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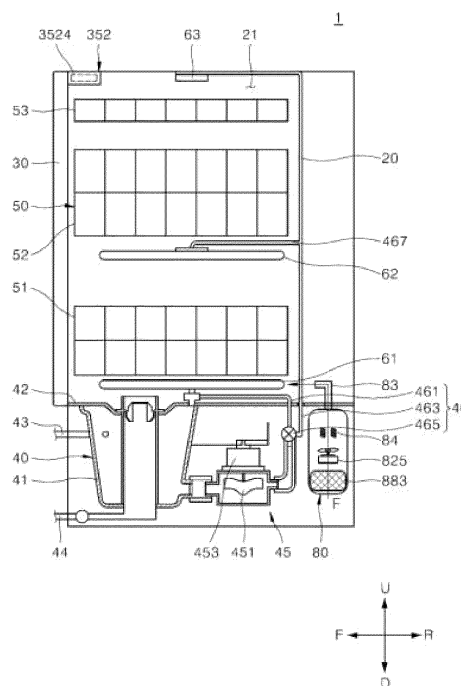
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(54) **DISHWASHER, METHOD FOR CONTROLLING OPERATION OF DISHWASHER, AND MEMORY STORING PROGRAM THEREFOR**

(57) The present invention relates to a dishwasher, a method for controlling the operation of the dishwasher, and a program therefor. To this end, a dishwasher according to one embodiment of the present invention may comprise: a tub having a washing space therein and open on the front; a door which opens and closes the open front of the tub; a drying air supply unit including a blowing motor, a blowing fan, a heater, and a temperature sensor; and a processor controlling the operation of the dishwasher. The processor can control the ON/OFF of the heater so that the temperature of the heater is maintained within a first threshold range when the time during which the dishwasher enters and operates in a door open drying process is less than a predetermined time. Accordingly, the present invention can efficiently dry dishes by controlling the operation of the heater so that the temperature of the heater is maintained within a certain range.

【FIG. 2】



Description

TECHNICAL FIELD

[0001] The present disclosure relates to a dishwasher, a method for controlling an operation of the dishwasher, and a memory for storing a program therefor.

DESCRIPTION OF RELATED ART

[0002] In general, a dishwasher is an apparatus that washes dishes by spraying highpressure washing water to remove food or dirt adsorbed on the dishes after a meal. Such dishwasher operates via strokes of several steps for the dish washing.

[0003] However, when a temperature of a heater is not properly controlled while the dishwasher heats the heater to dry the dishes at a high temperature, a user may suffer serious burns when the user opens a door.

[0004] To solve such problem, prior art (Korean Patent Application Publication No. 10-2021-0138422), which relates to a dishwasher, discloses discharging air in a washing room to the outside of the washing room during a drying stroke of a washing object to maintain a temperature of the washing room at an appropriate dry temperature.

[0005] However, the prior art merely discharges air in the washing room to the outside of the washing room to maintain the appropriate dry temperature, and does not disclose information on controlling an operation of the heater such that the temperature of the heater is maintained within a certain range during the drying stroke.

[0006] Furthermore, the prior art does not disclose information on controlling the operation of the heater such that the temperature of the heater is maintained within different certain ranges depending on a time period during which the drying stroke is in progress.

[0007] Therefore, there is a need to properly maintain the temperature of the heater of the dishwasher within a threshold range based on the operation time period.

[0008] Prior art includes Korean Patent Application Publication No. 10-2021-0138422.

DISCLOSURE

TECHNICAL PURPOSE

[0009] In the past, as a dishwasher does not properly control a temperature of a heater, a user may suffer serious burns when opening a door.

[0010] Therefore, the present disclosure is to provide a dishwasher and a method for controlling heat generation of a heater to prevent abnormal overheating (e.g., overshoot) of the heater during an initial operation of the heater in a stroke.

[0011] Furthermore, the present disclosure is to provide a dishwasher and a method for controlling an operation of a heater based on a time period during which the

dishwasher operates in a door opening drying process.

[0012] Furthermore, the present disclosure is to provide a dishwasher and a method for controlling a heating temperature of a heater differently depending on a time period during which a door opening drying process is in progress.

[0013] Furthermore, the present disclosure is to provide a program that includes commands to check whether a blower motor and a temperature sensor are abnormal and maintain a heating temperature of a heater within a threshold range based on execution of a door opening drying logic.

[0014] Purposes of the present disclosure are not limited to the above-mentioned purpose. Other purposes and advantages of the present disclosure that are not mentioned may be understood based on following descriptions, and may be more clearly understood based on embodiments of the present disclosure. Further, it will be easily understood that the purposes and advantages of the present disclosure may be realized using means shown in the claims and combinations thereof.

TECHNICAL SOLUTION

[0015] To achieve such purpose, the present disclosure may control an operation of a heater such that a temperature of the heater is maintained within a certain range to prevent abnormal overheating (e.g., overshoot) of the heater when a dishwasher is performing a door opening drying process.

[0016] Furthermore, according to the present disclosure, the dishwasher may discharge residual water present in a water jacket via a water discharge pipe after a condensation drying process and before executing the door opening drying process.

[0017] Furthermore, the present disclosure may control the operation of the heater such that the temperature is maintained within the certain range based on a time period during which the dishwasher performs the door opening dry process.

[0018] Furthermore, the present disclosure may control the heater such that the temperature of the heater is maintained within a first threshold range when the time period during which the dishwasher operates in the door opening dry process is smaller than a predetermined time period.

[0019] Furthermore, the present disclosure may control the heater such that the temperature of the heater is maintained within a second threshold range when the time period during which the dishwasher enters the door opening dry process and operates is equal to or greater than the predetermined time period.

[0020] Furthermore, the present disclosure may turn off the blower motor when the operation time period for the dishwasher to operate based on the door opening drying process is equal to or greater than a target time period set for the door opening drying process.

[0021] Furthermore, the present disclosure may mea-

sure the temperature of the heater using the temperature sensor when the dishwasher enters the door opening drying process, and compare the operation time period for the dishwasher after entering the door opening drying process with the predetermined time period.

[0022] Furthermore, the present disclosure may compare the temperature of the heater with a first temperature when the operation time period for the dishwasher after entering the door opening drying process is not equal to or greater than the predetermined time period, and remain the heater turned on when the temperature of the heater is equal to or lower than the first temperature.

[0023] Furthermore, the present disclosure may remain the heater turned on when the temperature of the heater is not equal to or higher than the second temperature, and turn off the heater when the temperature of the heater is equal to or higher than the second temperature.

[0024] Furthermore, the present disclosure may compare the temperature of the heater with a third temperature when the operation time period for the dishwasher after entering the door opening drying process is equal to or greater than the predetermined time period, remain the heater turned on when the temperature of the heater is equal to or lower than the third temperature, and compare the temperature of the heater with a fourth temperature higher than the third temperature when the temperature of the heater is not equal to or lower than the third temperature.

[0025] Furthermore, the present disclosure may remain the heater turned on when the temperature of the heater is not equal to or higher than the fourth temperature, and turn off the heater when the temperature of the heater is equal to or higher than the fourth temperature.

[0026] Furthermore, the present disclosure may compare a time period set for the door opening drying process with the operation time period for the dishwasher after entering the door opening drying process, and turn off the heater when a difference between the time period set for the door opening drying process and the operation time period for the dishwasher after entering the door opening drying process is equal to or smaller than a certain time period.

[0027] Furthermore, the present disclosure may count the number of failures when the blowing fan of the dishwasher does not operate for a first time period, determine that at least one of the blower motor or the blowing fan has failed when the counted number of failures is equal to or greater than a predetermined number of times, and output an error message using at least one of a display or a speaker.

[0028] Furthermore, the present disclosure may determine that the temperature sensor has failed when an open state or a short state of the temperature sensor is maintained for a certain time period or longer, and output an error message using at least one of the display or the speaker.

[0029] Furthermore, the present disclosure may determine that the dishwasher has automatically opened the

door to enter the door opening drying process when identifying that at least one of a first main sensor or a second main sensor is turned off and a sub-sensor is turned on.

5 **[0030]** Furthermore, the present disclosure may determine that the door has been forcibly closed and automatically open the door when identifying that both the first main sensor and the second main sensor are not turned off, and automatically open a handle of the door.

10 **[0031]** Furthermore, the present disclosure may determine that the door has been forcibly opened when identifying that at least one of the first main sensor or the second main sensor is turned off and the sub-sensor is not turned on.

15 **[0032]** Furthermore, the present disclosure may turn off the heater when determining that the door has been forcibly opened, and control the blower motor and the blowing fan such that the dishwasher operates in a cold air drying process.

TECHNICAL EFFECTS

25 **[0033]** The present disclosure may control the operation of the heater to maintain the temperature within the certain range to prevent the abnormal overheating (e.g. the overshoot) of the heater when the dishwasher is executing the door opening drying process, thereby preventing the risk of serious burns to the user in advance.

30 **[0034]** Furthermore, the present disclosure may discharge the residual water present in the water jacket via the water discharge pipe before the dishwasher performs the door opening drying process, thereby drying the dishes in the cleaner state.

35 **[0035]** Furthermore, the present disclosure may control the operation of the heater such that the temperature is maintained within the certain range depending on the time period during which the dishwasher performs the door opening drying process, thereby efficiently performing the dish drying.

40 **[0036]** Furthermore, the present disclosure may control the ON/OFF of the heater when the time period during which the dishwasher enters the door opening drying process and operates is smaller than the predetermined time period, thereby maintaining the temperature of the heater within the certain range.

45 **[0037]** Furthermore, the present disclosure may control the ON/OFF of the heater when the time period during which the dishwasher enters the door opening drying process and operates is equal to or greater than the predetermined time period, thereby maintaining the temperature of the heater within the certain range.

50 **[0038]** Furthermore, the present disclosure may turn off the blower motor when the progress time period during which the dishwasher operates based on the door opening drying process is equal to or greater than the target period set for the door opening drying process, thereby automatically terminating the door opening drying process.

[0039] Furthermore, the present disclosure may measure the temperature of the heater using the temperature sensor when the dishwasher enters the door opening drying process, and compare the time period during which the dishwasher enters the door opening drying process and operates with the predetermined time period, thereby differentially applying the temperature based on the operation time period.

[0040] Furthermore, the present disclosure may quickly heat the heater such that the temperature of the heater corresponds to the certain temperature (e.g., 100 degrees) when the dishwasher enters the door opening drying process, and gradually heat the heater when the temperature of the heater reaches the certain temperature (e.g., 100), thereby preventing the power waste compared to the case of heating the heater to the high temperature and then cooling the heated heater.

[0041] Furthermore, the present disclosure may compare the temperature of the heater with the first temperature when the time period during which the dishwasher enters the door opening drying process and operate is not equal to or greater than the predetermined time period, and remain the heater turned on when the temperature of the heater is equal to or lower than the first temperature, thereby continuously heating the heater for the predetermined time period.

[0042] Furthermore, the present disclosure may remain the heater turned on when the temperature of the heater of the dishwasher is not equal to or higher than the second temperature, and turn off the heater when the temperature of the heater is equal to or higher than the second temperature, thereby controlling the heater such that the temperature of the heater is maintained within the threshold range.

[0043] Furthermore, the present disclosure may compare the temperature of the heater with the third temperature when the time period during which the dishwasher enters the door opening drying process and operates is equal to or greater than the predetermined time period, remain the heater turned on when the temperature of the heater is equal to or lower than the third temperature, and compare the temperature of the heater with the fourth temperature higher than the third temperature when the temperature of the heater is not equal to or lower than the third temperature, thereby controlling the heater such that the temperature of the heater is maintained within the threshold range.

[0044] Furthermore, the present disclosure may remain the heater turned on when the temperature of the heater of the dishwasher is not equal to or higher than the fourth temperature, and turn off the heater when the temperature of the heater is equal to or higher than the fourth temperature, thereby maintaining the temperature appropriate for the door opening drying process.

[0045] Furthermore, the present disclosure may compare the time period set in the door opening drying process with the time period during which the dishwasher enters the door opening drying process and operates,

and turn off the heater when the difference between the time period set in the door opening drying process and the time period during which the dishwasher enters the door opening drying process and operates is within the certain time period, thereby cooling the dishwasher in advance before the door opening drying process is completed.

[0046] Furthermore, the present disclosure may count the number of failures when the blowing fan of the dishwasher does not operate for the first time period, and determine that at least one of the blowing motor or the blowing fan has failed and output the error message using at least one of the display or the speaker when the counted number of failures is equal to or greater than the predetermined number of times, thereby allowing the user to aware of the error of at least one of the blowing motor or the blowing fan.

[0047] Furthermore, the present disclosure may determine that the temperature sensor has failed and output the error message using at least one of the display or the speaker when the open or short state of the temperature sensor is maintained for the predetermined time period or more, thereby allowing the user to aware of the error of the temperature sensor.

[0048] Furthermore, the present disclosure may determine that the door has been automatically opened for the dishwasher to enter the door opening drying process when it is identified that at least one of the first main sensor or the second main sensor is turned off and the sub-sensor is turned on, thereby performing a different operation logic than when the user manually opens the door.

[0049] Furthermore, the present disclosure may determine that the door has been forcibly closed, automatically open the door, and automatically open the handle of the door when it is identified that both the first main sensor and the second main sensor are not turned off, thereby providing convenience in using the dishwasher.

[0050] Furthermore, the present disclosure may determine that that the door has been forcibly closed when it is identified that at least one of the first main sensor or the second main sensor is turned off and the sub-sensor is not turned on, thereby performing a different operation logic than when the door is automatically opened.

[0051] Furthermore, the present disclosure may turn off the heater and control the blower motor and the blowing fan such that the dishwasher operates in the cold air drying process when determining that the door has been forcibly closed, thereby preventing the danger caused by the high temperature.

[0052] In addition to the above-mentioned effects, the specific effects of the present disclosure as not mentioned will be described below along with the descriptions of the specific details for carrying out the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0053]

FIG. 1 is a front perspective view of a dishwasher according to an embodiment of the present disclosure.

FIG. 2 is a schematic cross-sectional view of a dishwasher shown in FIG. 1.

FIG. 3 is a front perspective view showing a state in which a dry air supply of a dishwasher is accommodated on a base, according to an embodiment of the present disclosure.

FIG. 4 is an exploded perspective view of a dry air supply shown in FIG. 3.

FIGS. 5 and 6 are exploded perspective views showing detailed configurations of a filter and a filter housing shown in FIG. 4.

FIGS. 7 and 8 are front perspective views showing a bottom tub coupled to a composition in FIG. 3.

FIG. 9 is a plan view of FIG. 7.

FIG. 10 is a cross-sectional view of FIG. 9 cut in an A-A direction.

FIG. 11 is a block diagram of a dishwasher according to an embodiment of the present disclosure.

FIG. 12 is a flowchart showing a process of determining whether a blower motor and a temperature sensor have failed according to an embodiment of the present disclosure.

FIG. 13 is a flowchart showing a process of identifying opening of a door of a dishwasher according to an embodiment of the present disclosure.

FIG. 14 is a flowchart showing a cold air drying process according to an embodiment of the present disclosure.

FIG. 15 is a flowchart showing a process of controlling an operation of a heater according to an embodiment of the present disclosure.

FIG. 16 is a flowchart showing a process of controlling an operation of a heater according to another embodiment of the present disclosure.

DETAILED DESCRIPTIONS

[0054] The above-mentioned purpose, features and advantages are described in detail below with reference to the attached drawings. Accordingly, a person skilled in the art in the technical field to which the present disclosure belongs will be able to easily implement the technical idea of the present disclosure. In describing the present disclosure, when it is determined that a detailed description of the known technology related to the present disclosure may unnecessarily obscure the gist of the present disclosure, the detailed description thereof is omitted. Hereinafter, preferred embodiments according to the present disclosure will be described in detail with reference to the attached drawings. In the drawings, identical reference numerals are used to indicate iden-

tical or similar components.

[0055] It will be understood that, although the terms "first", "second", "third", and so on may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section described below could be termed a second element, component, region, layer or section, without departing from the spirit and scope of the present disclosure.

[0056] It will also be understood that when a first element or layer is referred to as being present "on" a second element or layer, the first element may be disposed directly on the second element or may be disposed indirectly on the second element with a third element or layer being disposed between the first and second elements or layers. It will also be understood that when a first element or layer is referred to as being present "under" a second element or layer, the first element may be disposed directly under the second element or may be disposed indirectly under the second element with a third element or layer being disposed between the first and second elements or layers.

[0057] It will be understood that when an element or layer is referred to as being "connected to", or "coupled to" another element or layer, it may be directly connected to or coupled to another element or layer, or one or more intervening elements or layers therebetween may be present. In addition, it will also be understood that when an element or layer is referred to as being "between" two elements or layers, it may be the only element or layer between the two elements or layers, or one or more intervening elements or layers therebetween may also be present.

[0058] As used herein, the singular constitutes "a" and "an" are intended to include the plural constitutes as well, unless the context clearly indicates otherwise.

[0059] It will be further understood that the terms "comprise", "comprising", "include", and "including" when used in this specification, specify the presence of the stated features, integers, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, operations, elements, components, and/or portions thereof.

[0060] As used herein, "A and/or B" means A, B or A and B, unless specifically stated otherwise. Expression such as "at least one of" when preceding a list of elements may modify the entirety of list of elements and may not modify the individual elements of the list. As used herein, "C to D" means C inclusive to D inclusive unless otherwise specified.

[0061] Hereinafter, a dishwasher, a method for controlling an operation thereof, and a program for the method according to some embodiments of the present disclosure will be described.

[Overall structure of the dishwasher]

[0062] Hereinafter, an overall structure of a dishwasher 100 according to an embodiment of the present disclosure will be described in detail with reference to the attached drawings.

[0063] FIG. 1 is a front perspective view showing the dishwasher according to the present disclosure. FIG. 2 is a simplified cross-sectional view briefly showing an internal structure of the dishwasher according to the present disclosure.

[0064] As shown in FIG. 1 to FIG. 2, the dishwasher 100 according to the present disclosure may include a main body 10 having a washing space defined therein and having an open front portion, a tub 20 installed in an inner space of the main body 10 and having a washing space 21 defined therein where the washing target is washed, wherein a front surface of the tub is open, a door 30 that opens/closes the open front surface of the tub 20, a driver 40 located under the tub 20 to supply, collect, circulate, and discharge the washing water for washing the washing target, a dish rack 50 removably provided in the inner washing space 21 of the tub 20 to receive therein the washing target, and a spraying nozzle 61 and 62 installed adjacent to the dish rack 50 to spray the washing water for washing the washing target thereto. For example, the driver 40 may include a water supply device (1110 in FIG. 11) and a washing device (1150 in FIG. 11).

[0065] For example, the washing target received in the dish rack 50 may be, for example, dishes such as bowls, plates, spoons, and chopsticks, and other cooking utensils. Hereinafter, unless otherwise specified, the washing target will be referred to as a dish.

[0066] In accordance with one embodiment, the tub 20 may be formed in a box shape with an entirely open front surface, and have a configuration of a so-referred to as washing tub.

[0067] For example, the washing space 21 may be defined inside the tub 20. The open front surface of the tub 20 may be opened/closing by the door 30.

[0068] The tub 20 may be formed via pressing of a metal plate resistant to high temperature and moisture, for example, a stainless steel plate.

[0069] In accordance with one embodiment, on an inner surface of the tub 20, a plurality of brackets may be disposed for the purpose of supporting and installing functional components such as the dish rack 50 and the spraying nozzle 61 and 62 which will be described later thereon within the tub 20.

[0070] In one example, the driver 40 may include a sump 41 that stores therein washing water, a sump cover 42 that distinguishes the sump 41 from the tub 20, a water supply pipe 43 that supplies washing water from an external source to the sump 41, a water discharge pipe 44 that discharges the washing water of the sump 41 to an outside, and a washing pump 45 and a supply flow path 46 that supply the washing water of the sump 41 to the

spraying nozzle 61 and 62.

