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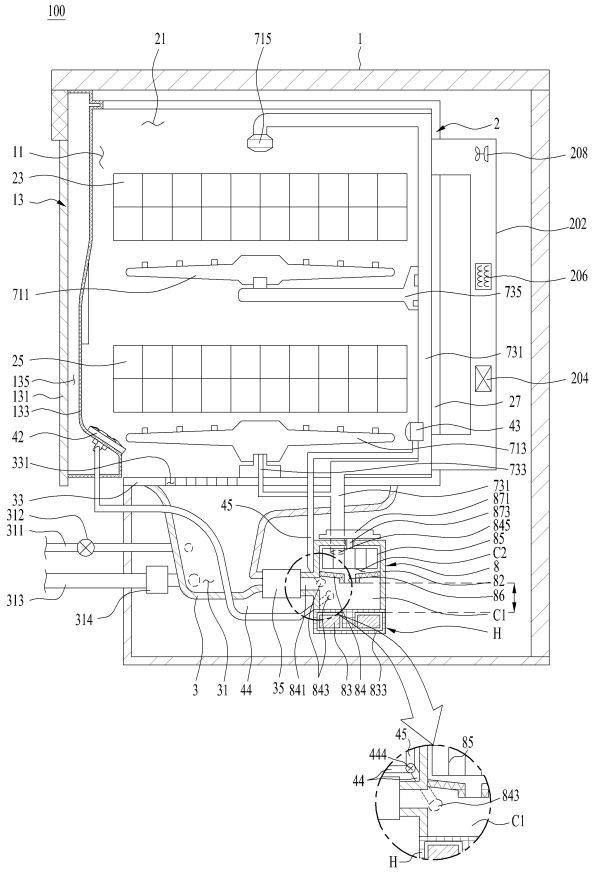
(54) DISHWASHER AND CONTROL METHOD THEREOF

(57) Disclosed a control method of a dishwasher comprising
a steam drying cycle (S500) for drying the washing objects by suppling steam;
wherein the steam drying cycle (S500) comprises:
a drying steam water supply step (S502) supplying water into the circulation pump (8);and
a drying steam supply step (S504) supplying steam generated inside the circulation pump (8) to the tub (2) so as to dry the washing objects, and
controlling a water level of the water supplied in the drying steam water supply step (S502) to be lower than a steam outlet hole (843) provided in the circulation pump (8).

FIG. 2



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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Korean Patent Application No. 10-2016-0000564 filed on January 4, 2016 in Korea, the entire contents of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE DISCLOSURE

Field of the Disclosure

[0002] Embodiments of the present disclosure relate to a dishwasher and a control method thereof.

Background of the Disclosure

[0003] Generally, a dishwasher is the electric appliance configured to remove food scraps or foreign substances from one or more dishwashing objects or dishes held therein by injecting wash water to the dishes.

[0004] Such a conventional dishwasher includes a case defining an exterior appearance; a tub providing a washing space for dishes; one or more racks provided in the tub and holding washing objects therein; an injection arm for injecting wash water to the racks; a sump storing wash water; and a pump for supplying the wash water stored in the sump to the injection arm.

[0005] The conventional dishwasher is able to wash or sterilize washing objects or dishes by supplying the washing objects or dishes, with heated wash water or steam so as to wash or sterilize them.

[0006] The conventional dishwasher typically heats the wash water stored in the sump to generate heated water, using a heater provided in the sump or generates steam, using an auxiliary steam generator provided therein.

[0007] In addition, the conventional dishwasher includes a steam nozzle provided in a lateral surface of the tub to supply steam to the tub and a steam hose connecting the steam nozzle and the steam generator with each other. In this instance, it is disadvantageously impossible to expose front portions of the washing objects to the steam supplied only to the washing objects put in both sides of the rack.

[0008] Furthermore, steam is injected only to the washing objects placed in both side areas of the rack and fails to be injected to the washing objects placed in a central area of the rack disadvantageously.

[0009] Still further, the steam is supplied only via the lateral surface of the tub and there is another disadvantage of failure in uniform temperature distribution in the washing space formed in the tub.

[0010] Still further, the conventional dishwasher has the algorithm set to implement a final rinsing cycle after a rinsing cycle so that the temperature of the dishes are raised by injecting heated hot wash water via the injection arm. Wash water is evaporated from the surfaces of the hot dishes and the dishes are dry. However, the amount of the hot wash water supplied to the dishes is disadvantageously increased in the final rinsing cycle.

SUMMARY OF THE DISCLOSURE

[0011] Accordingly, embodiments of the present disclosure are to address the above-noted and other problems. An object of the present disclosure is to provide a dishwasher which is capable of supplying steam even to washing objects placed in front or rear portions of a rack, and a control method thereof.

[0012] Another object of the present disclosure is to provide a dishwasher which need not use much water in drying washing objects, and a control method thereof.

[0013] A further object of the present disclosure is to provide a dishwasher which is capable of supplying steam to dry washing objects, and a control method thereof.

[0014] A further object of the present disclosure is to provide a dishwasher which is capable of soaking the foreign substances or food scraps stuck on washing objects by supplying steam.

[0015] A further object of the present disclosure is to provide a dishwasher which is capable of removing foreign substances or food scarps by supplying only wash water not containing dishwashing liquid, and a control method thereof.

[0016] A further object of the present disclosure is to provide a dishwasher which is capable of preventing the overheat of a heater and economizing in energy by using the residual heat of a heater, and a control method thereof.

[0017] A further object of the present disclosure is to provide a dishwasher which is capable of reducing the amount of the water needed to wash washing objects and the washing duration time, and a control method thereof.

[0018] A further object of the present disclosure is to provide a dishwasher which is capable of preventing damage to a pump heater that is caused by foreign substances remaining in a pump, and a control method thereof.

[0019] A further object of the present disclosure is to provide a dishwasher which is capable of washing one or more dishes having dust that are not used for a long time, and a control method thereof.

[0020] To achieve these objects and other advantages and in accordance with the purpose of the embodiments, as embodied and broadly described herein, a control method of a dishwasher comprises a rinsing cycle for rinsing one or more washing objects by injecting wash water; a steam drying cycle for drying the washing objects by suppling steam; a normal drying cycle for drying the washing objects, without supplying steam, wherein the rinsing cycle comprises a rinse water supply step for supplying rinse water to a sump; a rinse water circulating

step for injecting the rinse water via an injection arm by driving a pump; a rinse water drainage step for draining the rinse water from the sump, and the steam drying cycle comprises a drying steam water supply step for supplying drying steam water so as to dry the washing objects; and a drying steam supply step for supplying steam to a tub, and a water level of the steam water supplied in the drying steam water supply step is lower than a steam outlet hole provided in the pump and for exhausting steam.

[0021] The control method of the dishwasher may further comprise a pre-washing cycle for washing the washing objects by supplying the wash water not mixed with dishwashing liquid; and a main-washing cycle for washing the washing objects by supplying the wash water mixed with the dishwashing liquid, before the rinsing cycle.

[0022] The control method of the dishwasher may further comprise a course/option selecting step for selecting one of the courses preset to wash the washing objects or adding steam to the selected course, wherein when a steam refresh course is selected in the course/option selecting step, the rinsing cycle, the steam drying cycle and the normal drying cycle are implemented.

[0023] The rinsing cycle may comprise a first rinsing step for injecting rinse water via a top arm at a first preset temperature for a first preset time period; and a second rinsing step for injecting rinse water via an upper arm and a lower arm at a second preset temperature for a second preset time period, after the first rinsing step, and the first preset time period may be shorter than the second preset time period.

[0024] The second rinsing step may comprise a rinse water heating step for heating a pump heater.

[0025] The control method of the dishwasher may further comprise a third rinsing step for injecting rinse water via the top arm at a third preset temperature for a third preset time period, after the second rinsing step.

[0026] The normal drying cycle may comprise a first drying step for exhausting steam from the tub by opening a door or via an exhaustion duct.

[0027] The dishwasher may comprise a circulation duct for circulating air inside the tub, in communication with the tub; and a dehumidifier provided in the circulation duct, and the normal drying cycle may comprise a second drying step for circulating humid air inside the tub toward the circulation duct and removing moisture by using the humidifier.

[0028] The control method of the dishwasher may further comprise a course/option selecting step for selecting a course or an option adding steam to the selected course.

[0029] When a steam refresh course is selected in the course/option selecting step, the steam refresh course may be implemented and configured in a rinsing cycle, a steam cycle and a normal drying cycle.

[0030] The drying steam supply step may comprise a first water supply step for supplying wash water to the sump so as to wash the sump and the pump; and a first drainage step for draining the supplied wash water.

