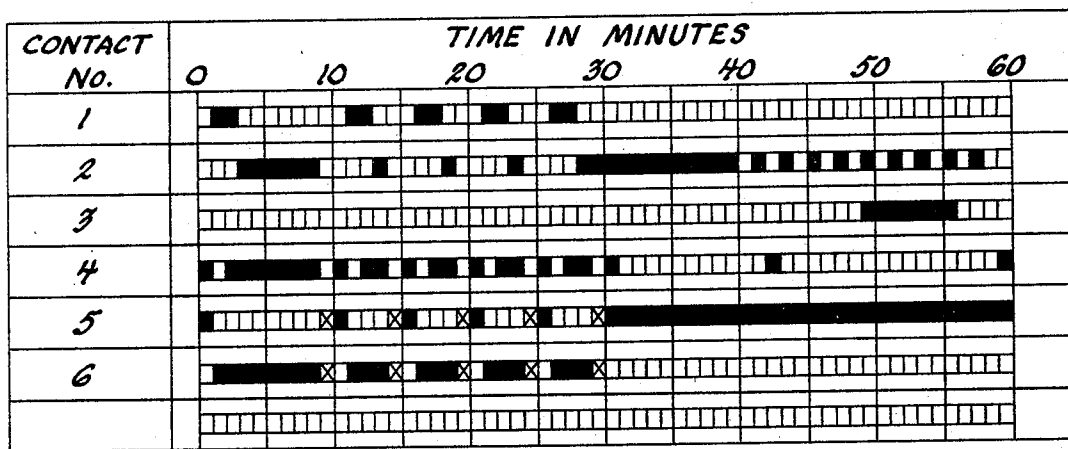
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FORCED AIR DRYING SYSTEM FOR A DISHWASHER

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■ CONTACT CLOSED

⊠ CONTACT OPEN OR CLOSED

Fig. 8

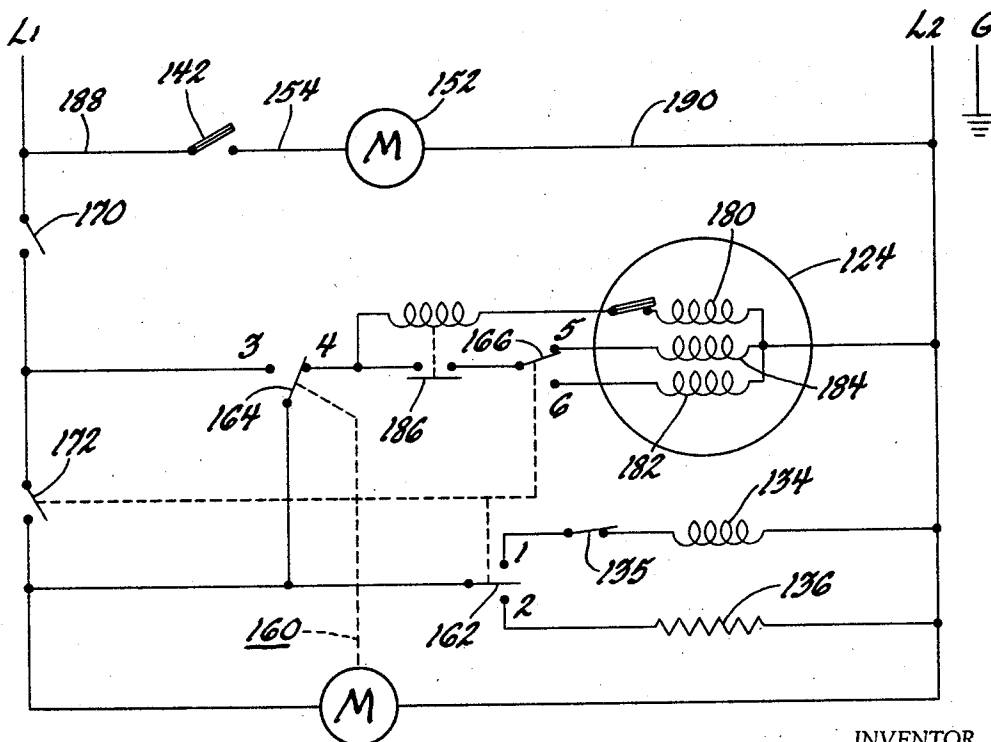


Fig. 7

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3,397,708

FORCED AIR DRYING SYSTEM FOR A DISHWASHER

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Continuation-in-part of application Ser. No. 350,991, Mar. 11, 1964. This application Feb. 1, 1966, Ser. No. 524,057