[0071] The sump cover 42 may be disposed at a top of the sump 41 and may serve to distinguish the tub 20 and the sump 41 from each other. Moreover, the sump cover 42 may have a plurality of collecting holes defined therein for collecting washing water sprayed into the washing space 21 through the spraying nozzle 61 and 62 into the sump 41.

[0072] For example, the washing water sprayed from the spraying nozzle 61 and 62 toward the dish may fall down to a bottom of the washing space 21, and may be collected again through the sump cover 42 and into the sump 41.

[0073] In accordance with one embodiment, the washing pump 45 may be disposed at a side or a bottom of the sump 41 and may serve to pressurize the washing water and supply the pressurized washing water to the spraying nozzle 61 and 62.

[0074] One end of the washing pump 45 may be connected to the sump 41 and the other end thereof may be connected to the supply flow path 46. The washing pump 45 may be equipped with an impeller 451 and a motor 453. When power is supplied to the motor 453, the impeller 451 may rotate, and thus the washing water in the sump 41 may be pressurized, and then may be supplied to the spraying nozzle 61 and 62 through the supply flow path 46.

[0075] In accordance with one embodiment, the supply flow path 46 may serve to selectively supply the washing water supplied from the washing pump 45 to the spraying nozzle 61 and 62.

[0076] For example, the supply flow path 46 may include a first supply flow path 461 connected to the first nozzle 61 (for example, a lower spraying arm), and a second supply flow path 463 connected to the second nozzle 62 (for example, an upper spraying arm) and a top nozzle 63. The supply flow path 46 may be provided with a supply flow path switching valve 465 that selectively opens/closes the supply flow paths 461 and 463.

[0077] In this regard, the supply flow path switching valve 465 may be controlled so that the supply flow paths 461 and 463 are opened sequentially or simultaneously.

[0078] In accordance with one embodiment, the spraying nozzle 61 and 62 may be constructed to spray the washing water to the dishes stored in the dish rack 50.

[0079] More specifically, the spraying nozzle 61 and 62 may include the lower spraying arm 61 located under the tub 20 to spray the washing water to a lower rack 51, the upper spraying arm 62 located between the lower rack 51 and an upper rack 52 to spray the washing water to the lower rack 51 and the upper rack 52, and the top nozzle 63 located on top of the tub 20 to spray the washing water to a top rack 53 or the upper rack 52.

[0080] In one example, the lower spraying arm 61 and the upper spraying arm 62 may be rotatably disposed in the washing space 21 of the tub 20 and may spray the washing water toward the dish of the dish rack 50 while being rotating.

[0081] The lower spraying arm 61 may be rotatably supported on a top of the sump cover 42 so as to spray the washing water toward the lower rack 51 while being rotating and being disposed under the lower rack 51.

[0082] Moreover, the upper spraying arm 62 may be rotatably supported by a spraying arm holder 467 so as to spray the washing water on the dish while being rotating and being disposed between the lower rack 51 and the upper rack 52.

[0083] In accordance with one embodiment, in order to increase washing efficiency, additional means for diverting the washing water sprayed from the lower spraying arm 61 into an upward direction (diverting in a U-direction) may be provided at a lower surface 25 of the tub 20 of the dishwasher 100.

[0084] Since a configuration already known in the art may be applied to a detailed configuration of the spraying nozzle 61 and 62, description of a specific configuration of the spraying nozzle 61 and 62 will be omitted below.

[0085] The dish rack 50 for storing the dish therein may be disposed in the washing space 21.

[0086] In accordance with one embodiment, the dish rack 50 may be constructed to extend or retract from or into the inner space of the tub 20 through the open front surface of the tub 20.

[0087] For example, in FIG. 2, an embodiment is shown in which the dish rack 50 includes the lower rack 51 located at a lower portion of the tub 20 to accommodate therein relatively large dishes, the upper rack 52 located on top of the lower rack 51 to accommodate therein medium-sized dishes, and the top rack 53 located at a top level of the tub 20 and capable of storing therein small dishes, etc. However, the present disclosure is not limited thereto. However, hereinafter, an example in which the dishwasher includes the three dish racks 50 as shown is described.

[0088] Each of the lower rack 51, the upper rack 52, and the top rack 53 may be constructed to extend or retract from or into the inner space of the tub 20 through the open front surface of the tub 20.

[0089] For this purpose, guide rails (not shown) may be respectively disposed on both opposing walls constituting an inner surface of the tub 20. By way of example, the guide rails may include an upper rail, a lower rail, and a top rail.

[0090] Wheels may be disposed on a bottom of each of the lower rack 51, the upper rack 52, and the top rack 53. The user may extend the lower rack 51, the upper rack 52, and the top rack 53 from the inner space of the tub 20 through the open front surface of the tub 20 and may place the dishes thereon, or easily withdraw the dishes that have been washed out thereof.

[0091] The guide rail may be embodied as a simple rail-type fixed guide rail to guide the extending or the retracting of the dish rack 50, or a telescopic guide rail capable of guiding the extending or the retracting of the dish rack 50 and at the same time, increasing an extension distance thereof as the dish rack 50 further extends from the inner

space of the tub.

[0092] In one example, the door 30 is configured for opening/closing the open front surface of the tub 20 as described above.

[0093] A hinge (not shown) around which the door 30 is closed or opened may be provided at a bottom of the open front surface. Thus, the door 30 may pivot around the hinge as a pivot axis. Additionally, sensors (e.g., a first main sensor 1131, a second main sensor 1132, and a sub-sensor 1133) for detecting the opening of the door 30 may be placed at appropriate positions.

[0094] For example, the first main sensor 1131 and the second main sensor 1132 may be disposed at a junction between the door 30 and the main body of the dishwasher 100 at which the main body contacts an upper surface of the door 30. Additionally, the sub-sensor 1133 may be disposed around the hinge and may detect the opening of the door 30.

[0095] In this regard, a handle 31 for opening the door 30 and a control panel 32 for controlling the dishwasher 100 may be disposed on an outer side surface of the door 30.

[0096] With reference to FIG. 1, the control panel 32 disposed on the door 30 may include a display 33 that visually displays information regarding a current operating status of the dishwasher, etc., and a button unit 34 including a selection button through which a user's selection manipulation is input and a power button through which a user's manipulation for turning the dishwasher on and off is input.

[0097] In accordance with one embodiment, an inner side surface of the door 30 may constitute a front surface as one surface of the tub 20 when the door 30 has been closed, and may constitute a seat surface on which the lower rack 51 of the dish rack 50 is supported when the door 30 is fully opened.

[0098] For this purpose, when the door 30 is fully opened downwardly (for example, when the user forcibly fully opens the door 30), the inner side surface of the door 30 may constitute a horizontal plane extending in the same direction as a direction in which the guide rail 54 guiding the displacement of the lower rack 51 extends.

[0099] As illustrated in FIG. 2, a door automatic opening module 352 for automatically opening the door outside of the upper surface of the tub 20.

[0100] In accordance with one embodiment, when dry air is supplied into the tub 20 as a dry air supply 80 described hereafter operates, the door automatic opening module 352 moves the door 30 to a predetermined opening position to open a front surface 22 of the tub 20 partially.

[0101] Accordingly, air that becomes moist while cooking vessels are dried may be discharged through the upper side of the open front surface 22 of the tub 20.

[0102] For example, the door automatic opening module 352 may be provided with a push rod 3524 that rotates the upper end of the rear surface of the door 30 to the opening position.

[0103] Additionally, the dry air supply 80 may be provided under the tub 20, and generate high-temperature or low-temperature dry air and supply the same into the washing space in the tub 20.

[0104] According to one embodiment, the dry air supply 80 may include a filter 883 that filters external air, a blowing fan 825 that generates dry airflow, a heater 84 that heats dry airflow, a blow motor 89 for operating the blowing fan 825, and an airflow guide 83 that is disposed in the tub and guides dry airflow.

[0105] In one example, the tub 20 may have a dry air supply hole on the lower surface of the tub 20 to draw high-temperature dry air generated in the dry air supply into the tub 20.

[0106] Hereafter, a detailed configuration of the dry air supply 80 is described with reference to FIG. 3.

[Detailed Configuration of Dry Air Supply]

[0107] FIG. 3 is a front perspective view showing a state in which a dry air supply of a dishwasher according to an embodiment of the present disclosure is accommodated on a base. FIG. 4 is an exploded perspective view of the dry air supply as shown in FIG. 3. FIG. 5 and FIG. 6 are exploded perspective views showing a detailed configuration of a filter and a filter housing as shown in FIG. 4. FIG. 7 and FIG. 8 are front perspective views showing a bottom tub coupled to FIG. 3.

[0108] Hereafter, the detailed configuration of the above-described dry air supply 80 is described with reference to FIGS. 3 to 8.

[0109] As illustrated in FIG. 3, the dry air supply 80 may be accommodated in a base 90 and may be disposed to be supported by a lower surface 91 of the base 90.

[0110] For example, the dry air supply 80 may be disposed in a position adjacent to a rear surface 93 of the base 90, and disposed in a position between a leakage detecting part and the rear surface 93 of the base 90, approximately in parallel with the rear surface 93 of the base 90.

[0111] The position in which the dry air supply is disposed may be selected considering the characteristics of the dry air supply 80 that generates heat of a temperature (e.g., about 100°C) predetermined in a high-temperature dry air supply process or greater. For example, the dry air supply may be disposed to avoid electronic components that are greatly affected by high-temperature heat.

[0112] Additionally, the arrangement position of the dry air supply may be selected based on the position of a dry air supply hole formed on the lower surface 25 of the tub 20. That is, considering the user's safety, the dry air supply hole into which dry air flows may be formed at the corner of the lower surface 25 of the tub 20, which is adjacent to the rear surface and the left side surface of the tub 20.

[0113] For the dry air supply 80 to effectively generate dry air and supply the same to the dry air supply hole formed in the above-described position, the dry air supply

80 may be disposed at the lower side of the dry air supply hole.

[0114] The arrangement position of the dry air supply 80 is merely an example. The dry air supply 80 may be disposed near a left side surface 94, a right side surface 95 or a front surface 92 of the base 90 rather than the rear surface 93 of the base 90. Hereafter, the dry air supply 80 disposed near the rear surface 93 of the base 90 approximately in parallel with the rear surface 93 is described, but the position of the dry air supply 80 is not limited.

[0115] In one example, a support rib (not shown) for supporting the dry air supply 80 and preventing the escape of the dry air supply 80, a plurality of guide ribs (not shown) for setting the position of a leakage detecting part (not shown) that detects whether washing water leaks from the tub 20 and preventing the escape of the leakage detecting part, and a washing water rib (not shown) for guiding washing water being discharged from the dry air supply 80 to the leakage detecting part may be provided on the lower surface 91 of the base 90.

[0116] For example, the support rib, the guide ribs and the washing water rib may be formed integrally on the lower surface 91 of the base 90, for example.

[0117] A first leg 891, a second leg 892 and a third leg 893 of the dry air supply 80 described hereafter may be coupled to the support rib, based on a non-fastening method. That is, the first leg 891, the second leg 892 and the third leg 893 may be simply held at the support rib without an additional fastening means such that the dry air supply 80 may be supported in up-down, front-rear and left-right directions.

[0118] FIGS. 5 to 6 show a detailed configuration of the dry air supply 80.

[0119] In accordance with one embodiment, the dry air supply 80 generating dry air and supplying the same into the tub 20 may include the air blowing fan 825 that generates dry airflow F to be supplied into the tub 20, the heater 84 that heats dry air, a heater housing 81 that has an air passage in which the heater 84 is accommodated, and a filter 883 that filters air to be suctioned into the air blowing fan. For example, the heater housing 81 may be made of a metal material including stainless steel.

[0120] In accordance with one embodiment, the air blowing fan 525 is disposed at the upstream side in the direction of dry airflow F with respect to the heater 84 and the heater housing 81, and accelerates air to the air passage formed in the heater housing 81 to generate dry airflow F.

[0121] The air blowing fan 525, and the air blow motor 89 generating rotational driving force of the air blowing fan 825 may be mutually modularized with each other to constitute an assembly in a way that the air blowing fan and the air blowing motor are accommodated in the fan housing 82.

[0122] The air blowing fan 825 and the fan housing 82 may be fixed to a housing connector 87 that connects a filter housing 881 of a below-described filtering part 88 and the heater housing 81.

[0123] More specifically, the air blowing fan 825 and the fan housing 82 may be accommodated entirely in the filter housing 881 in the state of being fixed to the housing connector 87.

[0124] The type of the air blowing fan to be applied to the dry air supply 80 is not limited, but a sirocco fan, for example, is preferred considering the position and space limitations in the installation of the air blowing fan.

[0125] When a sirocco fan is applied as illustrated, the air filter by the filter 883 may be suctioned from a lower surface 824 of the fan housing 82, in a direction parallel a direction from the center of the sirocco fan to the rotational axis of the same, and be accelerated and discharged outward in the radial direction.

[0126] The accelerated and discharged air may form dry airflow F and be drawn into the air passage in the heater housing 81 through the fan housing 82 and an inlet 8712 of the housing connector 97.

[0127] In this case, the air blowing fan 825, e.g., a sirocco fan, and a rotation shaft 8251 of the motor may be disposed to have directionality approximately parallel with the up-down direction (U-D direction), and the air filtered by the filter 883 may be suctioned through the lower surface 824 of the fan housing 82, for example. For example, the filter 883 may be an air filter.

[0128] In accordance with one embodiment, a PCB board for controlling the motor may be built into an upper surface 821 of the fan housing 82, which corresponds to the opposite side of the lower surface 824 into which the air filtered by the filter 883 is suctioned.

[0129] For example, components as shown in FIG. 11 which will be described later may be disposed on the PCB board and may be electrically connected to each other.

[0130] In accordance with one embodiment, the fan housing 82, as illustrated, may be fixed to a ring-type connection tab 872 provided at the housing connector 87 through a fastening means such as a screw bolt and the like, for example.

[0131] For example, the connection tab 872 may extend from the inlet 8712 of a connector main body 871 in a direction that the connection tab 872 covers an upper surface 821 of the fan housing 82.

[0132] The connection tab 872 may have a pair of fastening bosses 873 that extends from the upper surface of the connection tab 872 in the upward direction (U-direction), as illustrated in FIGS. 7 and 8.

[0133] For example, the pair of fastening bosses 873 may be coupled to a guide boss 8811 e that is provided in a first housing 8811 corresponding to the upper housing of the filtering part 88, in the state of being disposed on the base 90.

[0134] In accordance with one embodiment, the connector main body 871 of the housing connector 87 is coupled to an open front end of the heater housing 81 that is disposed downstream with respect to the flow direction of dry airflow, and together with the heater housing 81, forms an air passage C through which dry airflow flows.

[0135] To this end, the connector main body 871 may

be formed into a hollow hole-shaped box that has a vacant inner portion.

[0136] On the inner surface of the connector main body 871, the cross-sectional area of the air passage C may expand gradually along the flow direction of dry airflow, and the cross-sectional area of a rear end portion 871b to which the heater housing 81 is coupled may be approximately the same as that of the front end portion of the heater housing 81. By doing so, the flow loss of dry airflow may be minimized.

[0137] To support the fan housing 82 and the heater housing 81, the first leg 891 protruding toward the base may be integrally formed under the connector main body 871.

[0138] In one example, based on the illustrated embodiment, the upper surface and the front surface of the box-shaped connector main body 871 may be open at least partially.

[0139] The upper surface and the front surface of the connector main body 871 that are open at least partially provides a passage into which the heater 84 enters while the heater 84 is disposed and fixed to the inside of the air passage C.

[0140] The heater 84 may be indirectly supported in the state of separating from the heater housing 81 and a connector main body 871.

[0141] The front end side of the heater 84 may be supported by a terminal fixation part, in the state of separating from the connector main body 871. A pair of terminals may be fixed to the front surface of the terminal fixation part, in the state of protruding outward.

[0142] The partially open front surface of the connector main body 871 may have a fixation slot 8711 having a U shape that corresponds to the outer shape of the terminal fixation part, and the terminal fixation part is coupled to the fixation slot 8711 in a sliding manner.

[0143] The up-down slide of the terminal fixation part may be guided by the edge of the fixation slot 8711, and may have a guide groove to be coupled with the edge of the fixation slot 8711.

[0144] The partially open upper end of the connector main body 871 may be covered and shielded by an upper housing 812.

[0145] In accordance with one embodiment, a plurality of second support ribs 8715 may be provided under a coupling surface 8716, and support the front end portion of the upper housing 812 having entered into the connector main body 871 from below.

[0146] The entirely open rear end portion 871b of the connector main body 871 may be fixed while being fitted and coupled to the heater housing 81.

[0147] In this regard, the rear end portion 871b of the connector main body 871 may be fitted and coupled to the heater housing 81 in a way that the rear end portion 871b is partially inserted into the heater housing 81.

[0148] To form a fit coupling embodying surface-to-surface contact, a plurality of first support ribs 8714 may be provided at the rear end portion 871b of the

connector main body 871, as illustrated.

[0149] In accordance with one embodiment, the heater 84 (in FIG. 10) is disposed in the air passage formed in the heater housing 81, and preferably, is directly exposed to dry airflow F in the air passage and heats the dry airflow F.

[0150] In accordance with one embodiment, when the dry air supply 80 supplies high-temperature dry air, power may be supplied to the heater 84, and the heater 84 may heat dry air, and when the dry air supply 80 supplies low-temperature dry air, the supply of power to the heater 84 may be cut off, and the heater 84 may stop operating.

[0151] In this regard, when low-temperature dry air is supplied, the air blowing motor may keep operating to generate dry airflow F.

[0152] The type of the heater 84 provided in the dry air supply 80 of one embodiment of the present disclosure is not limited particularly, but a tube-type sheath heater may be selected since the sheath heater has a relatively simple structure, ensures excellent heat generation efficiency and helps to prevent electric leakage caused by the reverse inflow of washing water that comes in from the tub 20 reversely, for example.

[0153] To enhance heat exchange efficiency, the heater 84 that is a sheath heater may have a stereoscopic shape with a plurality of bends, to be directly exposed to dry airflow F at the air passage in the heater housing 81 and ensure a maximum heat transfer surface.

[0154] One end portion and the other end portion of the heater 84 may pass and extend through the front surface of the connector main body 871 of the housing connector 87.

[0155] Additionally, a pair of terminals may be formed in one end portion and the other end portion of the heater 84 and be supplied with power.

[0156] As illustrated, the pair of terminals may be installed and fixed to the connector main body 871 through a terminal fixation part (not shown).

[0157] In this regard, a fixation slot 8711 may be provided on the front surface of the connector main body 871 such that the terminal fixation part is fit-coupled to the front surface of the connector main body 871 in a sliding manner.

[0158] In accordance with one embodiment, the front end side of the heater 84, as described above, may be fixed and supported through the terminal fixation part.

[0159] The rear end side of the heater 84 may be fixed and supported through a single heater bracket 845 disposed in the heater housing 81, as illustrated in FIG. 10. That is, the rear end side of the heater 84 may be supported on the air passage through the heater bracket 845 in the state of being separated from the heater housing 81.

[0160] In accordance with one embodiment, a temperature sensor as a temperature sensing part 86 sensing the temperature of high-temperature dry air generated through the heater 84 or detecting the overheating of the heater 84 may be provided on the upper side surface 8121a of the upper housing 812 of the heater housing 81.

[0161] For example, the temperature sensor 86 may include a thermistor that senses the temperature of dry air, and a thermostat that detects the overheating of the heater 84.

[0162] In addition, the temperature sensor 86 is coupled to the heater housing 81 and can indirectly (or directly) measure the temperature of the heater by measuring the temperature of the heater housing 81 made of metal heated by the heater.

[0163] Alternatively, the temperature of the heater can be known by measuring the temperature of the space inside the heater housing 81, or can be measured indirectly by measuring the temperature of the air passing through the outlet of the dry air supply 80, that is, the hot air outlet of the airflow guide 83.

