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(54) **Dishwasher**

Geschirrspüler

Lave-vaisselle

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(56) References cited:
WO-A2-2006/129928
DE-A1-102006 025 150
GB-A- 635 755
US-A- 2 878 360
US-A1- 2004 187 898

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Description

[0001] The present invention relates to a dishwasher, and more particularly, to a dishwasher having a steam generator and a device for generating superheated steam. Although the present invention is suitable for a wide scope of applications, it is particularly suitable for use in a dishwasher.

[0002] Generally, a dishwasher is a device for washing tableware by spraying high-pressure water into a wash tub to separate particles such as leftover food attached on a surface of tableware from the tableware.

[0003] The dishwasher consists of a washtub provided within a case, upper and lower racks slidably loaded in upper and lower parts of the washtub, respectively, and upper and lower nozzles rotatably provided to the upper and lower racks to spray water, respectively.

[0004] A sump for collecting the water sprayed into the washtub is provided to a bottom of the washtub, and a wash pump, used to pump the water from the sump to the upper and lower nozzles, may be provided to the sump.

[0005] The upper and lower nozzles are connected to the wash pump via upper and lower passages, respectively. Hence, if the wash pump is activated, the water within the sump is supplied to the upper and lower nozzles via the upper and lower passages, respectively. The upper and lower nozzles then rotate and spray the water into the washtub.

[0006] As tableware holds greasy meals thereon, once the tableware is used, it gets filthy with greasy stains, fur, and the like. The filth on the tableware is difficult to remove even if high-pressure water is sprayed thereon.

[0007] Meanwhile, since germs such as bacteria and the like may flourish in the filth, it is preferable that the filth is removed from the tableware.

[0008] Although a high-temperature environment, over 120°C, is necessary to remove the filth from the tableware, it is however difficult to provide the high-temperature environment to the internal space of the washtub of the related art dishwasher.

[0009] GB 635 755 A relates to a method and apparatus for cleaning soiled chocolate moulds, in order to remove fatty and sticky matter therefrom.

[0010] Accordingly, the present invention is directed to a dishwasher that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0011] An advantage of the present invention is that it can provides a dishwasher, by which filth can be removed from tableware and the like.

[0012] Another advantage of the present invention is that it can provide a dishwasher, by which germs can be eliminated from tableware and the like.

[0013] Additional advantages and features of the invention will be set forth in part in the description that follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The advantages and features of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0014] To achieve these advantages and features, and in accordance with the invention as embodied and broadly described herein, a dishwasher according to the present invention includes a cabinet, a washtub provided within the cabinet to wash tableware therein, and a steam jet device enabling either steam or superheated steam to be selectively supplied to the washtub.

[0015] A steam generator generating the steam by heating water and a superheater generating the superheated steam by heating the steam generated by the steam generator.

[0016] More preferably, the superheater is located above the steam generator.

[0017] More preferably, the superheater includes a heater generating the superheated steam by heating the steam generated by the steam generator while the steam is flowing along a passage.

[0018] In this case, a steam jet device is provided to an end portion of the passage to enable the steam or the superheated steam to be jetted into the washtub, wherein the heater is provided to the steam jet device.

[0019] And, the steam jet device includes a connecting member connected with a steam hose for supplying the steam and a plurality of jet orifices jetting the steam supplied from the connecting member, wherein the heater is provided across a plurality of the jet orifices.

[0020] Moreover, the superheater includes a heating part having the heater embedded therein.

[0021] More preferably, the superheater includes a case having a storage space for accommodating the steam generated by the steam generator and a heater generating the superheated steam by heating the steam within the case.

[0022] In this case, the case is selectively airtight.

[0023] And, an exhaust means is provided within the case along a flowing direction of the steam.

[0024] Moreover, the superheater further includes a temperature sensor, wherein the superheater is controlled to be driven according to a temperature of the temperature sensor.

[0025] A control panel having an input unit for selecting a steam-using operation course and a superheated-steam-using operation course is provided.

[0026] The input unit includes a course selecting unit for selecting a sanitary course enabling the steam generator to be activated only or a powerful sterilization course enabling both of the steam generator and the superheater to be simultaneously activated.

[0027] The control panel has an option selecting unit having a plurality of course selecting parts, the option selecting unit enabling the superheated steam to be additionally used for the course.

[0028] Accordingly, the present invention provides the

following effects and/or advantages.

[0029] First of all, filth such as greasy stains, fur and the like can be removed from tableware by spraying superheated steam into a washtub in the course of operating a dishwasher.

[0030] Secondly, the present invention can eliminate such germs existing in the filth as bacteria and the like.

[0031] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

[0032] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is a perspective diagram of a dishwasher according to one embodiment of the invention;

FIG. 2 is a cross-sectional diagram of the dishwasher shown in FIG. 1;

FIG. 3 is a cross-sectional diagram of a steam generator as used in a dishwasher in accordance with an embodiment of the invention;

FIG. 4 is an exploded perspective diagram of a steam jet unit in accordance with an embodiment of the invention;

FIG. 5 is a front diagram of the steam jet unit shown in FIG. 4;

FIG. 6 is a perspective diagram of a superheater according to an embodiment of the invention;

FIG. 7 is a cross-sectional diagram of the superheater shown in FIG. 6;

FIG. 8 is a perspective diagram of a superheater according to a another embodiment of the invention;

FIG. 9 is a cross-sectional diagram of the superheater shown in FIG. 8;

FIG. 10 is a T-S graph of steam supplied by the steam generator shown in FIG. 3; and

FIG. 11 is a front diagram of a control panel of the dishwasher shown in FIG. 1.

[0033] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0034] A dishwasher according to one preferred embodiment of the present invention is explained in detail with reference to the accompanying drawings as follows.

[0035] FIG. 1 is a perspective diagram of a dishwasher according to one embodiment of the invention, and FIG. 2 is a cross-sectional diagram of the dishwasher shown in FIG. 1.

[0036] Referring to FIG. 1 and FIG. 2, a dishwasher according to one embodiment of the invention includes a case 1 defining an exterior of the dishwasher, a door 2 opening/closing an open front side of the case 1, and a control panel 3 provided above the door 2 to display and control operations of the dishwasher.

[0037] A handle 4 is provided to the door 2 to enable a user to open and close the door 2.

[0038] The control panel 3 is provided with a power switch 5 for turning on/off power of the dishwasher, an input unit 6 enabling a prescribed operation of the dishwasher to be performed by a user's manipulation, a display unit 7 displaying an operational state of the dishwasher, and an outlet 8 for discharging hot air within the dishwasher.

[0039] A washtub 20 is provided within the case 1 to accommodate water therein. A sump 30 is provided to a bottom of the washtub 20. The sump 30 collects water sprayed into the washtub 20 and then enables the collected water to be sprayed into the washtub 20 again. A filter 31 is provided to a topside of the sump 30 to filter off particles from the water introduced into the sump 30.

[0040] Within the washtub 20, there are provided upper and lower racks 21, 22 vertically separated from each other to accommodate tableware therein and upper and lower nozzles 23, 24 to spray water toward the upper and lower racks 21, 22. Upper and lower passages 27, 28 are provided within the washtub 20 to supply the water pumped from the sump 30 to the upper and lower nozzles 23, 24 provided to the washtub 20, respectively.

[0041] A water supply pipe 41 is provided to enable water to be supplied into the washtub 20 by connecting the washtub 20 and a water supply source outside the case 1. A drain pipe 42 is provided to drain the polluted water to be discharged outside the dishwasher.

[0042] A wash pump 35 is provided to the sump 30 to supply water to the upper and lower nozzles 23, 24. The water pumped by the wash pump 35 is selectively supplied to the upper/lower nozzle 23/24 via the upper/lower passage 27/28.

[0043] A sump heater 36 can be provided to the sump 30 to heat the water collected in the sump 30.

[0044] The dishwasher according to the invention further includes a steam generator 50 for supplying steam into the washtub 20 as well as the sump heater 36.