4 Claims. (Cl. 134—57)

ABSTRACT OF THE DISCLOSURE

A domestic dishwashing chamber provided with a blower and a temperature responsive means outside the chamber to sense the temperature of the chamber so as to initiate drying air circulation through the chamber after a predetermined temperature has been obtained.

This is a continuation-in-part of my application Ser. No. 350,991 filed Mar. 11, 1964, now Patent No. 3,241,563.

This invention relates to a domestic appliance and more particularly to an improved apparatus for drying in a dishwasher using the cooling air of the pump motor for the dishwasher.

Automatic dishwashers are generally provided with a drying cycle following the period during which the dishes are washed and rinsed. This drying cycle is generally accomplished by heating the dishes to sterilize them and to vaporize the moisture droplets therefrom. The prior art has also used a current of air through the dishwashing chamber, heated or otherwise, as an aid in drying the dishes during the drying period. This invention is directed to an improved forced air system for drying dishes or the like in an automatic dishwasher.

Accordingly, it is a general object of this invention to provide a forced air drying system for a dishwasher.

It is another object of this invention to provide in a dishwasher a forced air drying system which utilizes the cooling air from a dishwasher motor, thereby to economize on the heat necessary to perform the drying operation.

It is also an object of this invention to provide a forced air system for an automatic dishwasher which is adapted to exhaust to atmosphere the motor cooling air during the wash and rinse portions of an automatic dishwashing cycle and then to divert the motor cooling air through the dishwashing chamber during the drying portion of the automatic cycle, thereby to dry the dishes with heat from the motor.

A further object of this invention is the provision for such a forced air drying system of an air flow diverter means which is responsive to the dishwasher timer to divert air flow from the atmosphere to the dishwashing chamber at a predetermined time in said automatic cycle.

A still further object of this invention is the provision for such a forced air drying system of an air flow diverter means which is thermally responsive to temperatures in the dishwashing chamber, thereby to initiate the flow of forced air through the dishwashing chamber after the dishes have been elevated to a sanitizing temperature by an auxiliary heater.

Another object of this invention is the provision of an optional forced air drying system for a dishwasher and more particularly to such a system in which an auxiliary blower means is adapted for subsequent attachment to the outside of a dishwasher tub wherein said blower means includes means operably responsive to the temperature of the tub for starting a drying air flow when the temperature of the tub reaches a predetermined value.

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Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a front elevational view, with parts broken away, of a dishwasher suitable for use with this invention and provided with one embodiment thereof;

FIGURE 2 is a fragmentary sectional view, partly in elevation, taken along line 2—2 in FIGURE 1;

FIGURE 3 is a fragmentary sectional view, partly in elevation, taken along line 3—3 in FIGURE 2;

FIGURE 4 is a fragmentary side elevational view similar to FIGURE 1 showing another embodiment of this invention.

FIGURE 5 is a fragmentary sectional view, partly in elevation of still another embodiment of this invention;

FIGURE 6 is a fragmentary sectional view, partly in elevation, taken along line 6—6 in FIGURE 5;

FIGURE 7 is a schematic wiring diagram suitable for use with the embodiment of FIGURE 5; and

FIGURE 8 is a timer cycle chart showing the operation of the schematic wiring diagram of FIGURE 7.

In accordance with this invention and with reference to FIGURE 1, a dishwasher 10 is illustrated. The dishwasher 10 is comprised of a casing 12 which defines a dishwashing chamber 14 having a front opening. The bottom of the dishwashing chamber 14 is closed by a bulkhead or bottom wall 18 which has a depressed sump area 20 in a central portion thereof. The sump leads to a pump 22 which is operated by an electric motor 24. Within the dishwashing chamber 14, a rotatably mounted spray tube 26 is positioned and interconnected with the pump 22 by way of a conduit 28. Interposed in the fluid stream between the spray tube and the pump is a diverter valve 30 which may be selectively energized to direct the output of the pump either to the spray tube 26 or to a drain line 32. Water may be admitted to the sump 20 by means of a water valve 34, and an electric heater 36 is included in the sump for sanitizing the dishes at the conclusion of a dishwashing cycle and for aiding in the drying of the dishes in accordance with the teachings of this invention to be set forth more fully hereinafter. The heater 36 is also used to maintain the temperature of the water throughout the dishwashing cycle.