[0164] This temperature sensor 86 can measure the temperature of the heater, the temperature of the heater housing, the temperature of the interior space of the heater housing, or the temperature of air passing through the outlet of the dry air supply. Additionally, the temperature sensor 86 may transmit information about the measured temperature to the processor (1160 in FIG. 11).

[0165] An output signal of the temperature sensor 86 may be delivered to a processor (1160 in FIG. 11), and the processor (1160 in FIG. 11) may receive the output signal of the temperature sensor to determine the temperature of high-temperature dry air and the overheating of the heater. As the heater overheats, the processor (1160 in FIG. 11) may cut off the supply of power to the heater 84 and change the operation mode of the dry air supply 80 from the high-temperature dry air supply process to the low-temperature dry air supply process.

[0166] In accordance with one embodiment, the heater housing 81 may be formed into a hollow hole that has a vacant inner space such that the air passage, in which the above-described heater 84 and heater bracket 845 are disposed, is formed.

[0167] In this regard, for dry airflow F to move, the front end portion of the heater housing 81, corresponding to the upper stream side with respect to the direction of the movement of the dry airflow F, and the rear end portion of the heater housing 81, corresponding to the lower stream side with respect to the direction of the movement of the dry airflow F, may be open at least partially.

[0168] In accordance with one embodiment, the dry air supply 80 may further include a connection duct part 85 that is coupled to an outlet, formed at the left end side of the heater housing 81 and being open in the upward direction (U-direction), and has an air passage therein.

[0169] As described above, the heater housing 81 and the air blowing fan are disposed under the lower surface 25 of the tub 20. The connection duct part 85 guides dry air being discharged from the heater housing 81 to a predetermined position, i.e., the dry air supply hole formed at the tub 20.

[0170] For example, the predetermined position may be the lower surface 25 of the tub 20, and the dry air supply hole into which dry airflow F guided to the con-

nection duct part 85 is drawn may be formed at a corner of the lower surface 25 of the tub 20, which is adjacent to a rear surface 23 and a left side surface 26.

[0171] As shown in the illustrative embodiment, a duct main body 851 of the connection duct part 85 may have a shape that is capable of changing the direction of dry airflow and connecting the dry air supply hole of the tub 20 and the outlet of the heater housing 81.

[0172] For example, the duct main body 851 of the connection duct part 85 may have a cylinder shape that allows of the fluid communication of a lower end portion 8512 with the outlet of the heater housing 81 and allows an upper end portion 8511 to extend in the upward direction (U-direction) and connect to the dry air supply hole.

[0173] The lower end portion 8512 of the duct main body 851 may be coupled the heater housing 81 in a sliding manner.

[0174] In accordance with one embodiment, in consideration of the cross section of the rectangle-shaped outlet of the heater housing 81, the lower end portion of the duct main body 851 may have a rectangle pillar shape, and for the prevention of leakage, the upper end portion 8511 of the duct main body 851 may have a cylinder shape.

[0175] For example, the duct main body 851 may have a cylinder shape to improve the efficiency of a coupling between the upper end portion 8511 of the duct main body 851 and the dry air supply hole of the tub 20 and to prevent leakage.

[0176] An airflow guide 83 may be coupled to the upper end portion 8511 of the duct main body 851 and divert the direction of dry airflow being supplied through the duct main body 851 to supply the dry airflow to the washing space.

[0177] The filtering part 88 may be disposed in the upper stream of the heater 84 with respect to the flow direction of dry airflow, to filter air to be suctioned into the air blowing fan 825 and supply the filtered air to the heater 84.

[0178] More specifically, the filtering part 88 may include a filter 883 that filters air to be suctioned into the air blowing fan, and a hollow hole-type filter housing 881 that has a filter accommodation space 51 in which the filter 883 is disposed in a replaceable manner and a fan housing accommodation space S 2 in which the fan housing 82 is disposed.

[0179] As illustrated in FIGS. 5 and 6, the filter housing 881 may include a first housing 8811 and a second housing 8812 that are disposed in the form of a segment body that is segmented with respect to the up-down direction (U-D direction), for example. In this regard, the first housing 8811 may be the upper housing, and the second housing 8812 may be the lower housing.

[0180] In accordance with one embodiment, the filter housing 881 accommodates and supports the filter 883 and the fan housing 82 of the air blowing fan 825.

[0181] For example, the first housing 8811 may be divided into a filter receiving portion 8811a and a fan

housing receiving portion 8811b such that the first housing 8811 accommodates and supports the filter 883 and the fan housing 82 at least partially, preferably, accommodates and supports the upper portion of the filter 883 and the upper portion of the fan housing 82.

[0182] As illustrated, the lower surfaces of the filter receiving portion 8811a and the fan housing receiving portion 8811b of the first housing 8811 are open entirely to allow the second housing 8812 to be coupled to the lower sides of the filter receiving portion 8811a and the fan housing receiving portion 8811b of the first housing 8811.

[0183] The filter receiving portion 8811a may be formed further upstream than the fan housing receiving portion 8811b with respect to the flow direction of dry airflow, and in the illustrative embodiment, formed on the right of the fan housing receiving portion 8811b.

[0184] The filter receiving portion 8811a, for example, may have an outer shape of a partial cylinder to accommodate the filter 883 having a cylinder shape in a way that the filter 883 may be inserted and withdrawn when the filter 883 is replaced.

[0185] Additionally, a filter guide rib 8811 may be integrally provided in the filter receiving portion 8811a and have a shape similar to that of a filter guide rib 8812f of the second housing 8812 described hereafter.

[0186] In accordance with one embodiment, the filter receiving portion 8811a may have a coupling opening 8811c at the upper end thereof, and the coupling opening 8811c is open in the form of a circle, to correspond to the outer shape of the filter 883. The filter 883 may move downward through the coupling opening 8811c, and move to a filter receiving portion 8812a of the second housing 8812.

[0187] In accordance with one embodiment, the fan housing receiving portion 8811b may be formed further downstream than the filter receiving portion 8811a with respect to the flow direction of dry airflow, and in the illustrative embodiment, formed integrally at the filter receiving portion 8811a, on the right of the filter receiving portion 8811a, near the heater housing 81.

[0188] The fan housing receiving portion 8811b may have an inner shape corresponding to the outer shape of the upper portion of the fan housing 82, to cover the upper portion of the air blowing fan entirely. For example, the fan housing receiving portion 8811b may have an upper surface formed into a flat plate.

[0189] However, a vent hole 8811f may be formed in the central portion of the upper surface of the fan housing receiving portion 8811b, to expose the fan housing 82's upper surface 821 area, where the PCB substrate is disposed, to the outside at least partially, thereby cooling the above-described PCB substrate and motor of the air blowing fan. A hollow hole cylinder-type vent duct 8811g may be formed under the vent hole 8811f and extend toward the upper surface 821 of the fan housing 82.

[0190] In accordance with one embodiment, a water discharge channel 8811h formed into a slit may be provided on the upper surface of the fan housing receiving

portion 8811b, and one end portion of the water discharge channel 8811h connects to the lower end of the vent duct 8811g, and the other end portion of the water discharge channel 8811h extends to the front surface of the first housing 8811. Thus, the washing water drawn into the vent hole 8811f may move through the water discharge channel 8811h and be discharged toward the base 90.

[0191] As illustrated, the upper surface of the first housing 8811 may have an inclined surface 8811b1 that connects the upper end of the filter receiving portion 8811a and the fan housing receiving portion 8811b. The water discharge channel 8811h discharges washing water that leaks from the upper end of the filter receiving portion 8811a and then is drawn into the vent duct 8811g along the inclined surface.

[0192] As a means of minimizing the flow of the washing water flowing along the inclined surface into the vent duct, a blocking rib may be integrally provided on the upper surface of the first housing. The blocking rib, for example, may include a first blocking rib 8811i1 provided on the upper side surface of the fan housing receiving portion 8811b, and a second blocking rib 8811i2 provided on the inclined surface 8811b1. The first blocking rib 8811i1 may extend along the front-rear direction, in a line shape, and the second blocking rib 8811i2 may extend along the front-rear direction in a curved line shape.

[0193] In accordance with one embodiment, a pair of guide bosses 8811 e may be provided in the first housing 8811 and protrude toward the fan housing 82 from the upper surface of the first housing 8811. Each of the guide bosses 8811 e protrudes toward the above-described connection tab 872 of the housing connector 87, and joins each of the pair of fastening bosses 873 provided at the connection tab 872.

[0194] In one example, the left side surface of the fan housing receiving portion 8811b of the first housing 8811 is partially open and form a portion of a housing connector coupling hole 881 a. The remaining portion of the housing connector coupling hole 881 a may be formed on the left side surface of a fan housing receiving portion 8812b of the second housing 8812 described hereafter.

[0195] In accordance with one embodiment, the connector main body 871 of the housing connector 87 may be inserted into the filter housing 881 at least partially through the housing connector coupling hole 881a. To this end, the shape of the housing connector coupling hole 881a may correspond to the outer shape of the connector main body 871.

[0196] In accordance with one embodiment, the second housing 8812 of the filter housing 881 is coupled to the lower portion of the first housing 8811 and forms a sealed accommodation space, and accommodates and supports the lower portions of the filter 883 and the fan housing 82.

[0197] Like the first housing 8811, the second housing 8812 may be divided into a filter receiving portion 8812a and a fan housing receiving portion 8812 b, to accom-

modate and support the lower portion of the filter 883 and the lower portion of the fan housing 82.

[0198] As illustrated, the upper end of the second housing 8812 may be open entirely to be coupled to the lower end of the first housing 8811.

[0199] In accordance with one embodiment, in a corresponding manner to the filter receiving portion 8811a of the first housing 8811, the filter receiving portion 8812a of the second housing 8812, provided under the filter receiving portion 8811a of the first housing 8811, may be provided with a plurality of filter guide ribs 8812f that guides the filter 883's movement and prevents the filter 883's escape from the right position at a time of inserting the filter 883.

[0200] The filter guide rib 8812f may protrude upward from a bottom surface 8812e of the filter receiving portion 8812a, and its lower end may be integrally formed on the bottom surface 8812e of the filter receiving portion 8812a.

[0201] Additionally, in a corresponding manner to the filter 883's outer shape formed into a cylinder, the plurality of filter guide ribs 8812f may be arranged and disposed in a radial shape around the filter 883.

[0202] In accordance with one embodiment, as the center of the plurality of filter guide ribs 8812f, a lower suction opening 8812c may be formed on the bottom surface 8812e of the filter receiving portion 8812a in a penetrating manner, and be open toward the lower surface of the base 90 and allows external air to be drawn.

[0203] The lower suction opening 8812c may have a circle shape to correspond to the shape of a lower opening of the filter 883 having a cylinder shape, and a relative position and size of the lower suction opening 8812c may be determined to allow external air to pass through the lower opening and to be smoothly suctioned into the filter 883.

[0204] In accordance with one embodiment, as one airtight means, a pair of ring-type ribs may be formed around the lower suction opening 8812c of the bottom surface 8812e of the second housing 8812, and prevent non-filtered external air from being leaked and suctioned into the inner space of the filter housing 881 directly.

[0205] In accordance with one embodiment, the fan housing receiving portion 8812b may be formed further downstream than the filter receiving portion 8812a with respect to the flow direction of dry airflow, and in the illustrative embodiment, formed integrally at the filter receiving portion 8812a, on the right of the filter receiving portion 8812a, near the heater housing 81.

[0206] The fan housing receiving portion 8811b may have an inner shape corresponding to the outer shape of the lower portion of the fan housing 82, to cover the lower portion of the air blowing fan entirely.

[0207] The bottom surface 8812e of the fan housing receiving portion 8811b may be spaced a predetermined distance apart from the lower surface 824 of the fan housing 82, to allow filtered air to be suctioned effectively, and for example, be formed into a flat surface in a direc-

tion parallel with the horizontal direction.

[0208] As a means of spacing the fan housing 82 apart from the bottom surface 8812e of the fan housing receiving portion 8811b and supporting the fan housing 82, a plurality of uplifted surface parts 8812e3 and a screw boss 8812e2 that protrude from the bottom surface 8812e may be provided in the fan housing receiving portion 8812b.

[0209] In accordance with one embodiment, the plurality of uplifted surface parts 8812e3 is provided to avoid another structure disposed under the second housing 8812, and for example, provided to avoid the base's ribs and leakage detecting part disposed under the second housing 8812.

[0210] Accordingly, the shape of an individual uplifted surface part 8812e3 may vary depending on the shape of another avoided structure.

[0211] The plurality of uplifted surface parts 8812e3 may be used as a support part that supports the fan housing 82 in the state of being spaced from the bottom surface of the fan housing receiving portion 8811b. Thus, the air blowing fan may be disposed such that the lower surface 824 of the fan housing 82 surface-contacts the upper end surface of an individual uplifted surface part 8812e3.

[0212] Further, the plurality of uplifted surface parts 8812e3 may function as a stopper that prevents the filter housing 881 from moving relative to the base 90 in the front-rear direction.

[0213] The screw boss 8812e2 supports the lower surface 824 of the fan housing 82 together with an individual uplifted surface part 8812e3. Additionally, the screw boss 8812e2 may be provided with a bolt hole 8812e1 into which one of the pair of screw bolts fastening the fan housing 82 and the connection tab 872 of the housing connector 87 at the same time is inserted.

[0214] The other remaining bolt hole 8812e1 may be formed at any one of the plurality of uplifted surface parts 8812e3 in a penetrating manner.

[0215] In the first housing 8811 and the second housing 8812 that are disposed in the form of a segment body as described above, the lower end of the first housing 8811 and the upper end of the second housing 8812 may be detachably coupled to each other.

[0216] To achieve the above-described detachable coupling relationship, a fastening tab 8811d extending toward the second housing 8812 is provided at the lower end of the first housing 8811, and a hook protrusion 8812d may be provided at the upper end of the second housing 8812 and fastened to the fastening tab 8811d based on a hook coupling.

[0217] A tub connection duct 882 may be detachably coupled and fastened to the coupling opening 8811c of the filter receiving portion 8811a of the first housing 8811.

[0218] The filter 883 of the filtering part 88 of one embodiment of the present disclosure may be replaced through the lower surface 25 of the tub 20.

[0219] To this end, the filter receiving portion 8811a of

the first housing 8811 needs to connect to the lower surface 25 of the tub 20, and the tub connection duct 882 connects the lower surface 25 of the tub 20 and the filter receiving portion 8811a of the first housing 8811.

[0220] The tub connection duct 882 may be integrally provided at the filter receiving portion 8811a of the first housing 8811. Hereafter, the tub connection duct 882 that is additionally provided in the first housing 8811, as illustrated, is described.

[0221] Like the duct main body 851 of the above-described connection duct part 85, an upper end portion 8821 of the tub connection duct 882 may pass through the lower surface 25 of the tub 20 and extend upward.

[0222] A filter replacement hole 253 may be provided on the lower surface 25 of the tub 20 to allow the upper end portion 8821 of the tub connection duct 882 to come in, as illustrated in FIGS. 7 and 8.

[0223] A sump hole 252 on which a sump 41 is mounted may be provided in the central portion of the lower surface 25 of the tub 20. The lower surface 25 of the tub 20 may have a convergence surface having an inclination angle at which the convergence surface gradually inclines downward toward the sump hole 252, to allow washing water to be effectively converged on the sump hole 252.

[0224] As illustrated, the filter replacement hole 253 may be formed on the convergence surface, at the rear of the sump hole 252.

[0225] To distinguish the filter replacement hole 253 from the dry air supply hole, the filter replacement hole 253 may be formed at the corner adjacent to the rear surface and the right side surface, on the lower surface 25 of the tub 20. Additionally, to easily insert and withdraw the filter 883 for replacement, the filter replacement hole 253 may be disposed closer to the front surface of the tub 20 than the dry air supply hole and disposed further rearward than a water softener communication hole 255.

[0226] In accordance with one embodiment, the water softener communication hole 255 formed in front of the filter replacement hole 253, for example, may be used to insert a water softening agent into a water softener (not shown) provided under the water softener communication hole 255, and the like, or used for the replacement and maintenance and repairs of another component such as a purification filter (not shown) of a water supply, and the like.

[0227] In accordance with one embodiment, the filter replacement hole 253 may be disposed between the water softener communication hole 255 and the dry air supply hole with respect to the front-rear direction or the left-right direction.

[0228] That is, the filter replacement hole 253 may be disposed outside a virtual extension line that connects the water softener communication hole 255 and the dry air supply hole.

[0229] Thus, even when the lower surface 25 of the tub 20 has a plurality of openings, the strength, torsional rigidity and flexural rigidity of the tub 20 may not de-

crease.

[0230] In accordance with one embodiment, in order to distinguish the filter replacement hole 253 from the water softener communication hole 255 formed in front of the filter replacement hole 253, a sealing cap 884 having a different shape or color from the water softener communication hole 255 may be applied at the upper end of the tub connection duct 882 that passes through the filter replacement hole 253 and is exposed to the washing space.

[0231] To improve coupling efficiency and prevent leakage between the upper end portion 8821 of the tub connection duct 882 and the filter replacement hole 253 of the tub 20, the tub connection duct 882 may be formed into a cylinder.

[0232] As a means of improving coupling efficiency and preventing leakage, a ring-type flange 8823 and a male screw part 8824 may be provided at the upper end portion 8821 side of the tub connection duct 882.

[0233] The upper end portion 8821 of the tub connection duct 882 may pass through the lower surface 25 of the tub 20 and extend in the upward direction (U-direction), and the upper end portion 8821 of the tub connection duct 882 and the male screw part 8824 may pass through the lower surface 25 of the tub 20 and protrude toward the inside of the tub 20 at least partially.

[0234] As described above, the filter replacement hole 253 is provided on the convergence surface provided on the lower surface 25 of the tub 20. Thus, the tub connection duct 882's upper end portion 8821 and flange 8823 coupled to the filter replacement hole 253 may have a predetermined inclination angle with respect to the perpendicular direction, to correspond to the inclination angle of the convergence surface of the tub 20, i.e., may be formed to incline with respect to the perpendicular direction.

[0235] A fastening nut 886 may be coupled to the male screw part 8824 that is disposed by passing through the tub 20.

[0236] In accordance with one embodiment, at a time of fixing and fastening the tub connection duct 882, the fastening nut 885 is screw-coupled to the male screw part 8824, in the tub 20. Accordingly, the upper end portion 8821 of the tub connection duct 882 may be fixed in the state of being exposed to the inside of the tub 20. A first gasket 885 may be further provided between the flange 8823 and the lower surface 25 of the tub 20 to prevent the fastening nut 886 from loosening and prevent leakage.

[0237] As the tub connection duct 882 is fixed to the lower surface 25 of the tub 20 through the fastening nut 886, the sealing cap 884 may be coupled to the upper end portion 8821 of the tub connection duct 882 exposed to the inside of the tub 20. In this regard, an airtight ring 887 for preventing water leakage may be disposed between the sealing cap 884 and the upper end portion 8821 of the tub connection duct 882.

[0238] Additionally, an upper suction opening 8826 into which external air is drawn may be formed in a position

under the flange 8823, corresponding to the upper side of the filter accommodation space S1, between the upper end portion 8821 and a lower end portion 8822 of the tub connection duct 882, in a penetrating manner.

[0239] In accordance with one embodiment, the upper suction opening 8826 may be formed in a way that penetrates the cylinder-type tub connection duct 882 from the inner circumferential surface thereof to the outer circumferential surface thereof. For example, the upper suction opening 8826 may be provided as a plurality of penetration openings arranged and formed along the circumferential direction of the tub connection duct 882.

[0240] Since the upper suction opening 8826 is formed along the circumferential direction of the tub connection duct 882 that extends approximately perpendicularly, the upper suction opening 8826 is open approximately horizontally. External air suctioned into the upper suction opening 8826 forms airflow having directionality approximately parallel with the horizontal direction.