[0031] The control method of the dishwasher may further comprise a first circulating step for circulating the wash water supplied to the sump and the pump by driving the pump and washing internal spaces of the sump and the pump, after the first drainage step.

[0032] The control method of the dishwasher may further comprise a second water supply step for supplying steam water to the sump so as to generate steam, after the first drainage step, wherein the first drainage step drains all of the wash water supplied in the first water supply step.

[0033] The first drainage step may drain a predetermined amount of the wash water supplied in the first water supply step and generate steam by using the remaining wash water.

[0034] Accordingly, the embodiments have following advantageous effects. The dishwasher is capable of supplying steam even to washing objects placed in front or rear portions of a rack.

[0035] Furthermore, the dishwasher need not use much water in drying washing objects.

[0036] Still further, the dishwasher is capable of supplying steam to dry washing objects.

[0037] Still further, the dishwasher is capable of removing foreign substances or food scraps by supplying only wash water not containing dishwashing liquid.

[0038] Still further, the dishwasher is capable of preventing the overheat of a heater and economizing in energy by using the residual heat of a heater.

[0039] Still further, the dishwasher is capable of reducing the amount of the water needed to wash washing objects and the washing duration time.

[0040] Still further, the dishwasher is capable of preventing damage to a pump heater that is caused by foreign substances remaining in a pump.

[0041] Still further, the dishwasher is capable of washing one or more dishes having dust that are not used for a long time.

[0042] Further scope of applicability of the present disclosure will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the disclosure, are given by illustration only, since various changes and modifications within the spirit and scope of the disclosure will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] The present disclosure will become more fully understood from the detailed description given herein below and the accompanying drawings, which are given by illustration only, and thus are not limitative of the present disclosure, and wherein:

FIG. 1 is a perspective diagram illustrating one ex-

ample of a dishwasher in accordance with the present disclosure;

FIG. 2 is a sectional diagram illustrating the example of the dishwasher;

FIG. 3 is a block diagram illustrating a control method of a dishwasher in accordance with one embodiment of the present disclosure;

FIG. 4 is a block diagram illustrating a method of suppling steam water to generate steam in the control method of the dishwasher in accordance with one embodiment;

FIG. 5 is a block diagram illustrating a steam refresh course provided in a control method of the dishwasher in accordance with another embodiment; and

FIG. 6 is a diagram illustrating several embodiments of courses and options for the control method of the dishwasher in accordance with the present disclosure.

DESCRIPTION OF SPECIFIC EMBODIMENTS

[0044] Referring to the accompanying drawings, exemplary embodiments of the present disclosure according to one embodiment of the present disclosure will be described in detail. Use of such terminology for structures and control methods herein is merely intended to facilitate description of the specification, and the terminology itself is not intended to give any special meaning or function. In the present disclosure, that which is well-known to one of ordinary skill in the relevant art has generally been omitted for the sake of brevity.

[0045] Regardless of numeral references, the same or equivalent components may be provided with the same reference numbers and description thereof will not be repeated. For the sake of brief description with reference to the drawings, the sizes and profiles of the elements illustrated in the accompanying drawings may be exaggerated or reduced and it should be understood that embodiments of a device or a controlling method presented herein are not limited by the accompanying drawings.

[0046] Embodiments of the present disclosure relate to a dishwasher configured to inject steam from a front or rear surface of a tub. FIG. 1 is a perspective diagram illustrating one example of a dishwasher in accordance with the present disclosure and FIG. 2 is a sectional diagram illustrating the example of the dishwasher.

[0047] As shown in FIGS. 1 and 2, the dishwasher 100 may include a cabinet 1; a tub 2 provided in the cabinet 1 and accommodating one or more washing objects or dishes; one or more injection arms 711, 713 injecting wash water to the one or more washing objects; a sump 3 in which wash water is held; and a door 13 for opening and closing an opening 11 formed in the cabinet 1

[0048] The cabinet 1 defines an exterior design of the dishwasher and includes the opening 11 that is in communication with an internal space of the tub 2.

[0049] The tub 2 includes a washing space 21 formed therein and one or more racks provided in the washing space 21. The rack may include an upper rack 23 provided in an upper portion of the tub and a lower rack 25 provided under the upper rack 23.

[0050] The tub 2 is open and closed by the door 13 coupled to one surface of the cabinet. After opening the door 13 to open the tub 2, a user is able to move the upper rack 23 or lower rack 25 forward from the tub 2.

[0051] When the rack includes the upper rack 23 and the lower rack 25, the injection arm 711, 713 and 715 may include an upper arm 711 injecting wash water from a lower portion under the upper rack 23; a lower arm 713 injecting wash water from a lower portion of the lower rack; and a top arm 715 injecting wash water from an upper portion over the upper rack 23.

[0052] The wash water injected to the washing objects from the injection arms 711, 713 and 715 may be collected in the sump 3.

[0053] The sump 3 includes a storage 31 provided under the tub to store wash water. Foreign substances or food scraps removed from the washing objects are mixed in the wash water stored in the storage 31.

[0054] The sump 3 includes a sump cover 33 provided in its top and the sump cover 33 distinguishes the sump 3 from the tub 2. In this instance, the sump cover 33 may include a collect hole 331 for making the washing space 11 of the tub 2 in communication with the storage 31 of the sump 3.

[0055] Meanwhile, the sump 3 is connected to a water supply source (not shown) via a water supply path 311. The water supply path 311 may be open and closed by a water supply valve 312 which is controllable by a controller (not shown). When the water supply valve 312 is open, water is supplied to the internal space of the sump 3, in other words, the storage 31 via the water supply path 311.

[0056] The wash water stored in the sump 3 is drained outside the dishwasher via a drainage path 313 by a drainage pump 314. The drainage path 313 is in communication with a lower lateral surface or a bottom surface of the sump 3 to drain the wash water from the storage 31.

[0057] The water stored in the sump 3 is supplied to the injection arms 711, 713 and 715 via a first water supply path 731 by a pump 8 which will be described later. The first water supply path 731 connects the pump 8 and the top arm 715 with each other. The first water supply path 731 is provided in the tub 2 after penetrating a bottom surface of the tub 2, and connected to a top of the tub 2 along one lateral surface of the tub 2.

[0058] The upper arm 711 is connected to a third water supply path 735 which is branched from the first water supply path 731 and rotatably coupled to one end of the third water supply path 735. The upper arm 713 is rotatably connected to a second water supply path 733 penetrating the bottom surface of the tub 2 and the second water supply path 733 is branched from the pump 8 or the first water supply path 731 to be supplied wash water.

[0059] Meanwhile, the illustrated example of the dish-

washer 100 in accordance with the present disclosure includes the pump 8 for supplying wash water to the injection arms 711, 713 and 715.

[0060] The pump 8 may include a body 82 fixed in the cabinet 1; a sump partition wall 84 partitioning off an internal space of the body into a first chamber (C1) and a second chamber (C2); a communication hole 86 provided in the sump partition wall 84 and making the first chamber (C1) and the second chamber (C2) communicate with each other; an inlet 841 connecting the sump 3 and the first chamber (C1) with each other; a wash water outlet hole 845 connecting the second chamber (C2) and the first water supply path 731 with each other; an impeller 85 provided in the second chamber (C2); and a heater assembly (H) provided in a bottom surface of the first chamber.

[0061] The pump 8 is connected with the sump 3 via a connection path 35 and the connection path 35 is connected to a lower end of a lateral surface of the storage 31 formed in the sump 3 and to the inlet 841 of the pump 8.

[0062] The heater assembly (H) forms the bottom surface of the first chamber (C1) and the example of the dishwasher may include the pump 8 which can perform a wash water heating function and a wash water circulating function.

[0063] The heater assembly (H) may include a pump heater 83 exposed to the first chamber (C1) and then directly contact with wash water. Alternatively, the heater assembly (H) may include a heater pump 83 provided in a heater housing 833 and the heater housing 833 may form a bottom surface of the first chamber (C1), so that it may have the structure configured to allow the sump heater 83 to transfer heat to the heater housing 833 without directly contact with wash water and the heater housing 833 to heat wash water. In this instance, the heater housing 833 may be made of a conductive material such as metal so as to make the thermal energy transmitted effectively.

[0064] The impeller 85 functions as means for moving the wash water raised from the first chamber (C1) to the second chamber (C2) toward the wash water outlet hole 845 and it may be rotated by an impeller driving unit 87 provided outside the body.

[0065] The impeller driving unit 87 may include a motor 871 provided on a top of the second chamber (C2); and a shaft 873 connected to the impeller 85 through the pump 8.

[0066] The illustrated example of the dishwasher 100 is capable of supplying steam to the washing objects so as to enhance washing efficiency.

