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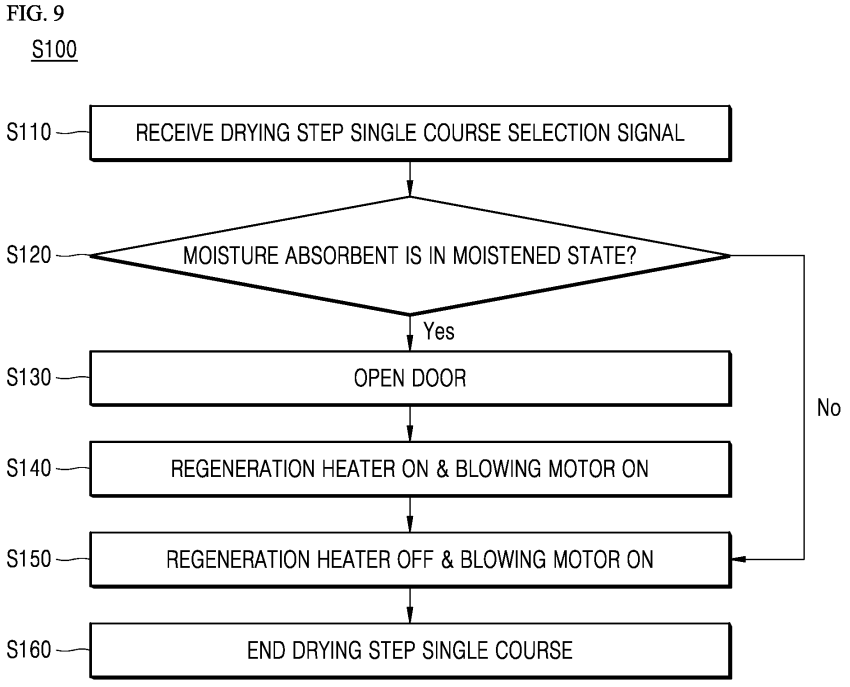
(54) **DISHWASHER**

(57) The present invention relates to a dishwasher (1) configured to perform a separate storage mode and a single drying course including only a single drying step by using a sorption drying device (80) to meet a user's need to perform only an step of quickly drying dishes and the user's need to store dishes in a clean state for a long period of time, thereby significantly improving user convenience.

FIG. 9



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Description

[Technical Field]

[0001] The present invention relates to a dishwasher, and more particularly, to a dishwasher configured to perform a separate storage mode and a single drying course including only a single drying step by using a sorption drying device to meet a user's need to perform only an step of quickly drying dishes and the user's need to store dishes in a clean state for a long period of time, thereby significantly improving user convenience.

[Background art]

[0002] A dishwasher refers to a device that washes washing targets, such as dishes and cookware, contained in the dishwasher by spraying washing water, such as water, to the washing targets. In this case, the washing water used for a washing process may include a detergent.

[0003] In general, the dishwasher includes a washing tub configured to define a washing space, an accommodation part disposed in the washing tub and configured to accommodate the washing targets, a spray arm configured to spray the washing water to the accommodation part, and a sump configured to store water and supply the washing water to the spray arm.

[0004] The use of the dishwasher may contribute to user convenience by reducing the time and effort required to wash washing targets, such as dishes, after a meal.

[0005] Typically, the dishwasher may be configured to perform a washing step of washing the washing target, a rinsing step of rinsing the washing target, and a drying step of drying the washing target completely washed and rinsed.

[0006] Recently, dishwashers have been introduced, which include a moisture absorption device that may absorb water vapor contained in air discharged from a tub and resupply the air into the tub during the drying step to reduce the time required to dry the washing target.

[0007] A moisture absorbent provided in the moisture absorption device may be configured to perform a moisture absorption process of absorbing moisture contained in an airflow during a drying step and perform a regeneration process of drying the moisture absorbent by exposing the moisture absorbent to a high-temperature airflow after the drying step is completed.

[0008] In general, the regeneration process of regenerating the moisture absorbent is performed during a washing step.

[0009] In this regard, European Patent No. 1830690 (Patent Document 001) discloses a dishwasher including a configuration of generating a high-temperature airflow by using a regeneration heater and supplying the high-temperature airflow to a tub to regenerate a moisture absorbent during a washing step.

[Document of Related Art]

[Patent Document]

[0010] (Patent Document 001) European Patent No. 1830690

[Disclosure]

[Technical Problem]

[0011] The dishwasher disclosed in Patent Document 001 is configured such that a drying step for dishes completely washed and rinsed is performed as only one of several steps constituting a standard course.

[0012] For this reason, because the dishwasher disclosed in Patent Document 001 does not have a separate course that singly performs only the drying step, there is a problem in that it is impossible to meet a user's need to perform only an step of drying the dishes.

[0013] In addition, because the dishwasher disclosed in Patent Document 001 is configured such that the moisture absorbent is regenerated only during the washing step and a regeneration heater and a washing water heater operate alternately, there is a problem in that an additional time may be required to perform the washing step, and energy efficiency may be significantly degraded.

[0014] The present invention has been made in an effort to solve the above-mentioned problems in the related art, and a first object of the present invention is to provide a dishwasher configured to perform a separate storage mode and a single drying course including only a single drying step by using a moisture absorption/drying device to meet a user's need to perform only an step of quickly drying dishes and the user's need to store dishes in a clean state for a long period of time, thereby significantly improving user convenience.

[0015] A second object of the present invention is to provide a dishwasher that may maintain a moisture absorbent in a dried state or a regenerated state when a separate storage mode and a single drying course including only a single drying step are performed by using a moisture absorption/drying device, such that a regeneration process of regenerating the moisture absorbent may be excluded from a course to be subsequently performed, which may remarkably reduce the time and energy that are additionally required in the related art to regenerate the moisture absorbent.

[0016] The objects of the present invention are not limited to the above-mentioned objects, and other objects and advantages of the present invention, which are not mentioned above, may be understood from the following descriptions and more clearly understood from the embodiment of the present invention. In addition, it can be easily understood that the objects and advantages of the present invention may be realized by means defined in the claims and a combination thereof.

[Technical Solution]

[0017] A dishwasher according to the present invention may include: a tub having a washing space configured to accommodate dishes; a moisture absorption/drying device including a blowing fan configured to generate an airflow of air to be supplied to the washing space, a blowing motor configured to generate rotational driving power for the blowing fan, a moisture absorbent configured to absorb water vapor contained in the airflow discharged from the tub, and a regeneration heater configured to dry the moisture absorbent by heating the airflow to be supplied to the moisture absorbent; and a control unit configured to perform at least any one of a plurality of courses defined by combining multiple detailed steps on the dishes, in which the control unit performs a drying step single course performing step of operating the moisture absorption/drying device to singly perform only a drying step among the multiple detailed steps.

[0018] In addition, the drying step single course performing step may include an identification step of identifying whether the moisture absorbent is in a moistened state or a dried state.

[0019] In addition, the control unit may determine that the moisture absorbent is in the dried state when the course, which has been performed immediately before, does not include the drying step or when the course, which has been performed immediately before, includes a moisture absorbent regenerating step and a moisture absorbing step is not performed after the moisture absorbent regenerating step.

[0020] In addition, the drying step single course performing step may include: a moisture absorbent regenerating step of drying the moisture absorbent and supplying steam to the washing space by turning on both the blowing motor and the regeneration heater by supplying electric power to the blowing motor and the regeneration heater when it is identified that the moisture absorbent is in the moistened state in the identification step; and a moisture absorbing step of turning off the regeneration heater by cutting off a supply of electric power to the regeneration heater and turning on the blowing motor by supplying electric power to the blowing motor after the moisture absorbent regenerating step.

[0021] In addition, the dishwasher may further include: a door configured to open or close an opened front side of the tub; and an automatic door opening module configured to partially open the door, in which the drying step single course performing step may further include a door opening step of opening the door by means of the automatic door opening module before the moisture absorbent regenerating step when it is identified that the moisture absorbent is in the moistened state in the identification step.

[0022] In addition, the drying step single course performing step may further include: a moisture absorbing step of turning off the regeneration heater by cutting off a supply of electric power to the regeneration heater and turning on the blowing motor by supplying electric power to the blowing motor when it is identified that the moisture absorbent is in the dried state in the identification step.

[0023] Meanwhile, a dishwasher according to the present invention may include: a tub having a washing space configured to accommodate dishes; a moisture absorption/drying device including a blowing fan configured to generate an airflow of air to be supplied to the washing space, a blowing motor configured to generate rotational driving power for the blowing fan, a moisture absorbent configured to absorb water vapor contained in the airflow discharged from the tub, and a regeneration heater configured to dry the moisture absorbent by heating the airflow to be supplied to the moisture absorbent; and a control unit configured to perform at least any one of a plurality of courses defined by combining multiple detailed steps on the dishes, in which the control unit performs, in accordance with a user's option selection, a first mode performing step of operating the moisture absorption/drying device after the at least any one course is completed or a second mode performing step of singly operating the moisture absorption/drying device separately from the at least any one course.