[0241] In this regard, in order to prevent a reduction in strength of the tub connection duct 882, the upper suction opening 8826 provided as a plurality of penetration openings may be formed into a slit having an up-down height less than a circumferential width.

[0242] In accordance with one embodiment, each of the plurality of penetration openings constituting the upper suction opening 8826 may have the same open surface area, to allow external air to be suctioned evenly along the circumferential direction.

[0243] The upper suction opening 8826 may be formed higher than an upper opening of the filter 883, in the state where the filter 883 is disposed in the filter accommodation space S1. Accordingly, the upper suction opening 8826 may be formed between the tub 20 and an upper surface 8835 of the filter 883 with respect to the up-down direction.

[0244] Therefore, after external air having passed through the upper suction opening 8826 in a direction parallel with the horizontal direction may enter into the filter 883, the direction of the airflow changes, and the external air may be filtered while passing through the outer circumferential surface 8832 of the filter 883.

[0245] In accordance with one embodiment, in the filtering part 88 according to the present disclosure, external air may flow into the filter 883 through two suction paths comprising the lower suction opening 8812c and the upper suction opening 8826 that are spaced from each other along the up-down direction. Thus, a sufficient flow rate of dry airflow F required to dry a wash target may be ensured effectively.

[0246] The suction path of external air and the flow path of dry airflow having passed through the filter are described hereafter with reference to FIG. 10.

[0247] Further, a fastening part 8825 for providing a detachably fastening function to the coupling opening 8811c of the first housing 8811 may be integrally provided in the lower end portion 8822 of the tub connection duct 882. For example, the fastening part 8825 may be a

fastening means that is coupled to the coupling opening 8811c of the first housing 8811 based on a hook coupling.

[Airflow Path Before and After Filtering]

[0248] FIG. 9 is a plan view of FIG. 7. FIG. 10 is a cross-sectional view of FIG. 9 cut in a A-A direction.

[0249] Hereinafter, the flow path of external air before the external air passes through the filter 883 of the dishwasher 1 of one embodiment, and the flow path of dry airflow F after external air passes through the filter 883 and is filtered are described with reference to FIG. 9 and FIG. 10.

[0250] The first housing 8811 and the second housing 8812 of the filter housing 881 of the dishwasher 1 of one embodiment are spaced from each other in the up-down direction, and in the filter housing 881, external air is suctioned through a plurality of suction openings that are open toward a space between the base 90 and the tub 20.

[0251] As described above, the plurality of suction openings may include the upper suction opening 8826 provided at the tub connection duct 882, at the upper side of the filter accommodation space S1, and the lower suction opening 8812c provided on the bottom surface 8812e of the second housing 8812, at the lower side of the filter accommodation space S1.

[0252] As described above, the upper suction opening 8826 and the lower suction opening 8812c are spaced from each other and disposed respectively in the uppermost position and the lowermost position of the filter housing 881 with respect to the space between the tub 20 and the base 90. Accordingly, in the state where the effect of the flow rate of air suctioned respectively into the upper suction opening and the lower suction opening is minimized, external air may flow into the filter housing 881 through the two suction inlets, thereby ensuring more flow rate of air required to dry a wash target and spending less time drying a wash target than usual.

[0253] As illustrated, the upper suction opening 8826 is open in a direction approximately parallel with the horizontal direction. Accordingly, external air suctioned into the upper suction opening 8826 forms airflow of a direction parallel with the horizontal direction.

[0254] In accordance with one embodiment, the lower suction opening 8812c is formed on the bottom surface 8812e that extends horizontally. Accordingly, the lower suction opening 8812c is open toward the base 90 in a direction parallel with the perpendicular direction, and external air suctioned into the lower suction opening 8812c forms airflow of a direction parallel with the perpendicular direction.

[0255] External air suctioned through the upper suction opening 8826 may enter into the upper opening of the filter 883 disposed right under the upper suction opening 8826 in the state where the filter 883 is disposed in the filter accommodation space S1.

[0256] Additionally, external air suctioned through the

lower suction opening 8812c may enter into the lower opening of the filter 883 disposed right on the lower suction opening 8812c in the state where the filter 883 is disposed in the filter accommodation space S1.

[0257] In accordance with one embodiment, in the state where the filter 883 is disposed, an airtight means of preventing non-filtered air from being suctioned into the filter housing 881 may be provided at the upper end side and the lower end side of the filter 883. The airtight means may include a second gasket 8852 fixed to the coupling opening 8811c of the first housing 8811, and a pair of ring-type ribs 8812 g provided around the lower suction opening 8812c of the second housing.

[0258] Thus, external air suctioned into the upper suction opening 8826 and the lower suction opening 8812c may enter respectively into the upper opening and the lower opening of the filter 883, without leaking.

[0259] In accordance with one embodiment, in the state where the filter 883 is disposed in the filter accommodation space S1, the upper opening of the filter 883 is open toward the lower surface 25 of the tub 20, and the lower opening of the filter 883 is open toward the lower surface of the base 90. Accordingly, the direction of airflow of external air changes to the downward direction while passing through the upper opening, and external air having passed through the lower opening flows upward.

[0260] As described above, external air suctioned into the filter 883 may pass through the filtering material of the filter 883 and be evenly suctioned entirely in the up-down direction and circumferential direction.

[0261] In accordance with one embodiment, external air suctioned into an inner circumferential surface 8831 of the filter 883 is filtered, and while passing through the outer circumferential surface 8832 of the filter 883, is discharged, and immediately after the discharge, the flow direction of the external air changes.

[0262] As illustrated in FIG. 10, the flow direction of the filtered air having passed through the outer circumferential surface 8832 of the filter 883 may change toward the lower surface 824 of the fan housing 82 that is open toward the bottom surface 8812e of the filter housing 881.

[0263] In accordance with one embodiment, the lower surface 824 of the fan housing 82 is disposed in a position spaced upward from the bottom surface 8812e, between the lower end and the upper end of the filter 883. Accordingly, air, having passed through the filter 883 in a position higher than the lower surface 824 of the fan housing 82, flows downward to the lower surface 824 of the fan housing 82, and air, having passed through the filter 883 in a position lower than the lower surface 824 of the fan housing 82, flows upward to the lower surface 824 of the fan housing 82.

[0264] The filtered air drawn into the fan housing 82 through the above-described flow path is accelerated by a fan and then drawn into the housing connector 87 and the inner space of the heater housing 81 through an exhaust duct 822, such that dry airflow F is generated.

[0265] FIG. 11 is a block diagram of a dishwasher

according to an embodiment of the present disclosure.

[0266] Referring to FIG. 11, the dishwasher 100 according to an embodiment of the present disclosure may include the water supply device 1110, a memory 1120, the door automatic opening module 352, a sensor 1130, and a speaker 1140, the display 33, the button unit 34, the washing device 1150, the dry air supply 80, and the processor 1160.

[0267] For example, the door automatic opening module 352 may include a driving motor 353, and the sensor 1130 may include the first main sensor 1131, the second main sensor 1132, and the sub-sensor 1133. Additionally, the washing device 1150 may include the washing pump 45, the first nozzle 61, and the second nozzle 62. Furthermore, the dry air supply 80 may include the blower motor 89, the heater 84, and the temperature sensor 86.

[0268] Such dishwasher 100 may control ON/OFF of the heater 84 to properly maintain the temperature of the heater 84 during a stroke of drying the dishes with the door open (e.g., a door opening drying process).

[0269] The configuration of the dishwasher 100 shown in FIG. 11 is according to an embodiment, the components of the dishwasher 100 are not limited to those in the embodiment shown in FIG. 11, and some components are able to be added, changed, or deleted as needed.

[0270] According to an embodiment, the water supply device 1110 may supply water into the dishwasher 100. The water supply device 1110 may include the water supply pipe 43 that forms a water supply passage through which water is supplied from the external water source, and a water supply valve (not shown) that opens and closes the water supply passage formed in the water supply pipe 43.

[0271] According to an embodiment, the memory 1120 may store a control signal related to an operating condition, a time condition, and the like for each stroke of the dishwasher 100. Furthermore, the memory 1120 may store the control signal for controlling operation of the door automatic opening module 352, the display 33, the washing device 1150, the sensor 1130, the dry air supply 80, and the like.

[0272] According to an embodiment, the memory 1120 may store at least one command for each stroke (or an operation process) of the dishwasher 100 (e.g., a washing process, a rinsing process, an additional rinsing process, a heated rinsing process, a drying process, and the like). The memory 1120 may store various programs that enable the dishwasher 100 to operate based on each stroke (or the operation process).

[0273] According to an embodiment, the memory 1120 may store information, data, programs, and the like necessary for the operation of the dishwasher 100. Specifically, information regarding the stroke of the dishwasher 100 (e.g., the washing process, the rinsing process, the additional rinsing process, the heated rinsing process, the drying process, and the like) may be stored in advance in the memory 1120. The information may include information on an operation time period of each stroke.

Furthermore, the information may include information on an operation sequence of each stroke.

[0274] According to an embodiment, the drying process may include hot air drying of drying the dishes by supplying hot air, door opening hot air drying of drying the dishes by opening the door and then supplying hot, door opening drying of drying the dishes by opening the door, and condensation drying. Additionally, the memory 1120 stores information, data, and commands necessary for such hot air drying, door opening hot air drying, door opening drying, and condensation drying.

[0275] According to an embodiment, the memory 1120 may store a program built to execute commands that control the operation of the dishwasher 100.

[0276] For example, the program may include commands that identify whether the dishwasher 100 enters the door opening drying process, and commands that open the door 30 and operate the heater when it is identified that the dishwasher 100 has entered the door opening drying process.

[0277] Furthermore, the program may include commands that control ON/OFF of the heater 84 such that the temperature of the heater 84 is maintained within a first threshold range when a time period during which the dishwasher 100 enters the door opening drying process and operates is smaller than a predetermined time period.

[0278] Furthermore, the program may include commands that control ON/OFF of the heater 84 such that the temperature of the heater 84 is maintained within a second threshold range when a time period during which the dishwasher 100 enters the door opening drying process and operates is equal to or greater than the predetermined time period.

[0279] For example, the predetermined time period may be 600 seconds, the first threshold range may be a range from 111 degrees to 114 degrees, and the second threshold range may be a range from 117 degrees to 120 degrees, but these are merely an example and the predetermined time period, the first threshold range, and the second threshold range may be adjusted variably.

[0280] In addition, the program may include commands that generally control the operation of the dishwasher by the processor 1160.

[0281] According to an embodiment, when receiving a control signal for opening the door 30 from the processor 1160, the door automatic opening module 352 may be electrically operated to pivotably open the door 30.

[0282] To this end, the door automatic opening module 352 may include the driving motor 353 that generates a rotational driving force, a reduction gear that reduces the rotational driving force of the driving motor 353 and converts the rotational driving force into a linear reciprocating driving force, and a push rod that reciprocates linearly in a front and rear direction by the linear reciprocating driving force.

[0283] According to an embodiment, the sensor 1130 may include the first main sensor 1131, the second main

sensor 1132, and the sub-sensor 1133 that may detect the opening or closing of the door 30. The sensor 1130, for example, the first sensor 741 and the second sensor 742 may be disposed at a junction of the main body of the dishwasher 100 in contact with the upper surface of the door 30.

[0284] For example, each of the first main sensor 1131 and the second main sensor 1132 may include a microswitch that generates and outputs an ON signal when the door 30 is in a closed position, and generates and outputs an OFF signal when the door 30 leaves the closed position.

[0285] To this end, the microswitch may include a push button that is maintained in a pressed state when the door 30 is in the closed position and is released from the pressed state when the door 30 leaves the closed position. An electrical circuit may be disposed inside the microswitch to detect whether the push button is pressed and generate an electrical output signal including the ON signal or the OFF signal.

[0286] For example, even in a situation such as when a functional failure occurs in one of the first main sensor 1131 and the second main sensor 1132 or when the door 30 is incompletely opened, the processor 1160 may accurately identify the closed or open state of the door 30 via one of such first main sensor 1131 and second main sensor 1132.

[0287] According to an embodiment, the sub-sensor 1133 may detect whether the door 30 reaches a forced opening detection position.

[0288] For example, the sub-sensor 1133 may include a microswitch that outputs the ON signal when the position of the door 30 is between the closed position and the forced opening detection position, and outputs the OFF signal when the position of the door 30 reaches the forced opening detection position.

[0289] However, unlike the first main sensor 1131 and the second main sensor 1132, which detect the position of the door 30 by being in direct contact with the door 30, the sub-sensor 1133 may indirectly detect the position of the door 30.

[0290] According to an embodiment, the button unit 34 may include a selection button through which a user's selection manipulation is input, a power button through which a user's manipulation to turn on/off the dishwasher is input, and the like. The button portion 34 may include the power button, the selection button, and the like. Via the button unit 34, the processor 1160 may receive a user's control command signal (e.g., a power on signal and a power off signal), a stroke selection signal, and the like.

[0291] According to an embodiment, the speaker 1140 may output an alarm regarding an operation state, an operation time period, whether the washing is complete, and the like of the dishwasher 100 in voice or sound. The alarm output via the speaker 1140 may include an alarm output when the user forcibly opens or closes the door 30.

[0292] According to an embodiment, the speaker 1140

may output different sounds for each process of the stroke, activation or deactivation of the sensor (e.g., the first main sensor 1131, the second main sensor 1132, the sub-sensor 1133, and the temperature sensor 86), a pause in the stroke, a start or a restart of the stroke, and the opening or the closing of the door 30.

[0293] Furthermore, the speaker 1140 may output different alarms regarding various operations of the dishwasher 100 by the processor 1160.

[0294] According to an embodiment, the washing device 1150 may supply washing water to the first nozzle 61 and the second nozzle 62 via the washing pump 45, so that the washing water may be sprayed via the first nozzle 61 and the second nozzle 62.

[0295] Alternatively, the washing device 1150 may drain water present inside the dishwasher 100 to the outside. The washing device 1150 may include the water discharge pipe 44 having a drain passage defined therein that leads water stored in the sump 41 to the outside. Furthermore, the washing device 1150 may include a drain pump that is disposed on the drain passage defined in the water discharge pipe 44 and drains washing water in the sump 41 to the outside via a drain motor (not shown).

[0296] According to an embodiment, the dry air supply 80 is electrically connected to the blower motor 89, the heater 84, and the temperature sensor 86. For example, when the door 30 is at least partially opened, the processor 1160 may simultaneously supply power to the blower motor 89 and the heater 84 to supply high-temperature hot air or may block power supply to the heater 84 and operate only blower motor 89 to supply low-temperature dry air. In the process of supplying high-temperature dry air, the processor 1160 may identify whether dry air at an appropriate temperature is being supplied and whether overheating occurs in the process of supplying high-temperature dry air, via an output signal of the temperature sensor 86 (e.g., a detection signal of the temperature of the heater 84).

[0297] According to an embodiment, the display 33 may include a display panel, a light-emitting element, and a touch detection sensor. The light-emitting element may be disposed around the touch detection sensor.

[0298] The display panel may display various information regarding the overall operation of the dishwasher 100. Additionally, the light-emitting element may output information regarding whether the pause function is usable or not usable. Additionally, the touch detection sensor may detect an input to pause the stroke of the dishwasher 100.

[0299] According to an embodiment, the processor 1160 may load a command or data received from the memory 1120 to the memory 1120 and process the same, and may store the processed data in the memory 1120. Alternatively, the processor 1160 may display the processed data via the display 33.

[0300] According to an embodiment, the processor 1160 may have a built-in artificial intelligence algorithm.

Alternatively, the algorithm for the artificial intelligence may be implemented by the processor 1160. The artificial intelligence may support a deep learning algorithm that independently analyzes, recognizes, infers, and determines various data as a program that imitates a human brain neural network.

[0301] According to an embodiment, when detecting an input to start the stroke of the dishwasher 100, the processor 1160 may start a reservation operation for washing the dishes present in a room of the dishwasher 100. The reservation operation may include a pretreatment process for operating the dishwasher 100 and a process for heating washing water.

[0302] According to an embodiment, when the stroke of the dishwasher 100 enters the drying process (e.g., the door opening drying process), the processor 1160 may turn on the blower motor 89, and when the blowing fan 825 does not operate for a first time period (e.g., 6 seconds) based on the turn on(ON) of the blower motor 89, may count the number of failures.

[0303] Alternatively, the processor 1160 may turn on the blower motor 89 just before the stroke of the dishwasher 100 enters the drying process (e.g., the door opening drying process), and when the blowing fan 825 does not operate for the first time period (e.g., 6 seconds) based on the turn on(ON) of the blower motor 89, may count the number of failures.

[0304] According to an embodiment, when the counted number of failures is equal to or greater than a predetermined number of times (e.g., 3 times), the processor 1160 may determine that at least one of the blower motor 89 and the blowing fan 825 has failed. In addition, the processor 1160 may output an error message regarding the failure of the at least one of the blower motor 89 or the blowing fan 825 using at least one of the display 33 or the speaker 1140.

[0305] According to an embodiment, when determining that the blower motor 89 and the blowing fan 825 are normal, the processor 1160 may determine an open or short state of the temperature sensor 86. When the open or short state of the temperature sensor 86 is maintained for a certain time period (e.g., 10 seconds) or more, the processor 1160 may determine that the temperature sensor 86 has failed. Additionally, the processor 1160 may output an error message regarding the failure of the temperature sensor 86 using at least one of the display 33 or the speaker 1140.

[0306] According to an embodiment, the processor 1160 may identify whether the door 30 is opened automatically based on the drying process (e.g., the door opening drying process), whether the door 30 is forcibly closed by the user, or whether the door 30 is forcibly opened by the user (i.e., when the door opens more than it does via the automatic operation).

[0307] For example, when it is identified that at least one of the first main sensor 1131 or the second main sensor 1132 is turned off and the sub-sensor 1133 is turned on, the processor 1160 may determine that the

door 30 has been automatically opened for the dishwasher 100 to enter the door opening drying process.

[0308] Further, when determining that the door 30 is automatically opened, the processor 1160 may start the drying process (e.g., the door opening drying process).

[0309] According to an embodiment, when it is identified that both the first main sensor 1131 and the second main sensor 1132 are not turned off, the processor 1160 may determine that the door 30 has been forcibly closed, and may automatically open the door 30 that has been forcibly closed by the user. Additionally, the processor 1160 may automatically open a handle of the door 30 after a certain time period (e.g., 3 seconds) elapses after the door 30 is automatically opened.

[0310] According to an embodiment, when it is identified that at least one of the first main sensor 1131 or the second main sensor 1132 is turned off and the sub-sensor 1133 is not turned on, the processor 1160 may determine that the door 30 has been forcibly opened by the user. The forced opening, in which the door 30 is forcibly opened by the user, implies that the door 30 is opened further from the main body 10 than it is in the automatic opening, in which the door 30 is opened automatically by the drying process (e.g., the door opening drying process).

[0311] According to an embodiment, when determining that the door 30 has been forcibly opened, the processor 1160 may turn off the heater 84, and control the motor 89, the heater 84, and the blowing fan 825 such that the dishwasher 100 operates in a cold air drying process. For example, the processor 1160 may operate the blower motor 89, turn off the heater 84, and operate the blowing fan 825 such that the dishwasher 100 operates in the cold air drying process.

[0312] According to an embodiment, when the blowing fan 825 and the temperature sensor 86 operate normally and it is identified that the door 30 has been automatically opened based on the drying process (e.g., the door opening drying process), the processor 1160 may operate the heater 84 to execute the door opening drying process.

[0313] According to an embodiment, the processor 1160 may measure the temperature of the heater 84 via the temperature sensor 86 when the dishwasher 100 enters the door opening drying process. In addition, the processor 1160 may compare the time period during which the dishwasher 100 enters the door opening drying process and operates (e.g., the time period during which the door opening drying process is in progress) with the predetermined time period (e.g., the time period set for the door opening drying process). For example, the processor 1160 may operate the dishwasher 100 in the door opening drying process for the time period set for the door opening drying process.