The front opening of the dishwashing chamber is closed by a door 38 which is hingedly mounted at 40 so that the door may be placed in a vertical position as shown for closing the dishwashing chamber and in a horizontally disposed position for loading the dishwasher—a dish supporting rack 39 being slidably removable on the door in its open position for this purpose. A conventional timer 42 is included in the door for selectively and sequentially operating the water valve 34, the pump motor 24, the heater 36 and the diverter valve 30 in a conventional dishwashing cycle. For additional details pertaining in particular to the dishwasher construction and control cycle therefor, reference may be had to the patent to Abresch et al., 2,734,520, issued Feb. 14, 1956.

A conventional dishwashing cycle, such as taught in Abresch et al., may include the sequential periods of FLUSHING out the interior of the dishwashing chamber 14, while the diverter valve 30 is conditioned to direct the water to drain; a FILL period during which time the valve 34 supplies wash water to the chamber 14 with the diverter valve 30 conditioned to direct water from the pump 22 to the spray tube 26; a WASH period during which time the water is recirculated between the sump and the spray tube by the pump 22; a DRAIN period during which time the diverter valve 30 is conditioned to direct the water from the sump to the drain 32 with the

pump 22 operating; a second FILL period; a RINSE period during which the second fill is circulated to rinse the soiled wash water from the surface of the dishes; a second FLUSHING period followed by a third FILL period and a third RINSE period and a final DRAIN period. The foregoing cycle operations precede the DRYING cycle during which time the moisture droplets deposited on the dishes during the final rinse are vaporized from the surface thereof.

In a dishwasher constructed in accordance with this invention the rate at which the dishes are dried can be increased by introducing air, forced first through the motor for cooling thereof, and then into the dishwashing chamber during all or some portion of the drying cycle. In this manner the heat of the motor is added either exclusively to the drying chamber or in addition to the heat output of the heater 36 which may or may not be energized.

In accordance with the concept of this invention and turning now to FIGURE 1, the dish drying system is shown comprised of a blower housing assembly 50 and a heat duct assembly 52, both of plastic such as Monsanto Corporation's 410 (ABS). In general, the duct work 50, 52 conveys the cooling air from the motor 24 to the dishwashing chamber 14.

More specifically, the blower housing assembly 50 is comprised of an upper shroud 54 and a lower shroud 56 which snugly circumscribe the outer casing of the motor 24—the shrouds being spaced from the motor casing to form a duct 58 adjacent the motor cooling ports 60 in the motor jacket. A flexible conduit 66 interconnects one end 68 of the blower housing assembly with the inlet end 70 to the heat duct assembly 52 to minimize transmission of motor noise.

The heat duct assembly 52 is comprised of an upstanding duct 72 which communicates with the dishwashing chamber 14 through an opening 74 in the sidewall thereof—an inverted cup-like deflector 76 serving to prevent spray from entering the duct work. With reference to FIGURE 3, an opening 80 is provided in the lower end of the duct for selectively exhausting the cooling air of the motor into the machinery compartment 21 of the dishwasher and from there to atmosphere. A diverter valve or flapper 82 is pivoted at 84 between the solid line position A (FIGURE 3) wherein the air is channeled from the motor to the dishwashing chamber and a phantom line position B wherein the motor cooling air is exhausted into the machinery compartment.

Forced air currents are provided to the dishwashing chamber by the motor 24 which includes a casing having inlets 86 on the top and bottom of its casing as well as the outlet ports 60 around the side thereof. In accordance with conventional practice, an impeller 90 is rotatably mounted within the motor casing for rotation with the motor rotor, thereby to induce currents through the motor via the inlets 86 and the outlets 60 into the blower housing 50. Heat is entrained from the motor components in passing therethrough and this heat is added to the dishwashing chamber 14 whenever the flapper valve 82 is in its A position. Air entering the dishwashing chamber 14 through the deflector 76 exhausts from the dishwashing chamber by means of vents 94, 96 extending through the door 38 of the dishwasher.