[0024] In addition, the first mode performing step may include: a moisture absorbent regenerating step of drying the moisture absorbent and supplying steam to the washing space by turning on both the blowing motor and the regeneration heater by supplying electric power to the blowing motor and the regeneration heater; and a moisture absorbing step of turning off the regeneration heater by cutting off a supply of electric power to the regeneration heater and turning on the blowing motor by supplying electric power to the blowing motor after the moisture absorbent regenerating step.

[0025] In addition, the first mode performing step may include an option identification step of identifying whether a performing option of the first mode is included in the user's option selection after the at least any one course is completed before the moisture absorbent regenerating step.

[0026] In addition, the first mode performing step may include an elapsed time identifying step of identifying whether an elapsed time after initiation of the moisture absorbent regenerating step reaches a preset designated time after the moisture absorbing step.

[0027] In addition, the first mode performing step may include a first mode ending step of ending the first mode by turning off the regeneration heater and the blowing motor when it is identified that the elapsed time reaches the designated time in the elapsed time identifying step.

[0028] In addition, the second mode performing step may include an identification step of identifying whether the moisture absorbent is in a moistened state or a dried state.

[0029] In addition, the dishwasher may include: a moisture absorbent regenerating step of drying the moisture absorbent and supplying steam to the washing space by turning on both the blowing motor and the

regeneration heater by supplying electric power to the blowing motor and the regeneration heater when it is identified that the moisture absorbent is in the moistened state in the identification step; and a moisture absorbing step of turning off the regeneration heater by cutting off a supply of electric power to the regeneration heater and turning on the blowing motor by supplying electric power to the blowing motor after the moisture absorbent regenerating step.

[0030] In addition, the second mode performing step may include an elapsed time identifying step of identifying whether an elapsed time after initiation of the moisture absorbent regenerating step reaches a preset designated time after the moisture absorbing step.

[0031] In addition, the second mode performing step may include a second mode ending step of ending the first mode by turning off the regeneration heater and the blowing motor when it is identified that the elapsed time reaches the designated time in the elapsed time identifying step.

[0032] In addition, the dishwasher may further include: a washing pump configured to pressurize washing water and supply the washing water to the washing space; and a washing water heater configured to heat the washing water, in which the second mode performing step includes a washing water drying/supplying step of providing heated washing water to the washing space by supplying electric power to the washing pump and the washing water heater when it is identified that the moisture absorbent is in the dried state in the identification step.

[0033] In addition, the dishwasher may further include: a door configured to open or close an opened front side of the tub; and a door position sensor configured to detect whether the door is in a closed state or an opened state, in which the second mode performing step includes a door position determining step of identifying whether the door is in the closed state or the opened state by means of the door position sensor before the identification step.

[0034] In addition, the identification step may be performed when it is determined that the door is in the closed state in the door position determining step.

[Advantageous Effect]

[0035] The dishwasher according to the present invention is configured to perform the separate storage mode and the single drying course including only the single drying step by using the moisture absorption/drying device to meet the user's need to perform only the step of quickly drying dishes and the user's need to store dishes in a clean state for a long period of time, thereby significantly improving user convenience.

[0036] In addition, the dishwasher according to the present invention may maintain the moisture absorbent in a dried state or a regenerated state when the separate storage mode and the single drying course including only the single drying step are performed by using the moisture absorption/drying device, such that the regeneration process of regenerating the moisture absorbent may be excluded from the course to be subsequently performed, which may remarkably reduce the time and energy that are additionally required in the related art to regenerate the moisture absorbent.

[0037] The specific effects of the present invention, together with the above-mentioned effects, will be described along with the description of specific items for carrying out the present invention.

[Description of Drawings]

[0038]

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

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

FIGS. 3 to 6 are schematic cross-sectional views schematically illustrating a configuration of a moisture absorption/drying device illustrated in FIG. 1.

FIG. 7 is a function block diagram briefly illustrating a configuration of a control unit provided in the dishwasher according to the embodiment of the present invention.

FIG. 8 is a flowchart illustrating the order of steps performed by the dishwasher according to the embodiment of the present invention.

FIG. 9 is a flowchart illustrating steps of a method of controlling the dishwasher according to a first embodiment of the present invention.

FIGS. 10 to 11 are flowcharts illustrating steps of a method of controlling the dishwasher according to a second embodiment of the present invention.

[Mode for Invention]

[0039] The above-mentioned objects, features, and advantages will be described in detail below with reference to the accompanying drawings, and thus the technical spirit of the present invention will be easily carried out by those skilled in the art to which the present invention pertains. In the description of the present invention, the specific descriptions of publicly known technologies related with the present invention will be omitted when it is determined that the specific descriptions may unnecessarily obscure the subject matter of the present invention. Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings. In the drawings, the same reference numerals are used to indicate the same or similar constituent elements.

[0040] Terms "first", "second", and the like may be used to describe various constituent elements, but the constituent elements are of course not limited by these terms. These terms are merely used to distinguish one constituent element from another constituent element. There-

fore, unless explicitly described to the contrary, the first constituent element may, of course, be the second constituent element.

[0041] Throughout the specification, unless explicitly described to the contrary, the respective constituent elements may each be singular or plural.

[0042] Hereinafter, a configuration in which any component is disposed "above (below)" a constituent element or disposed on "an upper portion (or a lower portion)" of a constituent element may not only mean that any component is disposed to adjoin an upper surface (or a lower surface) of the constituent element, but also mean that another component may be interposed between the constituent element and any component disposed above (or below) the constituent element.

[0043] In addition, when one constituent element is described as being "connected," "coupled," or "attached" to another constituent element, it should be understood that the constituent elements may be connected or attached directly to each other, and an intervening constituent element may be "interposed" between the constituent elements, or the constituent elements may be "connected," "coupled," or "attached" to each other by an intervening constituent element.

[0044] Singular expressions used in the present specification include plural expressions unless clearly described as different meanings in the context. It should not be interpreted that the terms "comprises," "comprising," "includes" and/or "including," used herein necessarily include all of the several constituent elements or several steps disclosed in the present specification, and it should be interpreted that the terms do not include some of the constituent elements or steps and may further include additional constituent elements or steps.

[0045] In addition, singular expressions used in the present specification include plural expressions unless clearly described as different meanings in the context. It should not be interpreted that the terms "comprises," "comprising," "includes" and/or "including," used herein necessarily include all of the several constituent elements or several steps disclosed in the present specification, and it should be interpreted that the terms do not include some of the constituent elements or steps and may further include additional constituent elements or steps.

[0046] Throughout the specification, "A and/or B" means A, B, or A and B unless explicitly described to the contrary, and "C to D" means C or more and D or less unless explicitly described to the contrary.

[0047] Hereinafter, the present invention will be described with reference to the drawings illustrating configurations according to the embodiment of the present invention.

[Overall Structure of Dishwasher]

[0048] Hereinafter, an overall structure of a dishwasher 1 according to an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0049] FIG. 1 is a front perspective view illustrating a dishwasher according to the present invention, and FIG. 2 is a schematic cross-sectional view briefly illustrating an internal structure of the dishwasher according to the present invention.

[0050] As illustrated in FIGS. 1 to 2, the dishwasher 1 according to the present invention includes a casing 10 configured to define an external shape, a tub 20 installed in the casing 10, configured to define a washing space 21 in which a washing target is washed, and having an opened front side, the door 30 configured to open or close the opened front side of the tub 20, a drive part 40 positioned below the tub 20 and configured to supply, collect, circulate, and drain washing water used to wash the washing target, an accommodation part 50 detachably provided in the washing space 21 in the tub 20 and configured such that the washing target is seated in the accommodation part 50, and a spray part disposed adjacent to the accommodation part 50 and configured to spray the washing water used to wash the washing target.

[0051] In this case, for example, the washing targets seated in the accommodation part 50 may be dishes, such as bowls, plates, spoons, and chopsticks, and other cookware. Hereinafter, the washing target will be referred to as the dish unless otherwise stated.

[0052] The tub 20 may be formed in a box shape having a front side entirely opened and correspond to a component known as a so-called washing tub.

[0053] The washing space 21 may be formed in the tub 20, and the opened front side may be opened or closed by the door 30.

[0054] The tub 20 may be formed by pressing a metal plate highly resistant to a high temperature and moisture, for example, a board made of a material such as a stainless steel.

[0055] In addition, a plurality of brackets may be disposed on an inner surface of the tub 20, and the plurality of brackets serves to support and install functional components, such as the accommodation part 50 and the spray part to be described below, in the tub 20.

[0056] Meanwhile, the drive part 40 may include a sump 41 configured to store the washing water, a sump cover 42 configured to separate the sump 41 from the tub 20, a water supply part 43 configured to supply the washing water to the sump 41 from the outside, a water discharge part 44 configured to discharge the washing water in the sump 41 to the outside, and a washing pump 45 and a supply channel 46 configured to supply the washing water in the sump 41 to the spray part. The sump cover 42 may be disposed above the sump 41 and serve to separate the tub 20 and the sump 41. In addition, the sump cover 42 may have a plurality of recovery holes for recovering the washing water, which is sprayed to the washing space 21 by the spray part, into the sump 41.

[0057] That is, the washing water, which is sprayed

toward the dishes by the spray part, may fall downward to a lower side of the washing space 21 and be recovered into the sump 41 through the sump cover 42.