[0314] According to an embodiment, when the time period during which the dishwasher 100 enters the door opening drying process and operates is smaller than the predetermined time period (e.g., 600 seconds), the pro-

cessor 1160 may control the ON/OFF of the heater 84 such that the temperature of the heater 84 is maintained within the first threshold range (e.g., the range from 111 degrees to 114 degrees).

[0315] According to an embodiment, when the time period during which the dishwasher 100 enters the door opening drying process and operates is not equal to or greater than the predetermined time period (e.g., 600 seconds), the processor 1160 may compare the temperature of the heater 84 measured via the temperature sensor 86 with a first temperature (e.g., 111 degrees). Further, when the temperature of the heater 84 is equal to or lower than the first temperature (e.g., 111 degrees), the processor 1160 may maintain the heater 84 in the ON state.

[0316] Further, when the temperature of the heater 84 is not equal to or lower than the first temperature (e.g. 111 degrees), the temperature of the heater 84 may be compared with a second temperature (e.g. 114 degrees) higher than the first temperature (e.g. 111 degrees).

[0317] As such, when the time period during which the dishwasher 100 enters the door opening drying process and operates is not equal to or greater than the predetermined time period (e.g., 600 seconds), the processor 1160 may control the heating temperature of the heater 84 such that the temperature of the heater 84 is within the first threshold range (e.g., the range from 111 degrees to 114 degrees).

[0318] According to an embodiment, when the time period during which the dishwasher 100 enters the door opening drying process and operates is equal to or greater than the predetermined time period (e.g., 600 seconds), the processor 1160 may control the ON/OFF of the heater 84 such that the temperature of the heater 84 is maintained within the second threshold range (e.g., the range from 117 degrees to 120 degrees).

[0319] According to an embodiment, when the time period during which the dishwasher 100 enters the door opening drying process and operates is equal to or greater than the predetermined time period (e.g., 600 seconds), the processor 1160 may compare the temperature of the heater 84 with a third temperature (e.g., 117 degrees). Further, when the temperature of the heater 84 is equal to or lower than the third temperature (e.g., 117 degrees), the processor 1160 may maintain the heater in the ON state.

[0320] Further, when the temperature of the heater 84 is not equal to or lower than the third temperature (e.g., 117 degrees), the processor 1160 may compare the temperature of the heater 84 with a fourth temperature (e.g., 120 degrees) higher than the third temperature (e.g., 117 degrees). The third temperature (e.g., 117 degrees) is higher than the second temperature (e.g., 114 degrees).

[0321] According to an embodiment, when the temperature of the heater 84 is not equal to or higher than the fourth temperature (e.g., 120 degrees), the processor 1160 may maintain the heater 84 in the ON state. Further,

when the temperature of the heater 84 is equal to or higher than the fourth temperature (e.g., 120 degrees), the processor 1160 may turn off the heater 84.

[0322] As such, when the time period during which the dishwasher 100 enters the door opening drying process and operates is equal to or greater than the predetermined time period (e.g., 600 seconds), the processor 1160 may control the heating temperature of the heater 84 such that the temperature of the heater 84 is maintained within the second threshold range (e.g., the range from 117 degrees to 120 degrees).

[0323] That is, the processor 1160 may control the ON/OFF of the heater 84 such that the temperature of the heater 84 is maintained within the first threshold range (e.g., the range from 111 degrees to 114 degrees) or the second threshold range (e.g., the range from 117 degrees to 120 degrees), based on the comparison between the time period during which the dishwasher 100 operates based on the door opening drying process and a target time period (e.g., 600 seconds).

[0324] According to an embodiment, the processor 1160 may compare the time period (e.g., 1200 seconds) set for the door opening drying process with the time period during which the dishwasher 100 enters the door opening drying process and operates, and may turn off the heater 84 when a difference between the time period set for the door opening drying process and the time period during which the dishwasher 100 enters the door opening drying process and operates is equal to or smaller than a certain time period (e.g. 300 seconds).

[0325] As such, the processor 1160 may turn on the blower motor 89 and the blowing fan 825 and turn off the heater 84 a certain time period (e.g., 300 seconds) before an end of the door opening drying process, thereby lowering an internal temperature of the dishwasher 100 and thus reducing a risk to the user resulted from the high temperature.

[0326] According to an embodiment, when the time period during which the dishwasher 100 operates based on the door opening drying process is equal to or greater than the time period (e.g., 1200 seconds) set for the door opening drying process (i.e., the time period set for the door opening drying process), the processor 1160 may turn off the blower motor 89.

[0327] Hereinafter, the drying process (e.g., the door opening drying process) in which the dishwasher 100 dries the dishes will be described.

[0328] FIG. 12 is a flowchart showing a process of determining whether a blower motor and a temperature sensor have failed according to an embodiment of the present disclosure.

[0329] Hereinafter, with reference to FIG. 12, the process of determining whether the blower motor and the temperature sensor have failed according to an embodiment of the present disclosure will be described in detail as follows. An embodiment of the present disclosure may be performed after discharging residual water in the sump 41 via the water discharge pipe 44 before the door

opening drying process, which will be described below, begins.

[0330] Alternatively, an embodiment of the present disclosure may be performed after discharging residual water in a water jacket via the water discharge pipe 44 before the door opening drying process begins.

[0331] According to an embodiment, the processor 1160 may identify whether the door opening drying process begins. The dishwasher 100 proceeds the stroke, under the control of the processor 1160, in an order of the washing process of washing the dishes in the washing space 21 using washing water sprayed via the nozzles 61 and 62, the rinsing process of rinsing the washed dishes using washing water, the additional rinsing process of additionally rinsing the rinsed dishes using, the heated rinsing process of rinsing the dishes with high-temperature washing water, and the drying process of drying the dishes.

[0332] The drying process may include the hot air drying of drying the dishes by supplying hot air, the door opening hot air drying of drying the dishes by opening the door and then supplying hot air, the door opening drying of drying the dishes by opening the door, and the condensation drying. The processor 1160 may operate the dishwasher 100 in the door opening drying process after the condensation drying process.

[0333] According to an embodiment, the processor 1160 may discharge residual water in the sump 41 via the water discharge pipe 44 before the door opening drying process begins. The processor 1160 may discharge residual water in the water jacket via the water discharge pipe 44 before the door opening drying process begins.

[0334] According to an embodiment, when the door opening drying process begins, the processor 1160 may set a progress time period of the door opening drying process, an initial temperature, a continuous operation time period of the heater 84, and a continuous operation time period of the blower motor 89 to 0. In this regard, an inspection of the heater 84 may not proceed.

[0335] Further, the processor 1160 may start counting the progress time period based on the door opening drying process, may turn on the temperature sensor 86, and inspect a load state.

[0336] According to an embodiment, the processor 1160 may turn on the blower motor (S1212). When the load state inspection is completed, the processor 1160 may turn on the blower motor 89, and perform a process of identifying whether the blower motor 89 is operating normally or not.

[0337] According to an embodiment, the processor 1160 may detect whether the blowing fan operates for a first time period (S1214). The processor 1160 may identify whether the blowing fan 825 rotates or does not rotate via a sensor (e.g., a Hall sensor) that detects the operation of the blowing fan 825 for the predetermined first time period (e.g., 6 seconds). For example, when the blowing fan 825 rotates, the processor 1160

may determine that the blower motor 89 and the blowing fan 825 are operating normally.

[0338] According to an embodiment, the processor 1160 increases the number of failures of the operation of the blower motor by 1 (S1216). When the blowing fan 825 does not rotate, the processor 1160 determines that the operation of the blower motor 89 has failed, and increase the number of operation failures by 1.

[0339] According to an embodiment, the processor 1160 may identify whether the number of operation failures is equal to or greater than the predetermined number of times (S1218). The processor 1160 may identify whether the number of operation failures accumulated as the blowing fan 825 does not rotate is equal to or greater than the predetermined number of times (e.g., 3 times).

[0340] According to an embodiment, the processor 1160 may turn off the blower motor (S1220). The processor 1160 may turn off the blower motor 89 when the accumulated number of operation failures is not equal to or greater than the predetermined number of times (e.g., 3 times).

[0341] According to an embodiment, the processor 1160 may identify whether a time period during which the blower motor is turned off is equal to or greater than a second time period (S1222). The processor 1160 turns off the blower motor 89 and then operates the timer 1161. In addition, after turning off the blower motor 89, the processor 1160 may identify in real time whether the time period during which the blower motor is turned off is equal to or greater than the second time period (e.g., 5 seconds).

[0342] According to an embodiment, the processor 1160 may turn off the blower motor (S1224). When identifying that the time period during which the blower motor is turned off is equal to or greater than the second time period (e.g., 5 seconds), the processor 1160 may return to the above process (S1212) and turn on the blower motor 89.

[0343] According to an embodiment, the processor 1160 may repeatedly perform the processes (S1212 to S1222) until the number of times the operation of the blower motor 89 has failed is equal to or greater than the predetermined number of times (e.g., 3 times).

[0344] According to an embodiment, the processor 1160 may output the error message of the blower motor (S1226). When it is identified in the process (S1218) that the number of times the operation of the blower motor 89 has failed is equal to or greater than the predetermined number of times (e.g., 3 times), the processor 1160 may turn off the blower motor 89.

[0345] For example, when it is identified that the number of times the operation of the blower motor 89 has failed is equal to or greater than the predetermined number of times (e.g., 3 times), the processor 1160 may determine that an error has occurred in the blower motor 89, generate the error message indicating that the error has occurred in the blower motor 89, and output the generated error message to at least one of the speaker

1140 or the display 33.

[0346] According to an embodiment, the processor 1160 may identify the open and short states of the temperature sensor (S1228). When the rotation of the blowing fan 825 is detected in the process (S1214), the processor 1160 may identify whether the temperature sensor 86 is operating normally or not.

[0347] For example, the processor 1160 may identify whether the temperature sensor 86 is maintained in the open or short state for a certain time period (e.g. 10 seconds).

[0348] According to an embodiment, the processor 1160 may identify whether the temperature sensor is normal (S1230). When the temperature sensor 86 is continuously maintained in the open state or in the short state for the certain time period (e.g. 10 seconds) or more, the processor 1160 may determine that the temperature sensor 86 is abnormal.

[0349] In this case, the processor 1160 may stop all loads.

[0350] According to an embodiment, the processor 1160 may output the error message of the temperature sensor (S1232). When identifying in the process (S1230) that the temperature sensor 86 is abnormal, the processor 1160 may determine that the error has occurred in the temperature sensor 86, generate the error message indicating that the error has occurred in the temperature sensor 86, and output the generated error message using at least one of the speaker 1140 or the display 33.

[0351] When identifying in the process (S1230) that the temperature sensor 86 is normal, the processor 1160 may perform processes in FIG. 13.

[0352] FIG. 13 is a flowchart showing a process of identifying opening of a door of a dishwasher according to an embodiment of the present disclosure.

[0353] Hereinafter, with reference to FIG. 13, the process of identifying the opening of the door of the dishwasher according to an embodiment of the present disclosure will be described in detail as follows.

[0354] According to an embodiment, the processor 1160 may identify whether the first main sensor is turned off (S1310). When determining in the process (S1230) in FIG. 12 that the temperature sensor 86 is normal, the processor 1160 may identify whether the first main sensor 1131 is turned off.

[0355] According to an embodiment, the processor 1160 may identify whether the second main sensor is turned off (S1312). When determining that the first main sensor 1131 is turned off, the processor 1160 may identify whether the second main sensor 1132 is turned off.

[0356] As such, the first main sensor 1131 and the second main sensor 1132 being turned off means that the door 30 has not been opened from the main body 10. Conversely, the first main sensor 1131 and the second main sensor 1132 being not turned off (i.e., being turned on) means that the door 30 has been opened from the main body 10.

[0357] The door opening drying process according to

an embodiment of the present disclosure means drying the dishes with the door 30 open. The reason for determining whether at least one of the first main sensor 1131 or the second main sensor 1132 is turned off or is not turned off as such is to check whether the user has deliberately closed or opened the door 30.

[0358] Therefore, before the process (S1310) is performed, the door 30 is already open.

[0359] According to an embodiment, the processor 1160 may determine that the door is closed (S1314). When determining that both the first main sensor 1131 and the second main sensor 1132 are not turned off, the processor 1160 may determine that the user has forcibly closed the door 30. When determining that the door is closed, the processor 1160 may output a warning sound via the speaker 1140 or output a warning message via the display 33.

[0360] In this case, the processor 1160 may selectively perform a dish warming process. For example, when selectively performing the dish warming process, the processor 1160 may turn on the blower motor 89 and turn off the heater 84.

[0361] According to an embodiment, the processor 1160 may open the door (S1316). When determining that both the first main sensor 1131 and the second main sensor 1132 are not turned off, the processor 1160 may determine that the user has forcibly closed the door 30, and automatically open the door 30 to a certain extent based on the door opening drying process.

[0362] According to an embodiment, the processor 1160 may identify whether the door opening has continued for a third time period or more. After opening the door 30, the processor 1160 may operate the timer 1161 to identify whether the opening of the door 30 has continued for a certain time period (e.g., 3 seconds) or more.

[0363] According to an embodiment, the processor 1160 may open the handle of the door. When the opening of the door 30 has continued for the certain time period (e.g., 3 seconds) or more, the processor 1160 may automatically open the handle of the door 30.

[0364] According to an embodiment, the processor 1160 may identify whether the progress time period is equal to or greater than the target time period (S1322). The processor 1160 may identify whether the progress time period is equal to or greater than the target time period after the door 30 is opened.

[0365] For example, when identifying that the progress time period is not equal to or greater than the target time period after the door 30 is opened, the processor 1160 may return to the process (S1212) in FIG. 12 and perform the following processes in FIG. 12.

[0366] According to an embodiment, the processor 1160 may turn off the blower motor (S1324). When identifying that the progress time period is equal to or greater than the target time period after automatically opening the handle of the door 30, the processor 1160 may turn off the blower motor 89. The target time period may be a time period (e.g., 1200 seconds) set for the door opening

drying process.

[0367] According to an embodiment, when identifying the second main sensor is turned off in the process (S1312), the processor 1160 may identify whether the sub-sensor 1133 is turned on (S1326). The processor 1160 may determine whether the door 30 has been opened based on the door opening drying process or whether the user has deliberately and forcibly opened the door 30, depending on whether the sub-sensor 1133 is turned on or off.

[0368] According to an embodiment, when identifying that the sub-sensor 1133 is not turned on, the processor 1160 may determine that the door has been opened manually (S1328). When identifying that at least one of the first main sensor 1131 or the second main sensor 1132 is turned off and the sub-sensor 1133 is not turned on, the processor 1160 may determine that the door 30 has been forcibly opened by the user.

[0369] According to an embodiment, when determining that the door has been manually opened, the processor 1160 may output the warning sound via the speaker 1140 or output the warning message via the display 33.

[0370] Further, when determining that the door has been manually opened, the processor 1160 may start the cold air drying process. When identifying that the sub-sensor 1133 is not turned on, the processor 1160 may determine that the door has been opened manually, and start the cold air drying process. Further, when identifying that the sub-sensor 1133 is not turned on, the processor 1160 may perform processes shown in FIG. 14.

[0371] According to an embodiment, when identifying in the process (S1326) that the sub-sensor 1133 is turned on, the processor 1160 may identify whether the progress time period is equal to or greater than a time period obtained by subtracting a certain amount of time from the target time period (S1332). When identifying that the sub-sensor 1133 is turned on, the processor 1160 may identify whether the progress time period is equal to or greater than a time period obtained by subtracting the third time period (e.g., 300 seconds) from the target time period (e.g., 1200 seconds).

[0372] As such, the processor 1160 may turn off the heater 84 and operate the blowing fan 825 before the third time period (e.g., 300 seconds) to cool the dishwasher 100.

[0373] According to an embodiment, when identifying that the progress time period is equal to or greater than the time period obtained by subtracting the third time period (e.g., 300 seconds) from the target time period (e.g., 1200 seconds), the processor 1160 may perform the processes shown in FIG. 14.

[0374] According to an embodiment, when determining that the progress time period is not equal to or greater than the time period obtained by subtracting the certain amount of time from the target time period, the processor 1160 may determine that the door 30 has been automatically opened (S1334). When identifying that the sub-sensor 1133 is turned on, the processor 1160 may de-

termine that the door 30 has been automatically opened to perform the door opening drying process.

[0375] According to an embodiment, the processor 1160 may identify whether the door opening drying process is set to a night quiet course (S1336). The processor 1160 may identify whether the door opening drying process is set in detail to operate in the night quiet course. Alternatively, the processor 1160 may determine a current time, and when the current time is determined to be a nighttime (e.g., from after 9 PM to 6 AM the next morning), may operate the door opening drying process in the night quiet course.

[0376] According to an embodiment, when the door opening drying process is set to the night quiet course, the processor 1160 may operate the blower motor 89 at a first revolutions per minute (RPM) (e.g., 3100 RPM) (S1338). The processor 1160 may determine detailed conditions set in the door opening drying process, and when the night quiet course is set in the door opening drying process, operate the blower motor 89 at the first RPM (e.g., 3100 RPM).

[0377] Alternatively, when the current time is the nighttime (e.g., after 9 PM to 6 AM the next morning), the processor 1160 may operate the blower motor 89 at the first RPM (e.g., 3100 RPM).

[0378] According to an embodiment, when the door opening drying process is not set to the night quiet course, the processor 1160 may operate the blower motor 89 at a second RPM (e.g., 3600 RPM) (S1340). The processor 1160 may determine detailed conditions set in the door opening drying process, and when the night quiet course is not set in the door opening drying process, may operate the blower motor 89 at the second RPM (e.g., 3600 RPM).

[0379] Alternatively, when the current time is not the nighttime (e.g., after 9 PM to 6 AM the next morning), the processor 1160 may operate the blower motor 89 at the second RPM (e.g., 3600 RPM).

[0380] Further, the processor 1160 may start the process of operating the heater 84. The processor 1160 may operate the blower motor 89 at the RPMs in the processes (S1338 and S1340), and start process of operating the heater 84. That is, the processor 1160 may operate the blower motor 89 at the RPMs in the processes (S1338 and S1340), and perform processes shown in FIG. 15.

[0381] FIG. 14 is a flowchart showing a cold air drying process according to an embodiment of the present disclosure.

[0382] Hereinafter, with reference to FIG. 14, the cold air drying process according to an embodiment of the present disclosure will be described in detail as follows. The processes in FIG. 14 may be performed after the process (S1332 or S1330) in FIG. 13.

[0383] According to an embodiment, the processor 1160 may start the cold air drying process.

[0384] According to an embodiment, the processor 1160 may identify whether the door opening drying pro-

cess is set to the night quiet course (S1412). The processor 1160 may identify whether the door opening drying process is set in detail to operate in the night quiet course. Alternatively, the processor 1160 may determine the current time and, when the current time is determined to be the nighttime (e.g., after 9 PM to 6 AM the next morning), operate the door opening drying process in the night quiet course.

[0385] According to an embodiment, when the door opening drying process is set to the night quiet course, the processor 1160 may operate the blower motor 89 at the first RPM (e.g., 3100 RPM) (S1414). The processor 1160 may determine the detailed conditions set in the door opening drying process, and when the night quiet course is set in the door opening drying process, operate the blower motor 89 at the first RPM (e.g., 3100 RPM).

[0386] Alternatively, when the current time is the nighttime (e.g., after 9 PM to 6 AM the next morning), the processor 1160 may operate the blower motor 89 at the first RPM (e.g., 3100 RPM).

[0387] According to an embodiment, when the door opening drying process is not set to the night quiet course, the processor 1160 may operate the blower motor 89 at the second RPM (e.g., 3600 RPM) (S1416). The processor 1160 may determine the detailed conditions set in the door opening drying process, and when the night quiet course is not set in the door opening drying process, may operate the blower motor 89 at the second RPM (e.g., 3600 RPM).