[0045] The steam generator 50 generates steam by heating water supplied thereto. The generated steam may pass into the washtub 20. Before passing into the washtub 20, the steam may pass through a superheater

100, which generates superheated steam by applying additional heat to the steam generated by the steam generator 50. The superheated steam may pass into the washtub 20. Superheated steam supplied to the washtub 20 may eliminate various germs on tableware positioned therein.

[0046] The steam generator 50 is explained in detail as follows.

[0047] The steam generator 50 generates steam by heating water and a superheater 100 supplying superheated steam into the washtub 20. In accordance with this embodiment, superheated steam is generated by heating the steam generated by the steam generator 50.

[0048] In the following description, the steam generator 50 and the superheater 100 are explained in sequence.

[0049] FIG. 3 is a cross-sectional diagram of a steam generator 50 according to one embodiment of the invention.

[0050] Referring to FIG. 3, the steam generator 50 includes a water tank 51 for accommodating water therein, a heater 52 provided within the water tank 51, a water level sensor 53 for measuring a water level of the steam generator 50, and a temperature sensor 54 for measuring a temperature of the steam generator 50.

[0051] The water level sensor 53 normally includes a common electrode 53a, a low water level electrode 53b and a high water level electrode 53c. The water level sensor 53 detects a high or low water level according to a presence or non-presence of an electrical connection between the common electrode 53a and the high or low water level electrodes 53c, 53b, respectively.

[0052] A water supply hose 55 is connected to one side of the steam generator 50 to supply water and a steam hose 60 is connected to the other side to discharge steam. Preferably, an end portion of the steam hose 60 is connected to a steam jet unit 70. One end portion of the water supply hose 55 is normally connected to an external water supply source such as a tap. The steam jet unit 70 is provided to a prescribed portion of the washtub 20 to jet the steam into the washtub 20.

[0053] Accordingly, if water is supplied via the water supply hose 55, it is decided whether the water is at a high or low water level. If the water is not at the high level, then the water is supplied up to the high water level. Once the water is supplied to the high water level, it is heated by the heater 52 to generate steam. The generated steam is then jetted into the water tub 20 via the steam hose 60 and the steam jet unit 70.

[0054] Meanwhile, in case that the water is heated in the above manner, the temperature within the steam generator 50 is measured by the temperature sensor 54. If the temperature within the steam generator 50 becomes higher than a prescribed temperature, the heater 52 stops being driven.

[0055] If the water within the water tank 51 is reduced, due to the generation of the steam, the water level sensor 53 detects a water level drop. Therefore, the water is supplied again via the water supply hose 55.

[0056] The steam, generated by heating water in the steam generator, normally reaches 100°C, corresponding to the boiling point of water. In general, the steam that is jetted into the washtub 20 raises the temperature of tableware and has a sterilization effect. Moreover, it is bale to expect the sterilization effect if the steam jet is performed in the course of washing or rinsing or drying after completion of the washing.

[0057] If the steam is jetted into the washtub 20, one might expect a general sterilization effect. Yet, it is difficult to expect the complete sterilization of germs that can survive the temperature of about 100°C. For instance, it is well known that a fungus living in a wet environment survives at a temperature of about 100°C but dies at a temperature over 120°C. Therefore, even if the steam at 100°C is jetted to the tableware containing the fungus, complete sterilization may not be achieved.

[0058] Accordingly, in accordance with an embodiment of the invention includes a superheater 100 that generates superheated steam by adding additional heat to the steam generated by the steam generator 50. In this case, superheated steam means steam having a temperature over 120°C in a steam phase. By jetting superheated steam, having a temperature over 120°C, into the washtub 20, it is possible to sterilize the fungus and the like within the washtub 20.

[0059] Preferably, the superheater 100 is provided over the steam generator 50. Because the steam generated by the steam generator 50 tends to ascend, installing the superheater 100 above the steam generator 50 enables the steam to flow smoothly and proceed according to its natural tendency.

[0060] Preferably, the superheater 100 is provided between the steam generator 50 and the washtub 20. If the superheated steam flows a relatively long distance via the steam hose 60 before being supplied to the washtub 20, the temperature of the superheated steam may fall below 120°C or the steam may condense into water. In order to prevent the cooling or condensation of the superheated steam, the superheater 100 is preferably provided adjacent to the washtub 20 as close as possible.

[0061] The superheater 100 according to one embodiment of the invention is provided within a steam jet device 70.

[0062] FIG. 4 is an exploded perspective diagram of a steam generator provided to the dishwasher shown in FIG. 1, and FIG. 5 is a front diagram of the steam generator shown in FIG. 4.

[0063] Referring to FIG. 4 and FIG. 5, the steam jet device 70 includes a first case 71 having a coupling opening 73 coupled with the steam hose 60 and a second case 72 having a pair of jet orifices 74. The jet orifices 74 jet the steam supplied to the jet device 70 via the coupling opening 73 into the washtub 20. The first and second cases 71, 72 are coupled to for the external shell of the steam jet device 70.

[0064] The steam supplied from the steam hose 60 is

supplied to the steam jet device 70 via the coupling opening 73 and is then jetted into the washtub 20 via the jet orifices 74 provided to the steam jet device 70.

[0065] The steam jet device 70 according to the embodiment is configured in a manner that a pair of the jet orifices 74 are provided to be spaced apart from each other centering on a position of the coupling opening 73 coupled with the steam hose 60. As the jet orifices 74 are configured to be spaced apart from each other and centered on the coupling opening 73, particles of food or debris introduced into the jet orifices 74 from the washtub 20 are not likely to enter the coupling opening 73.

[0066] At least one outlet 75 is provided to the bottom of the steam jet device 70 to enable any food particles or debris introduced into the jet orifices 74 to be discharged from the steam jet device 70. Even if food particles or debris are introduced into the steam jet device 70 via the jet orifices 74, they are discharged via the at least one outlet 75. Accordingly, this configuration is likely to prevent food particles or debris from being introduced into the coupling opening 73.

[0067] At least one partition 76 can be provided within the steam jet device 70 to prevent food particles or debris introduced via the jet orifices 74 from entering the coupling opening 73. Preferably, the partition 76 is provided between the coupling opening 73 and the corresponding jet orifice 74.

[0068] The superheater 100 may be provided within the steam jet device 70 to generate the superheated steam as illustrated in the embodiment of FIG. 4

[0069] A heater 110 (such as a wire element) can be used as the superheater 100. If the heater 110 is installed within the steam jet device 70 as configured in the embodiment of FIG. 4, it is preferable to install the heater in such a way that it spans both jet orifices 74. In this way, the steam introduced into the steam jet device 70 via the coupling opening 73 may be exposed to the heater 110 and sufficiently heated to generate superheated steam prior to being jetted into the washtub 20.

[0070] A superheater according to another embodiment of the invention is explained as follows.

[0071] FIG. 6 is a perspective diagram of a superheater 200 according to another embodiment of the invention, and FIG. 7 is a cross-sectional diagram of the superheater 200 shown in FIG. 6.

[0072] Referring to FIG. 6 and FIG. 7, a superheater 200 according to another embodiment of the invention is arranged in-line with a steam hose 60. The internal void of the steam hose 60 may form a passage for the steam generated by the steam generator 50. The superheater 200 of this embodiment includes a heating part 210 that adds heat to the steam flowing within the steam hose 60.

[0073] In particular, the heating part 210 may be configured to have a pipe-shape and form a passage 211 in which the steam flows. Preferably, the heating part 210 is manufactured using such a material having high thermal conductivity as aluminum. In one embodiment, the heating part 210 can be processed by die-casting.

[0074] A heater 220, that adds heat to the steam inside, is provided to one side of the heating part 210. It may be possible for the heater 220 to directly heat the steam. Alternatively, as shown in the drawings, the heater 220 is buried along a surface of the heating part 210 to directly heat the heating part 210. Hence, the inner was of the passage 211 become heated and thus superheat the steam passing through the passage 211 of heating part 210.