[0058] The washing pump 45 is provided at one side of the sump 41 and serves to pressurize the washing water and supply the washing water to the spray part.

[0059] One end of the washing pump 45 may be connected to the sump 41, and the other end of the washing pump 45 may be connected to the supply channel 46. The washing pump 45 may include an impeller 451, a motor 453, and the like. When electric power is supplied to the motor 453, the impeller 451 may rotate, and the washing water in the sump 41 may be pressurized and then supplied to the spray part via the supply channel 46.

[0060] Although not illustrated, a washing water heater may be provided in the washing pump 45 and serve to heat the supplied washing water during a washing step or a drying/rinsing step.

[0061] Meanwhile, the supply channel 46 may serve to selectively supply the spray part with the washing water supplied from the washing pump 45.

[0062] For example, the supply channel 46 may include a first supply channel 461 connected to a lower spray arm 61, and a second supply channel 463 connected to an upper spray arm 62 and a top nozzle 63. A supply channel switching valve 465 may be provided in the supply channel 46 and selectively open or close the supply channels 461 and 463.

[0063] In this case, the supply channel switching valve 465 may be controlled to sequentially or simultaneously open the supply channels 461 and 463.

[0064] Meanwhile, the spray part is configured to supply the washing water to the dishes and the like accommodated in the accommodation part 50.

[0065] More specifically, the spray part may include the lower spray arm 61 positioned at a lower side of the tub 20 and configured to spray the washing water to a lower rack 51, the upper spray arm 62 positioned between the lower rack 51 and an upper rack 52 and configured to spray the washing water to the lower rack 51 and the upper rack 52, and the top nozzle 63 positioned at an upper side of the tub 20 and configured to spray the washing water to a top rack 53 or the upper rack 52.

[0066] In particular, the lower spray arm 61 and the upper spray arm 62 may be rotatably provided in the washing space 21 of the tub 20 and spray the washing water while rotating toward the dishes in the accommodation part 50.

[0067] The lower spray arm 61 may be rotatably supported above the sump cover 42 to spray the washing water toward the lower rack 51 while rotating at a position below the lower rack 51.

[0068] In addition, the upper spray arm 62 may be rotatably supported by a spray arm holder 467 to spray the washing water while rotating at a position between the lower rack 51 and the upper rack 52.

[0069] Meanwhile, although not illustrated, a means for switching a direction of the washing water sprayed from the lower spray arm 61 to an upward direction (U-direction) may be further provided on a lower surface 25 of the tub 20 to improve washing efficiency.

[0070] Because the configuration already publicly known in the art may be applied to the detailed configuration of the spray part, a description of the specific configuration of the spray part will be omitted hereinafter.

[0071] Meanwhile, the accommodation part 50 for accommodating the dishes may be provided in the washing space 21.

[0072] The accommodation part 50 may be configured to be withdrawn from the inside of the tub 20 through the opened front side of the tub 20.

[0073] FIG. 2 exemplarily illustrates an embodiment in which the accommodation part includes the lower rack 51 positioned at the lower side of the tub 20 and configured to accommodate comparatively large dishes, the upper rack 52 positioned above the lower rack 51 and configured to accommodate dishes with middle sizes, and the top rack 53 positioned at the upper side of the tub 20 and configured to accommodate dishes and the like with small sizes. As illustrated, the description will be made on the basis of the embodiment of the dishwasher 1 in which three accommodation parts 50 are provided. However, the present invention is not limited thereto.

[0074] The lower rack 51, the upper rack 52, and the top rack 53 may be configured to be withdrawn to the outside through the opened front side of the tub 20.

[0075] To this end, guide rails (not illustrated) may be provided at two opposite side walls that define an inner peripheral surface of the tub 20. For example, the guide rails 54 may include an upper rail, a lower rail, a top rail, and the like.

[0076] Wheels may be provided on a lower portion of each of the lower rack 51, the upper rack 52, and the top rack 53. A user may withdraw the lower rack 51, the upper rack 52, and the top rack 53 to the outside through the front side of the tub 20 and easily accommodate the dishes on the lower rack 51, the upper rack 52, and the top rack 53 or easily take out the completely washed dishes from the lower rack 51, the upper rack 52, and the top rack 53.

[0077] The guide rail 54 may be provided in the form of a stationary guide rail with a simple rail shape for withdrawing or loading the accommodation part 50 or a stretchable guide rail configured to guide the withdrawal and accommodation of the accommodation part 50 and increase a withdrawal distance in accordance with the withdrawal of the accommodation part 50.

Meanwhile, the door 30 serves to open or close the opened front side of the tub 20.

[0078] Typically, a hinge part (not illustrated) is provided below the opened front side to open or close the door 30, and the door 30 is opened while rotating about the hinge part as a rotation axis.

[0079] In this case, a handle 31 used to open the door

30 may be provided on an outer surface of the door 30, and a control panel 32 configured to control the dishwasher 1 may be provided on the outer surface of the door 30.

[0080] As illustrated, the control panel 32 may have a button part 34 including a display 33 configured to visually display information on a current operating state or the like of the dishwasher, a selection button to which the user's course selection manipulation is inputted, and a power button to which the user's manipulation for turning on or off the power of the dishwasher is inputted.

[0081] Meanwhile, an inner surface of the door 30 may define one surface of the tub 20 when the door 30 is closed, and the inner surface of the door 30 may define a seating surface on which the lower rack 51 of the accommodation part 50 may be supported when the door 30 is fully opened.

[0082] To this end, when the door 30 is fully opened, the inner surface of the door 30 may be formed in a horizontal plane state in a direction identical to a direction in which the guide rail 54 configured to guide the lower rack 51 extends.

[0083] Meanwhile, a detergent supply device may be further provided on the inner surface of the door 30 and automatically supply a detergent into the tub 20.

[0084] In addition, as illustrated in FIG. 2, an automatic door opening module 352 may be provided outside the upper surface of the tub 20 to automatically open the door 30.

[0085] As described below, during a drying step single course, the automatic door opening module 352 serves to partially open the front side of the tub 20 by moving the door 30 to a predetermined opening position in accordance with a dried state of the moisture absorbent.

[0086] Therefore, a part of the air in the tub 20 is discharged through an upper side of the opened front side of the tub 20, which may shorten the time required to dry the dishes.

[0087] For example, the automatic door opening module 352 may have a push rod 3524 configured to rotate an upper end of a rear surface of the door 30 to the opening position.

[0088] In addition, a door position detection part 36 may be provided outside the upper surface of the tub 20 and detect whether the door 30 is in a closed state or an open state. For example, the door position detection part 36 may include a door position sensor 361 or a latch sensor configured to detect a position of a non-illustrated door latch.

[0089] Meanwhile, a moisture absorption/drying device 80 may be provided at the lower side of the tub 20. The moisture absorption/drying device 80 may absorb water vapor contained in air discharged from the tub 20 and then resupply the air into the tub 20 during the drying step.

[0090] As illustrated, the moisture absorption/drying device 80 may include a suction duct 81 configured to suck air discharged from the tub 20, a blowing part 82 configured to generate an airflow, a heater part 83 configured to heat the air sucked from the tub 20, and a moisture absorbent 85 configured to absorb water vapor contained in the air.

[0091] As described below, an air supply hole 254 may be provided in the lower surface 25 of the tub 20 so that the air from which water vapor is removed by the moisture absorption/drying device 80 may be introduced into the tub 20.

[0092] A detailed configuration of the moisture absorption/drying device 80 will be described below with reference to FIG. 3 below.

[Detailed Configuration of Moisture Absorption/Drying Device]

[0093] Hereinafter, a detailed configuration of the moisture absorption/drying device 80 according to the present invention will be schematically described with reference to FIGS. 3 to 6.

[0094] With reference to FIG. 3, the moisture absorption/drying device 80 according to the first embodiment of the present invention may include the blowing part 82 configured to generate an airflow of air sucked from the tub 20 and to be supplied into the tub 20, the heater part 83 having a regeneration heater 831 configured to heat the air to be supplied to the moisture absorbents 85 or the tub 20, the plurality of moisture absorbents 85 disposed at a downstream side of the blowing part 82 and the heater part 83 based on the flow direction of the airflow and configured to absorb moisture contained in the air, a housing 84 configured to accommodate the heater part 83 and the moisture absorbent 85 therein, the suction duct 81 configured to connect an air suction hole 20h of the tub 20 and the blowing part 82, and a supply duct 88 configured to guide the airflow, which has passed through the moisture absorbent 85, to the air supply hole 254 of the tub 20.

[0095] Based on the flow direction of the airflow, the blowing part 82 is disposed at an upstream side of the heater part 83 and the moisture absorbent 85 and disposed at a downstream side of the suction duct 81. The blowing part 82 serves to suck the air from the tub 20 and generate the airflow of the air so that the sucked air may pass through the moisture absorbent 85.

[0096] An assembly may be formed in which a blowing fan 821 and a blowing motor 822 configured to generate rotational driving power for the blowing fan are modularized together and accommodated in a housing or the suction duct 81.