[0388] Alternatively, when the current time is not the nighttime (e.g., after 9 PM to 6 AM the next morning), the processor 1160 may operate the blower motor 89 at the second RPM (e.g., 3600 RPM).

[0389] According to an embodiment, the processor 1160 may turn off the heater (S1418). The processor 1160 may turn off the heater 84 while operating the blower motor 89 at the first RPM (e.g., 3100 RPM) or the second RPM (e.g., 3600 RPM).

[0390] According to an embodiment, the processor 1160 may turn off the heater 84 and then operate the timer 1161 (S1420).

[0391] According to an embodiment, the processor 1160 may identify whether the progress time period is equal to or greater than the target time period (S1422). After turning off the heater 84, the processor 1160 may identify whether the progress time period is equal to or greater than the target time period.

[0392] For example, after turning off the heater 84, when identifying that the progress time period is not equal to or greater than the target time period (e.g., 1200 seconds), the processor 1160 may return to the process (S1212) in FIG. 12 and perform the following processes in FIG. 12.

[0393] According to an embodiment, the processor 1160 may turn off the blower motor (S1424). When identifying that the progress time period is equal to or greater than the target time period (e.g. 1200 seconds), the processor 1160 may turn off the blower motor 89.

[0394] FIG. 15 is a flowchart showing a process of controlling an operation of a heater according to an embodiment of the present disclosure.

[0395] Hereinafter, with reference to FIG. 15, the process of controlling the operation of the heater according to an embodiment of the present disclosure will be described in detail as follows.

[0396] According to an embodiment, the processor 1160 may operate the heater 84 (S1510). When it is identified in FIG. 13 that the door 30 has been automatically opened based on the door opening drying process, and when an operation logic of the heater 84 based on the door opening drying process starts, the processor 1160 may operate the heater 84.

[0397] According to an embodiment, the processor 1160 may quickly heat the heater such that the temperature of the heater 84 corresponds to a certain temperature (e.g., 100 degrees) when the dishwasher 100 enters the door opening drying process, and may gradually heat the heater 84 when the temperature of the heater 84 reaches the certain temperature (e.g., 100). Accordingly, the present disclosure may derive an effect of preventing power waste compared to a case of heating the heater 84 to a high temperature and then cooling the heated heater 84.

[0398] According to an embodiment, the processor 1160 may identify whether the progress time period is equal to or greater than a certain time period (S1512). The processor 1160 may compare the time period during which the door opening drying process is in progress with a fourth time period (e.g., 600 seconds), and may identify whether the time period during which the door opening drying process is in progress is equal to or greater than the fourth time period (e.g., 600 seconds).

[0399] According to an embodiment, the processor 1160 may identify whether the temperature of the heater 84 is equal to or lower than the first temperature (S1514). When identifying that the time period during which the door opening drying process is in progress is not equal to or greater than the certain time period (e.g., 600 seconds), the processor 1160 may measure the temperature of the heater 84, and identify whether the measured temperature of the heater 84 is equal to or lower than the first temperature (e.g., 111 degrees).

[0400] For example, when identifying that the measured temperature of the heater 84 is equal to or lower than the first temperature (e.g., 111 degrees), the processor 1160 may turn on the heater in the process (S1520). For example, when identifying that the measured temperature of the heater 84 is equal to or lower than the first temperature (e.g., 111 degrees), the processor 1160 may apply a predetermined amount of current to the heater 84 to operate the heater 84. For example, the predetermined amount of current may be 2.1A, or may fall within a certain range (e.g., a range from 1.5A to 2.5A). In the present disclosure, the case in which the amount of current applied to the heater 84 is 2.1A is described, but this is only an example and does not limit

the present disclosure.

[0401] According to an embodiment, the processor 1160 may identify whether the temperature of the heater 84 is equal to or higher than the second temperature (S1516). When identifying that the measured temperature of the heater 84 is not equal to or lower than the first temperature (e.g., 111 degrees), the processor 1160 may compare the measured temperature of the heater 84 with the second temperature (e.g., 114 degrees).

[0402] For example, when identifying that the measured temperature of the heater 84 is not equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may turn on the heater in the process (S1520). Alternatively, when identifying that the measured temperature of the heater 84 is not equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may remain the heater turned on. For example, when identifying that the measured temperature of the heater 84 is not equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may apply the predetermined amount of current to the heater 84 to operate the heater 84. For example, the predetermined amount of current may be 2.1A, or may fall within the certain range (e.g., the range from 1.5A to 2.5A).

[0403] According to an embodiment, the processor 1160 may turn off the heater 84 (S1518). When identifying that the measured temperature of the heater 84 is equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may turn off the heater 84. For example, when identifying that the measured temperature of the heater 84 is equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may block the predetermined amount of current applied to the heater 84 and stop the operation of the heater 84.

[0404] According to an embodiment, the processor 1160 may turn on the heater 84 (S1520). When identifying that the temperature measured in the heater 84 in the process (S1514) is equal to or lower than the first temperature (e.g., 111 degrees) or the temperature measured in the heater 84 in the process (S1516) is not equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may turn on the heater 84. For example, when identifying that the temperature measured in the heater 84 is equal to or lower than the first temperature (e.g., 111 degrees) or the temperature measured in the heater 84 in the process (S1516) is not equal to or higher than the second temperature (e.g., 114 degrees), the processor 1160 may apply the predetermined amount of current to the heater 84 to operate the heater 84. For example, the predetermined amount of current may be 2.1A, or may fall within the certain range (e.g., the range from 1.5A to 2.5A).

[0405] According to an embodiment, the processor 1160 may identify whether the temperature of the heater 84 is equal to or lower than the third temperature (S1522). When identifying in the process (S1512) that the time

period during which the door opening drying process is in progress is equal to or greater than the certain time period (e.g., 600 seconds), the processor 1160 may measure the temperature of the heater 84, and identify whether the measured temperature of the heater 84 is equal to or lower than the third temperature (e.g., 117 degrees).

[0406] For example, when identifying that the measured temperature of the heater 84 is equal to or lower than the third temperature (e.g., 117 degrees), the processor 1160 may turn on the heater in the process (S1528). Alternatively, when identifying that the measured temperature of the heater 84 is equal to or lower than the third temperature (e.g., 117 degrees), the processor 1160 may remain the heater turned on. For example, when identifying that the measured temperature of the heater 84 is equal to or lower than the third temperature (e.g., 117 degrees), the processor 1160 may apply the predetermined amount of current to the heater 84 to operate the heater 84.

[0407] According to an embodiment, the processor 1160 may identify whether the temperature of the heater 84 is equal to or higher than the fourth temperature (S1524). When identifying that the measured temperature of the heater 84 is not equal to or lower than the third temperature (e.g., 117 degrees), the processor 1160 may identify whether the temperature of the heater 84 is equal to or higher than the fourth temperature (e.g., 120 degrees).

[0408] For example, when identifying that the measured temperature of the heater 84 is not equal to or higher than the fourth temperature (e.g., 120 degrees), the processor 1160 may turn on the heater in the process (S1528). Alternatively, when identifying that the measured temperature of the heater 84 is not equal to or higher than the fourth temperature (e.g., 120 degrees), the processor 1160 may remain the heater turned on.

[0409] According to an embodiment, the processor 1160 may turn off the heater 84 (S1526). When identifying that the measured temperature of the heater 84 is equal to or higher than the fourth temperature (e.g., 120 degrees), the processor 1160 may turn off the heater 84.

[0410] According to an embodiment, the processor 1160 may turn on the heater 84 (S1528). When identifying that the temperature measured in the heater 84 in the process (S1522) is equal to or lower than the third temperature (e.g., 117 degrees) or the temperature measured in the heater 84 in the process (S1524) is not equal to or higher than the fourth temperature (e.g., 114 degrees), the processor 1160 may turn on the heater 84.

[0411] According to an embodiment, the processor 1160 may identify whether the progress time period is equal to or greater than the target time period (S1530). After turning off the heater 84 in the process (S1518), the processor 1160 may identify whether the progress time period is equal to or greater than the target time period. Alternatively, the processor 1160 may turn on the heater 84 in the process (S1520) and then identify whether the progress time period is equal to or greater than the target

time period.

[0412] According to an embodiment, the processor 1160 may turn off the heater 84 in the process (S1526) and then identify whether the progress time period is equal to or greater than the target time period. Alternatively, the processor 1160 may turn on the heater 84 in the process (S1528) and then identify whether the progress time period is equal to or greater than the target time period.

[0413] For example, when identifying that the progress time period is not equal to or greater than the target time period (e.g., 1200 seconds) after turning on the heater 84, the processor 1160 may return to the process (S1212) in FIG. 12 and perform the following processes in FIG. 12.

[0414] According to an embodiment, the processor 1160 may turn off the blower motor (S1532). When identifying that the progress time period is equal to or greater than the target time period (e.g. 1200 seconds), the processor 1160 may turn off the blower motor 89.

[0415] As described above, the dishwasher 100 may variably adjust a heating intensity of the heater 84 (e.g., strong/medium/weak) based on the temperature of the heater 84 to prevent abnormal overheating (e.g., overshoot) of the heater 84 during the hot air drying (e.g., the door opening drying) process, thereby securing safety of the user against the high temperature of a hot air outlet.

[0416] Furthermore, the door opening drying process may or may not be set.

[0417] According to an embodiment, before the door opening drying process is performed, the processor 1160 may discharge residual water in the dishwasher 100 (e.g., residual water in the water jacket) in advance via the water discharge pipe 44.

[0418] Further, when the door opening drying process is set, the processor 1160 may automatically open the door 30 and then perform the logic based on the door opening drying process.

[0419] Alternatively, when the door opening drying process is not set, the processor 1160 may not perform the logic based on the door opening drying process without opening the door 30.

[0420] Therefore, to prevent the abnormal overheating (e.g., the overshoot) of the heater 84 during the initial operation or the stroke of the heater 84, the present disclosure may prevent air from being heated to a temperature that is excessively higher than a target temperature as the heater 84 operates excessively during initial heating.

[0421] FIG. 16 is a flowchart showing a process of controlling an operation of a heater according to another embodiment of the present disclosure.

[0422] Hereinafter, with reference to FIG. 16, the process of controlling the operation of the heater according to another embodiment of the present disclosure will be described in detail as follows.

[0423] According to an embodiment, the processor 1160 may operate the heater (S1610). When identifying in FIG. 13 that the door 30 has been automatically

opened based on the door opening drying process, and when the operation logic of the heater 84 based on the door opening drying process starts, the processor 1160 may operate the heater 84.

[0424] According to an embodiment, the processor 1160 may identify whether the operation time period of the heater is equal to or greater than a certain time period (S1612). The processor 1160 may compare the time period during which the door opening drying process is in progress with a sixth time period (e.g., 600 seconds). Additionally, the processor 1160 may identify whether the time period during which the door opening drying process is in progress is equal to or greater than the sixth time period (e.g., 600 seconds).

[0425] According to an embodiment, when the operation time period of the heater is not equal to or greater than the certain time period, the processor 1160 may check the temperature of the heater (S1614). When identifying that the time period during which the door opening drying process is in progress is not equal to or greater than the sixth time period (e.g., 600 seconds), the processor 1160 may check the temperature of the heater 84 via the temperature sensor 86.

[0426] According to an embodiment, the processor 1160 may control the heater such that the temperature of the heater is maintained within the first range (S1616). The processor 1160 may adjust the heating intensity of the heater 84 such that the temperature of the heater 84 is maintained within the first range (e.g., the range from 111 degrees to 114 degrees).

[0427] According to an embodiment, when the operation time period of the heater is not equal to or greater than the certain time period, the processor 1160 may check the temperature of the heater (S1618). When identifying in the process (S1612) that the time period during which the door opening drying process is in progress is equal to or greater than the certain time period (e.g., 600 seconds), the processor 1160 may check the temperature of the heater 84 via the temperature sensor 86.

[0428] According to an embodiment, the processor 1160 may control the heater such that the temperature of the heater is maintained within the second range (S1620). The processor 1160 may adjust the heating intensity of the heater 84 such that the temperature of the heater 84 is maintained within the second temperature range (e.g., the range from 117 degrees to 120 degrees).

[0429] The temperatures and the time periods expressed numerically in the present disclosure are merely examples, and the temperatures and the time periods described in the present disclosure are able to be variably adjusted. In addition, the embodiment of the present disclosure is not limited by the temperatures and the time periods described herein.

[0430] Respective steps in each flowchart described above may be operated regardless of the order shown or may be performed simultaneously. Furthermore, at least

one component in the present disclosure and at least one operation performed on the at least one component may be implemented in hardware and/or software.

[0431] As described above, the present disclosure has been described with reference to the illustrative drawings, but it is obvious that the present disclosure is not limited to the embodiments disclosed herein and drawings, and that various modifications may be made by those skilled in the art within the scope of the technical idea of the present disclosure. In addition, although the effect of the composition of the present disclosure was not explicitly described and illustrated in the above description of the embodiment of the present disclosure, it is natural that effects that are predictable from the corresponding composition should also be recognized.

Claims

1. A dishwasher comprising:

a tub having a washing space defined therein and having an open front portion;
a door configured to open and close the open front portion of the tub;
a dry air supply including a blower motor, a blowing fan, a heater, and a temperature sensor;
and
a processor configured to control an operation of the dishwasher,
wherein the processor is configured to:

open the door and operate the heater such that the dishwasher enters a door opening drying process;
control the heater to maintain a temperature of the heater within a first threshold range when an operation time period for the dishwasher after entering the door opening drying process is smaller than a predetermined time period; and
control the heater to maintain the temperature of the heater within a second threshold range when the operation time period for the dishwasher after entering the door opening drying process is equal to or greater than the predetermined time period.

2. The dishwasher of claim 1, wherein the processor is configured to control an ON/OFF of the heater to maintain the temperature of the heater within the first threshold range or the second threshold range, based on comparison between the operation time period for the dishwasher after entering the door opening drying process and the predetermined time period.

3. The dishwasher of claim 2, wherein the processor is

configured to turn off the blower motor when the operation time period for the dishwasher after entering the door opening drying process is equal to or greater than a target time period set for the door opening drying process.

4. The dishwasher of claim 1, wherein the processor is configured to:

measure the temperature of the heater using the temperature sensor when the dishwasher enters the door opening drying process; and
compare the operation time period for the dishwasher after entering the door opening drying process with the predetermined time period.

5. The dishwasher of claim 4, wherein the processor is configured to:

compare the temperature of the heater with a first temperature when the operation time period for the dishwasher after entering the door opening drying process is not equal to or greater than the predetermined time period;
remain the heater turned on when the temperature of the heater is equal to or lower than the first temperature; and
compare the temperature of the heater with a second temperature higher than the first temperature when the temperature of the heater is not equal to or lower than the first temperature.

6. The dishwasher of claim 5, wherein the processor is configured to:

remain the heater turned on when the temperature of the heater is not equal to or higher than the second temperature; and
turn off the heater when the temperature of the heater is equal to or higher than the second temperature.

7. The dishwasher of claim 6, wherein the processor is configured to:

compare the temperature of the heater with a third temperature when the operation time period for the dishwasher after entering the door opening drying process is equal to or greater than the predetermined time period;
remain the heater turned on when the temperature of the heater is equal to or lower than the third temperature; and
compare the temperature of the heater with a fourth temperature higher than the third temperature when the temperature of the heater is not equal to or lower than the third temperature,

wherein the third temperature is higher than the second temperature.

8. The dishwasher of claim 7, wherein the processor is configured to:

remain the heater turned on when the temperature of the heater is not equal to or higher than the fourth temperature; and
turn off the heater when the temperature of the heater is equal to or higher than the fourth temperature.

9. The dishwasher of claim 1, wherein the processor is configured to:

compare a time period set for the door opening drying process with the operation time period for the dishwasher after entering the door opening drying process; and
turn off the heater when a difference between the time period set for the door opening drying process and the operation time period for the dishwasher after entering the door opening drying process is equal to or smaller than a certain time period.

10. The dishwasher of claim 1, further comprising:

a display; and
a speaker,
wherein the processor is configured to:

turn on the blower motor when the dishwasher enters the door opening drying process;
count the number of failures when the blowing fan does not operate for a first time period based on the turn on of the blower motor;
determine that least one of the blower motor or the blowing fan has failed when the counted number of failures is equal to or greater than a predetermined number of times; and
output an error message regarding the failure of the at least one of the blower motor or the blowing fan using at least one of the display or the speaker.

11. The dishwasher of claim 10, wherein the processor is configured to:

determine whether the temperature sensor is in an open state or a short state;
determine that the temperature sensor has failed when the open state or the short state of the temperature sensor is maintained for a sec-

ond time period or longer; and
output an error message regarding the failure of the temperature sensor using at least one of the display or the speaker.

12. The dishwasher of claim 1, further comprising a sensor including a first main sensor, a second main sensor, and a sub-sensor,
wherein the processor is configured to:

determine that the door has been automatically opened for the dishwasher to enter the door opening drying process when it is identified that at least one of the first main sensor or the second main sensor is turned off and the sub-sensor is turned on, and
start the door open drying process when determining that the door has been automatically opened.

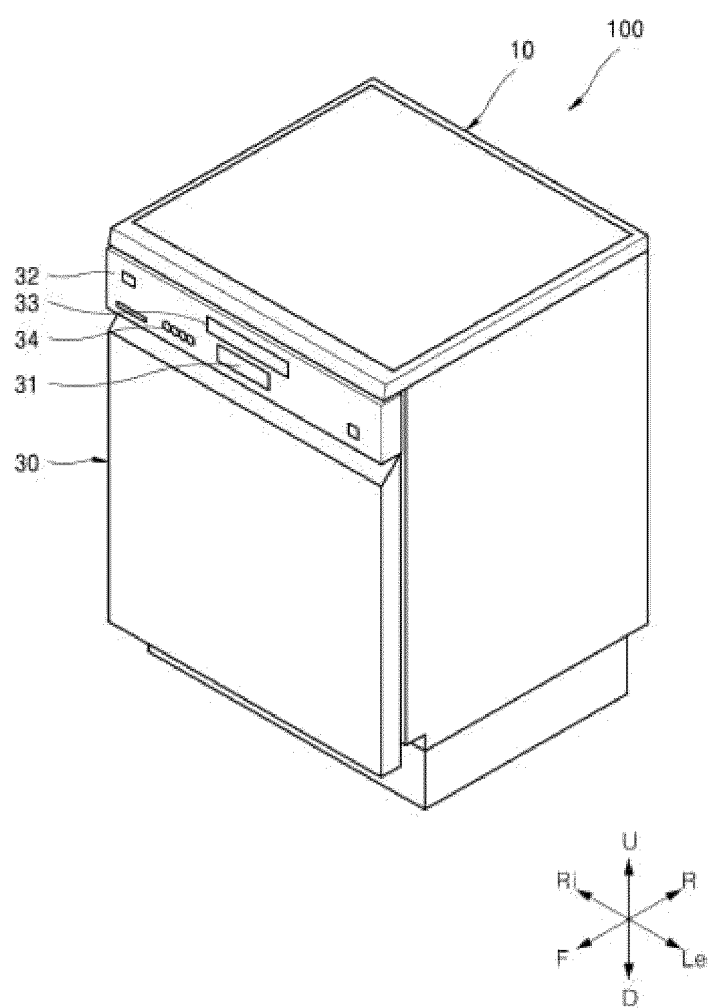
13. The dishwasher of claim 12, wherein the temperature sensor is configured to measure the temperature of the heater, a temperature of a heater housing, a temperature of an inner space of the heater housing, or a temperature of air passing through the outlet of the dry air supply.

14. The dishwasher of claim 12, wherein the processor is configured to determine that the door has been forcibly opened when identifying that at least one of the first main sensor or the second main sensor is turned off and the sub-sensor is not turned on,
wherein the forced opening causes the door to open further from the tub than the automatic opening.