In one embodiment the damper 82 may be moved between the positions A and B by means of a solenoid 98 which is selectively energized by the timer 42 at the start of the drying cycle or at some time shortly thereafter.

In another embodiment and with reference to FIGURE 4, the damper 82 may be moved in response to the temperature within the dishwashing chamber 14 by means of a temperature responsive device 100 which actuates a switch 102 in series with the solenoid 98. In this arrangement it is possible to allow time for the temperatures within the dishwashing chamber to increase sufficiently to sanitize the dishes before the motor is energized and the cooling air thereof is diverted through the dish-

washing chamber to carry away the vapors from the drying operation and to dry the dishes.

In line with making the forced air drying system responsive to the temperature in the dishwashing chamber, my invention also facilitates the incorporation of such a drying system as an optional extra which may be added to an earlier purchased dishwasher without forced air drying. It is thus an object of my invention to provide a forced air drying arrangement which is responsive to dishwasher temperature rather than the dishwasher timer so that subsequent installation is comparatively quick and simple.

With reference to FIGURES 5 and 6, a blower means 110 is adapted for attachment to a casing means or tub wall 112 which defines the dishwashing chamber of an appliance such as shown in FIGURE 1 or as taught in copending application Ser. No. 403,479 filed Oct. 13, 1964, now Patent No. 3,292,645, and having the same assignee as this application.

More particularly, the blower means 110 attaches to the outside of the tub wall adjacent an opening 174 in the tub wall and in communication therethrough with the interior of the dishwashing chamber 114. It should be understood that air entering the chamber 114 through the opening 174 will leave the chamber through suitable vent openings such as 94, 96 in FIGURE 1, the arrangement of the inlet opening 174 with regard to the vent openings being such as to provide a good coverage of the interior of the chamber 114 so as to completely sweep the steamy vapor from the chamber during the drying portion of the wash cycle. Although FIGURE 1 shows the inlet on the side and the vents on the door to simplify the drawing, in reality, the air sweep of the chamber would be improved with the inlet 174 on the back wall of the tub as shown in the aforementioned copending case.

The blower means is comprised of a sheet metal support wall 118 and an open-sided plastic duct 120 closed by the support wall and held thereto by bent-over tangs 122 which grip a peripheral flange 124 on the plastic duct member 120. A fan housing 126 is formed at the lower end of the duct member which has an inlet opening 128 connected to the atmosphere and an outlet 130 connected to a duct 132 formed by the upper portion of the duct member 120.

Any suitable fastening arrangement may be used to attach the blower means 110 to the tub, but a preferred arrangement places the tub wall 112 in sandwiched relationship between the blower means on the outside and a plastic vent cover 116 on the inside. Fastening means, such as screws 115, extend through side flanges 117 on the vent cover from the inside of the chamber 114 into engagement with the casing wall 112. The blower means 110 is attached to the outside of the casing wall 112 by screws 133 extending into the support wall 118. Since the dishwasher is originally provided with the vent cover 116 to protect the vent opening 174 from splash-out, attachment of the blower means is made simply by removing the vent cover 116, aligning the blower means with the vent opening 174, inserting the screws 133 and replacing the vent cover 116.

At one side of support wall 118 (FIGURE 6) and attached thereto is an offset bracket 140 which carries a thermally responsive, high differential, disc type thermostat 142 which includes a thermally sensitive actuator portion 144 in touching thermally responsive engagement with the outside of the tub wall 112. The thermostat 142 is the sole control of the blower means 110 as will be explained more fully hereinafter.

An impeller 148 in the fan housing 126 is drivably connected to a shaft 150 of an electric motor 152. A conductor 154 extends between the thermostat 142 and the motor 152 and serves to condition the motor 152 for energization whenever the temperature of the air in the dishwashing chamber, as reflected by the temperature of tub wall 112, reaches a predetermined temperature such as 150 °F.