[0067] The conventional dishwasher integrally injects steam only to the washing objects placed in both side areas of the rack only from the lateral surfaces of the tub. Accordingly, steam injection coverage is sided/unbalanced within the tub and temperatures between dishes fail to rise uniformly.

[0068] To solve such disadvantages, the dishwasher in accordance with the present disclosure includes a first steam nozzle 42 provided in the door 13 and injecting steam toward the washing objects.

[0069] In this instance, the dishwasher is capable of injecting steam to the washing objects or dishes placed in the washing space uniformly and providing the effect of the steam injection to overall washing objects not the effect of the steam injection concentrated on only some washing objects placed in both sides.

[0070] The first steam nozzle 42 may be provided in a lower portion of the door 13, so as to use a characteristic of hot steam which will rise, specifically, to supply steam not only to a lower portion but also to an upper portion of the washing space. Accordingly, the rise of the temperatures of the washing objects can be maximized. An injection direction of the first steam nozzle 42 is inclined upward. In other words, the injecting direction of the first steam nozzle 42 is toward the washing objects placed in the upper rack 23 or other washing objects placed in the lower rack 25. That is to directly inject the steam injected from the first steam nozzle 42 to the washing objects.

[0071] A first steam path 44 connected to the first steam nozzle 42 may be further provided to supply steam. The first steam path 44 is provided outside the tub 2. In other words, the first steam path 44 for supplying steam is not connected to the first steam nozzle 42 within the tub 2.

[0072] The first steam path 44 may be provided as a hose made of rubber or plastic so as to stand a twisting stress which is generated when the door 13 is open and closed.

[0073] The first steam path 44 is connected to the pump 8 and supplies steam, using the pump heater 83 provided in the pump 8.

[0074] The heater assembly (H) is provided in the bottom surface of the first chamber (C1) and a predetermined amount of wash water is supplied to the first chamber (C1). After that, the pump heater 83 is put into operation to generate steam. A steam outlet 843 is provided in the first chamber (C1) to exhaust steam from the first chamber (C1) and the steam outlet 843 is connected to the first steam path 44.

[0075] The steam outlet 843 is provided with a predetermined height from the bottom surface of the first chamber (C1). The amount of the steam which can be generated in the first chamber (C1) is determined according to the height between the steam outlet 843 and the first chamber (C1). If wash water is supplied over a water level higher than the steam outlet 843, the steam generated in the first chamber (C1) cannot be exhausted via the steam outlet 843. In other words, the water level of the water supplied to the first chamber (C1) to generate steam cannot become higher than the steam outlet 843.

[0076] Meanwhile, the steam outlet 843 may be provided in the second chamber (C2), while the embodiment disclosing that the steam outlet 843 is provided in the first chamber (C1) has been described. Although steam is generated in the first chamber (C1), steam is sucked into the second chamber (C2) via the communication

hole 86 because it has the characteristic of moving upward and then supplied to the first steam nozzle 44 via the steam outlet 843 provided in the second chamber (C2).

[0077] Hereinafter will be described the structure configured to inject steam from a rear surface of the tub.

[0078] The dishwasher may include a second steam nozzle 43 provided in the rear surface of the tub 2 and injecting steam toward washing objects; and a second steam path 45 for supplying steam to the second steam nozzle 43.

[0079] The second steam nozzle 43 may be detachably coupled to the first water supply path 731.

[0080] The second steam nozzle 43 may be provided in the rear surface 27 of the tub 2, preferably, a lower portion (a side lower portion) of the rear surface of the tub 2. That is because steam has the characteristic of moving upward, specifically, that is to supply the overall area of the washing space. The second steam nozzle 43 may be inclined upward to the washing objects and configured to supply steam to the washing objects directly so as to remove foreign substances or food scraps effectively.

[0081] The second steam path 45 is provided in the tub 2 and penetrates the bottom surface of the tub 2. The second steam path 45 is connected to the steam outlet 843 provided in the first chamber (C1) of the pump (or the steam outlet provided in the second chamber). Alternatively, the second steam path 45 is branched from the first steam path 44 to be connected to the steam outlet 843. A transfer valve 444 is provided in a branched portion so as to adjust the amount of the steam supplied to the first steam path 44 or the second steam path 45 or open/close the steam supply.

[0082] Meanwhile, the dishwasher may supply steam to the tub, using the injection arms 711, 713 and 715 instead of the first steam nozzle or the second steam nozzle 43. The steam generated in the first chamber (C1) by using the heater assembly (H) may is allowed to pass the first water supply path 731 and the second water supply path 733 by the characteristic of air tending to move upward or the operation of the impeller 85 and then supplied to the tub via the injection arms 711, 713 and 715.

[0083] FIG. 3 is a block diagram illustrating a control method of a dishwasher in accordance with one embodiment of the present disclosure.

[0084] Referring to FIG. 3, the control method of the dishwasher in accordance with one embodiment of the present disclosure will be described hereinafter.

[0085] The control method of the dishwasher in accordance with one embodiment includes a main-washing cycle (S300), a rinsing cycle (S400) and a normal drying cycle (S600).

[0086] In the main-washing cycle (S300), the washing objects or dishes held in the tub 2 are washed and foreign substances or food scraps which remain on the washing objects are removed. In other words, the wash water mixed with dishwashing liquid is injected toward the washing objects to wash.

[0087] The main-washing cycle (S300) includes a pre-steam water supply step (S322) for supplying steam water (referenced to as the water supplied to the sump to generate steam) to the sump 3 so as to supply steam to the tub 2; a pre-steam supply step (S324) for generating steam by heating the pump heater 83 and supplying the steam to the tub 2; a main-wash water supply step (S342) for supplying wash water to the sump 3 to wash the washing objects, without drainage of the steam water supplied to the sump 3; a main-wash water injecting step (S344) for washing the washing objects by circulating the supplied wash water; and a main-wash water drainage step (S346) for draining the wash water.

[0088] In other words, the main-washing cycle (S300) consists of the pre-steam step (S320) for supplying steam; and a main-washing step (S340). The pre-steam step (S320) includes the pre-steam water supply step (S322) and the pre-steam supply step (S324). The main washing step (S340) includes the main-wash water supply step (S342), the main-wash water injecting step (S344) and the main-wash water drainage step (S346).

[0089] In the pre-steam water supply step (S322), the water supply valve 312 is open to supply steam water to the sump 3 and the steam water is supplied to the sump 3 via the water supply path 311. The steam water supplied to the sump 3 is then supplied to the first chamber (C1) of the pump 8 via the connect path 35.

[0090] The amount of the steam water supplied in the pre-steam water supply step (S322) is smaller than that of the wash water supplied in the main-wash water supply step. That is to generate a less amount of steam. If much water is supplied, it takes much time to phase-change water into steam by heating the pump heater 83. Also, before performing the main-washing step (S340), steam is supplied to the washing objects so as to gain an effect of soaking the foreign substances or food scraps remaining on the washing objects. At this time, a large amount of steam is not necessary.

[0091] The pump heater 83 is provided in the pump 8. To exhaust the steam generated by the heated pump heater 83 outside the pump 8, the pump 8 includes a steam outlet hole 843.

[0092] In this instance, a level of the water supplied in the pre-steam water supply step (S322) is lower than the steam outlet hole 843. If the steam water is supplied to a water level higher than the steam outlet hole 843, the steam generated in the pump 8 cannot be exhausted via the steam outlet hole 843.

[0093] Accordingly, when the height from the steam outlet hole 843 to an inner bottom of the pump 8 is referenced to as 'H', the water level of the steam water supplied in the pre-stem water supply step (S322) is lower than 'H'.

[0094] When an internal volume of the pump 8 is calculated through an experiment to determine a water level of steam water, the opening time of the water supply valve 312 is adjusted or the amount of the water supplied to

the sump 3 and the pump 8 may be adjusted by using a flowmeter (not shown) configured to calculate the flow is provided in the water supply path 311.

[0095] It is preferred that the amount of the steam water supplied in the pre-steam water supply step (S322) is approximately 0.8L.

[0096] Meanwhile, in the pre-steam supply step (S324), electric currents flow to the pump heater 83 and the heated pump heater 83 then heats the steam water inside the pump 8 to generate steam. The steam exhausted from the pump 8 via the steam outlet hole 843 is selectively supplied to the first steam nozzle 42 and/or the second steam nozzle 43 along the first steam path 44 and/or the second steam path 45.

[0097] The steam injected via the first steam nozzle 43 and/or the second steam nozzle 43 soaks foreign substances or food scraps to provide moisture to the foreign substances or food scraps which become dry after moisture of the washing objects is evaporated and exchanges heat. Also, the steam heats the washing objects or dishes to enhance washing efficiency in the following main-washing step (S340).