[0075] In this case, the heater 220 preferably includes a sheath heater. The heater 220 may be buried within the heating part 210 by molding and is preferably provided adjacent to the passage 211 of the heating part 210 to safely maximize heat transfer and instantly heat the steam flowing within the passage to a superheated state.

[0076] In particular, in the embodiment of FIG. 7, when activated, the heater 220 buried within the heating part 210 rapidly heats the heating part 210, which is formed of aluminum, thereby generating the superheated steam by rapidly adding heat to the steam flowing within the passage 211 of heating part 210.

[0077] As the heater 220 heats the entire inner circumferential surface of the heating part 210, the heating surface area is increased greatly in comparison to the case of heating by exposed heater, such as heater 110 of FIG. 4. Therefore, this configuration is obtains a successful heating effect.

[0078] In the embodiment of FIG. 7, both the heating part 210 and the interior passage 211 are configured in a pipe, or cylindrical, shape. A supply coupling 213, into which steam may be introduced, and an exhaust coupling 214, from which steam may be exhausted, are provided to respective ends of the heating part 210. The supply coupling 213 and the exhaust coupling 214 may be connected in-line with the steam hose 60, as illustrated in FIG. 7.

[0079] Preferably, a temperature sensor (not shown) is provided to the heating part 210. In one embodiment, the temperature sensor measures a temperature of steam by measuring a temperature within the passage 211 of heating part 210. A different, or the same, temperature sensor (not shown) may measure the temperature of the heating part 210. If the temperature abnormally increases or decreases, due for example to malfunction of the heating part 210, a user is informed of the abnormality via the display unit 7 provided to the control panel 3 or the heater 220 can be controlled to stop being driven, that is, it can be turned off.

[0080] According to the superheater 200 shown in FIG. 6 and FIG. 7, the superheated steam is generated by adding heat to the steam that is flowing from steam hose 60 through passage 211. Yet, as the above-mentioned system operates to heat the flowing steam, heat-conducting efficiency is reduced. Hence, if the steam is stored, rather than permitted to flow freely through the passage 222, it is possible to efficiently superheat the stored steam.

[0081] In the following description, a superheater 300,

which generates superheated steam by adding heat to the stored steam, according to a further embodiment of the invention is explained.

[0082] FIG. 8 is a perspective diagram of a superheater 300 according to another embodiment of the invention, and FIG. 9 is a cross-sectional diagram of the superheater 300 shown in FIG. 8.

[0083] Referring to FIG. 8 and FIG. 9, a superheater 300, according to another embodiment of the invention, includes a case 310 having an accommodating space therein for accommodating steam supplied from the steam hose 60. The case 310 also includes a heater 320 to heat the steam within the case 310 into superheated steam.

[0084] In this embodiment, the case 310 for accommodating the steam is preferably manufactured into an airtight container to prevent the steam from leaking. More preferably, valves or the like are provided to a supply opening 311 and an exhaust opening 312. These valves are controlled to selectively make the inner space of the case 310 airtight. As will be understood, the supply opening 311 receives steam into the accommodating space formed by the case 300 and the exhaust opening 312 permits the superheated steam to exit the case 310.

[0085] In the embodiment, after steam is supplied into the case 310 via the steam hose 60, the inner space of the case 310 is made airtight by closing the valves (not shown) coupled to the supply opening 311 and the exhaust opening 312. Additional heat can then be added to the steam by the heater 320.

[0086] In this case, it is preferable that a compressor or the like (not shown) is further provided to increase an internal pressure of the case 310. Namely, if the air pressure within the case 310 is raised while the steam within the case 310 is heated by the heater 320, the generation of superheated steam is facilitated.

[0087] The above-process for generating the superheated steam is explained with reference to the temperature-entropy (T-S) graph of FIG. 10. FIG. 10 is a T-S graph of steam supplied by the steam generator shown in FIG. 3.

[0088] Referring to FIG. 10, if steam is generated from heating water within the steam generator 50, a 'water-steam region', in which water and steam co-exists, is formed under the bell-shaped curve of FIG. 10. Subsequently, if the steam is heated further by the superheater 300, a 'superheated steam region' is entered along path A. This region lies to the right of the bell-shaped curve. Paths A and B represent 'entropy' lines of constant pressure 'P'. Meanwhile, if pressure is applied while the steam is heated, the 'superheated steam region' is entered along path-B. That is, the higher the pressure (line B is a higher pressure than line A) the higher the temperature of the superheated steam.

[0089] In the exemplary embodiment, as mentioned in the foregoing description, a temperature sensor (not shown) can be provided. A method of detecting and control a temperature using the temperature sensor is similar to that of the former embodiment of the invention. As such, its details will be omitted in the following description.

[0090] Because the steam accommodated in the accommodating space of the case 310 is heated, the exemplary embodiment may include a device to move the superheated steam from the case 310 into the washtub 20. Therefore, in an embodiment of the invention, an exhaust means 330 for moving the superheated steam is provided within the case 310. The exhaust means may be, for example, any type of fan. The exhaust means 330 can be provided to any position within the case 310 and accomplish the result of discharging the superheated steam from the exhaust opening 312. In one embodiment, the exhaust means 330 may be provided near supply opening 311 or exhaust opening 312 of the case 310 along the flow path of the steam.

[0091] Thus, if the superheater 300 is provided with the exhaust means 330 for moving the superheated steam, it is facilitated to supply the superheated steam into the washtub 20. If the superheated steam is supplied by the exhaust means 330, the super heated steam is jetted at a relatively high speed from the steam jet unit 70 so that the superheated steam can sufficiently come into contact with the tableware and the like within the washtub 20. Therefore, it is able to maximize the sterilization effect.

[0092] As mentioned in the foregoing description, the above-configured superheater 300 is preferably located adjacent to the washtub 20. More preferably, the superheater 300 is provided adjacent to the steam jet unit 70 for jetting the steam or the superheated steam.

[0093] FIG. 11 is a front diagram of a control panel of the dishwasher shown in FIG. 1.

[0094] Referring to FIG. 11, the control panel 3 can be provided to a front side of the dishwasher shown in FIG. 1 or the like.

[0095] A course selecting unit 10 for selecting an operation course of the dishwasher and an option selecting unit 11 for selecting a side function according to the operation course selected through the course selecting unit 10.

[0096] The course selecting unit 10 can provide a simple course, a soaking course, a fuzzy course, a delicate course, a sanitary course, a powerful sterilization course and the like. A user is able to select a specific one of the courses through the course selecting unit 10. In the course selected by the user through the course selecting unit 10, a water quantity, a temperature, a rinsing count, a drying time, and the like are previously inputted as defaults. These defaults, along with any executable code necessary to practice the invention, may be stored in a memory (not show). A processor (not shown) may read the executable code from the memory and, using the code, execute the steps necessary to practice the invention.

[0097] Part of the course selecting unit 10 indicated by 'A' represents a course of using steam or superheated

steam. In this example, the sanitary course is the course for washing tableware using steam, while the powerful sterilization course is the course for washing tableware using superheated steam.

[0098] If a user selects the sanitary course, the steam is supplied at the defaulted steam time and for the defaulted steam period. If a user selects the powerful sterilization course, the superheated steam is supplied at the defaulted steam time and for the defaulted steam period.

[0099] The option selecting unit 11 can be used to additionally supply the steam or the superheated steam in case that a user selects a random course. For instance, when a user selects the delicate course, if the user attempts to use the steam, the steam or the superheated steam can be supplied via a steam time selecting unit 12, a steam period selecting unit 13 and a superheated steam selecting unit 14 which are provided to the option selecting unit 11.

[0100] In case that a user selects the sanitary course or the powerful sterilization course, both located in the portion of the control panel 6 identified by 'A', the user is able to select a different value for steam time and a different value for steam period, other than those stored as the default values of the steam time and steam period, by using option selecting unit 11.

[0101] In the following description, operations of the above-configured dishwasher according to one preferred embodiment of the invention are explained.

