DISHWASHER WATER-AIR HEATER

An electrical heating element is mounted to the bottom of a dishwasher tank and a cover is positioned over said heating element to define a heating chamber. The cover has ports formed on both a top surface and on a side surface, said ports communicating the heating chamber with the wash chamber of the dishwasher. An air duct connects the heating chamber to an external blower and passes through the wall of the dishwasher tank at a level above the maximum water level of the dishwasher. When heating water, the water circulates through the heating chamber by convection to insure an even water temperature. When air is being heated, the external blower circulates room temperature air through the heating chamber where it comes in contact with the heating element prior to passing through the ports into the wash chamber where it circulates between the dishes to enhance drying.

7 Claims, 4 Drawing Figures
FIG. 3

FIG. 4

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to dishwashers and more particularly to a water-air heating system for a dishwasher.

2. Description of the Prior Art

A water heater is commonly used in automatic dishwashers for maintaining the water temperature during the wash and rinse portions of the cycle. The water heater is also used to raise the water temperature to a predetermined level for purposes of sterilizing or sanitizing the dishes.

Various means have also been provided in automatic dishwashers to enhance drying of the dishes after washing is completed. Some prior art devices merely circulated external air through the wash chamber to dry the dishes. Other prior art devices utilized the water heater to raise the temperature of the air within the wash chamber and thereby accelerate the drying process. Other prior art devices utilize a combination of these previously mentioned methods by circulating external air through the wash chamber and by using the water heater to raise the temperature in the wash chamber. However, the external air entering the wash chamber would usually circulate past the dishes leaving a dead air space around the heater resulting in less than maximum heat transfer from the heater.

Thus, many of the prior art devices required separate heaters, one for the water and another for the air. The water heater usually was at the bottom of the wash tank, while the air heater was located externally of the dishwasher tank in a separate duct connected to an external blower. Devices utilizing only one heating element did not provide for maximum heat transfer and therefore required longer drying time.

SUMMARY OF THE INVENTION

The present invention contemplates a water-air heating system for a dishwasher, wherein a single electrical heating element is mounted on the bottom of a dishwasher tank and a cover is positioned over the heating element to define a heating chamber. The cover element has ports formed in a top surface and a side surface, said ports communicating the heating chamber with the wash chamber of the dishwasher. The ports on the side surface extend to the tank bottom to prevent entrapment of liquid within the heating chamber when the wash tank is drained.

During a wash, a rinse or a sanitize pause cycle, the water level in the wash tank is maintained above the top surface of the cover so that the water is heated by the heating element and circulated through the heating chamber by convection. As the water is heated in the heating chamber, it flows in an upward direction passing through the ports formed in the top surface of the cover, while the cooler water at the bottom of the wash chamber enters the heating chamber through the ports formed in the side of the cover.

A duct connects the heating chamber with a blower mounted externally of the dishwasher tank. The duct enters the dishwasher tank at a position substantially above the maximum water level in the tank to prevent water from flowing through the duct. During a drying period of a dishwasher cycle, the blower circulates external air into the heating chamber where the air comes in contact with the heating element for maximum heat exchange after which the air flows through the ports and into the wash chamber where the air circulates past the dishes to enhance drying.

Thus, the present invention provides a water-air heater that requires only one heating element for heating both the water and the drying air and also provides for maximum heater efficiency by directing the external air past the heating element prior to releasing the air into the wash chamber.

The main objective of the present invention is to provide a water-air heater for a dishwasher, wherein the drying period is accelerated.

Another objective of the present invention is to provide a water-air heater for a dishwasher utilizing only one heating element.

Another objective of the present invention is to provide a water-air heater, wherein external air is circulated past the heater prior to being released into the chamber.

The foregoing objectives and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawings, wherein one embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawings are for illustrative purposes only and are not to be considered as defining the limits of the invention.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical section taken through a portion of a dishwasher tank and showing a water-air heater constructed in accordance with the present invention.

FIG. 2 is a horizontal section taken along line 2-2 of FIG. 1.

FIG. 3 is a vertical section taken along line 3-3 of FIG. 1.

FIG. 4 is a vertical section similar to that of FIG. 3 showing air circulation through the water-air heater.

DESCRIPTION OF THE INVENTION

Referring to FIGS. 1-3, there is shown a cover 10 mounted to a dishwasher tank 12. More particularly, cover 10 has a side wall 14 mounted to a bottom 16 of the tank and a top 18 mounted to a side wall 20 of tank 12. Side wall 14 has ports 22 formed therein, said ports extending to bottom 16 to prevent entrapment of water in the heating chamber 24 defined by cover 10 and tank 12. Top 18 has ports 26 formed therein to facilitate circulation of both air and water through heating chamber 24 and a wash chamber formed by tank 12.