[0098] The transfer valve 444 for selectively opening/closing the first steam path 44 and the second steam path 45 to inject the steam via the first steam nozzle 42 and/or the second steam nozzle 43 is controlled so that the steam may be injected from the front or rear side of the tub 2 or from both of the front and rear sides.

[0099] The pre-steam supply step (S324) may include a first steam step for supplying steam to the tub 2 by using the first steam nozzle 42 in the front side of the tub; and a second steam step for supplying steam to the tub 2 by using the second steam nozzle 43 in the rear side of the tub 2.

[0100] The first steam step and the second steam step may be performed simultaneously or selectively.

[0101] The steam generated in the pump 8 may be supplied to the tub 2 via the injection arms 711, 713 and 715 by the driving of the impeller 85.

[0102] In other words, the pre-steam supply step (S324) may include a third steam step for supplying stem by using one or more of the injection arms 711, 713 and 715 provided in the tub 2.

[0103] The conventional dishwasher supplies water to the tub to supply steam before the washing cycle and then heats the heater provided on a bottom surface of the tub to generate steam. Hence, the water supplied to the tub is drained to perform the washing cycle and wash water is re-supplied to the tub.

[0104] However, the conventional dishwasher has a disadvantage of draining the water remaining in the tub after failing to be heat-exchanged into steam before supplying wash water for the washing cycle. First, the heated heater is driven to drain the water before the heater is chilled and it is likely to damage the heater. Second, remaining water is drained and new wash water is supplied so that water usage could increase. Finally, relatively much energy is used in case of heating the wash water and that the overall washing time could increase disadvantageously.

[0105] To solve such disadvantages, according to the control method of the dishwasher in accordance with the present disclosure, the main-wash water supply step (S342) supplies wash water to the sump 3 for the main-washing step (S340), without drainage of the water which remains after condensed or failed to be exchanged into steam during the pre-steam supply step (S324).

[0106] Accordingly, the control method of the dishwasher in accordance with the present disclosure may prevent damage to the pump heater 83 which might be caused by the overheat after getting exposed and reduce water use, because the remaining water is used as wash water. Also, the control method may economize in energy and time in case the wash water is heated to a preset temperature by using the residual heat of the remaining water.

[0107] When generating and supplying steam, the pre-steam supply step (S324) may set an optimal value by experimentally adjusting the heating time and temperature of the pump heater 83 for the steam water to remain in the pump 8.

[0108] It is preferred that the water level of the remaining water in the sump 9 and/or the pump 8 is 1cm from the bottom of the pump 8.

[0109] The main-washing step (S340) is the step for actually removing foreign substances or food scraps from the washing objects or dishes. In other words, the main-washing step (S340) supplies the wash water containing dishwashing liquid and washes the dishes as the washing objects.

[0110] The amount of the wash water supplied in the main-wash water supply step (S342) is larger than the amount of the water supplied to the sump 3 in the pre-steam water supply step (S322). A level of the wash water supplied in the main-wash water supply step (S342) is higher than the steam outlet hole 843. More specifically, it is preferred that the water is supplied to the sump 3 or the pump 8 to a water level or more at which the communication hole 86 provided in the sump partition wall 84 is submerged. In other words, the amount of the wash water supplied in the main-wash water supply step (S342) may be approximately 2.2L.

[0111] In the main-wash water injecting step (S344), the impeller 85 is put into operation to rotate and the water filled in the first chamber (C1) flows upward to the wash water outlet hole 845 provided in the second chamber (C2) via the communication hole 86 and injected to the washing objects held in the tub 2 via the injection arms 711, 713 and 715. The foreign substances remaining on the washing objects are removed by a water pressure of the wash water injected from the injection arms 711, 713 and 715 and the wash water containing the foreign substances fall to the lower portion of the tub 2 to be filtered by the collect hole 331 of the sump cover 33. Only the wash water having the foreign substances filtered therefrom is supplied to the sump 3 and re-inject-

ed from the pump 8 via the injection arms 711, 713 and 715 to be circulated.

[0112] In this instance, the pump heater 83 is heated to heat the circulated wash water and the heated wash water is injected via the injection arms 711, 713 and 715.

[0113] The main-wash water drainage step (S346) is for draining the wash water stored in the sump 3 and the sump 8. After the main-wash water injecting step (S344) by using the drainage path 313 and the drainage pump 314 may be provided.

[0114] In the main-wash water drainage step (S346), all of the wash water stored in the sump 3 and the pump 8 is drained. The wash water collected in the sump 3 and the pump after the main-wash water injecting step (S344) is the contaminated wash water containing many foreign substances or food scraps.

[0115] Meanwhile, the rinsing cycle (S400) includes a rinse water supply step (S402) for supplying rinse water to the sump 3; a rinse water circulating step (S404) for injecting the rinse water to the injection arms 711, 713 and 715 by using the pump 8; and a rinse water drainage step (S406) for draining the rinse water from the sump 3.

[0116] When rinse water is supplied to the sump 3 in the rinse water supply step (S402), the impeller 85 is rotated to move the water stored in the first chamber (C1) toward the second chamber (C2) and the water is injected into the tub 2 via the injection arms 711, 713 and 715. The rinse water circulating step (S404) rotates the impeller 85 for a preset time period to drop the foreign substances stuck on the washing objects. After that, the rinse water drainage step (S406) drains the rinse water stored in the sump 3 and the pump 8. The rinsing cycle (S400) supplies water to the sump 3 and the rinse water injected via the injection arms 711, 713 and 715 contains no dishwashing liquid. The rinsing cycle (S400) is repeatedly performed two through four times, to remove the foreign substances and dishwashing liquid which might remain on the dishes.

[0117] The rinse water circulating step (S404) heats the pump heater 83 and heats the rinse water supplied from to the tub 2 to supply heated water.

[0118] In the rinse water drainage step (S406), the rinse water stored in the sump 3 and the pump 8 is drained. In case of re-supplying the steam water (as main-wash water) in the main-washing cycle (S300), some water remains to generate steam, not draining all of the steam water, and the damage to the pump heater 83 caused by overheat may be prevented. Also, residual heat may be used and then the energy consumption may be reduced in the main-washing step (S340). However, in the rinsing cycle (S400), the rinse water supplied to the pump 8 sufficiently is heated and there is no concern that the pump heater 83 is overheated too much, so that the pump heater 83 may not overheated to generate heated water. Accordingly, in the rinsing cycle (S400), the rinse water drainage step (406) drains the rinse water from the sump 3 and the pump 8 and a steam drying cycle (S500), which will be described in detail later) supplies clean steam to the tub.

[0119] The control method of the dishwasher in accordance with one embodiment of the present disclosure includes the steam drying cycle (S500) performed between the rinsing cycle (S400) and the normal drying cycle (S600).

[0120] The steam drying cycle (S500) makes internal circumferences/conditions of the tub 2 high-temperature humid and heats the washing objects by injecting steam toward the washing objects in such high temperature humid circumferences/conditions. The steam drying cycle (S500) is the cycle for vaporizing condensation or water drop on the washing objects and drying the washing objects, while the heated washing objects get chilled.

[0121] The conventional dishwasher includes the final rinsing cycle for injecting too much (highly) heated water to the washing objects to dry them after the rinsing cycle and raise the temperature of the washing objects. After that, water drop is vaporized while the heated washing objects get chilled. However, too much water has to be heated to heat the washing objects and energy consumption as well as water consumption rises disadvantageously.

[0122] However, the dishwasher in accordance with the present disclosure dries the washing objects by supplying steam, not water. Accordingly, a small amount of water is boiled only to raise the temperature inside the dishwasher to a preset value proper to dry the washing objects. The dishwasher in accordance with the embodiments of the present disclosure may economize in energy and water consumption and reduce the overall washing time. Also, it may prevent damage to the coating on the dishes by injecting high-temperature water and realize the high-temperature internal circumferences/conditions by injecting steam.

[0123] After the rinsing step (S400), the steam drying cycle (S500) includes a drying steam water supply step (S502) for supplying drying steam water; and a drying steam supply step (S504) for supplying steam to the tub 2.

[0124] In the drying steam water supply step (S502), a small amount of water is supplied to the sump 3 and the pump 8 and a water level of the steam water supplied to the drying steam water supply step (S502) is lower than the steam outlet hole and as high as or higher than 1cm from the bottom of the pump 8. Specifically, the amount of the steam water supplied in the drying steam water supply step (S502) may be around 0.81.