[0102] First of all, in order to wash tableware, a user puts the tableware into the washtub 20 and then drives the dishwasher by selecting a course via the course selecting unit 10 and then pressing a start button or the like. In this case, the user is able to select one of the steam courses for jetting stem using the course selecting unit 10. The user is also able to select a steam time and a steam period and the like using the option selecting unit 11. Moreover, the user is able to select the superheated steam to be jetted using the option selecting unit 11.

[0103] Explained in the following description is the case that a user selects the powerful sterilization course from the course selecting unit 10 or the superheated steam from the option selecting unit 11, i.e., the case that the superheated steam is jetted into the washtub 20.

[0104] First, once a user drives the dishwasher, water and detergent are introduced into the washtub 20 as soon as the steam generator 50 and the superheater 100/200/300 are activated to generate the superheated steam. The generated superheated steam is jetted into the washtub 20 to enable the tableware to be washed in a soaked state. Using this process, the wash efficiency of the dishwasher is raised.

[0105] Also, by soaking the contents of the washtub 20 as described, a user may expect the sterilization effect to exterminate germs, which may survive the steam, such as fungi and the like prior to the execution of washing the tableware.

[0106] Moreover, if the superheated steam is jetted into the washtub 20 in the course of drying the tableware, a temperature of the tableware can be raised. Therefore, the drying time, that is the time taken to dry the tableware, may be reduced.

[0107] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims.

Claims

1. A dishwasher comprising:

a cabinet;
a washtub (20) provided within the cabinet to wash tableware therein;
a steam supplier that selectively supplies either steam or superheated steam to the washtub (20); and
wherein the steam supplier comprises:

a steam generator (50) generating the steam by heating water; and
a superheater (100, 200, 300) generating the superheated steam by heating the steam generated by the steam generator,
characterized in that the dishwasher comprises a control panel (3) having an input unit (6) to select one of a steam-using operation course and a superheated-steam-using operation course,
wherein the input unit (6) includes a course selecting unit (10) for selecting a sanitary course enabling the steam generator (50) to be activated only or a powerful sterilization course enabling both of the steam generator (50) and the superheater (100, 200, 300) to be simultaneously activated, wherein the dishwasher is configured such that
if a user selects the sanitary course, the steam is supplied at the defaulted steam time and for the defaulted steam period and
if the user selects the powerful sterilization course, the superheated steam is supplied at the defaulted steam time and for the defaulted period,
wherein the control panel (3) further having an option selecting unit (11) having a plurality of course selecting parts, the option selecting unit (11) enabling the superheated steam to be additionally used for the course,
wherein the user is able to select a different value to steam time and a different value for steam period, other than those stored as the default values of the steam time and

steam period, by using the option selecting unit (11).

2. The dishwasher of claim 1, wherein the superheater comprises a heater generating the superheated steam by heating the steam generated by the steam generator.

3. The dishwasher of claim 2, wherein:

the steam supplier further comprises a steam jet device provided to an end portion of a passage, to direct the steam or superheated steam into the washtub (20), and
wherein the heater is positioned within the steam jet device.

4. The dishwasher of claim 3, wherein the steam jet device comprises:

a connecting member connected with a steam hose for supplying the steam; and
a plurality of jet orifices jetting the steam supplied from the connecting member into the cabinet,
wherein the heater is provided across a plurality of the jet orifices.

5. The dishwasher of claim 2, wherein the superheater (200) comprises a heating part (210) having the heater (220) embedded therein.

6. The dishwasher of claim 1, wherein the superheater (300) comprises:

a case (310) having a storage space for accommodating the steam generated by the steam generator (50); and
a heater (320) generating the superheated steam by heating the steam within the case (310).

7. The dishwasher of claim 6, wherein the case (310) is selectively airtight.

8. The dishwasher of claim 6 or 7, wherein an exhaust means (330) is provided within the case (310) along a flowing direction of the steam.

9. The dishwasher of any of claims 1 to 8, wherein the superheater (100, 200, 300) further comprises a temperature sensor, and wherein the superheater (100, 200, 300) is controlled to be driven according to a temperature measured by the temperature sensor.

10. The dishwasher of claim 1, wherein the option selecting unit (11) includes a superheated steam selecting unit (14) enabling both of the steam generator (50) and the superheater (100, 200, 300) to be simultaneously activated.

Patentansprüche

1. Geschirrspüler, der aufweist:

einen Kasten;
eine Spülwanne (20), die in dem Kasten bereitgestellt ist, um Geschirr darin zu spülen;
eine Wasserdampfzuführung, die wahlweise entweder Wasserdampf oder überhitzten Wasserdampf an die Spülwanne (20) zuführt; und
wobei die Wasserdampfzuführung aufweist:

einen Wasserdampfgenerator (50), der den Wasserdampf durch Erhitzen von Wasser erzeugt; und
einen Überhitzer (100, 200, 300), der den überhitzten Wasserdampf durch Heizen des von dem Wasserdampfgenerator erzeugten Wasserdampfs erzeugt, **dadurch gekennzeichnet, dass** der Geschirrspüler ein Bedienfeld (3) mit einer Eingabeeinheit (6) zum Auswählen eines Wasserdampf verwendenden Betriebsgangs und eines überhitzten Wasserdampf verwendenden Betriebsgangs aufweist,
wobei die Eingabeeinheit (6) eine Gangauswahleinheit (10) zum Auswählen eines Hygienegangs, der ermöglicht, dass nur der Wasserdampfgenerator (50) aktiviert wird, oder eines Leistungssterilisationsgangs, der ermöglicht, dass sowohl der Wasserdampfgenerator (50) als auch der Überhitzer (100, 200, 300) gleichzeitig aktiviert werden, umfasst, wobei der Geschirrspüler derart aufgebaut ist, dass
wenn ein Benutzer den Hygienegang auswählt, der Wasserdampf zu der Standardwasserdampfzeit und die Standardwasserdampfzeitspanne lang zugeführt wird, und
wenn der Benutzer den Leistungssterilisationsgang auswählt, der überhitzte Wasserdampf zu der Standardwasserdampfzeit und die Standardzeitspanne lang zugeführt wird,
wobei das Bedienfeld (3) ferner eine Optionsauswahleinheit (11) mit mehreren Gangauswahlteilen hat, wobei die Optionsauswahleinheit (11) ermöglicht, dass zusätzlich der überhitzte Wasserdampf für den Gang verwendet wird,
wobei der Benutzer fähig ist, unter Verwendung der Optionsauswahleinheit (11) einen anderen Wert für die Wasserdampfzeit und einen anderen Wert für die Wasserdampf-

zeitspanne auszuwählen als die, die als die Standardwerte für die Wasserdampfzeit und die Wasserdampfzeitspanne gespeichert sind.

2. Geschirrspüler nach Anspruch 1, wobei der Überhitzer eine Heizung aufweist, die den überhitzten Wasserdampf durch Heizen des von dem Wasserdampfgenerator erzeugten Wasserdampfs erzeugt.

3. Geschirrspüler nach Anspruch 2, wobei:

die Wasserdampfzuführung ferner eine Wasserdampfstrahlvorrichtung aufweist, die an einem Endabschnitt eines Durchgangs bereitgestellt ist, um den Wasserdampf oder überhitzten Wasserdampf in die Spülwanne (20) zu leiten, und
wobei die Heizung innerhalb der Wasserdampfstrahlvorrichtung positioniert ist.

4. Geschirrspüler nach Anspruch 3, wobei die Wasserdampfstrahlvorrichtung aufweist:

ein Verbindungselement, das mit einem Wasserdampfschlauch zum Zuführen des Wasserdampfs verbunden ist; und
mehrere Strahlmündungen, die den von dem Verbindungselement zugeführten Wasserdampf in den Kasten ausstoßen,
wobei die Heizung über mehrere der Strahlmündungen bereitgestellt ist.

5. Geschirrspüler nach Anspruch 2, wobei der Überhitzer (200) einen Heizungsteil (210) mit der darin eingebetteten Heizung (220) aufweist.