Of particular importance is the fact that the blower

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means 110 is independent from the timing control system of the dishwasher and thus may be used as an optional addition to an earlier purchased dishwasher without forced air drying—a feature which is generally recognized as speeding up the drying process. In operation the blower means acts as a slave to the heater 136 in the dishwashing chamber rather than to a timer such as 160 (FIGURE 7). In this regard the thermostat 142 is positioned adjacent to the heater 136 so that radiations from the heater, when the heater is dry during the drying portions of the cycle, will also affect the operation of the thermostat in addition to the temperature of the casing wall 112 which reflects the temperature conditions of the chamber 114.

With reference to FIGURES 7 and 8 which depict the control system of a dishwasher of the type taught in the aforementioned copending application, the operation of this invention will now be set forth. The means 134 for supplying water until a pressure switch 135 opens to terminate fill, the means 124 for distributing this water to wash the dishes and then, by reversing, to drain the dirty water after the dishes are washed, and the means 136 for heating the water during washing and then subsequently to provide heat in the chamber for drying these dishes are all under the control of a timer 160 which actuates timer switches 162, 164 and 166 in accordance with a schedule shown in the timer cycle chart of FIGURE 8, wherein the listed contact members correspond to reference numbers 1, 2, 3, 4, 5 and 6 in FIGURE 7. In accordance with conventional practice, the control system of FIGURE 7 may also include a door switch 170 to interrupt power from a 115-volt power supply L_1 , L_2 whenever the access door to the dishwashing chamber is opened; and a push-pull switch 172 on one end of the axially shiftable timer shaft which is closed whenever the timer 160 is actuated to control a dishwashing cycle.

The motor 124 includes a main run winding 180, a water distributing start winding 182 and a water draining start winding 184. A current responsive start relay 186 serves to energize the appropriate start winding in accordance with the timer selection of contacts 5 or 6 for a brief period until the motor comes up to its designed running speed and current flow in the main winding drops off.

In the context of FIGURE 7 it can now be seen that the blower means 110 is independent of the timing means 160 and is, indeed, responsive to a condition in the dishwasher rather than to either a function or control of the dishwasher. Power for the motor 152 of the forced air blower is supplied through conductors 188, 190 directly across the domestic power supply L_1 , L_2 and controlled solely by the thermostat 142 which, in turn, is controlled by and is responsive to the temperature of the dishwashing chamber. A differential of about 30° (152° F. on and 122° F. off) in the thermostat 142 has been found adequate to prevent premature blower shut-down at the start of the forced air drying due to rapid temperature drop in the dishwashing chamber brought about by the initial air movement.

The preferred foregoing attachment of the optional blower means could actually be effected electrically by a separate wall plug at the end of conductors 188 and 190. It should be appreciated, however, that the blower means

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could be connected in parallel with the heater 136 in series with one or more of the timer switches so that power to the blower means could also be controlled through the timer.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, casing means defining a vented chamber for washing dishes or the like, means for supplying water to said chamber, means for distributing the water supplied throughout said chamber and for draining the water from said chamber, means for heating in said chamber, timing means for controlling said water supply means, said distributing and draining means and said heating means in a washing and drying cycle, and means outside of said chamber responsive to the temperature of said casing means and independent of said timing means for impelling a stream of drying air through said chamber, said means outside of said chamber including a blower means and a thermostat means in control relationship with said blower means for operating said blower means when the temperature of said casing means reaches a predetermined value.

2. The combination of claim 1 wherein said blower means and said thermostat means are carried on a bracket means removably attachable to the outside of said casing means.

3. The combination of claim 1 wherein said thermostat means is a temperature responsive switch in contact with the outside of said casing means adjacent said heating means.

4. For use with a dishwasher having casing means defining a vented chamber for washing dishes or the like, means for supplying water to said chamber, means for distributing the water supplied throughout said chamber, means for heating in said chamber and timing means for controlling said water supply means, said distributing means and said heating means in a washing and drying cycle, optional forced air drying means adapted to be fastened to said casing means in communication with said chamber and including a fan motor and means in control relationship with said fan motor and adapted for touching engagement with said casing means to be responsive to the temperature in said chamber for energizing said motor to impel a stream of drying air through said chamber, said optional forced air drying means being energizable independently of the timing means of said dishwasher.

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