[0125] The rinsing cycle (S400) drains the rinse water and the steam drying cycle (S500) re-supplies drying steam water. In other words, the rinsing cycle (S400) and the steam drying cycle (S500) are separated and provided as independent cycles. Accordingly, the rinsed dishes become dry sanitarily. When only the steam drying cycle (S500) is performed without the rinsing cycle (S400), the dishes washed and rinsed by the user may be dried by using the steam and an auxiliary cycle, for example, a sterilizing course may be realized advantageously.

[0126] The control of the pre-steam step (S320) mentioned above may be applied to the control of the steam drying cycle (S500) as it is. In other words, the control of the pre-steam water supply step (S322) described above may be applied to the drying steam water supply step (S502) and the control of the pre-steam supply step (S324) described above may be applied to the drying steam supply step (S504). Accordingly, the detailed description of the drying steam water supply step (S502) and the drying steam supply step (S504) is repeated and will be omitted accordingly.

[0127] The steam drying cycle (S500) may further include a drying steam water drainage step (S506) for draining the water (steam water) stored in the sump 3 and the pump 8. After the drying steam water drainage step, the dishwashing is complete and no steam or wash water needs to be supplied to the tub. Accordingly, the water stored in the pump 8 and the sump 3 is drained to prevent reproduction of microbes.

[0128] FIG. 4 is a block diagram illustrating a method of suppling steam water to generate steam in the control method of the dishwasher in accordance with one embodiment.

[0129] The pre-steam step (S320) and the steam drying cycle (S500) supply steam to the tub. To generate steam, steam water is supplied to the sump. Hereinafter, a control method of supplying steam water to the sump 3 in the pre-steam water supply step (S322) or the drying steam water supply step (S502) will be described. The description which will be described here from may be applied to both the pre-steam water supply step (S322) and the drying steam water supply step (S502). On explanation sake, references and terminology of the steam water supply step (S322 and S502) will be used.

[0130] As shown in FIG. 4, the steam water supply step (S322 and S502) includes a first water supply step (S10) for supplying wash water to the sump 3 to wash the sump 3 and the pump 8; and a first drainage step (S30) for draining the supplied water.

[0131] If the steam water stored in the sump 3 or the pump 8 contains foreign substances and has a high contamination level, the pump heater 83 has to be heated too much to generate steam. In this instance, a desired amount of steam cannot be generated or the supplied steam is likely to become contaminated enough to contaminate the dishes. Accordingly, wash water is supplied to the sump 3 and the water held in the sump 3 or the pump 8 is diluted and the water containing foreign substances is drained in the first drainage step (S30) so as to wash the sump 3 and the pump 8.

[0132] A first circulating step (S20) may be further provided between the first water supply step (S10) and the first drainage step (S30). In the first circulating step (S20), foreign substances stuck on a surface of the tub or the dishes are removed by injecting wash water into the tub 2 via the injection arms 711, 713 and 715.

[0133] The steam water supply step (S322 and S502) in accordance with one embodiment may include the first water supply step (S10) and the first drainage step (S30), and selectively include the first circulating step (S20). In this instance, the water supply is performed in the first water supply step (S10) until its water level becomes higher than the steam outlet hole 843, preferably, performed to fill the storage 31 of the sump 3 with water to dilute the water stored in the sump and the pump. In the first drainage step (S30), the wash water supplied in the first water supply step is drained and all of the supplied wash water is not drained and the water is drained to a water level which is lower than the steam outlet hole 843 in the pump 8 and as high as 1cm from the bottom of the pump to generate steam. Accordingly, steam is generated by using the remaining water in the pump 8. Compared with a case in which the first water supply step (S10) is not performed, cleaner stem is generated and supplied and the amount of the water used in the washing may be minimized.

[0134] Meanwhile, the steam water supply step (S322 and S502) in accordance with another embodiment includes the first water supply step (S10) and the first drainage step (S30), and selectively include the first circulating step (S20). The water supply is performed in the first water supply step (S10) until its water level becomes higher than the steam outlet hole 843, preferably, performed to fill the storage 31 of the sump 3 with water to dilute the water stored in the sump and the pump. In the first drainage step (S30), all of the wash water supplied in the first water supply step is drained and the contaminated wash water is removed from the sump and pump. After that, a second water supply step (S40) is further provided. In the second water supply step (S40), steam water is supplied to generate steam until its water level becomes lower than the steam outlet hole 843 in the pump 8 and as high as and higher than 1cm from the bottom of the pump. Accordingly, clean steam may be generated and supplied, compared with the steam generated in the steam water supply step (S322 and S502) in accordance with the embodiment mentioned above.

[0135] Meanwhile, the normal drying cycle (S600) may supply no steam to the washing objects and dry them.

[0136] Before the normal drying cycle (S600), steam is supplied to the washing objects and the washing objects are heated. A drying method for drying the heated washing objects is classified into an exhaustion type drying method and a circulation type drying method.

[0137] According to the exhaustion type, after the normal drying cycle (S600) is complete, the door 13 is opened automatically to exhaust steam and humid air outside the washing space 21 through the opening 11 or an exhaustion duct (not shown) in communication with the tub 2 and an exhaustion valve (not shown) for opening and closing the exhaustion duct (not shown) are further provided. After the steam drying cycle (S500) is complete, a first drying step (not shown) may be performed for exhausting steam and humid air outside via the exhaustion duct (not shown) by opening the exhaustion valve (not shown).

[0138] According to the circulation type drying method, the dishwasher may include a circulation duct 202 having both sides which are in communication with the tub 2; a dehumidifier 204 provided in the circulation duct and condensing humid air; a heating mechanism 206 provided in the circulation duct 202 and heating the air condensed by the dehumidifier; and a circulation fan 208 provided in the circulation duct 202 and blowing the air heated by the heating mechanism 206 to the tub.

[0139] In this instance, the normal drying cycle (S600) may include a second drying step (not shown) for circulating internal air of the tub 2 through the circulation duct 202 by driving the circulation fan 208 after the steam drying cycle (S500) and supplying dry air to the tub by condensing the humid air circulating in the circulation duct 202 by using the dehumidifier 204. Accordingly, no hot heated air is exhausted outside the dishwasher and there is no risk of the user's burns. No exhaustion duct is provided and it becomes easier to install the dishwasher advantageously.

[0140] Moreover, the normal drying cycle (S600) may further include a third drying step (not shown) for heating the air dried in the dehumidifier 204 by using the heating mechanism 206 and supplying the heated hot air to the tub. Accordingly, the overall dry time may be reduced in the illustrated drying time and the hot food loaded on the warm-stated plate or dish dried by the hot air will not become cold, compared with the conventional drying cycle for supplying air to the tub.

[0141] Meanwhile, the control method of the dishwasher in accordance with one embodiment may further include a pre-washing cycle (S200).

[0142] The pre-washing cycle (S200) injects wash water which is not mixed with dishwashing liquid to the washing objects and removes the relatively large foreign substances stuck on the washing objects or dishes before the main-washing cycle (S300). Even in the pre-washing cycle (S200), the pump heater 83 is heated to heat the wash water and the heated water is injected via the injection arms.

[0143] FIG. 6 is a diagram illustrating several embodiments of courses and options for the control method of the dishwasher in accordance with the present disclosure.

[0144] Referring to FIGS. 1, 3 and 6, the control method of the dishwasher in accordance with one embodiment may include a course/option selecting step (S100) for selecting one or more preset courses or options.

[0145] The dishwasher includes a control panel 14 having a course selecting unit 16 for selecting one of preset courses; an option selecting unit 17 for adding a steam option even when the selected course is a non-steam course. The control panel 14 is provided in a top or an upper area of a front surface of the dishwasher.

[0146] The control panel 14 may include a display unit 15 and the display unit 15 displays the course selected from the course selecting unit 16 and the option selected from the option selecting unit 17 to provide the user with the information about the selected course and option.

[0147] The course selecting unit 16 includes a steam use course (st) using steam to wash washing objects or dishes; and a non-steam course (stn) not using steam. The non-steam course (stn) includes a normal washing course (stn-nor) which will be described later. The steam course (st) includes a pre-steam course (st-c1), a steam drying course (st-c2) and a steam course (st-c3).

[0148] Referring to FIG. 6, the pre-steam course and the steam drying course will be described in detail.

[0149] When the normal washing course (stn-nor) is selected in the course/option selecting step (S100), the normal washing course (stn-nor) configured in the main-washing cycle (S300) (or the main-washing step (S340)), the rinsing cycle (S400) and the normal drying cycle (S600), which supply no steam, is implemented. In this instance, while the high-temperature rinse water heated in the final rinsing step of the rinsing cycle is injected to the washing objects, the heated washing objects become chilled and water drop is vaporized from surfaces of the washing objects to dry the washing objects.