6. Geschirrspüler nach Anspruch 1, wobei der Überhitzer (300) aufweist:

ein Gehäuse (310) mit einem Lagerraum zum Aufnehmen des von dem Wasserdampfgenerator (50) erzeugten Wasserdampfs; und
eine Heizung (320) zum Erzeugen des überhitzten Wasserdampfs durch Heizen des Wasserdampfs innerhalb des Gehäuses (310).

7. Geschirrspüler nach Anspruch 6, wobei das Gehäuse (310) wahlweise luftdicht ist.

8. Geschirrspüler nach Anspruch 6 oder 7, wobei entlang einer Strömungsrichtung des Wasserdampfs eine Ausströmeinrichtung (330) in dem Gehäuse (310) bereitgestellt ist.

9. Geschirrspüler nach einem der Ansprüche 1 bis 8, wobei der Überhitzer (100, 200, 300) ferner einen Temperatursensor aufweist und wobei der Überhitzer (100, 200, 300) derart gesteuert wird, dass er gemäß einer von dem Temperatursensor gemessenen Temperatur angetrieben wird.

10. Geschirrspüler nach Anspruch 1, wobei die Optionsauswahleinheit (11) eine Auswahleinheit (14) für überhitzten Wasserdampf umfasst, die ermöglicht, dass sowohl der Wasserdampfgenerator (50) als auch der Überhitzer (100, 200, 300) gleichzeitig aktiviert werden.

Revendications

1. Lave-vaisselle comprenant :

une caisse ;
une cuve de lavage (20) prévue dans la caisse pour y laver la vaisselle ;
un fournisseur de vapeur qui alimente la cuve de lavage (20) sélectivement en vapeur ou en vapeur surchauffée ; et
dans lequel le fournisseur de vapeur comprend :

un générateur de vapeur (50) produisant de la vapeur par chauffage d'eau ; et
un surchauffeur (100, 200, 300) produisant de la vapeur surchauffée en chauffant la vapeur produite par le générateur de vapeur,
caractérisé en ce que le lave-vaisselle comprend un panneau de commande (3) comportant une unité d'entrée (6) pour choisir l'un d'un programme de fonctionnement à la vapeur et d'un programme de fonctionnement à la vapeur surchauffée,
dans lequel l'unité d'entrée (6) comprend une unité de sélection de programme (10) destinée à choisir un programme sanitaire permettant au générateur de vapeur (50) d'être activé seul ou un programme de stérilisation puissant permettant à la fois au générateur de vapeur (50) et au surchauffeur (100, 200, 300) d'être activés simultanément, dans lequel le lave-vaisselle est configuré de telle sorte que si un utilisateur choisit le programme sanitaire, la vapeur est fournie au moment de la vapeur par défaut et pour la durée de la vapeur par défaut et si l'utilisateur choisit le programme de stérilisation puissante, la vapeur surchauffée est fournie au moment de la vapeur par défaut et pour la durée par défaut,
dans lequel le panneau de commande (3) comporte en outre une unité de sélection d'option (11) comportant une pluralité d'éléments de sélection de programme, l'unité de sélection d'option (11) permettant à la vapeur surchauffée d'être en outre utilisée

pour le programme,
dans lequel l'utilisateur est apte à choisir une valeur différente du moment de la vapeur et une valeur différente pour la durée de la vapeur, autres que celles qui sont stockées en tant que valeurs par défaut du moment de la vapeur et de la durée de la vapeur, en utilisant l'unité de sélection d'option (11).

2. Lave-vaisselle selon la revendication 1, dans lequel le surchauffeur comprend un générateur de chaleur produisant de la vapeur surchauffée en chauffant la vapeur produite par le générateur de vapeur.

3. Lave-vaisselle selon la revendication 2, dans lequel :

le fournisseur de vapeur comprend en outre un dispositif à jet de vapeur fourni à une partie d'extrémité d'un passage, pour diriger la vapeur ou la vapeur surchauffée dans la cuve de lavage (20), et
dans lequel l'élément chauffant est positionné à l'intérieur du dispositif à jet de vapeur.

4. Lave-vaisselle selon la revendication 3, dans lequel le dispositif à jet de vapeur comprend :

un élément de liaison relié à un tuyau de vapeur pour fournir de la vapeur ; et
une pluralité d'orifices d'éjection projetant de la vapeur fournie par l'élément de liaison dans la caisse,
dans lequel le générateur de chaleur est prévu à travers une pluralité d'orifices d'éjection.

5. Lave-vaisselle selon la revendication 2, dans lequel le surchauffeur (200) comprend une partie de chauffage (210) dans laquelle le générateur de chaleur (220) est incorporé.

6. Lave-vaisselle selon la revendication 1, dans lequel le surchauffeur (300) comprend :

un boîtier (310) ayant un espace de stockage destiné à recevoir la vapeur produite par le générateur de vapeur (50) ; et
un générateur de chaleur (320) produisant de la vapeur surchauffée en chauffant la vapeur à l'intérieur du boîtier (310).

7. Lave-vaisselle selon la revendication 6, dans lequel le boîtier (310) est sélectivement étanche à l'air.

8. Lave-vaisselle selon la revendication 6 ou 7, dans lequel un moyen d'échappement (330) est prévu dans le boîtier (310) le long d'une direction d'écoulement de la vapeur.

9. Lave-vaisselle selon l'une quelconque des revendications 1 à 8, dans lequel le surchauffeur (100, 200, 300) comprend en outre un capteur de température, et dans lequel le surchauffeur (100, 200, 300) est commandé pour être piloté en fonction de la température mesurée par le capteur de température.

10. Lave-vaisselle selon la revendication 1, dans lequel l'unité de sélection d'option (11) comprend une unité de sélection de vapeur surchauffée (14) permettant à la fois au générateur de vapeur (50) et au surchauffeur (100, 200, 300) d'être activés simultanément.