[0097] For example, a Sirocco fan is appropriate in consideration of a positional constraint and a spatial constraint related to the installation of the blowing fan. However, the type of blowing fan 821 applied to the moisture absorption/drying device 80 is not limited.

[0098] The heater part 83 is disposed between the blowing part 82 and the moisture absorbent 85 based on the flow direction of the airflow and serves to heat the

airflow of the air to dry and regenerate the moisture absorbent 85 during the regeneration process for the moisture absorbent 85.

[0099] In case that the moisture absorption/drying device 80 generates a high-temperature airflow F during the regeneration process for the moisture absorbent 85, electric power is supplied to the regeneration heater 831, such that the regeneration heater 831 heats the airflow. In case that the moisture absorption/drying device 80 generates a low-temperature airflow F during a moisture absorption process, the supply of electric power to the regeneration heater 831 may be cut off, such that the step of the regeneration heater 831 may be turned off.

[0100] In this case, in case that the low-temperature airflow F and the high-temperature airflow F are generated, the step of the blowing fan 821 may be maintained.

[0101] For example, a tubular sheath heater may be selected, and the sheath heater may have a comparatively simple structure and excellent heat generation efficiency and be advantageous in preventing an electric leakage caused by the washing water introduced from the tub 20. However, the type of the regeneration heater 831 provided in the moisture absorption/drying device 80 is not limited.

[0102] A pair of terminals 832 may be formed at one end and the other end of the regeneration heater 831 to receive electric power. The pair of terminals 832 may pass through the housing 84 and extend toward the outside.

[0103] Meanwhile, although not illustrated, at a position adjacent to the regeneration heater 831, a thermostat, which is configured to detect whether the regeneration heater 831 is overheated, and a thermistor, which serves as a temperature sensor for detecting a temperature of the airflow, may be further provided. The moisture absorbent 85 serves to absorb moisture contained in the airflow of the air discharged from the tub 20 during a moisture absorption/drying process of the moisture absorption/drying device 80, and the moisture absorbent 85 serves to discharge the absorbed moisture to the airflow during the regeneration process of the moisture absorption/drying device 80.

[0104] That is, the moisture absorbent 85 may be made of a reversibly dehydratable material to absorb moisture or discharge the absorbed moisture depending on the operating temperature range.

[0105] The applicable reversibly dehydratable material may include any one of aluminum oxide, silicon oxide, silica gel, alumina silica, and zeolite or be a composition having a combination of two or more of the materials selected from these materials.

[0106] For example, in the moisture absorption/drying device 80 according to the present invention, the moisture absorbent 85 made of an alumina silica-based material including aluminum oxide and silicon oxide may be applied. The description will be made on the basis of the embodiment in which the moisture absorbent 85 made of an alumina silica-based material is applied. However, the present invention is not limited thereto.

[0107] The moisture absorbent 85, which is made of an alumina silica-based material as described above, may be provided in a particle shape having a predetermined particle diameter to ensure a maximum contact area to the airflow F of the air. In addition, in comparison with a moisture absorbent made of pure aluminum oxide or silicon oxide material, a moisture absorption action may occur within a lower temperature range, and a regeneration action may occur within a lower temperature range.

[0108] However, the airflow of the air comes into contact with the moisture absorbent 85 and absorbs moisture or absorbs moisture discharged from the moisture absorbent 85 while passing between the plurality of moisture absorbents 85 provided in particle shapes.

[0109] Therefore, the moisture absorbent 85 may inevitably apply flow resistance against the airflow of the air. The particle diameter of the moisture absorbent 85 may be selected to effectively form pores for minimizing the flow resistance and ensure optimal moisture absorption efficiency.

[0110] To this end, for example, the moisture absorbent 85 having a particle diameter within a range of 2 mm to 6 mm may be selected and applied.

[0111] Meanwhile, the moisture absorbent 85 is disposed at a downstream side of the blowing part 82 and the heater part 83 based on the flow direction of the airflow.

[0112] Specifically, the moisture absorbent 85 may be accommodated, by a moisture absorbent holder 86, in the housing 84 provided at a downstream side of the blowing part 82 and the heater part 83.

[0113] The moisture absorbent holder 86 may have a mesh part through which the airflow of the air may pass.

[0114] Meanwhile, the housing 84 of the moisture absorption/drying device 80 may serve to both accommodate the heater part 83 and the moisture absorbent 85 and define an inner flow path configured to guide a flow of the airflow having passed through the regeneration heater 831.

[0115] The housing 84 may be manufactured to have a hollow shape to define the inner flow path.

[0116] Meanwhile, the supply duct 88 of the moisture absorption/drying device 80 serves (1) to allow the housing 84 to communicate with the air supply hole 254 formed in the lower surface 25 of the tub 20.

[0117] The supply duct 88 may extend into the washing space 21 while passing through the air supply hole 254 having a tip portion communicating with the housing 84 based on the flow direction of the airflow, and a rear end formed in the lower surface 25 of the tub 20.

[0118] A supply flow path, through which the air having passed through the moisture absorbent 85 flows, may be formed in the supply duct 88.

[0119] The tip portion of the supply duct 88 may communicate with an outlet end side of the moisture absorbent 85 so that the airflow having passed through the

moisture absorbent 85 may be introduced.

[0120] A discharge port 881 may be connected to the rear end of the supply duct 88 and switch the flow direction of the airflow having passed through the supply flow path.

[0121] As illustrated, the discharge port 881 may be formed at a position lower than the lower rack 51 based on the upward/downward direction.

[0122] Therefore, during the moisture absorption/drying process and the regeneration process, the airflow having passed through the moisture absorbent 85 may be discharged to the washing space 21 through the discharge port 881 at the position lower than the lower rack 51.

[0123] Meanwhile, the moisture absorption/drying device 80 may further include the suction duct 81 having a tip portion connected to the air suction hole 20h of the tub 20 based on the flow direction of the airflow, and a rear end communicating with the housing 84, and the suction duct 81 may serve to guide the airflow of the air, which is discharged from the tub 20 through the air suction hole 20h, to the housing 84.

[0124] As illustrated, the interior of the suction duct 81 may be manufactured in a hollow shape to define an air passageway through which the airflow of the air may flow.

[0125] The suction duct 81 may extend long in the upward/downward direction to connect the air suction hole 20h, which is formed to be adjacent to the upper surface of the tub 20, to the housing 84 disposed below the lower surface 25 of the tub 20.

[0126] Hereinafter, a state in which the moisture absorption/drying device 80 supplies the low-temperature airflow F during the moisture absorption/drying process and a state in which the moisture absorption/drying device 80 supplies the high-temperature airflow F during the regeneration process will be described with reference to FIGS. 4 to 5.

[0127] First, FIG. 4 illustrates a state in which the moisture absorption/drying device 80 operates to supply the airflow F to the tub 20 when the door 30 is in the closed state.

[0128] The moisture absorption/drying device 80 of the dishwasher 1 according to the present invention may operate to perform the moisture absorption/drying process during the drying step included in a standard washing course or a general washing course as in the related art and operate to perform the regeneration process during the washing step or a heating/rinsing step.

[0129] Further, as described below, the moisture absorption/drying device 80 of the dishwasher 1 according to the present invention may be configured to operate even in the drying step single course in which only the drying step is performed singly and in the storage mode in which the dishes are stored for a long period of time.

[0130] As described above, in the state in which the moisture absorbent 85 is in a moistened state in the drying step single course, the moisture absorption/drying device 80 may operate when the door 30 is in the open state. In the state other than the above-mentioned state, the moisture absorption/drying device 80 may operate when the door 30 is in the closed state.

[0131] Therefore, as illustrated in FIG. 4, when the regeneration process is performed when the door 30 is in the closed state, the moisture absorption/drying device 80 may operate to generate the high-temperature airflow F, supply the high-temperature airflow F to the tub 20, and circulate the airflow while recovering the airflow from the tub 20.

[0132] In order to generate the high-temperature airflow F to regenerate or dry the moisture absorbent 85, the blowing motor 822 may be turned on by electric power supplied to the blowing part 82, and the regeneration heater 831 may be turned on by electric power supplied to the regeneration heater 831.

[0133] In this case, the high-temperature airflow F and high-temperature steam, which are produced as the moisture absorbent 85 is regenerated and dried, may serve to increase the temperature of the washing water in case that the high-temperature airflow F and the high-temperature steam are provided during the washing step. As described below, in case that the high-temperature airflow F and the high-temperature steam are provided during the drying step single course and the storage mode, the high-temperature airflow F and the high-temperature steam may be used to sterilize the dishes or remove water spots.

[0134] In addition, as illustrated in FIG. 4, the moisture absorption/drying device 80 may operate to perform the moisture absorption/drying process when the door 30 is in the closed state.

[0135] In this case, during the moisture absorption/drying process, electric power is not supplied to the regeneration heater 831 so that the low-temperature airflow F may be generated, and the regeneration heater 831 may be turned off.

[0136] Therefore, as illustrated, when the blowing motor 822 is turned on as electric power is supplied to the blowing motor 822, the airflow containing moisture may be introduced into the suction duct 81 through the air suction hole 20h from the tub 20.