[0150] When the pre-steam course (st-c1) is selected in the course/option selecting step (S100, the pre-steam course (st-c1) configured in the main washing cycle (S300) (or the pre-steam step (S320) and the main washing step (S340)), the rinsing cycle (S400) and the normal drying cycle (S600), which supply steam, is implemented.

[0151] Also, when the steam drying course (st-c2) is selected in the course/option selecting step (S100), the steam drying course (st-c2) configured of the main-washing cycle (S300)(or the main-washing step (S340)), the rinsing cycle (S400), the steam drying cycle (S500) and the normal drying cycle (S600), which supply no steam. is implemented. Accordingly, steam is supplied to the washing objects to heat them and the heated washing objects are dried by using evaporation heat while getting chilled.

[0152] When the steam course (st-c3) is selected in the course/option selecting step (S100), the steam course (st-c3) configured of the main washing cycle (S300) (or the pre-steam step (S320) and the main-washing step (S340)), the rinsing cycle (S400) and the normal drying cycle (S600), which supply steam, is implemented.

[0153] Meanwhile, even though the course selected in the course/option selecting step (S100) is the non-steam course (stn), steam may be supplied to the tub according to the user's selection from the option selecting unit 17. The option selection unit may include a first option (stn-o1) performing the pre-steam step (S320); a second option (stn-o2) performing the steam drying cycle (S500); and a third option (stn-o3) performing the pre-steam step (S320) and the steam drying cycle (S500). Accordingly, even when the normal washing course (stn-nor) is selected in the course/option selecting step (S100), the user may select one of the first through third options from the option selecting unit 17 during the normal washing course (stn-nor) to inject steam to the washing objects and enhance washing efficiency.

[0154] FIG. 5 is a block diagram illustrating a steam refresh course provided in a control method of the dishwasher in accordance with another embodiment. Referring to FIGS. 5 and 6, the steam refresh course (st-re) will be described.

[0155] The steam refresh course (st-re) as the control method of the dishwasher in accordance with this illustrated embodiment may include the rinsing cycle (S400) for rinsing the washing objects by injecting wash water; the steam drying cycle (S500) for drying the washing objects by supplying steam; and the normal drying cycle (S600) for drying the washing object without supplying steam.

[0156] The steam refresh course (st-re) may not include the washing cycle for washing the washing objects before the rinsing cycle (S400). The steam refresh course is the course for removing dust from the dishes not used for a long time or removing the foreign substances that are able to be rinsed by only using water without dishwashing liquid or warming up the dishes before loading food.

[0157] The detailed description of the rinsing cycle (S400), the steam drying cycle (S500) and the normal drying cycle (S600) is equal to those of the control method in accordance with the embodiment mentioned above. Accordingly, the repeated description is omitted and differences will be described hereinafter.

[0158] The rinsing cycle (S400) may include a first rinsing step (S420) for injecting rinse water at a first preset temperature for a first preset time period; and a second rinsing step (S440) for injecting rinse water at a second preset temperature for a second preset time period.

[0159] In the first rinsing step (S420) and the second rinsing step (S440), water is supplied to the sump 3 and the pump 8 is driven only to inject the water via the injection arms for a preset time period, also, the water stored in the sump and the pump is controlled to be drained.

[0160] The first rinsing step (S420) is configured to supply the water received from an external water supply source. A water level of the supplied water is as high as or higher than the sump partition wall 84. The supplied water is injected into the tub 2 via the wash water outlet hole 845 by the rotation of the impeller 85. In the first rinsing step (S420), the water is injected only via the top arm 715. The first preset temperature is the temperature of the water supplied from the external water supply source and the first preset time period is approximately 60 seconds. Accordingly, it can be said that the first rinsing step is the pre-rinsing step. As warm water is supplied from the external water supply source in North America, the first rinsing cycle provided in the dishwasher manufactured in North America is able to gain an effect of raising the temperature of the washing objects a little bit.

[0161] Meanwhile, the second rinsing step (S440) is configured to actually rinse the washing objects. In the second rinsing step (S440), water is injected to the washing objects while the upper arm 711 and the lower arm 713 are rotated. The second preset temperature is higher than the first preset temperature and the second preset time period is longer than the second preset time period. Accordingly, the second rinsing step (S440) is able to gain an effect of actually washing off dust from the washing objects.

[0162] The second rinsing step (S440) may include a rinse water heating step (not shown) for heating water to the second preset temperature by using the pump heater 83. Specifically, the second preset temperature is approximately 45 °C and the second preset time period is approximately 240 seconds.

[0163] Meanwhile, the rinsing cycle (S400) may further include a third rinsing cycle (S460) for injecting rinse water at a third preset temperature for a third preset time period.

[0164] The third preset temperature is lower than the second preset temperature, specifically, equal to the first preset temperature. In other words, water is supplied to the sump (S460) in the third rinsing step (S460) and the water injected to the tub 2 by the pump 8 means the water is not heated by the pump heater 83. Accordingly, the pump heater 83 driven to heat the water is chilled in the second rinsing step (S440) and the overheat of the pump heater is prevented. Unless the third rinsing step (S460) is performed after the water is drained from the sump and the pump, it means that all of the water stored in the pump 8 is drained and the pump heater 83 exposed to air is likely to become overheated and damaged or result in a fire hazard.

[0165] The third preset time period is shorter than the second preset time period. Specifically, the third preset time period is equal to the first preset time period, approximately 60 seconds. That is because it takes much time to chill the overheated pump heater 83.

[0166] The third rinsing step (S460) injects water via the top arm 715, similar to the first rinsing step (S420), and the injected water functions to chill the washing objects.

[0167] The dishwasher in accordance with the illustrated embodiment includes a control panel 14 having a course selecting unit 16 for selecting one of preset courses; and an option selecting unit 17 for adding steam to the course selected from the course selecting unit.

[0168] The control method of the dishwasher in accordance with the illustrated embodiment may include a course/option selecting step (S100) for selecting one of the preset courses to wash washing objects or adding steam to the selected course.

[0169] When a steam refresh course (st-re) is selected in the course/option selecting step, the rinsing cycle (S400), the steam drying cycle (S500) and the normal drying cycle (S600) are performed as the steam refresh course.

[0170] After the steam refresh course (st-re), the dust stuck on the dishes or washing objects is controlled and washed off without using dishwashing liquid. Accordingly, the overall duration time is relatively short and the

dishes are sterilized and dried by steam so that there may be almost no water stain and they can be warmed up.

[0171] There has therefore been disclosed a control method of a dishwasher comprising a main-washing cycle for washing one or more washing objects which are held in a tub; a rinsing cycle for rinsing the washing objects washed in the main-washing cycle by injecting wash water; a normal drying cycle for drying the washing objects rinsed in the rinsing cycle, wherein the main-washing cycle comprises a pre-steam water supply step for supplying steam water to a sump so as to supply steam to the tub; a pre-steam supply step for generating steam by heating a heater and supplying the steam to the tub; a main-wash water supply step for supplying wash water for washing to the sump, without draining the steam water supplied to the sump; a main-washing step for washing the washing objects by circulating the supplied wash water; and a main-wash water drainage step for draining the wash water.

[0172] The foregoing embodiments are merely exemplary and are not to be considered as limiting the present disclosure. The present teachings can be readily applied to other types of methods and apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments. As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be considered broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds, are therefore intended to be embraced by the appended claims.

Claims

1. A dishwasher control method comprising
   a rinsing cycle (S400) for rinsing one or more washing objects which are held in a tub (2) by injecting wash water;
   a steam drying cycle (S500) for drying the washing objects by suppling steam;
   a normal drying cycle (S600) for drying the washing objects, without supplying steam,
   wherein the rinsing cycle (S400) comprises,
   a rinse water supply step (S402) for supplying rinse water to a sump (3);
   a rinse water circulating step (S404) for injecting the rinse water into the tub (2) via an injection arm (711, 713, 715) by driving a pump (8);
   a rinse water drainage step (S406) for draining the rinse water from the sump (3), and wherein the steam drying cycle (S500) comprises,
   a drying steam water supply step (S502) for supplying drying steam water; and
   a drying steam supply step (S504) for supplying steam to the tub (2) so as to dry the washing objects, and
   controlling a water level of the steam water supplied in the drying steam water supply step (S502) to be lower than a steam outlet hole (843) provided in the pump (8) and for exhausting steam.

2. The dishwasher control method of claim 1, further comprising:

   a pre-washing cycle (S200) for washing the washing objects by supplying wash water not mixed with dishwashing liquid; and
   a main-washing cycle (S300) for washing the washing objects by supplying wash water mixed with the dishwashing liquid, before the rinsing cycle (S400).