FIG. 1

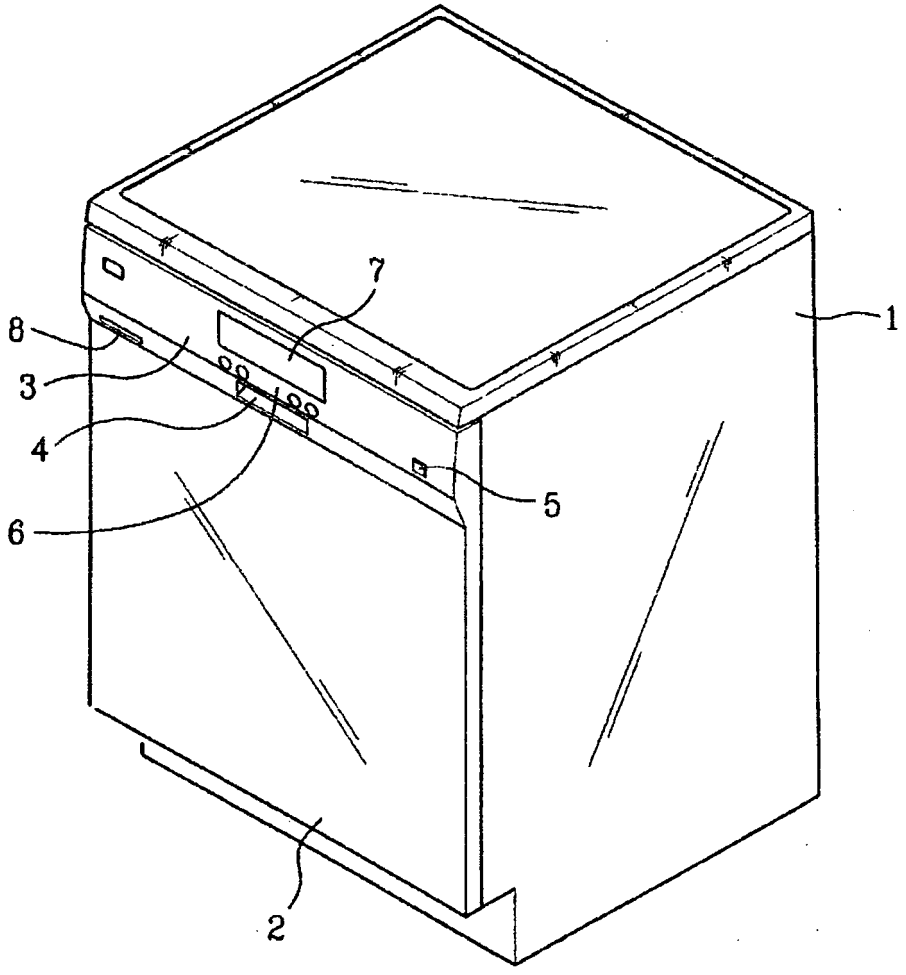


FIG. 2

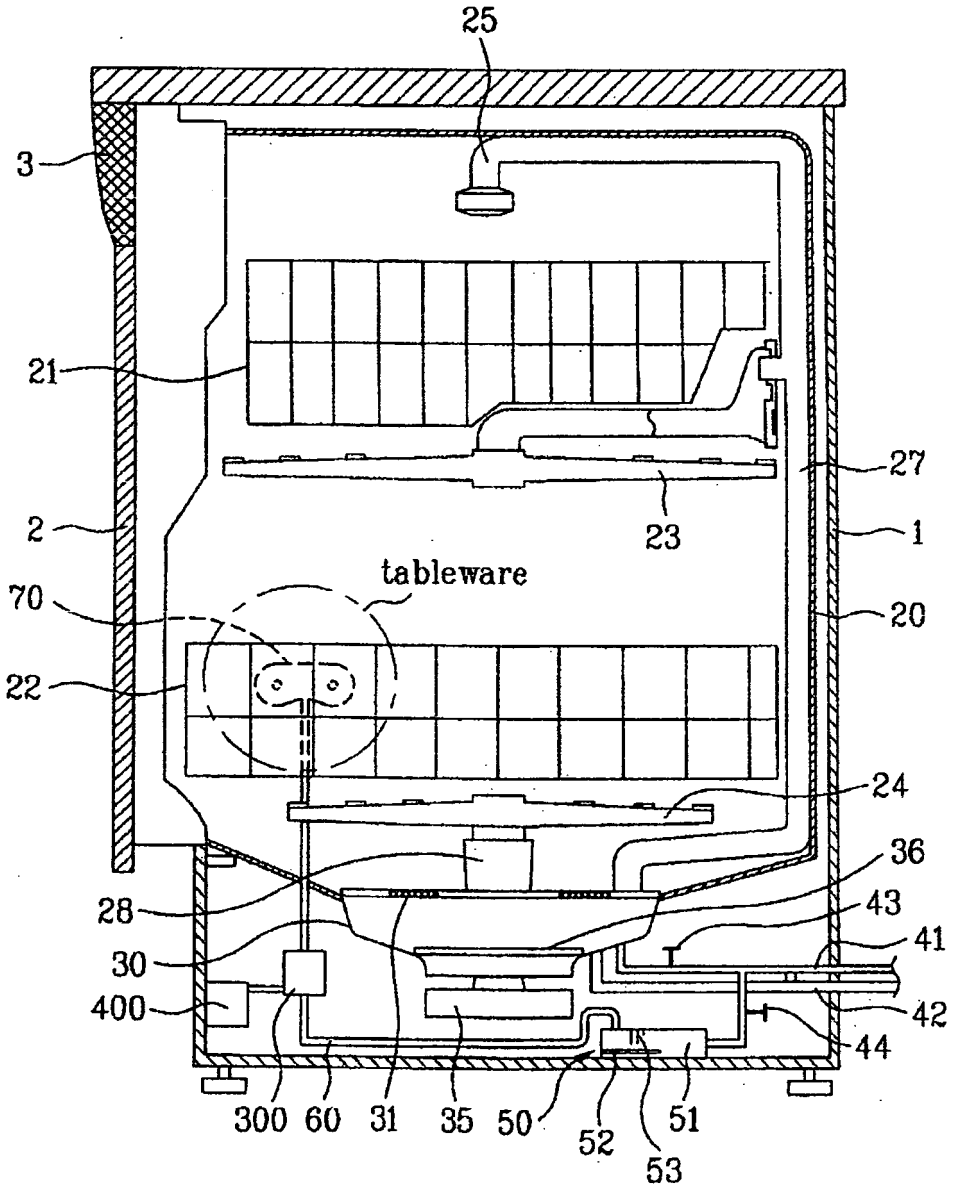

25
3
21
27
2
23
1
tableware
70
20
22
24
36
28
43
41
30
42
400
44
300
60
31
35
50
52
51
53