[0137] The airflow introduced into the suction duct 81 may be introduced into inner flow path of the housing 84 through the regeneration heater 831. Because the regeneration heater 831 is in the turned-off state, the airflow is not heated, and the state of the low-temperature airflow F may be maintained.

[0138] The low-temperature airflow F having passed through the regeneration heater 831 may be introduced into the moisture absorbent 85 along the supply flow path, the moisture contained in the airflow may be at least partially absorbed while passing through the moisture absorbent 85. In this case, the temperature of the moisture absorbent 85 may increase as the moisture absorbent 85 absorbs moisture. Therefore, the temperature of the airflow F passing through the moisture absorbent 85 may increase slightly.

[0139] The airflow F, which absorbs moisture while passing through the moisture absorbent 85, may be discharged to the washing space 21 through the supply duct 88 and the discharge port 881 and evaporate the washing water remaining on the surfaces of the dishes.

[0140] The airflow F, which is moistened while passing over the dishes in the washing space 21, may circulate while passing through the air suction hole 20h and being recovered to the moisture absorption/drying device 80.

[0141] However, as illustrated in FIGS. 5 and 6, in the state in which the moisture absorbent 85 is in the moistened state during the drying step single course, the moisture absorption/drying device 80 may operate when the door 30 is in the open state.

[0142] As described below, in the drying step single course, the operating process of the moisture absorption/drying device 80 may vary depending on whether the moisture absorbent 85 is in a dried state or a moistened state. Hereinafter, unless otherwise stated, the "dried state of the moisture absorbent" may be defined to refer to a state in which moisture has been desorbed (dehydrate) from the moisture absorbent 85 or a state in which the moisture absorbent 85 has not absorbed water and thus may absorb moisture.

[0143] As illustrated, in case that the moisture absorbent 85 is in the moistened state as the drying step is performed in the previous washing course, the regeneration heater 831 may be turned on by electric power supplied to the regeneration heater 831 when the door 30 is in the open state, and the blowing motor 822 may be turned on by electric power supplied to the blowing motor 822.

[0144] Because the moisture absorption/drying device 80 operates even in the state in which both the regeneration heater 831 and the blowing motor 822 are turned on as described above, the high-temperature airflow F containing high-temperature steam may be supplied to the washing space 21 of the tub 20 in the same way as the above-mentioned regeneration process.

[0145] In this case, the high-temperature steam provided to the washing space 21 may be used to effectively sterilize the dishes, and the temperatures of dishes and the internal temperature of the washing space 21 may be increased by the high-temperature airflow F.

[0146] However, the drying step single course corresponds to a course that is performed within a relatively short time in comparison with the storage mode to be described below.

[0147] In addition, as illustrated in FIGS. 5 and 6, the moisture absorption/drying device 80 may operate when the door 30 is in the open state in case that the drying step single course is performed when the moisture absorbent 85 is in the moistened state so that the moisture absorbent 85 is dried after the drying step single course is completed.

[0148] However, in case that the moisture absorbent 85 is in the dried state, the regeneration process does not need to be performed on the moisture absorbent 85. Therefore, as illustrated in FIGS. 3 and 4, the moisture absorption/drying device 80 may operate so that the moisture absorption/drying process is performed when the door 30 is in the closed state.

[0149] That is, electric power may be supplied only to the blowing motor 822 when the door 30 is in the closed state, and the moisture absorption/drying process may be performed so that the drying process may be performed on the dishes within a short time.

[Configuration of Control Unit and Method of Controlling Dishwasher]

[0150] Hereinafter, a configuration of a control unit 100 provided in the dishwasher 1 according to the embodiment of the present invention will be described with reference to FIG. 7.

[0151] As illustrated in FIG. 7, the dishwasher 1 according to the embodiment of the present invention may include the control unit 100 configured to control the functional components.

[0152] As publicly known in the art, the control unit 100 may be provided in various forms such as a microcontroller, a microcomputer, or a microprocessor.

[0153] First, the control unit 100 may be electrically connected to the motor 453 of the washing pump 45 configured to pressurize the washing water stored in the sump 41 and supply the washing water to the spray part. The control unit 100 may initiate or stop the step of the washing pump 45 by regulating electric power to be supplied to the motor 453 from an electric power supply part 48.

[0154] When a washing step S2, a rinsing step S3, and a heating/rinsing step S4 are initiated, the control unit 100 may initiate the operation of the washing pump 45 by supplying electric power to the motor 453 of the washing pump 45 through the electric power supply part 48.

[0155] In addition, as described below, when it is identified that the moisture absorbent 85 is in the dried state (regenerated state) in the storage mode, electric power may be supplied to operate a washing water heater 47 to moisten the internal ambience of the washing space 21 and supply moisture to the moisture absorbent 85. In this case, the washing water heater 47 and the washing pump 45 may operate in an operating mode similar to the heating/rinsing step S4.

[0156] In addition, the control unit 100 may be electrically connected to the button part 34 to which the user's operation instruction is inputted. When the user's power on/off manipulation input and a washing course selection manipulation or an option selection manipulation are inputted through the button part 34, the button part 34 may transmit an electrical signal, which corresponds to the input, to the control unit 100.

[0157] When the control unit 100 receives the electrical signal from the button part 34, the control unit 100 may turn on or off the power of dishwasher 1 or control the dishwasher 1 to perform an individual step of the dish-

washer 1 in accordance with the selected washing course and the selected operating mode.

[0158] Although not illustrated, the user's operation instruction may be inputted through other input means, such as a user's wireless terminal, other than the button part 34.

[0159] In addition, the control unit 100 may be electrically connected directly and indirectly to the regeneration heater 831 configured to heat the airflow F of the air to be supplied to the moisture absorbent 85 to dry and regenerate the moisture absorbent 85.

[0160] FIG. 7 illustrates an embodiment in which the regeneration heater 831 is configured to receive electric power indirectly from the electric power supply part 48 through the control unit 100. On the contrary, the regeneration heater 831 may be electrically connected directly to the electric power supply part 48, and the control unit 100 may be configured to control whether to supply electric power from the electric power supply part 48. The description will be made on the basis of the illustrated embodiment. However, the present invention is not limited thereto.

[0161] The control unit 100 may turn on or off the regeneration heater 831 by regulating electric power to be supplied to the regeneration heater 831 from the electric power supply part 48 to be described below.

[0162] Meanwhile, because the regeneration heater 831 serves to heat the airflow F of the air, a heater, which has a smaller output capacity than the washing water heater 47 for heating the washing water, may be applied. For example, the regeneration heater 831 may have a rated capacity within a range of 500 to 600 W.

[0163] In addition, the control unit 100 may be electrically connected to the washing water heater 47 configured to heat the washing water to be supplied to the tub 20 during the washing step S2, the heating/rinsing step S4, and the storage mode.

[0164] FIG. 7 illustrates an embodiment in which the washing water heater 47 is configured to receive electric power indirectly from the electric power supply part 48 through the control unit 100. On the contrary, like the regeneration heater 831, the washing water heater 47 may be electrically connected directly to the electric power supply part 48, and the control unit 100 may be configured to control whether to supply electric power from the electric power supply part 48. The description will be made on the basis of the illustrated embodiment. However, the present invention is not limited thereto.

[0165] Unlike the regeneration heater 831, the washing water heater 47 serves to heat the washing water that circulates through the tub 20. Therefore, the washing water heater may be configured to have a larger output capacity than the regeneration heater 831.

[0166] For example, in case that the output capacity of the regeneration heater 831 is a rated capacity within a range of 500 to 600 W, the output capacity of the washing water heater 47 may be a rated capacity within a range of 1,100 to 1,300 W.

[0167] The control unit 100 may control the operations of the constituent elements of the dishwasher 1, such as the motor 453 of the washing pump 45, the regeneration heater 831, and the washing water heater 47, by regulating electric power to be supplied to the constituent elements of the dishwasher 1 in response to the progress of the step of the washing course selected by the user.

[0168] The step parameters of the constituent elements of the dishwasher 1 are set in a memory, which will be described below, in accordance with selection options of adding or excluding the washing course and particular steps that may be selected by the user when the user pushes a button through the control panel 32, the wireless terminal, or the like.

[0169] The step parameters, such as an operating time, a degree of supply of electric power, electric power intensity, an on/off condition, and a flow rate of the washing water, of the constituent elements of the dishwasher 1, such as the washing water heater 47, the regeneration heater 831, the washing pump 45, the water discharge part 44, and the water supply part 43, may be set. An assembly of the step parameters, which are performed in accordance with the respective washing courses, may be defined as the operating mode.

[0170] Therefore, the washing course may mean the name of the operating mode of the dishwasher 1 displayed on a screen of the display 33 of the dishwasher 1 or the wireless terminal. That is, the user may select the washing course, and the control unit 100 of the dishwasher 1 may control the individual constituent elements of dishwasher 1 to sequentially perform the operating modes corresponding to the corresponding washing course. That is, in the present invention, the washing course and the operating mode are used separately for the specific description. However, the washing course and the operating mode may have similar meanings.

[0171] The washing course may be variously set as a normal course, a standard course, a powerful course, a dedicate course, a half course, an automatic course (a half-loaded course in which the washing process is concentrated on some of several racks), a short course, a one-hour course, and the like.