3. The dishwasher control method of claim 1 or 2, further comprising:

   a course/option selecting step (S100) for selecting one of the courses preset to wash the washing objects or to add steam to the selected course,
   wherein when a steam refresh course is selected in the course/option selecting step, a steam refresh course is implemented in at least one of the rinsing cycle, the steam drying cycle and the normal drying cycle.

4. The dishwasher control method of claim 1, 2 or 3, wherein the rinsing cycle (S400) comprises,
   a first rinsing step (S420) for injecting rinse water via a top injection arm (711) at a first preset temperature for a first preset time period; and
   a second rinsing step (S440) for injecting rinse water via an upper injection arm (713) and a lower injection arm (715) at a second preset temperature for a second preset time period, after the first rinsing step, and the first preset time period is shorter than the second preset time period.

5. The dishwasher control method of claim 4, wherein the second rinsing step (S440) comprises a rinse water heating step for heating a pump heater (83).

6. The dishwasher control method of claim 5, further comprising:

   a third rinsing step for injecting rinse water via the top injection arm (711) at a third preset tem-

perature for a third preset time period, after the second rinsing step.

7. The dishwasher control method of any preceding claim, wherein the normal drying cycle (S600) comprises,
a first drying step for exhausting steam from the tub (2) by opening a door or via an exhaustion duct.

8. The dishwasher control method of claim 1, wherein the dishwasher comprises,
a circulation duct (202) for circulating air inside the tub (2), in communication with the tub; and
a dehumidifier (204) provided in the circulation duct, and
the normal drying cycle (S600) comprises,
a second drying step for circulating humid air inside the tub (2) toward the circulation duct (202) and removing moisture by using the humidifier (204).

9. The dishwasher control method of any preceding claim, further comprising:

a course/option selecting step (S100) for selecting a course or an option adding steam to the selected course.

10. The dishwasher control method of claim 9, wherein when a steam refresh course is selected in the course/option selecting step, the steam refresh course is implemented and configured in at least one of the rinsing cycle, the steam drying cycle and the normal drying cycle.

11. The dishwasher control method of any preceding claim, wherein the drying steam supply step (S502) comprises,
a first water supply step (S10) for supplying wash water to the sump (3) so as to wash the sump (3) and the pump (8); and
a first drainage step (S30) for draining the supplied wash water.

12. The dishwasher control method of claim 11, further comprising:

a first circulating step (S20) for circulating the wash water supplied to the sump (3) and the pump (8) by driving the pump (8) and washing internal spaces of the sump (3) and the pump (3), before the first drainage step.

13. The dishwasher control method of claim 11, further comprising:

a second water supply step (s40) for supplying steam water to the sump (3) so as to generate steam, after the first drainage step (S30),
wherein the first drainage step (s30) drains all of the wash water supplied in the first water supply step (s10).

14. The dishwasher control method of claim 11, wherein the first drainage step (s30) drains a predetermined amount of the wash water supplied in the first water supply step (S10) and generates steam by using the remaining wash water.

15. A dishwasher comprising:

a tub (2) providing a washing space for dishes;
one or more injection arms (711, 713, 715) for injecting wash water to the tub (2);
a sump (3) to store wash water; and
a pump (8) for supplying the wash water stored in the sump (3) to at least one injection arm (711, 713, 715);
the dishwasher being configured to operate according to the method of any of claims 1 to 14.

FIG. 1

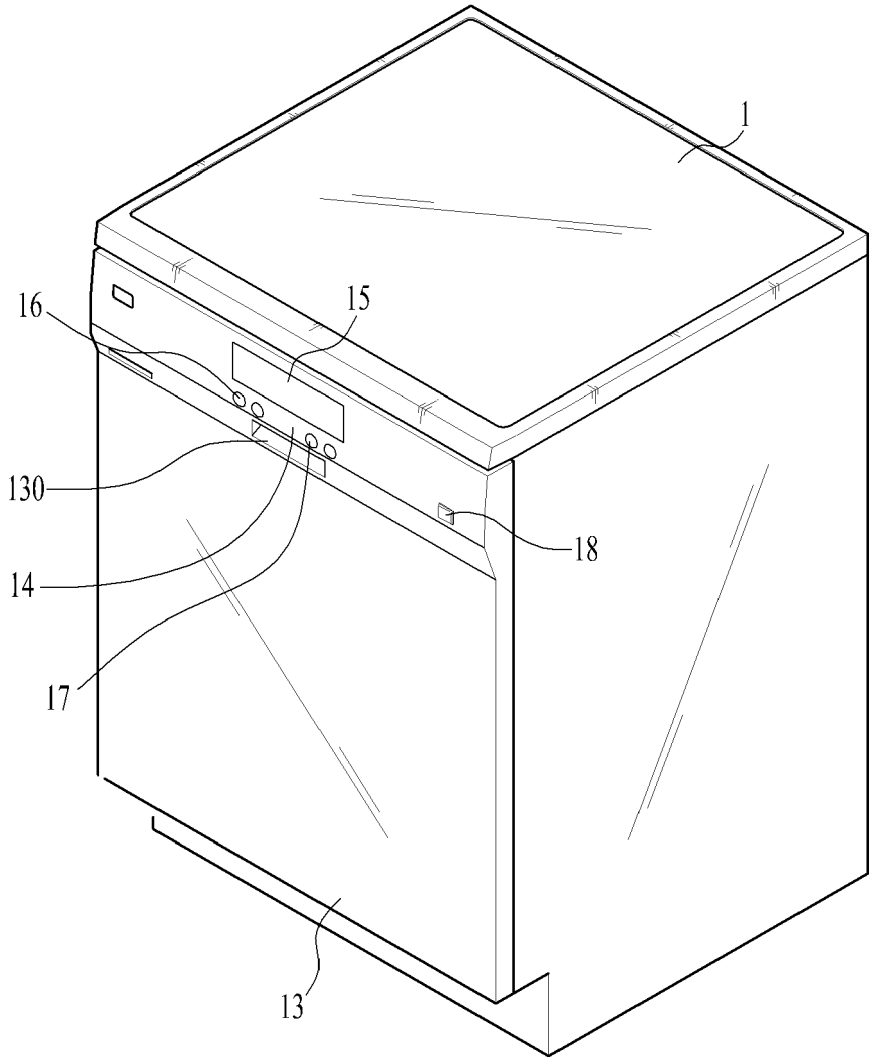

FIG. 2

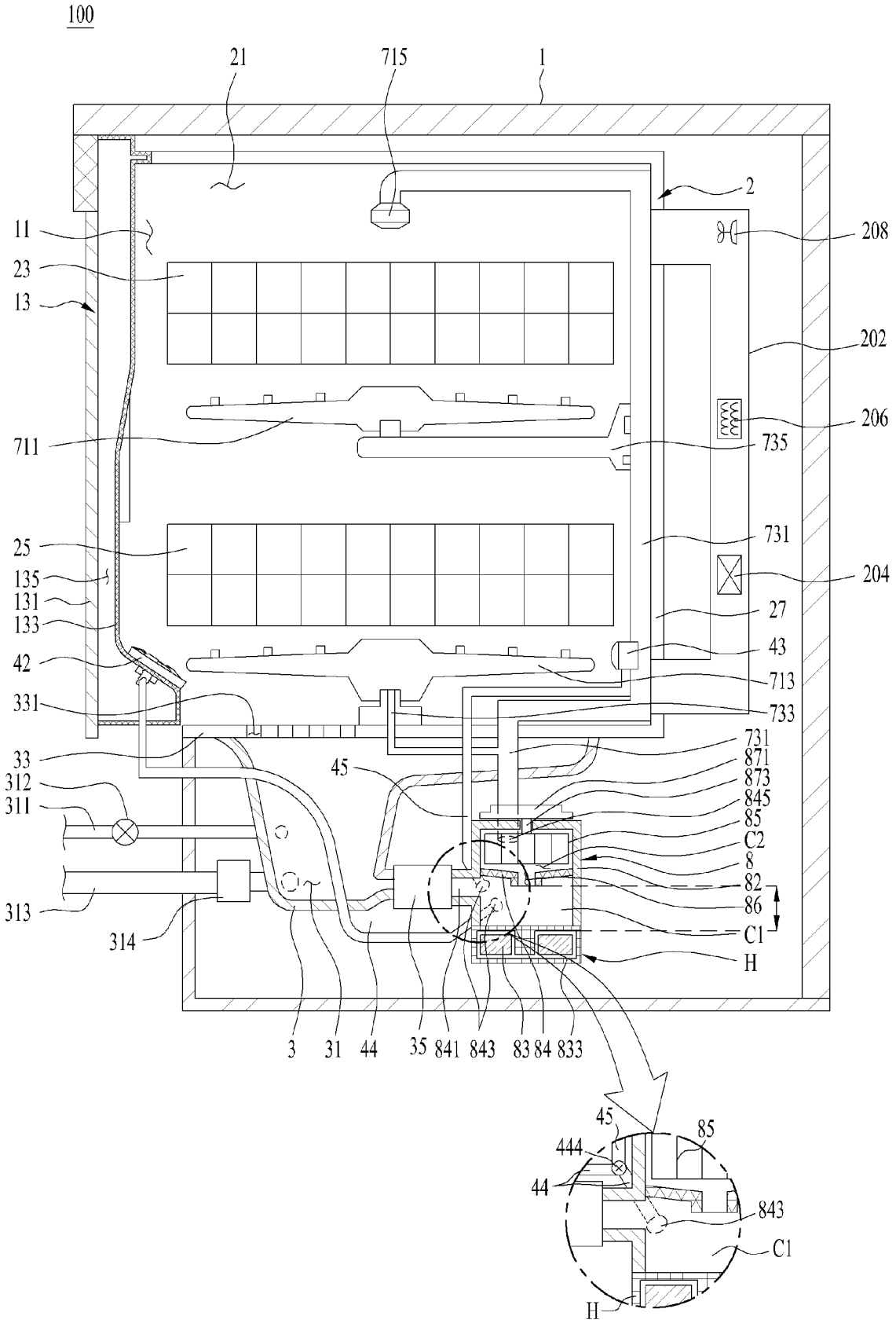
100
21
715
1
2
208
11
23
13
202
206
711
735
731
25
204
135
131
133
27
42
43
713
331
733
731
33
871
312
45
873
311
845
85
C2
8
313
82
86
314
C1
H
3
31
44
35
841
843
83
84
833
45
85
444
44
843
C1
H