FIG. 3

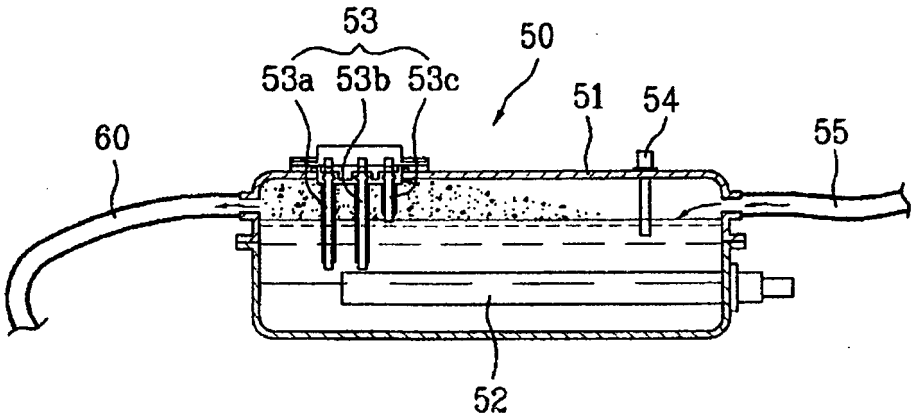


FIG. 4

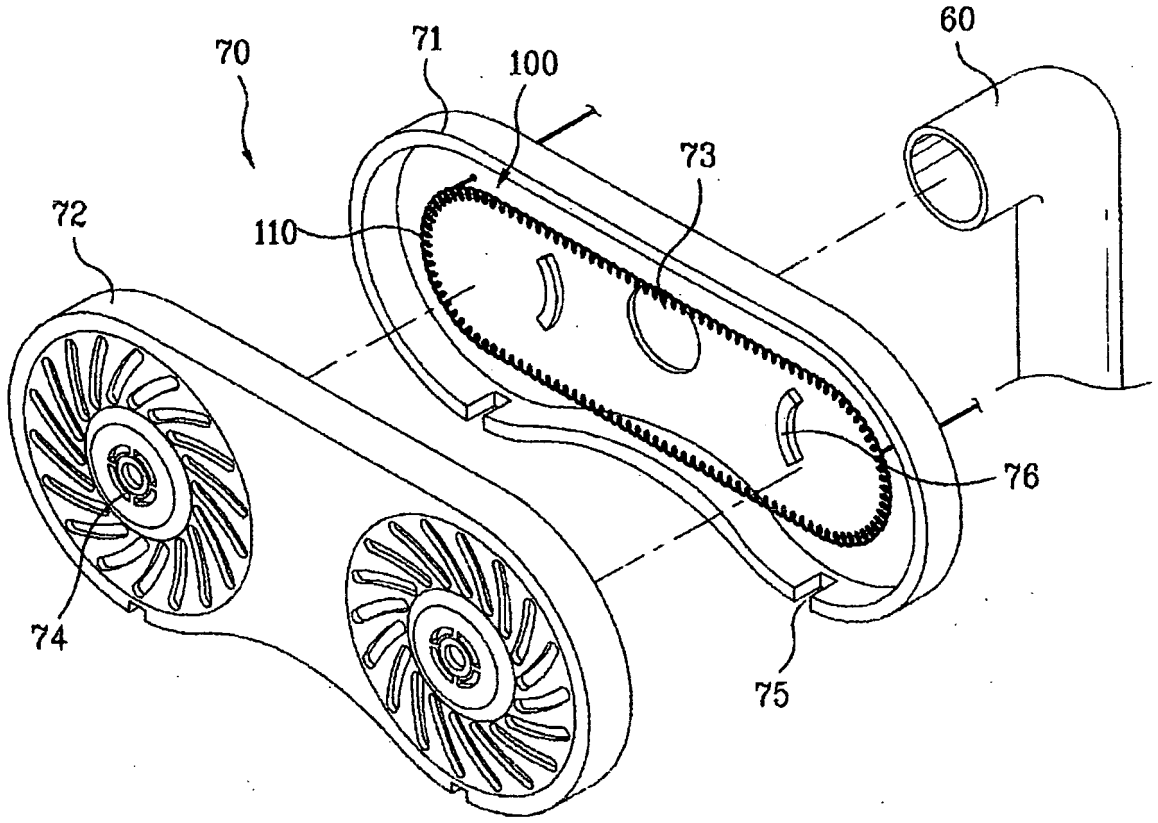


FIG. 5

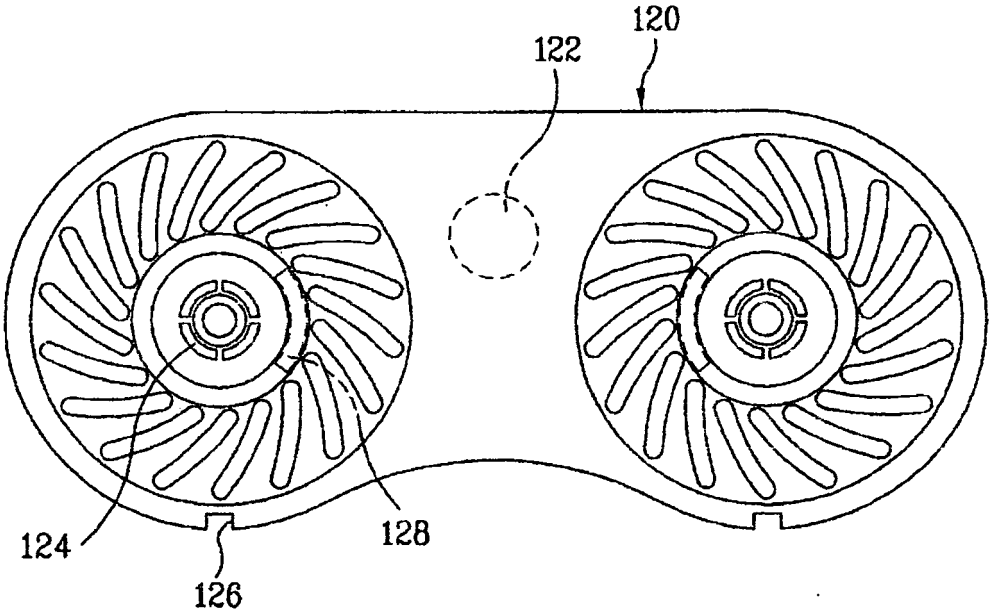


FIG. 6

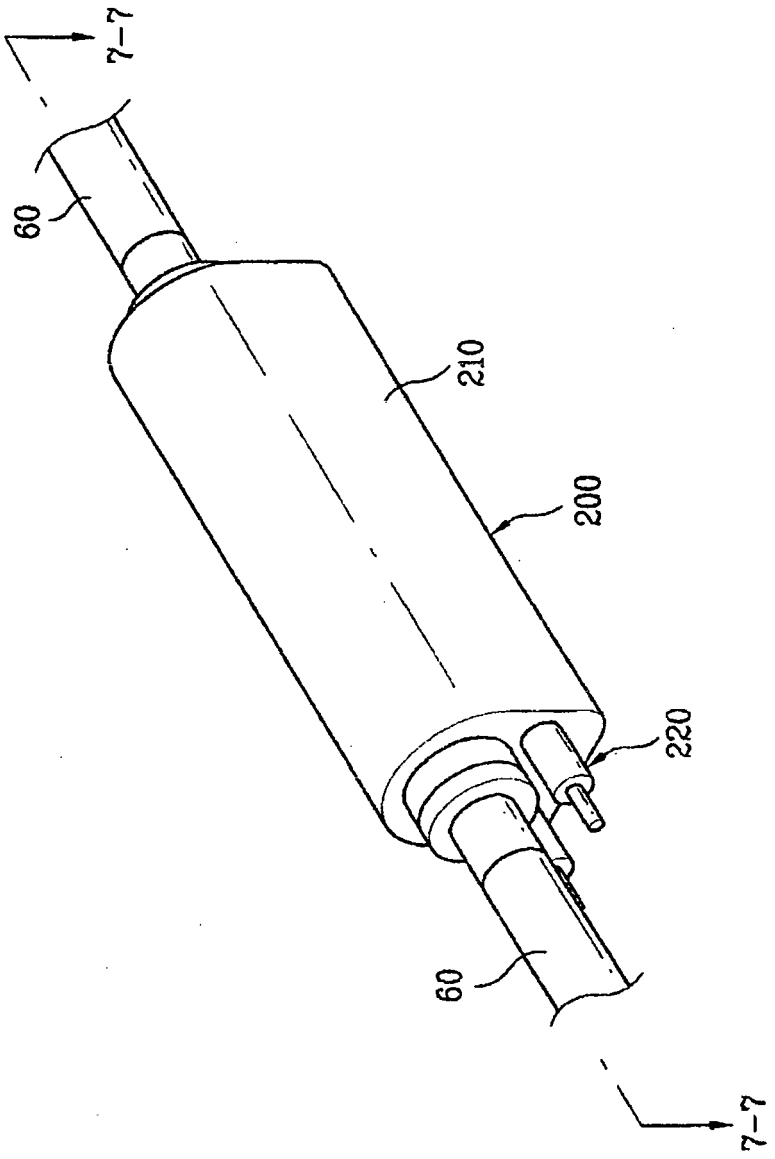


FIG. 7

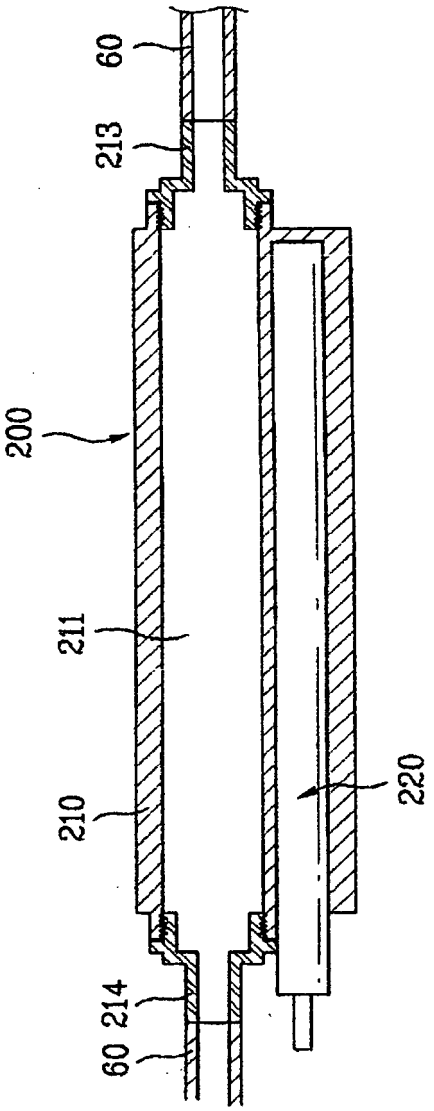


FIG. 8

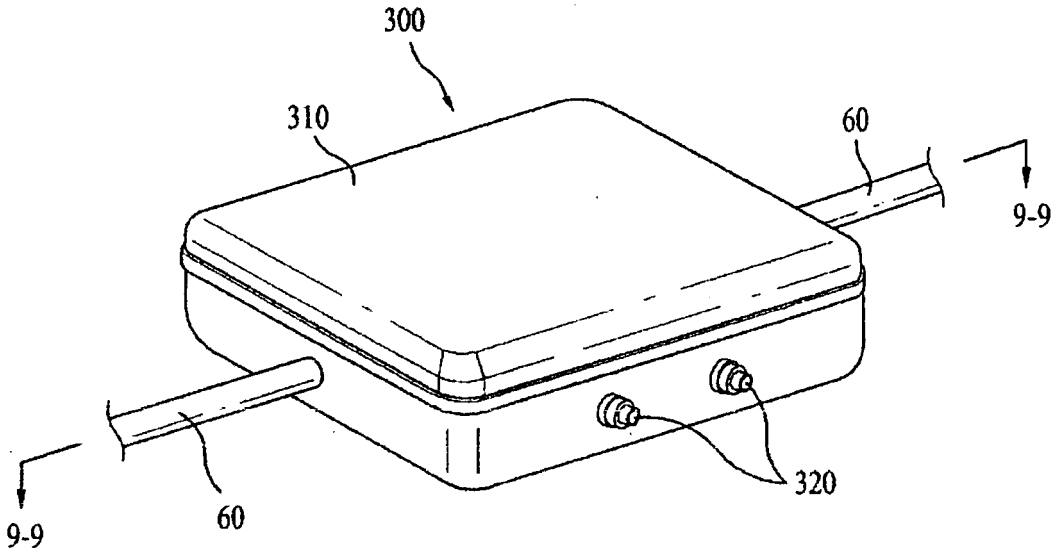


FIG. 9

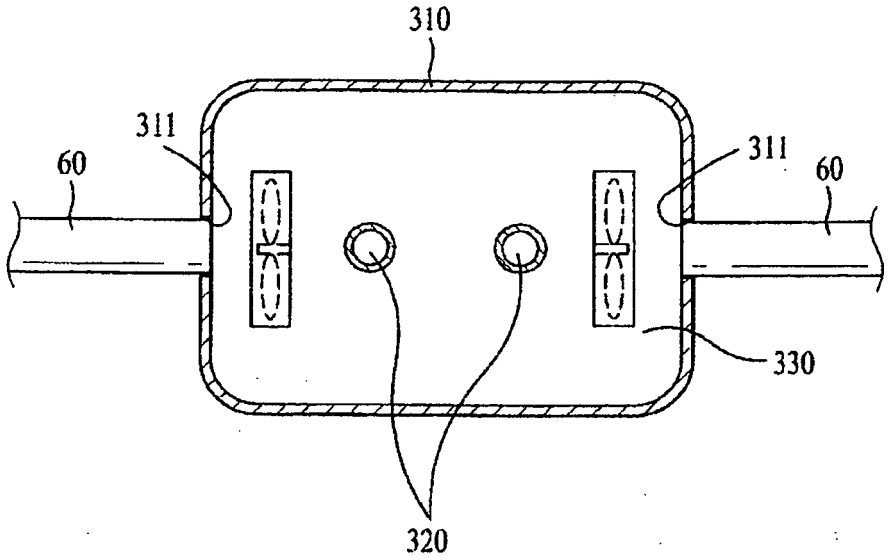


FIG. 10