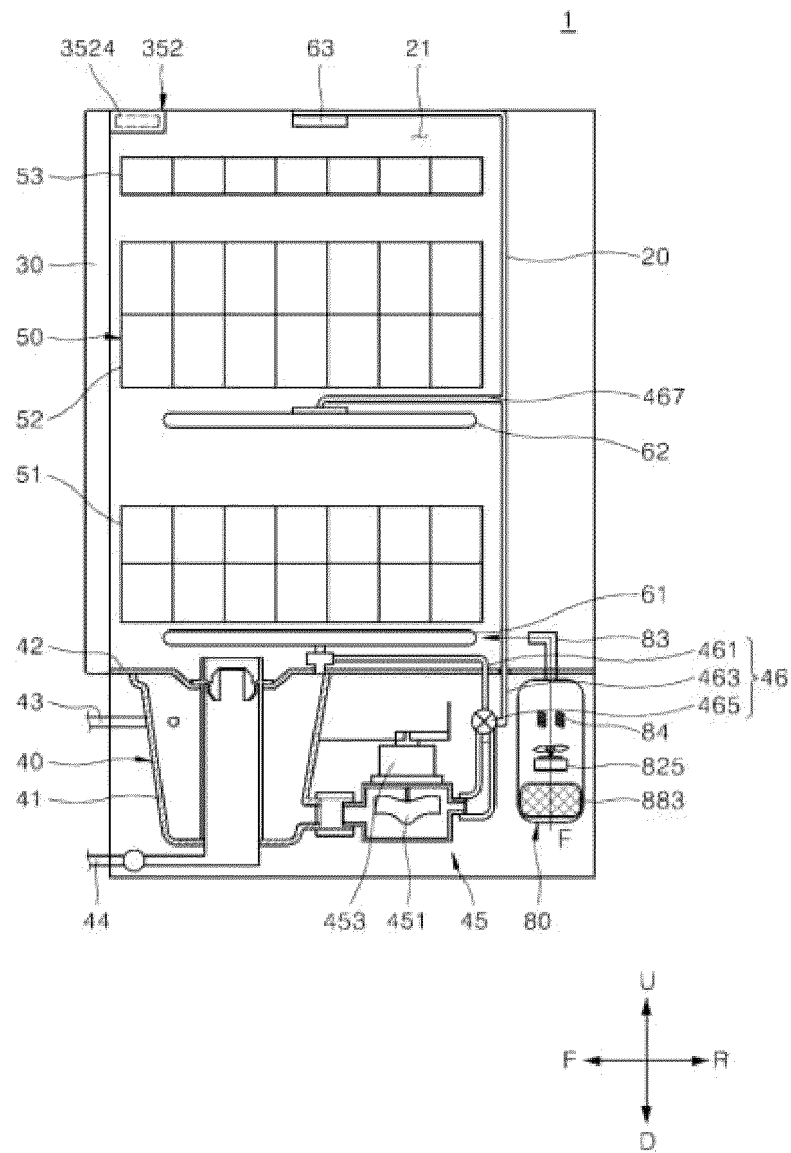
15. A method for controlling an operation of a dishwasher, the method comprising:

opening a door and operating a heater;
controlling the heater to maintain a temperature of the heater within a first threshold range when an operation time period for the dishwasher after entering a door opening drying process is smaller than a predetermined time period; and
controlling the heater to maintain the temperature of the heater within a second threshold range when the operation time period for the dishwasher after entering the door opening drying process is equal to or greater than the predetermined time period.