[0172] The designation of the name of the washing course may somewhat vary depending on the product. In particular, the one-hour course is performed for one hour or less, but the one-hour course may be performed for two hours or less in some instances.

[0173] That is, when the user selects the washing course, the control unit 100 may determine the operating mode of the dishwasher 1 that corresponds to the washing course. In the operating mode, the corresponding washing course may be performed on the basis of preset parameters.

[0174] Meanwhile, an option may be additionally set to each of the washing courses. The option may be an operating time setting of the drying step, the presence or absence of the storage mode performed after all the steps or performed as a separate course, notification

on/off, and the like.

[0175] Meanwhile, the control unit 100 may be electrically connected to the blowing motor 822 of the blowing part 82 that constitutes the moisture absorption/drying device 80.

[0176] The control unit 100 may turn on the blowing motor 822 by supplying electric power to the blowing motor 822 through the electric power supply part 48 during the regeneration process for the moisture absorbent 85 or the moisture absorption/drying process.

[0177] Meanwhile, the control unit 100 may be electrically connected to the memory and a timer. The control unit 100 may call an operating condition, a time condition, and the like for each step stored in advance for each washing course in the memory and use the operating condition, the time condition, and the like to generate control signals for controlling processes of performing or ending the steps in accordance with the washing courses.

[0178] In addition, the control unit 100 may use the timer to measure the elapsed time or the like for each step and determine whether the step is completed by comparing the elapsed time or the like with the time condition for each step stored in advance.

[0179] In this case, as illustrated in FIG. 8, the steps may include a preliminary washing step S1, the washing step S2, the rinsing step S3, the heating/rinsing step S4, and a drying step S5.

[0180] In addition, the control unit 100 may be electrically connected to the door position sensor 361 and the automatic door opening module 352. The control unit 100 may determine whether the door 30 is currently in the closed state or the opened state on the basis of the signal received from the door position sensor 361. In case that the door 30 needs to be opened when the door 30 is in the closed state, the control unit 100 may at least partially open the door 30 by operating the automatic door opening module 352.

[0181] Hereinafter, a method of controlling the dishwasher 1 according to the present invention will be described with reference to FIGS. 8 to 11.

[0182] As illustrated in FIG. 15, for example, the control unit 100 controls the overall washing course of the dishwasher 1 that is performed in the order of the preliminary washing step S1, the washing step S2, the rinsing step S3, the heating/rinsing step S4, and the drying step S5.

[0183] The preliminary washing step S1 is an step of circulating the washing water by operating the washing pump 45 in a state in which the detergent is not inputted by the detergent supply device, and measuring a degree of contamination by means of a turbidity sensor (not illustrated) provided in the sump 41. The washing step S2 is an step of washing the dishes by circulating the washing water in a state in which the detergent is inputted by the detergent supply device.

[0184] The rinsing step S3 and the heating/rinsing step S4 are steps of removing the detergent, which remains on the dishes, by inputting a rinse from the detergent supply device and circulating the washing water.

[0185] During the rinsing step S3 and the heating/rinsing step S4, the heated washing water may be supplied to heat the dishes to a predetermined temperature. Therefore, the efficiency in improving the dishes may be improved, and the drying time may be shortened during the drying step S5 to be performed after the rinsing step S3 and the heating/rinsing step S4.

[0186] These detailed steps may be excluded depending on the selected washing course setting and options or combined and adjusted to overlap each other.

[0187] In this case, a water discharge step of discharging the washing water used for the step and a water supply step of supplying new washing water may be included between the steps.

[0188] The water supply step may be included before the preliminary washing step S1.

[0189] The water discharge step and the water supply step may be performed between the preliminary washing step S1 and the washing step S2, between the washing step S2 and the rinsing step S3, and between the heating/rinsing step S4 and the rinsing step S3, and a water discharge process may be performed between the heating/rinsing step S4 and the drying step S5.

[0190] The water supply step may be performed by supplying the washing water to the sump 41 through a water supply flow path by controlling an aqua stop (not illustrated) provided in the water supply part 43. The water discharge step may be performed by discharging the washing water to the outside of the dishwasher 1 through a water discharge flow path by controlling the water discharge part 44 connected to the sump 41.

[0191] In this case, as described above, depending on the user's option selection, these detailed steps may be combined, or the washing course including only any one step may be performed. In particular, as described below, depending on the user's option selection, the control unit 100 may control the dishwasher 1 to perform the drying step single course in which only the drying step S5 is performed singly or perform the storage mode singly or as a part of the washing course.

[0192] FIG. 9 illustrates a drying step single course performing step S100 of singly performing only the drying step S5 as a first embodiment of a method S10 of controlling the dishwasher 1 according to the present invention.

[0193] With reference to FIG. 9, in the drying step single course performing step S100 according to the first embodiment of the present invention, first, the selection of the drying step single course among the plurality of washing courses may be inputted by the user through an input means such as the button part 34, and a drying step single course selection signal may be received through the input means in response to the selection of the drying step single course (S110).

[0194] In step S110, when the drying step single course selection signal is received, the control unit 100 identifies whether the moisture absorbent 85 is currently in the

moistened state or the dried state (regenerated state) before operating the moisture absorption/drying device 80 (S120).

[0195] In this case, the control unit 100 may identify the state of the moisture absorbent 85 by calling information stored in the memory and identifying which course of the washing course has been performed immediately before from the stored information.

[0196] If the washing course, which has been performed immediately before, does not include the drying step S5 or if the washing course, which has been performed immediately before, includes a moisture absorbent regenerating step S140 to be described below and a moisture absorbing step S150 has not been performed after the moisture absorbent regenerating step S140, the control unit 100 may determine that the moisture absorbent 85 is currently in the dried state (regenerated state). In other cases, the control unit 100 may determine that the moisture absorbent 85 is currently in the moistened state.

[0197] In step S120, when it is determined that the moisture absorbent 85 is currently in the moistened state, the control unit 100 at least partially open the door 30 by operating the automatic door opening module 352 before initiating the step of the moisture absorption/drying device 80 (S130).

[0198] Because the door 30 is partially opened in advance before the moisture absorption/drying device 80 is operated as described above, high-temperature steam, which is produced by being evaporated from the moisture absorbent 85 in the subsequent step, at least partially sterilizes the dishes and then is discharged to the outside through the door 30, such that the drying step single course may be quickly performed. Further, a degree to which the steam, which has passed over the dishes, is recovered to the moisture absorption/drying device 80 may be minimized, such that the moisture absorbent 85 is switched to the dried state (regenerated state) after the drying step single course is completed.

[0199] In step S130, when the door 30 is opened, the control unit 100 operates the moisture absorption/drying device 80 to turn on the regeneration heater 831 by supplying electric power to the regeneration heater 831 and turn on the blowing motor 822 by supplying electric power to the blowing motor 822 (S140).

[0200] As described above, when both the regeneration heater 831 and the blowing motor 822 are turned on, the moisture absorbent regeneration process may be initiated, and the high-temperature airflow containing high-temperature steam may be produced by the moisture absorption/drying device 80 and supplied into the tub 20.

[0201] As described above, the moisture absorption/-drying device 80 may operate similarly to the moisture absorbent regeneration process performed during the washing step S2 or the heating/rinsing step S4 in the state in which both the regeneration heater 831 and the blowing motor 822 are turned on. However, the time condition for operating the regeneration heater 831 and the blowing motor 822 and the heat generation capacity of the regeneration heater 831 may be set to be different from the conditions performed in the standard washing course or the general washing course.

[0202] That is, the temperature and humidity in the tub 20 during the drying step single course may be lower than the temperature and humidity in the tub 20 during the standard washing course or the general washing course.

[0203] In consideration of this configuration, the operating mode of the moisture absorbent regeneration process performed in the drying step single course may be set to have a shorter time condition and a lower output temperature than the operating mode of the moisture absorbent regeneration process performed in the standard washing course or the general washing course. Therefore, the elapsed time of the drying step single course may be remarkably shortened, and the energy consumption amount may be minimized.

[0204] When the moisture absorbent regeneration process is completed in accordance with the preset operating mode in step S140, the control unit 100 switches the regeneration heater 831 to the turned-off state by cutting off the supply of electric power to the regeneration heater 831, and the blowing motor 822 switches the step of the moisture absorption/drying device 80 to maintain the turned-on state (S150).

[0205] When the regeneration heater 831 is switched to the turned-off state and the blowing motor 822 is in the turned-on state as described above, the process may be switched to the moisture absorption/drying process, and a low-temperature dry airflow is generated and supplied into the tub 20, such that the dishes may be dried.

[0206] In this case, like step S140 described above, the operating mode of the moisture absorption/drying process performed in the drying step single course may be set to have a shorter time condition than the operating mode of the moisture absorbent regeneration process performed during the drying step included in the standard washing course or the general washing course.

[0207] In addition, as described above, in step S130, the moisture absorption/drying process is performed in the state in which the door 30 is partially opened in advance, the amount of moisture absorbed by the moisture absorbent 85, i.e., the moisture absorption amount may be maintained at a minimum level in comparison with the moisture absorption/drying process performed in the standard washing course or the general washing course.