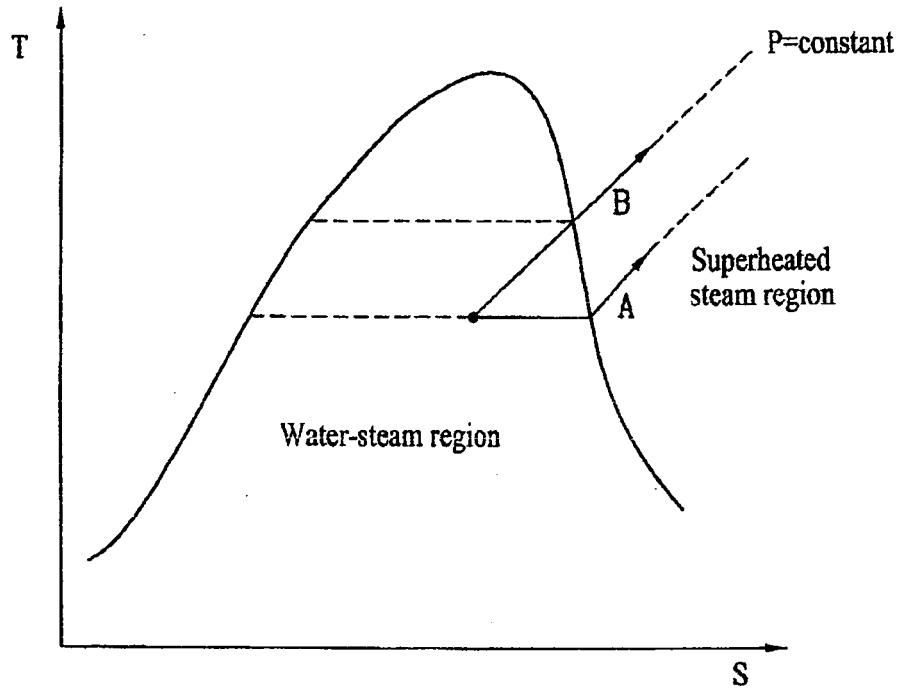
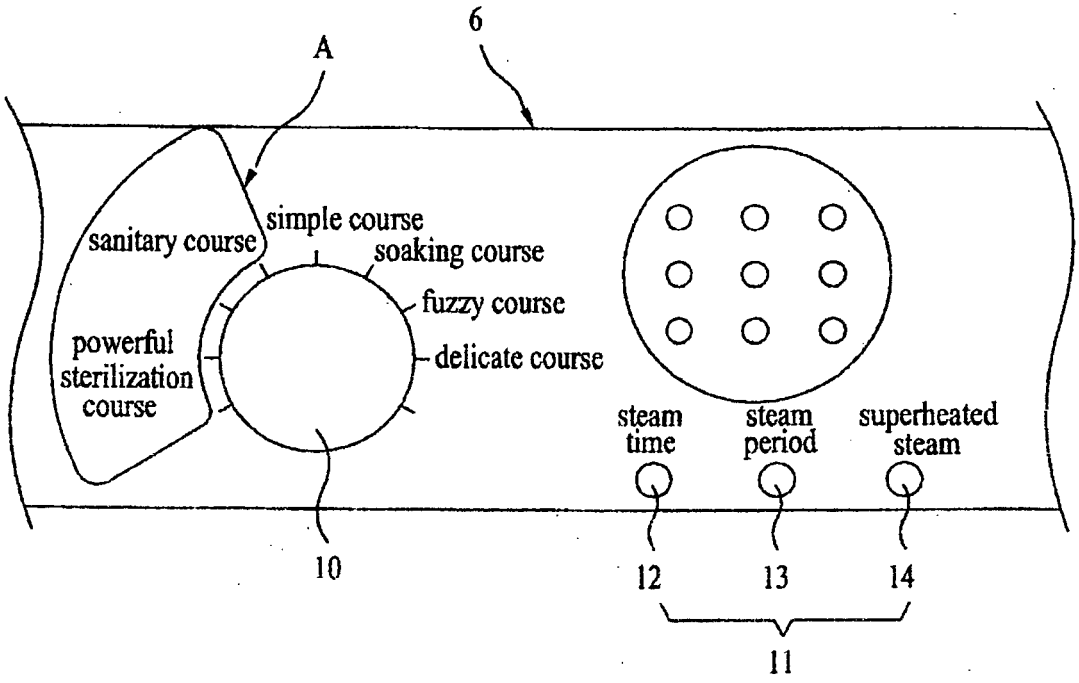

T
P=constant
B
Superheated
steam region
A
Water-steam region
S

FIG. 11


6
A
simple course
sanitary course
soaking course
fuzzy course
powerful
sterilization
course
delicate course
steam
time
steam
period
superheated
steam
10
12
13
14
11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 635755 A **[0009]**