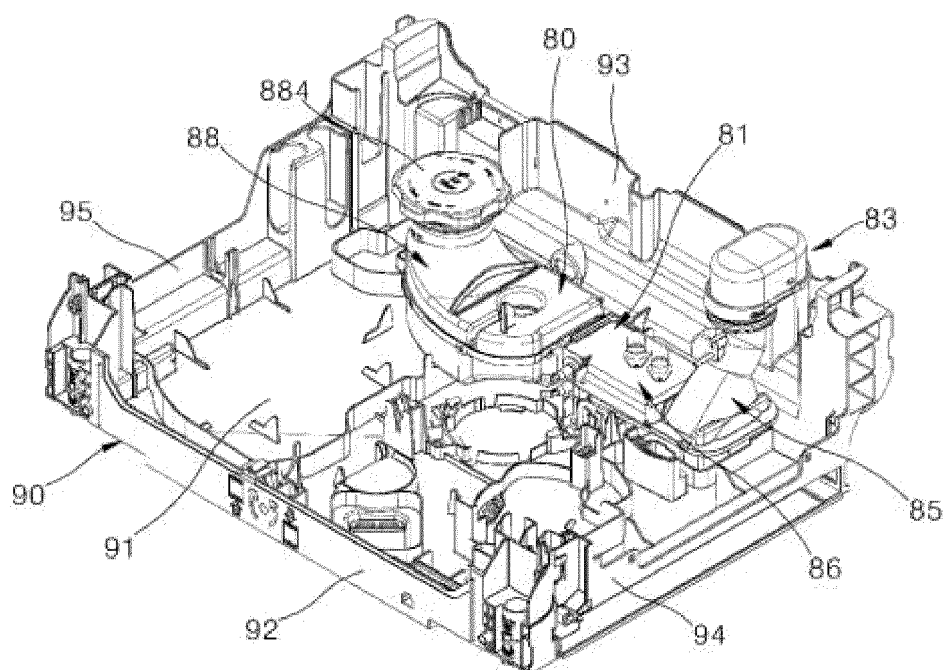
【FIG. 1】



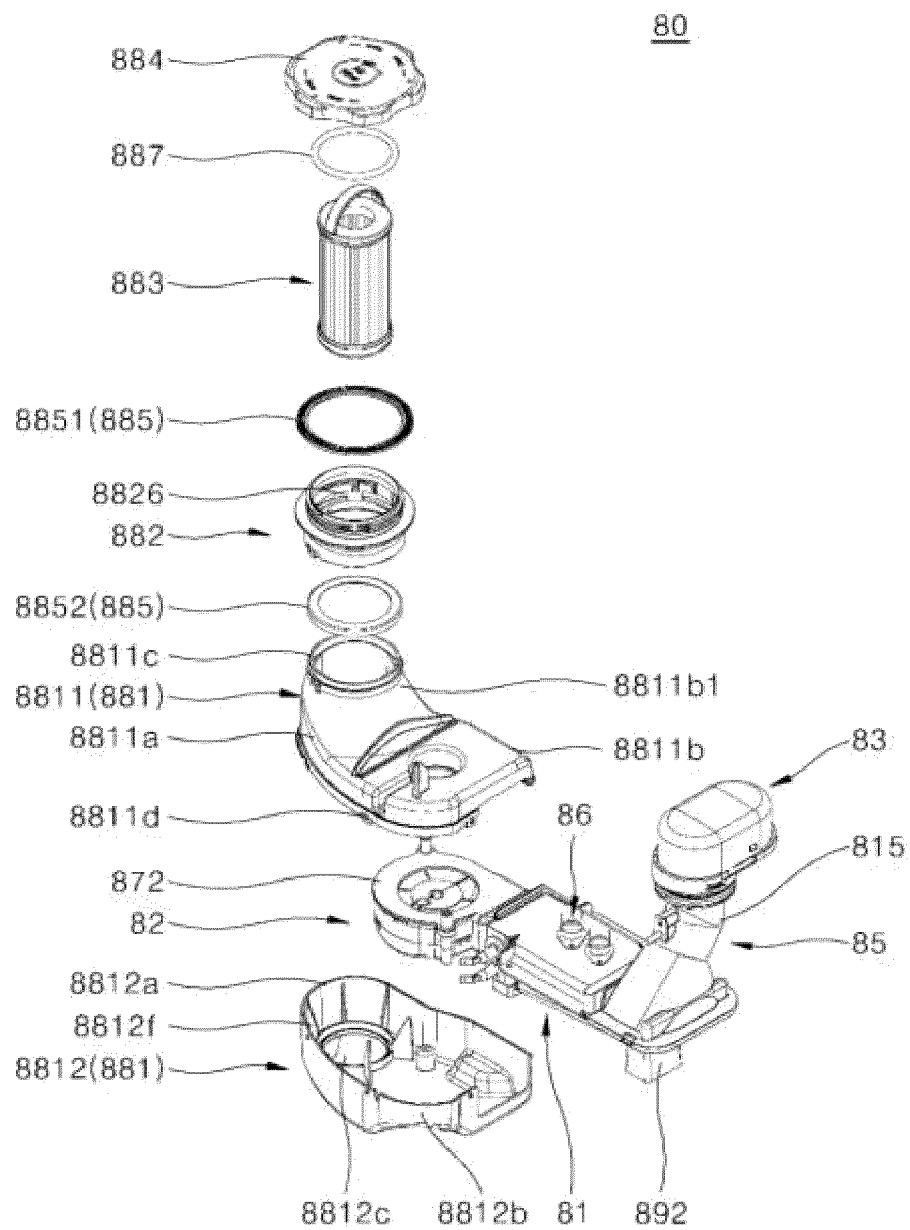
【FIG. 2】



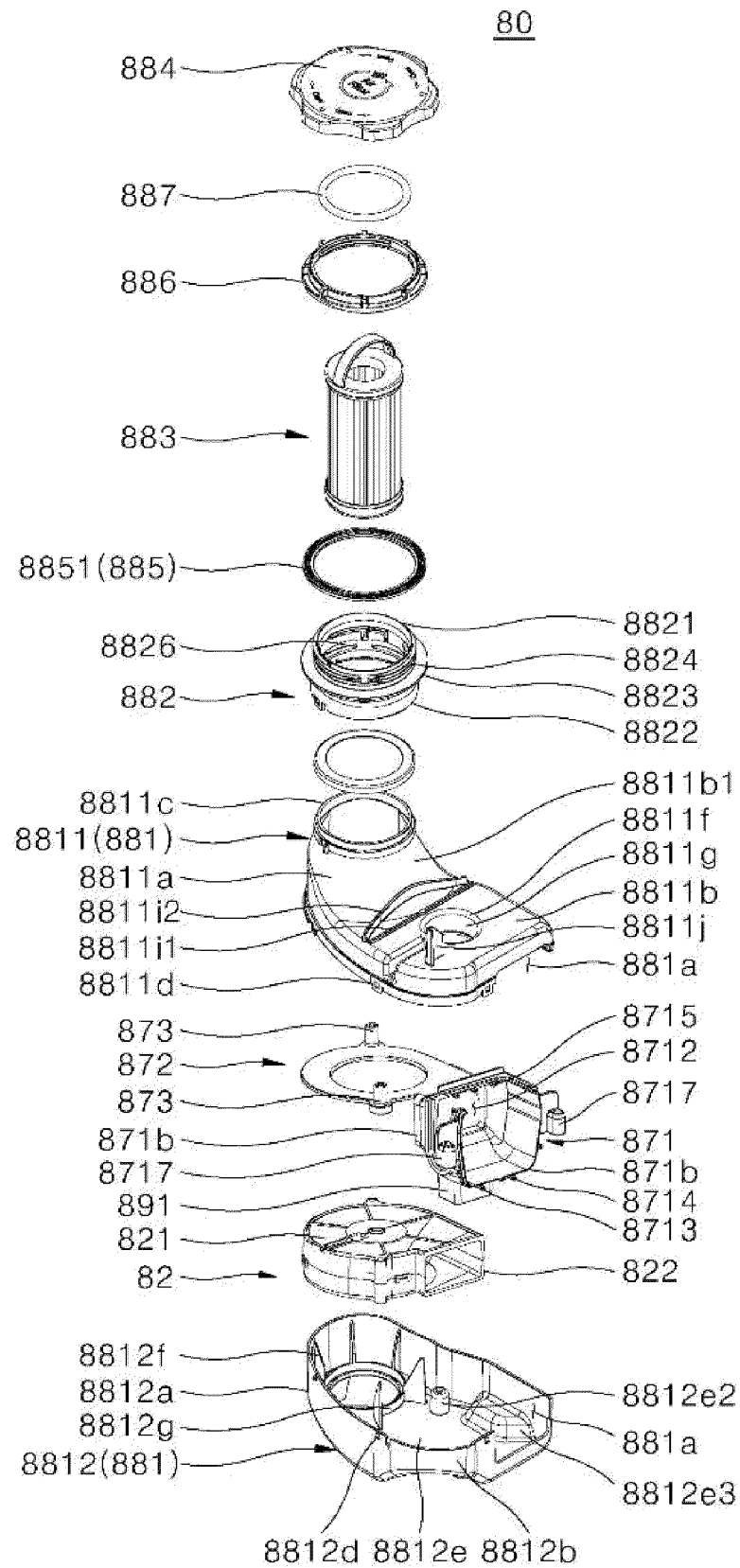
【FIG. 3】



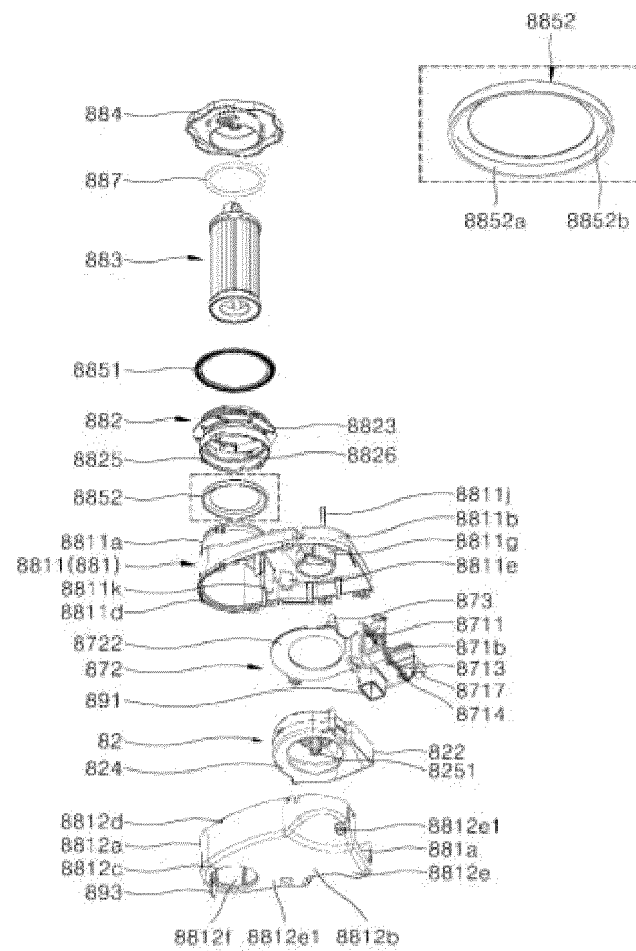
【FIG. 4】



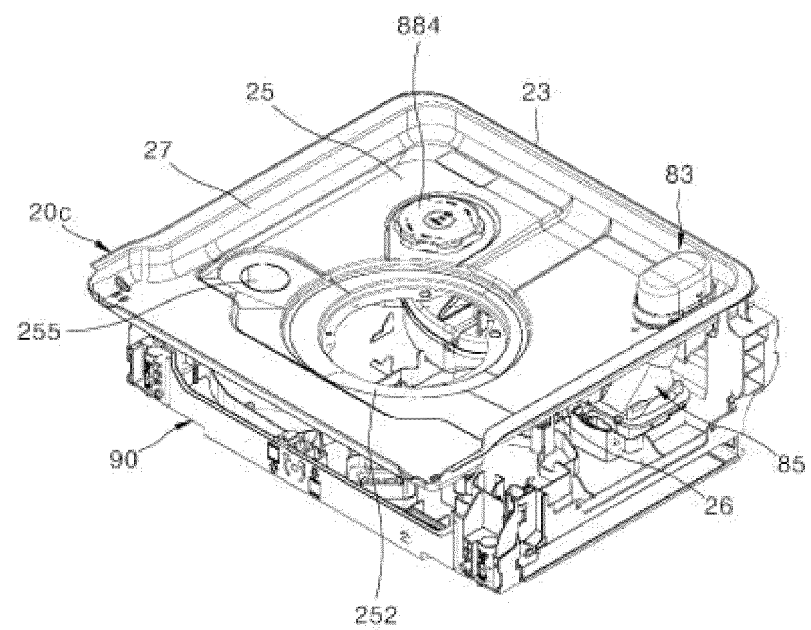
【FIG. 5】



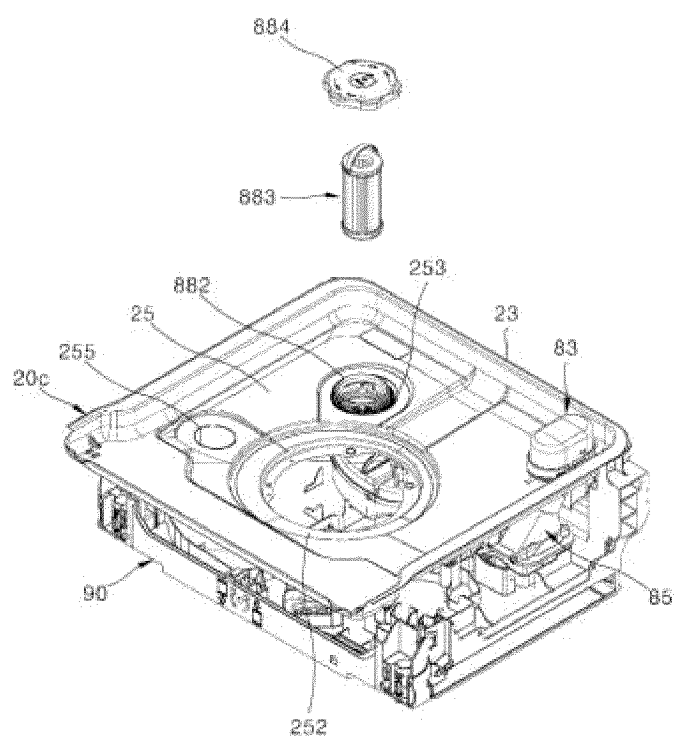
【FIG. 6】



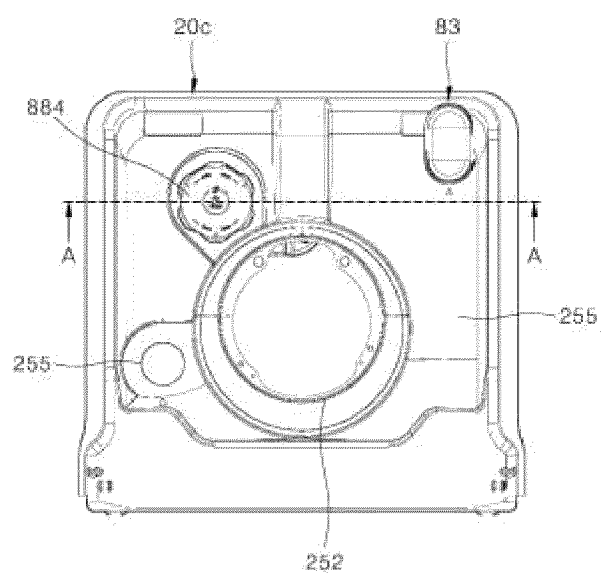
【FIG. 7】



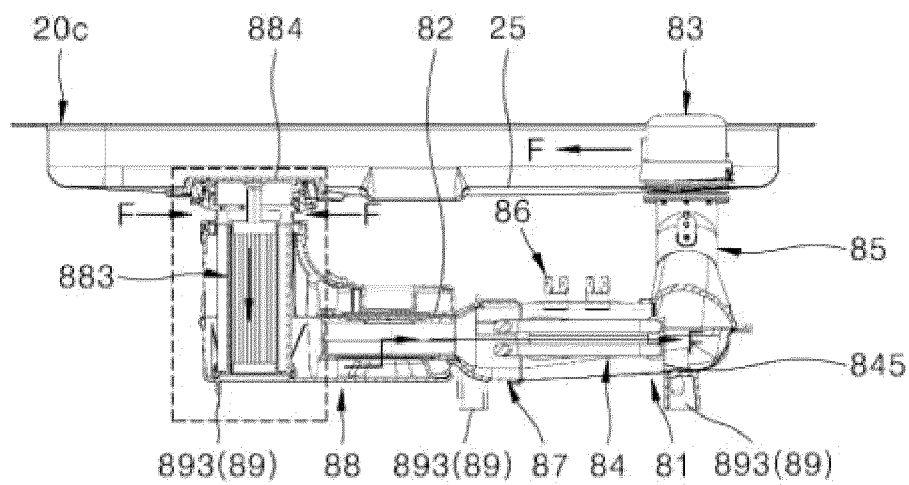
【FIG. 8】



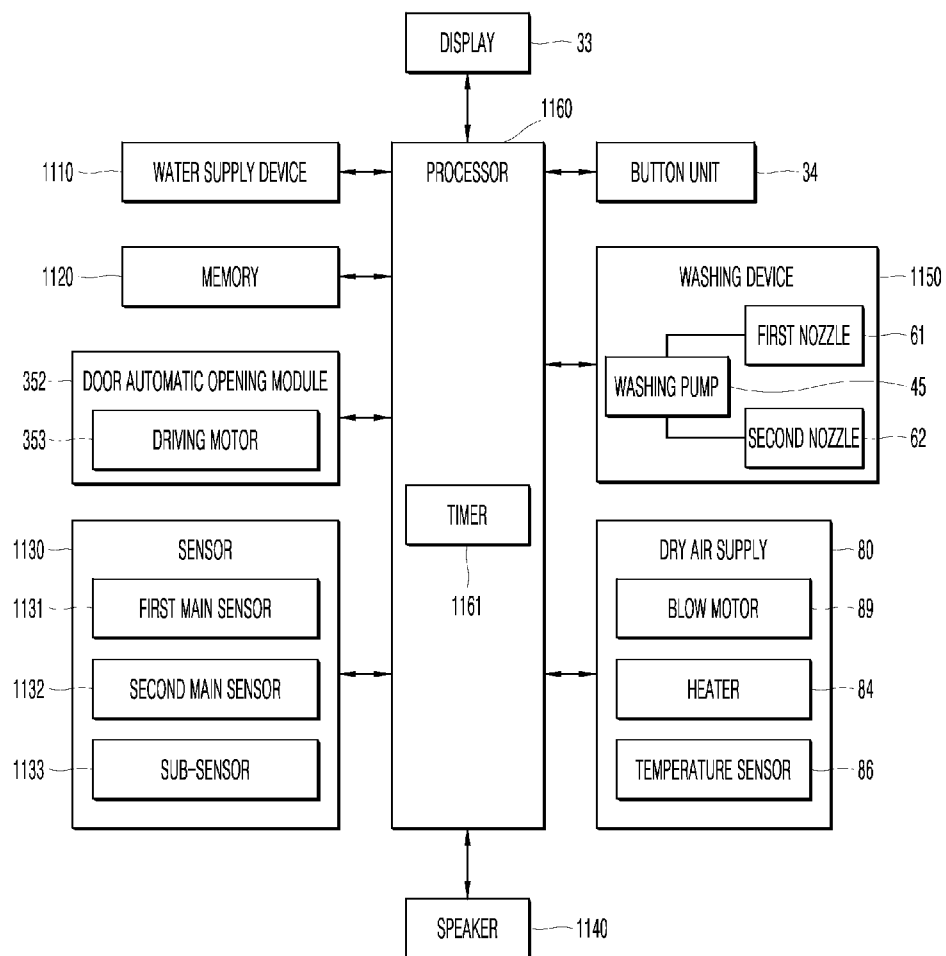
【FIG. 9】



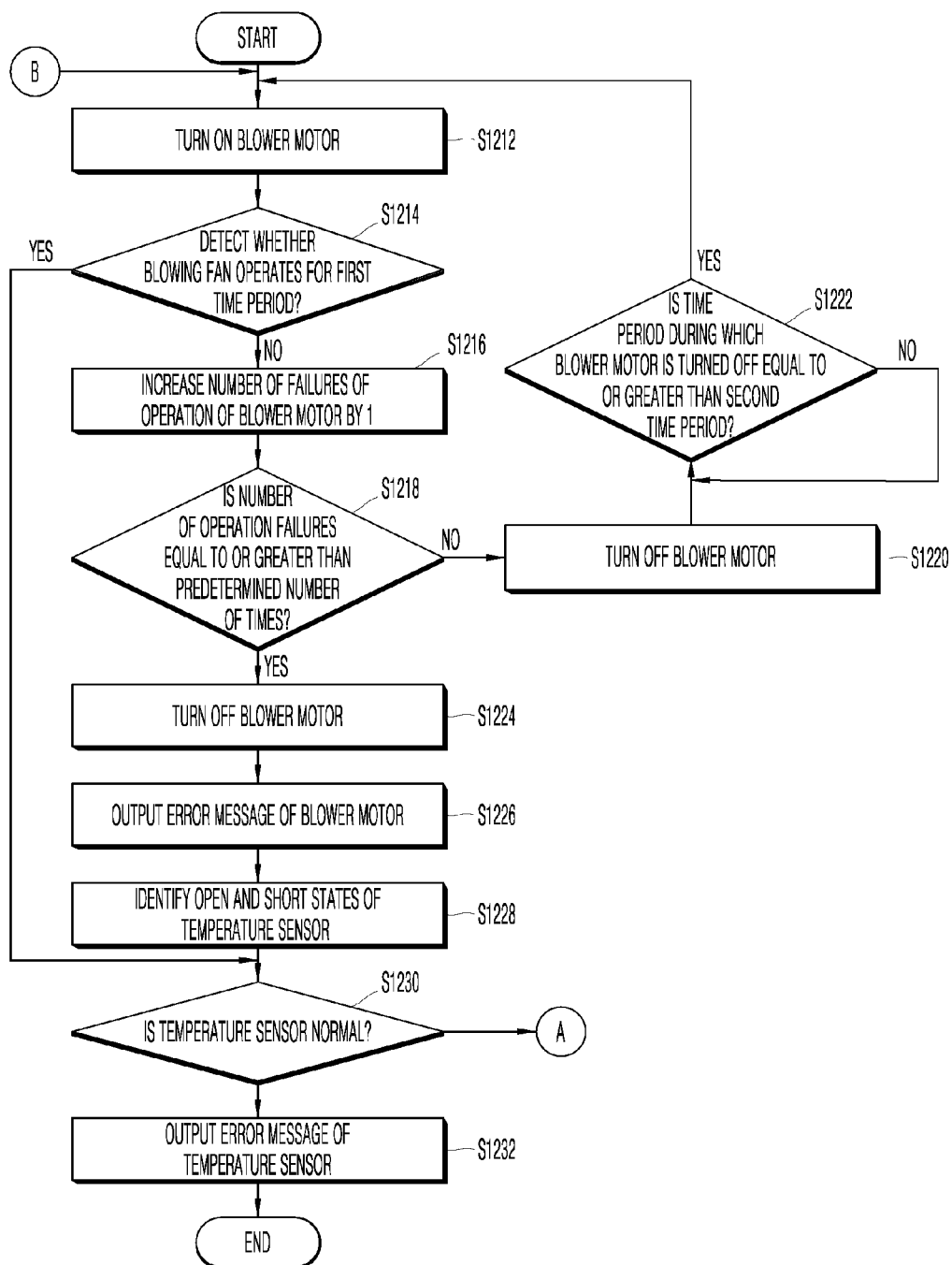
【FIG. 10】



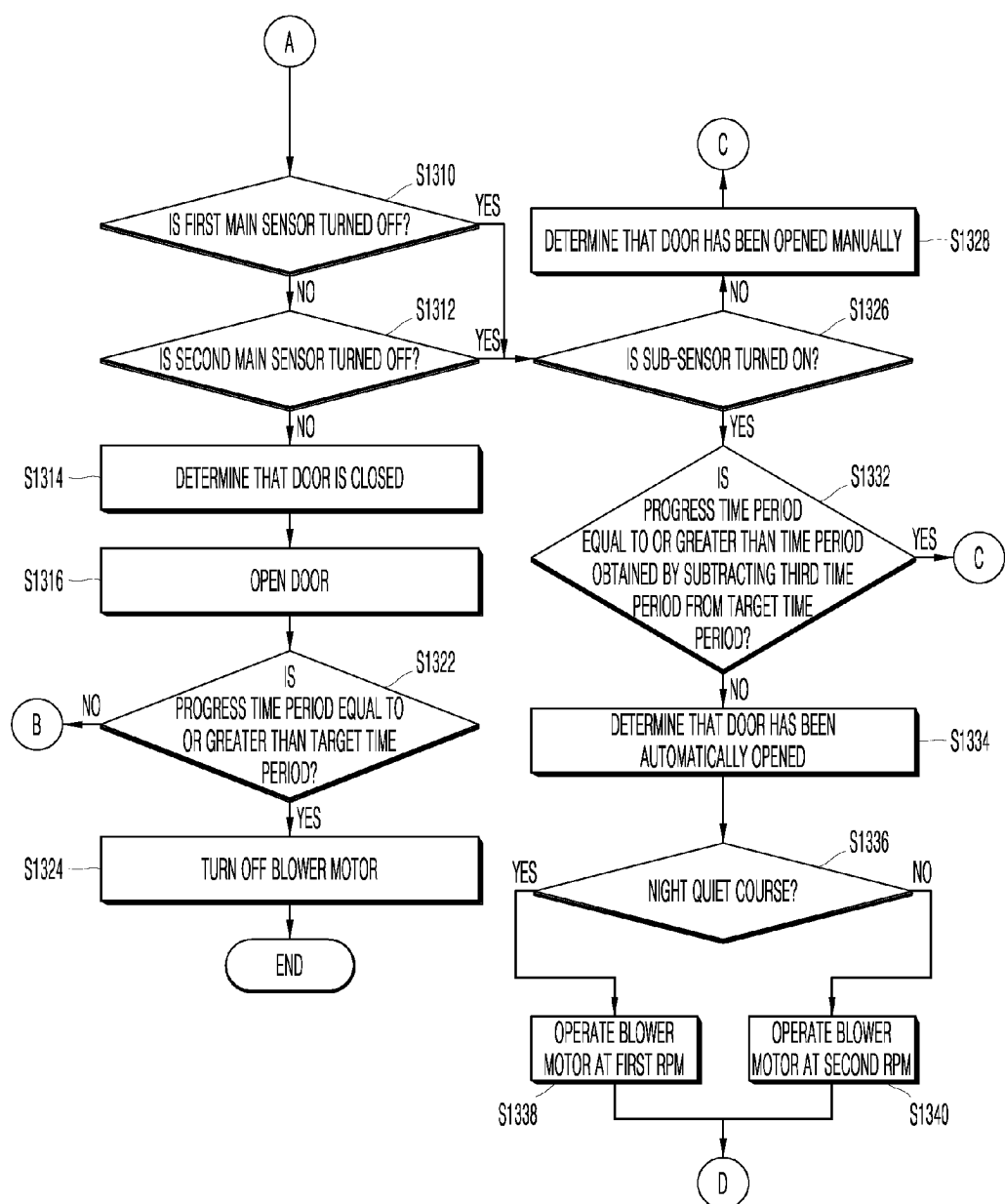
【FIG. 11】



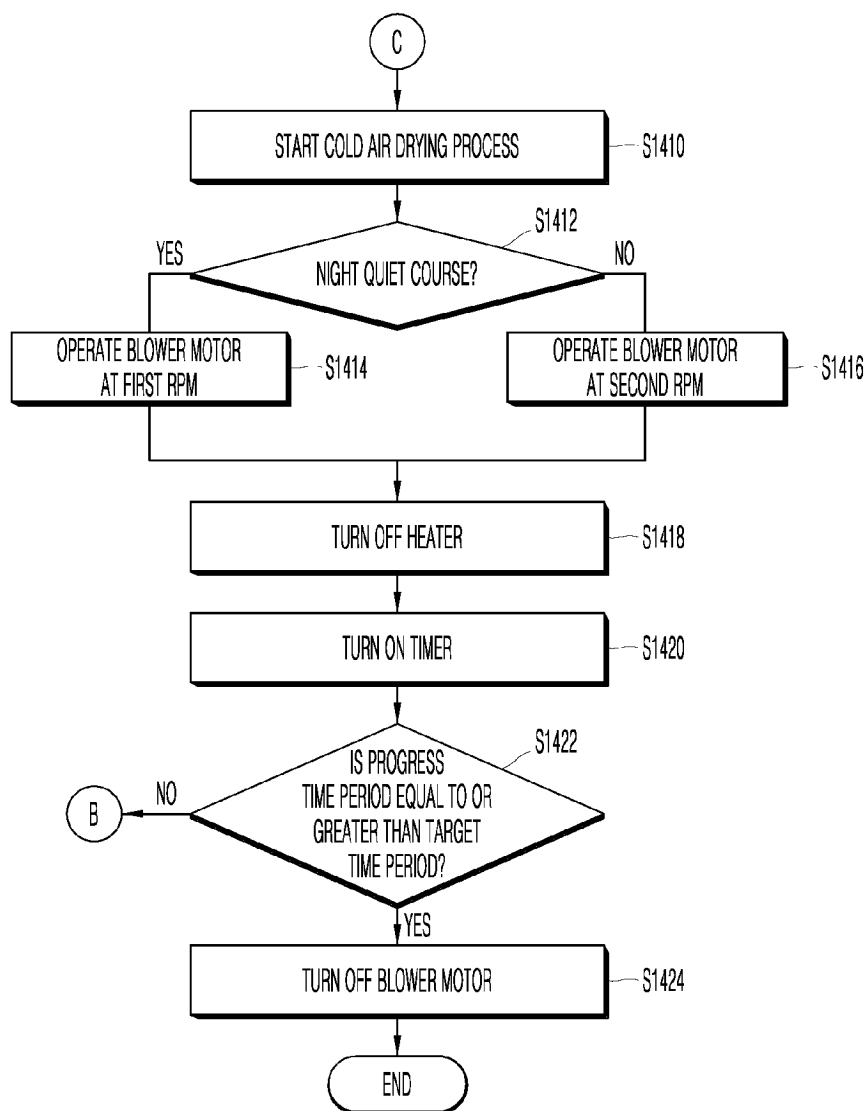
【FIG. 12】



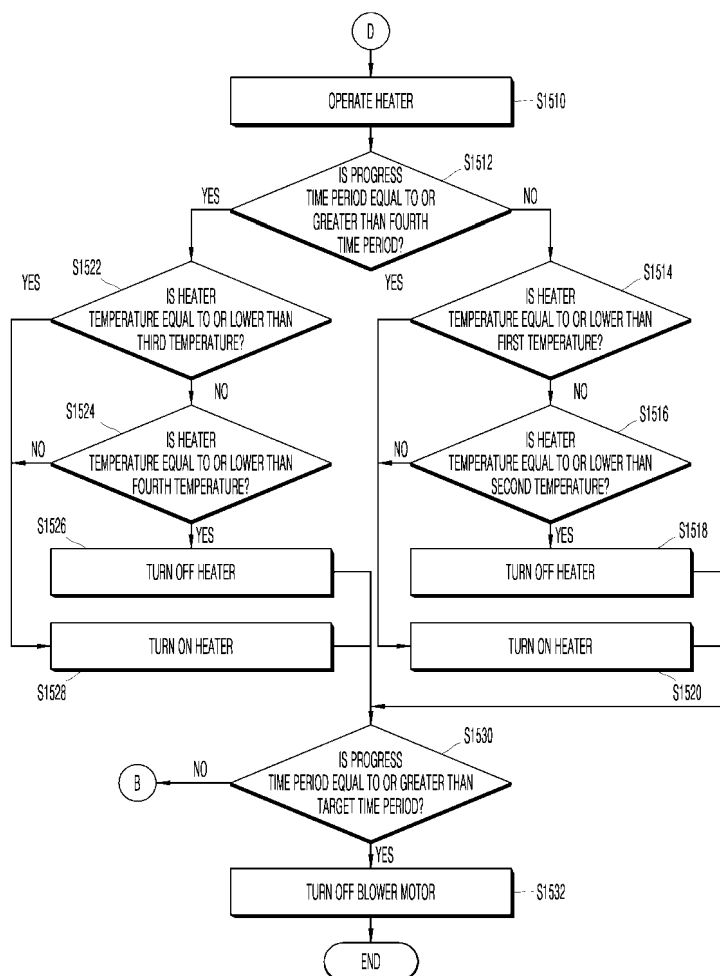
【FIG. 13】



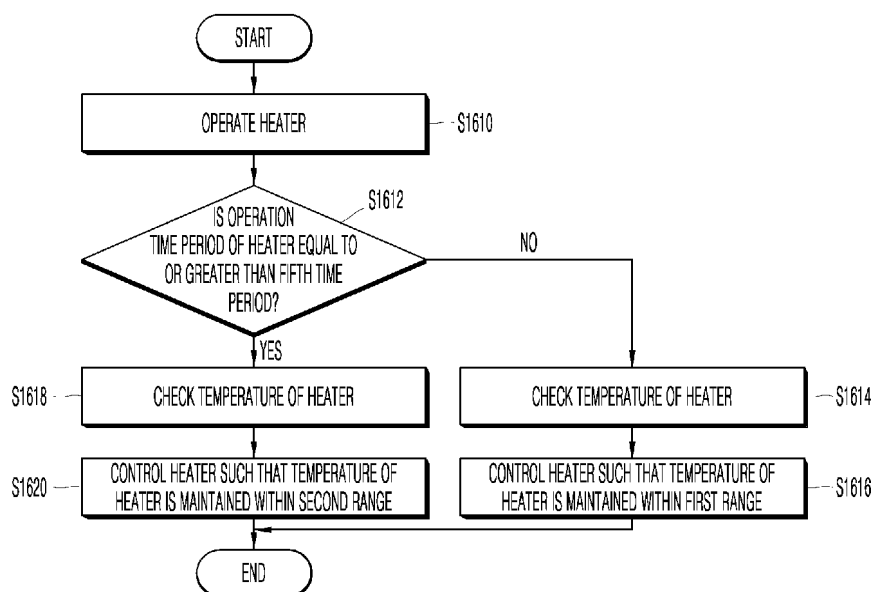
【FIG. 14】



【FIG. 15】



【FIG. 16】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/002648

A. CLASSIFICATION OF SUBJECT MATTER

A47L 15/48(2006.01)i; A47L 15/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L 15/48(2006.01); A47L 15/00(2006.01); A47L 15/42(2006.01); A47L 15/46(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 식기 세척기(dishwasher), 본체(main body), 모터(motor), 팬(fan), 히터(heater), 온도 센서(temperature sensor), 프로세서(processor)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2021-0066413 A (SK MAGIC CO., LTD.) 07 June 2021 (2021-06-07) See paragraphs [0019]-[0040]; claim 1; and figure 1.	1-4,9-11,13,15
A		5-8,12,14
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A	US 2021-0274993 A1 (HAIER US APPLIANCE SOLUTIONS, INC.) 09 September 2021 (2021-09-09) See paragraphs [0021]-[0041]; and figures 1-4.	1-15
A	US 2021-0353125 A1 (LG ELECTRONICS INC.) 18 November 2021 (2021-11-18) See paragraphs [0083]-[0153]; and figures 1-4.	1-15

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 07 June 2023	Date of mailing of the international search report 07 June 2023
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208	Authorized officer
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2023/002648

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KR 10-2018-0003313 A	09 January 2018	CN 107550429 A	09 January 2018
		CN 107550429 B	12 April 2022
		EP 3263005 A1	03 January 2018
		EP 3263005 B1	04 August 2021
		KR 10-2496333 B1	07 February 2023
		US 10470640 B2	12 November 2019
		US 2018-0000311 A1	04 January 2018
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US 2021-0353125 A1	18 November 2021	EP 3909496 A1	17 November 2021
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Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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