[0208] Therefore, even though step S150 ends, in the subsequent washing course, the moisture absorbent 85 may be maintained to be in the dried or regenerated state in which the moisture absorbent regeneration process may be excluded.

[0209] When the moisture absorption/drying process is completed in accordance with a preset operational condition in step S150, the control unit 100 switches the step of the moisture absorption/drying device 80 to turn on the blowing motor 822 by cutting off the supply of

electric power to the blowing motor 822 and ends the drying step single course (S150).

[0210] Meanwhile, when it is determined that the moisture absorbent 85 is currently in the dried state (regenerated state) in step S120, the control unit excludes steps S130 and S140 described above and immediately performs step S 150 to operate the moisture absorption/drying device 80 to turn on the blowing motor 822 by supplying electric power only to the blowing motor 822 (S150).

[0211] As described above, because it has been already identified that the moisture absorbent 85 is in the dried state (regenerated state), the moisture absorption/-drying process may be immediately performed in the state in which the process of opening the door 30 and the moisture absorbent regeneration process are excluded. Therefore, because steps S130 and S140 are excluded, the elapsed time of the drying step single course may be additionally reduced.

[0212] FIGS. 10 and 11 illustrate a storage mode performing step S240 of performing the storage mode on the dishes as a second embodiment of the method S10 of controlling the dishwasher 1 according to the embodiment of the present invention.

[0213] As described above, the storage mode may be included as a part of the washing course in accordance with the option selection, or the storage mode may be performed as a separate single course regardless of the washing course.

[0214] FIG. 10 illustrates a configuration of performing the storage mode included in accordance with the user's option selection as a part of the washing course as a first embodiment in the second embodiment (second-first embodiment). Hereinafter, the storage mode performing step, which is included as a part of the washing course in accordance with the user's option selection, will be referred to as a first storage mode performing step S241.

[0215] With reference to FIG. 10, first, the control unit 100 may receive the washing course selection and option selection manipulations from the user through the input means such as the button part 34 and receive signals related to the selected washing courses and options from the input means (S210).

[0216] When the washing course selection signal and the option selection signal are received in step S210, the control unit 100 may perform the detailed steps in accordance with the selected washing courses and options S220 and S230.

[0217] When a drying step S230, which corresponds to the final step of the selected detailed steps, is completed, the control unit 100 identifies whether a storage mode performing option is included in the user's selection option (S2411).

[0218] When it is identified that the storage mode performing option is included in the user's selection option in step S2411, the control unit 100 operates the moisture absorption/drying device 80 to turn on the regeneration heater 831 by supplying electric power to the regeneration heater 831 and turn on the blowing motor 822 by supplying electric power to the blowing motor 822 (S2412).

[0219] As described above, when both the regeneration heater 831 and the blowing motor 822 are turned on, the moisture absorbent regeneration process may be initiated, and the high-temperature airflow containing high-temperature steam may be produced by the moisture absorption/drying device 80 and supplied into the tub 20.

[0220] In this case, unlike the drying step single course, the moisture absorption/drying device 80 may operate when the door 30 is in the closed state without being opened.

[0221] The moisture absorption/drying device 80 may operate similarly to the moisture absorbent regeneration process performed during the washing step S2 or the heating/rinsing step S4 in the state in which both the regeneration heater 831 and the blowing motor 822 are turned on. In addition, the time condition for operating the regeneration heater 831 and the blowing motor 822 and the heat generation capacity of the regeneration heater 831 may be set to be almost identical to the conditions of the moisture absorbent regeneration process performed in the standard washing course or the general washing course. That is, the operating mode may be set to have a higher temperature condition and a longer time condition than the moisture absorbent regeneration process S140 in the drying step single course.

[0222] When the moisture absorbent regeneration process is completed in accordance with the preset operating mode in step S2412, the control unit 100 switches the regeneration heater 831 to the turned-off state by cutting off the supply of electric power to the regeneration heater 831, and the blowing motor 822 switches the step of the moisture absorption/drying device 80 to maintain the turned-on state (S2413).

[0223] When the regeneration heater 831 is switched to the turned-off state and the blowing motor 822 is in the turned-on state as described above, the process may be switched to the moisture absorption/drying process, and a low-temperature dry airflow is generated and supplied into the tub 20, such that the dishes may be dried.

[0224] The moisture absorption/drying process performed in step S2413 may be performed under a condition almost identical to the time condition and the temperature condition performed in the drying step S230.

[0225] Therefore, the operating mode may be set in advance to have a longer time condition than step S 150 of the moisture absorption/drying process in the drying step single course.

[0226] When step S2413 is completed in accordance with the preset operating mode, the control unit 100 identifies whether the elapsed time from the initiation time point of the moisture absorbent regeneration process S2412 to the completion time point of the moisture absorption/drying process S2413 reaches the designated time selected in advance by the user during the

option selection process (S2414).

[0227] In this case, the preset designated time may be set from 1 hour to 24 hours or more. That is, because the storage mode mainly serves to store the dishes in a comfortable state for a long period of time, the storage mode may be set to be much longer than the process time of the drying step single course.

[0228] When it is determined that the elapsed time does not reach the preset designated time in step S2414, the control unit 100 returns to step S2412 and performs the moisture absorbent regeneration process S2412 and the moisture absorption/drying process S2413 again.

[0229] That is, according to the present invention, the sterilization and moisture absorption/drying may be repeatedly performed by supplying steam until the elapsed time reaches the designated time set by the user during the storage mode. Therefore, the dishes may be stored in comfortable and sterilized states in the washing space 21 for a long period of time, which may remarkably improve the user convenience.

[0230] Meanwhile, when it is determined that the elapsed time reaches the preset designated time in step S2414, the control unit 100 ends the selected washing course and the first storage mode (S2415).

[0231] Although not illustrated, the control unit 100 may generate a visual or auditory alarm including information, which indicates that the selected washing course and the storage mode are completed, through the display 33, a sound output part, or the like and provide the alarm to the user.

[0232] Meanwhile, when it is identified that the storage mode performing option is not included in the user's selection option in step S2411, the control unit 100 excludes the moisture absorbent regeneration process S2412 and the moisture absorption/drying process S2413, immediately performs step S2415, and ends the selected washing course.

[0233] FIG. 11 illustrates a configuration of singly performing the storage mode separately from the washing course as a second embodiment in the second embodiment (second-second embodiment). Hereinafter, the step of singly performing the storage mode performing step will be referred to as a second storage mode performing step S242.

[0234] With reference to FIG. 11, first, the control unit 100 may receive the option selection manipulation, which intends to singly perform the storage mode, from the user through the input means such as the button part 34 and receive signals related to the selected options from the input means (S2421).

[0235] In step S2421, when the user's single storage mode performing selection signal is received, the control unit 100 receives an output signal from the door position sensor 361 and identifies whether the door 30 is currently in the closed state (S2422).

[0236] When it is identified that the door 30 is in the open state in step S2422, the control unit 100 is on standby without performing the storage mode.

[0237] In this case, although not illustrated, the control unit 100 may generate an error signal including information, which indicates that the storage mode cannot be performed because the door 30 is currently in the open state, through the display 33 or the sound output part.

[0238] Meanwhile, when it is identified that the door 30 is in the closed state in step S2422, the control unit 100 identifies whether the moisture absorbent 85 is currently in the moistened state or the dried state (regenerated state) before operating the moisture absorption/drying device 80 (S2423).

[0239] In this case, the control unit 100 may identify the state of the moisture absorbent 85 by calling information stored in the memory and identifying which course of the washing course has been performed immediately before from the stored information.

[0240] If the washing course, which has been performed immediately before, does not include the drying step S5 or if the washing course, which has been performed immediately before, includes a moisture absorbent regenerating step S2425 to be described below and a moisture absorbing step S2426 has not been performed after the moisture absorbent regenerating step S2425, the control unit 100 may determine that the moisture absorbent 85 is currently in the dried state (regenerated state). In other cases, the control unit 100 may determine that the moisture absorbent 85 is currently in the moistened state.

[0241] When it is determined that the moisture absorbent 85 is currently in the dried state (regenerated state) in step S2423, the control unit 100 turns on the washing pump 45 and the washing water heater 47 by supplying electric power to the washing pump 45 and the washing water heater 47 and provides the heated washing water to the washing space of the tub 20 (S2424).

[0242] Step S2424 may be performed similarly to the heating/rinsing step S4 included in the standard washing course or the general washing course. However, because the dishes currently stored in the washing space 21 has been already washed and rinsed, the operating mode may be set to have a lower operating temperature and a shorter operating time than the heating/rinsing step S4 included in the standard washing course or the general washing course.

[0243] Therefore, moisture may be supplied into the washing space 21 in the tub 20, the supplied moisture is evaporated in a moisture absorbent regeneration process S2425, which is performed subsequently, the evaporated moisture may be used as high-temperature steam, and the moisture may be absorbed by the moisture absorbent 85 in a moisture absorption/drying process S2426 subsequently performed.

[0244] When step S2424 is completed in accordance with the preset operating mode, the control unit 100 operates the moisture absorption/drying device 80 to turn on the regeneration heater 831 by supplying electric power to the regeneration heater 831 and turn on the

blowing motor 822 by supplying electric power to the blowing motor 822 (S2425).