FIG. 3

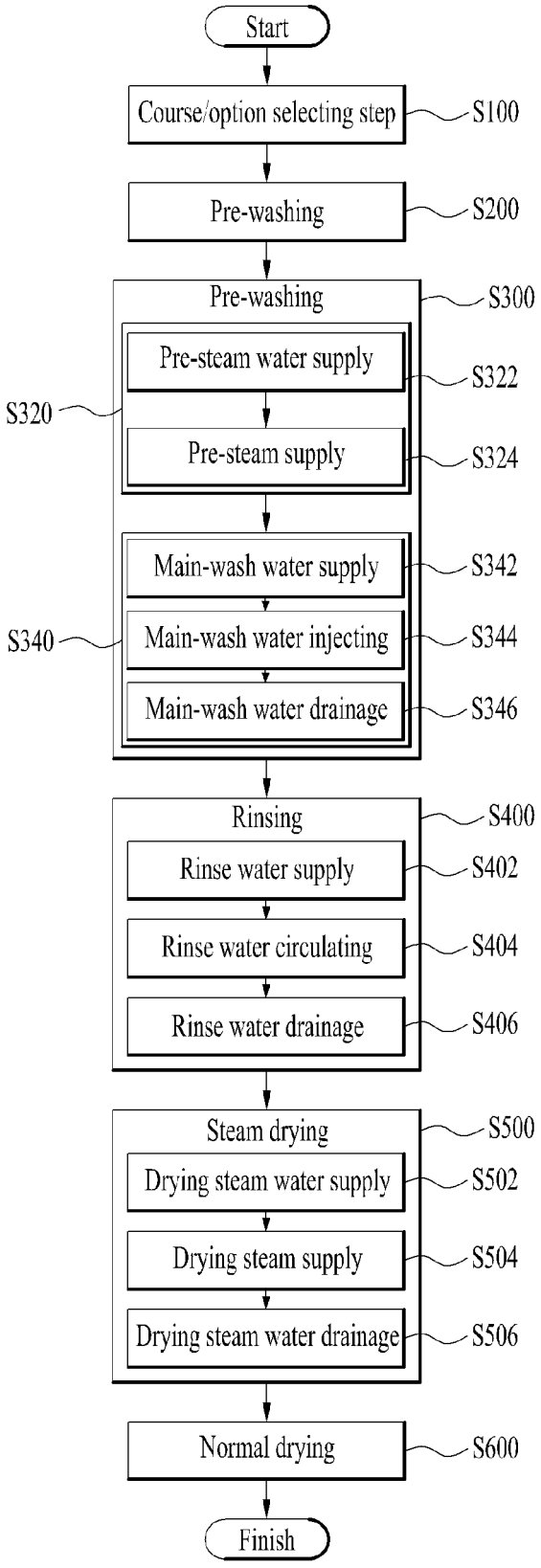
Start
Course/option selecting step
S100
Pre-washing
S200
Pre-washing
S300
Pre-steam water supply
S322
S320
Pre-steam supply
S324
Main-wash water supply
S342
S340
Main-wash water injecting
S344
Main-wash water drainage
S346
Rinsing
S400
Rinse water supply
S402
Rinse water circulating
S404
Rinse water drainage
S406
Steam drying
S500
Drying steam water supply
S502
Drying steam supply
S504
Drying steam water drainage
S506
Normal drying
S600
Finish

FIG. 4

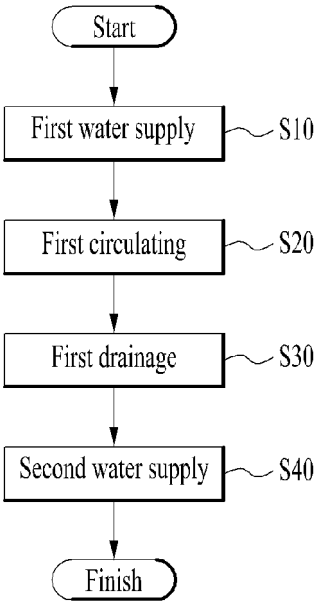
Start
First water supply
S10
First circulating
S20
First drainage
S30
Second water supply
S40
Finish

FIG. 5

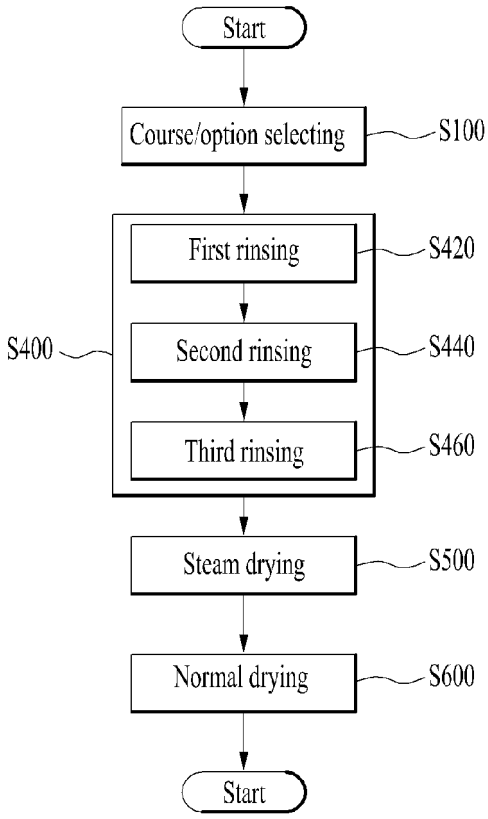
Start
Course/option selecting
S100
S400
First rinsing
S420
Second rinsing
S440
Third rinsing
S460
Steam drying
S500
Normal drying
S600
Start

FIG. 6

Course/option selecting (S100)		Pre-washing cycle (S200)	Main-washing cycle (S300)		Rinsing cycle (S400)	Steam drying cycle (S500)	Normal drying cycle (S600)
			Pre-washing step (S320)	Main-washing step (S340)			
Steam course(st)	Pre-steam course (st-c1)	△	O	O	O	X	O
	Steam drying course (st-c2)	△	X	O	O	O	O
	Steam course (st-c3)	△	O	O	O	O	O
	Steam refresh course(st-re)	△	X	X	O	O	O
Non-steam course (stn)	Normal washing course (stn-nor)	△	X	O	O	X	O
	Normal washing course+ First option(stn-o1)	△	O	O	O	X	O
	Normal washing course+ second option (stn-o2)	△	X	O	O	O	O
	Normal washing course+ third option (stn-o3)	△	O	O	O	O	O

(O : implemented , X : not implemented , △ : selective)

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 0191

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X,P	WO 2016/028049 A1 (LG ELECTRONICS INC [KR]) 25 February 2016 (2016-02-25)	15	
A,P	* paragraphs [0096], [0099], [0100]; figure 5 *	1	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 May 2017	Uhlig, Robert

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