Bottom 16 of the tank is inclined towards the center so that water drains to a central location. In like manner, top 18 is also inclined and ports 26 are formed near the uppermost portion of top 18.

An electrical heating element 28 having a U shape with downturned ends is mounted to bottom 16 in a manner well known in the art.

A duct 30 extends in an upward direction from an opening 32 in top 18. Duct 30 communicates with an opening 34 formed in a wall 36 of tank 12. Opening 34 is positioned above the maximum water level indicated by dashed line 38 to thereby prevent passage of wash water from the dishwasher tank into the duct. An external duct 40 is connected to opening 34 at one end and is connected to an outlet of an external blower 46. The
external blower provides external air for circulation through the wash chamber of the dishwasher.

Referring to FIGS. 1 & 3, there is shown the level 38 of wash water within the dishwasher tank 12 and said level is above the top of cover 10 but below opening 34 in side wall 36. During wash, rinse and sanitize pause cycles, heating element 28 is activated to heat the water contained in heating chamber 24. In accordance with the principles of physics, the heated water rises to the highest point in heating chamber 24 and flows into the wash chamber through ports 26 which are formed near the highest surface of top 18. Thus, the hottest water is not trapped within the heating chamber. In like manner, the cooler wash water which collects along the bottom 16 of tank 12 enters the heating chamber 24 through ports 22 where the water is heated by a heating element 28. Thus, it can be seen how the water is heated and circulated by convection to obtain an even water temperature throughout the wash tank.

At the termination of the final rinse cycle, water is drained from tank 12 in preparation for a drying period of a dishwasher cycle. The water is unobstructed and drains from the heating chamber 24 since ports 22 extend to the bottom 16 of tank 12. Thus, puddles of water are prevented from collecting in heating chamber 24. When the drying period is initiated, heating element 28 is activated and the external blower is turned on. Dry external air is forced into duct 40 by the blower and flows in path as shown by arrows 44 in FIGS. 1 & 4. The dry external air flows into heating chamber 24 through conduit 30 as external air passes heating element 28, it is heated to the maximum extend possible prior to entering the wash chamber through ports 22 and 26.

Thus, the present invention provides for even heating of wash and rinse water and also provides for maximum heat transfer from the heating element to the external air entering the wash chamber. Drying time is greatly reduced by the use of dry external air which is heated prior to being released into the wash chamber and circulated past the dishes. Thus, the present invention provides a water-air heater for a dishwasher that requires only one heating element and reduces the drying time.

What is claimed is:

1. In a dishwasher having a wash tank including side walls and a bottom, said wash tank adapted to be filled to a specified maximum level with water, the improve-

ment comprising a water-air heater including:

a cover having an upper surface portion and at least one downwardly extending surface portion mounted to the bottom of said wash tank to define therewith a heating chamber, said cover having openings formed in the upper surface portion thereof and openings formed in a lower portion of the downwardly extending surface portion adjacent the bottom of the wash tank, the upper surface portion of the cover being below the maximum water level;

heating means disposed within a heating chamber; duct means in communication with the heating chamber, and passing through a wall of the wash tank at a level above the specified maximum water level in the wash tank; and

means for forcing air through said duct means and into the heating chamber during a drying period, whereby the air passes the heating element and is heated prior to being released into the wash tank for drying dishes and water is heated and circulated through the heating chamber by convection during a period when water is present.

2. A water-air heater as described in claim 1, wherein the upper surface portion is connected to a side wall of the dishwasher tank and the downwardly extending surface portion comprises a side wall connected to the bottom of the dishwasher tank.

3. A water-air heater as described in claim 1, wherein the heating means is mounted to the bottom of the dishwasher tank.

4. A water-air heater as described in claim 3, wherein the heating means is an electrical heating element.

5. A water-air heater as described in claim 4, wherein the heating element has a U shape with downturned ends extending through the bottom of the dishwasher tank.

6. A water-air heater as described in claim 2, wherein the bottom of the dishwasher tank is inclined towards the center and the upper surface portion of the cover is inclined in a like manner, the openings in the upper surface portion of the cover being positioned adjacent the side wall of the dishwasher tank.

7. A water-air heater as described in claim 1, wherein the means for forcing air through the duct comprises an external blower for forcing external air into the duct.

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