[0245] As described above, when both the regeneration heater 831 and the blowing motor 822 are turned on, the moisture absorbent regeneration process may be initiated, and the high-temperature airflow containing high-temperature steam may be produced by the moisture absorption/drying device 80 and supplied into the tub 20.

[0246] Step S2425 may be performed in the same operating mode as step S2412 in the second-first embodiment. Therefore, the repetitive descriptions of the identical configurations will be omitted.

[0247] When the moisture absorbent regeneration process is completed in accordance with the preset operating mode in step S2425, the control unit 100 switches the regeneration heater 831 to the turned-off state by cutting off the supply of electric power to the regeneration heater 831, and the blowing motor 822 switches the step of the moisture absorption/drying device 80 to maintain the turned-on state (S2426).

[0248] When the regeneration heater 831 is switched to the turned-off state and the blowing motor 822 is in the turned-on state as described above, the process may be switched to the moisture absorption/drying process, and a low-temperature dry airflow is generated and supplied into the tub 20, such that the dishes may be dried.

[0249] Step S2426 may be performed in the same operating mode as step S2413 in the second-first embodiment. Therefore, the repetitive descriptions of the identical configurations will be omitted.

[0250] When step S2426 is completed in accordance with the preset operating mode, the control unit 100 identifies whether the elapsed time from the initiation time point of the moisture absorbent regeneration process S2425 to the completion time point of the moisture absorption/drying process S2426 reaches the designated time selected in advance by the user during the option selection process (S2427).

[0251] In this case, as in the second-first embodiment, the preset designated time may be set from 1 hour to 24 hours or more.

[0252] When it is determined that the elapsed time does not reach the preset designated time in step S2427, the control unit 100 returns to step S2425 and performs the moisture absorbent regeneration process S2425 and the moisture absorption/drying process S2426 again.

[0253] Meanwhile, when it is determined that the elapsed time reaches the preset designated time in step S2414, the control unit 100 ends the selected washing course and the second storage mode (S2428).

[0254] Although not illustrated, the control unit 100 may generate a visual or auditory alarm including information, which indicates that the selected washing course and the storage mode are completed, through the display 33, a sound output part, or the like and provide the alarm to the user.

[0255] Meanwhile, in step S2423 described above, when it is determined that the moisture absorbent 85 is currently in the moistened state, the control unit 100 may exclude step S2424 described above and immediately perform step S2425.

[0256] Because the moisture absorbent 85 already contains moisture, moisture does not need to be additionally supplied. Therefore, the control unit 100 may perform the storage mode on the dishes by performing step S2425 and subsequent steps.

[0257] While the present invention has been described above with reference to the accompanying drawings, the present invention is not limited to the drawings and the embodiments disclosed in the present specification, and it is apparent that the present invention may be variously changed by those skilled in the art without departing from the technical spirit of the present invention. Further, even though the operational effects of the configurations of the present invention have not been explicitly disclosed and described in the description of the embodiment of the present invention, the effects, which can be expected by the corresponding configurations, should, of course, be acceptable.

[Description of Reference Numerals]

[0258]

1: Dishwasher 10: Casing
20: Tub 30: Door
40: Drive part 50: Accommodation part
60: Spray part 80: Moisture absorption/drying device
90: Base

Claims

1. A dishwasher comprising:

a tub having a washing space configured to accommodate dishes;
a sorption drying device including a blowing fan configured to generate an airflow of air to be supplied to the washing space, a blowing motor configured to generate rotational driving power for the blowing fan, a moisture absorbent configured to absorb water vapor contained in the airflow discharged from the tub, and a heater configured to dry the moisture absorbent by heating the airflow to be supplied to the moisture absorbent; and
a control unit configured to perform at least any one of a plurality of courses defined by combining multiple detailed steps on the dishes,
wherein the control unit performs a drying step single course performing step of operating the sorption drying device to singly perform only a drying step among the multiple detailed steps.

2. The dishwasher of claim 1, wherein the drying step single course performing step comprises an identification step of identifying whether the moisture absorbent is in a moistened state or a dried state.

3. The dishwasher of claim 2, wherein the control unit determines that the moisture absorbent is in the dried state when the course, which has been performed immediately before, does not include the drying step or when the course, which has been performed immediately before, includes a moisture absorbent regenerating step and a moisture absorbing step is not performed after the moisture absorbent regenerating step.

4. The dishwasher of claim 2 or claim 3, wherein the drying step single course performing step comprises:

a moisture absorbent regenerating step of drying the moisture absorbent and supplying steam to the washing space by turning on both the blowing motor and the heater by supplying electric power to the blowing motor and the heater when it is identified that the moisture absorbent is in the moistened state in the identification step; and
a moisture absorbing step of turning off the heater by cutting off a supply of electric power to the heater and turning on the blowing motor by supplying electric power to the blowing motor after the moisture absorbent regenerating step.

5. The dishwasher of claim 2 or claim 3, further comprising:

a door configured to open or close an opened front side of the tub; and
an automatic door opening module configured to partially open the door,
wherein the drying step single course performing step further comprises a door opening step of opening the door by means of the automatic door opening module before the moisture absorbent regenerating step when it is identified that the moisture absorbent is in the moistened state in the identification step.

6. The dishwasher of claim 2, wherein the drying step single course performing step further comprises:
a moisture absorbing step of turning off the heater by cutting off a supply of electric power to the heater and turning on the blowing motor by supplying electric power to the blowing motor when it is identified that the moisture absorbent is in the dried state in the identification step.

7. A dishwasher comprising:

a tub having a washing space configured to accommodate dishes;
a sorption drying device including a blowing fan configured to generate an airflow of air to be supplied to the washing space, a blowing motor configured to generate rotational driving power for the blowing fan, a moisture absorbent configured to absorb water vapor contained in the airflow discharged from the tub, and a heater configured to dry the moisture absorbent by heating the airflow to be supplied to the moisture absorbent; and
a control unit configured to perform at least any one of a plurality of courses defined by combining multiple detailed steps on the dishes,
wherein the control unit performs, in accordance with a user's option selection, a first mode performing step of operating the sorption drying device after the at least any one course is completed or a second mode performing step of singly operating the sorption drying device separately from the at least any one course.

8. The dishwasher of claim 7, wherein the first mode performing step comprises:

a moisture absorbent regenerating step of drying the moisture absorbent and supplying steam to the washing space by turning on both the blowing motor and the heater by supplying electric power to the blowing motor and the heater; and
a moisture absorbing step of turning off the heater by cutting off a supply of electric power to the heater and turning on the blowing motor by supplying electric power to the blowing motor after the moisture absorbent regenerating step.

9. The dishwasher of claim 8, wherein the first mode performing step comprises an option identification step of identifying whether a performing option of the first mode is included in the user's option selection after the at least any one course is completed before the moisture absorbent regenerating step.

10. The dishwasher of claim 8 or claim 9, wherein the first mode performing step comprises an elapsed time identifying step of identifying whether an elapsed time after initiation of the moisture absorbent regenerating step reaches a preset designated time after the moisture absorbing step.

11. The dishwasher of any one of claim 8 to claim 10, wherein the first mode performing step comprises a first mode ending step of ending the first mode by turning off the heater and the blowing motor when it is identified that the elapsed time reaches the designated time in the elapsed time identifying step.

12. The dishwasher of claim 7, wherein the second mode performing step comprises an identification step of identifying whether the moisture absorbent is in a moistened state or a dried state.

13. The dishwasher of claim 12, comprising:

a moisture absorbent regenerating step of drying the moisture absorbent and supplying steam to the washing space by turning on both the blowing motor and the heater by supplying electric power to the blowing motor and the heater when it is identified that the moisture absorbent is in the moistened state in the identification step; and

a moisture absorbing step of turning off the heater by cutting off a supply of electric power to the heater and turning on the blowing motor by supplying electric power to the blowing motor after the moisture absorbent regenerating step.

14. The dishwasher of claim 12 or claim 13, wherein the second mode performing step comprises an elapsed time identifying step of identifying whether an elapsed time after initiation of the moisture absorbent regenerating step reaches a preset designated time after the moisture absorbing step.

15. The dishwasher of any one of claim 12 to claim 14, wherein the second mode performing step comprises a second mode ending step of ending the first mode by turning off the heater and the blowing motor when it is identified that the elapsed time reaches the designated time in the elapsed time identifying step.

16. The dishwasher of claim 12, further comprising:

a washing pump configured to pressurize washing water and supply the washing water to the washing space; and

a washing water heater configured to heat the washing water,

wherein the second mode performing step comprises a washing water drying/supplying step of providing heated washing water to the washing space by supplying electric power to the washing pump and the washing water heater when it is identified that the moisture absorbent is in the dried state in the identification step.

17. The dishwasher of claim 12, further comprising:

a door configured to open or close an opened front side of the tub; and

a door position sensor configured to detect whether the door is in a closed state or an opened state,

wherein the second mode performing step comprises a door position determining step of identifying whether the door is in the closed state or the opened state by means of the door position sensor before the identification step.

18. The dishwasher of claim 17, wherein the identification step is performed when it is determined that the door is in the closed state in the door position determining step.

FIG. 1

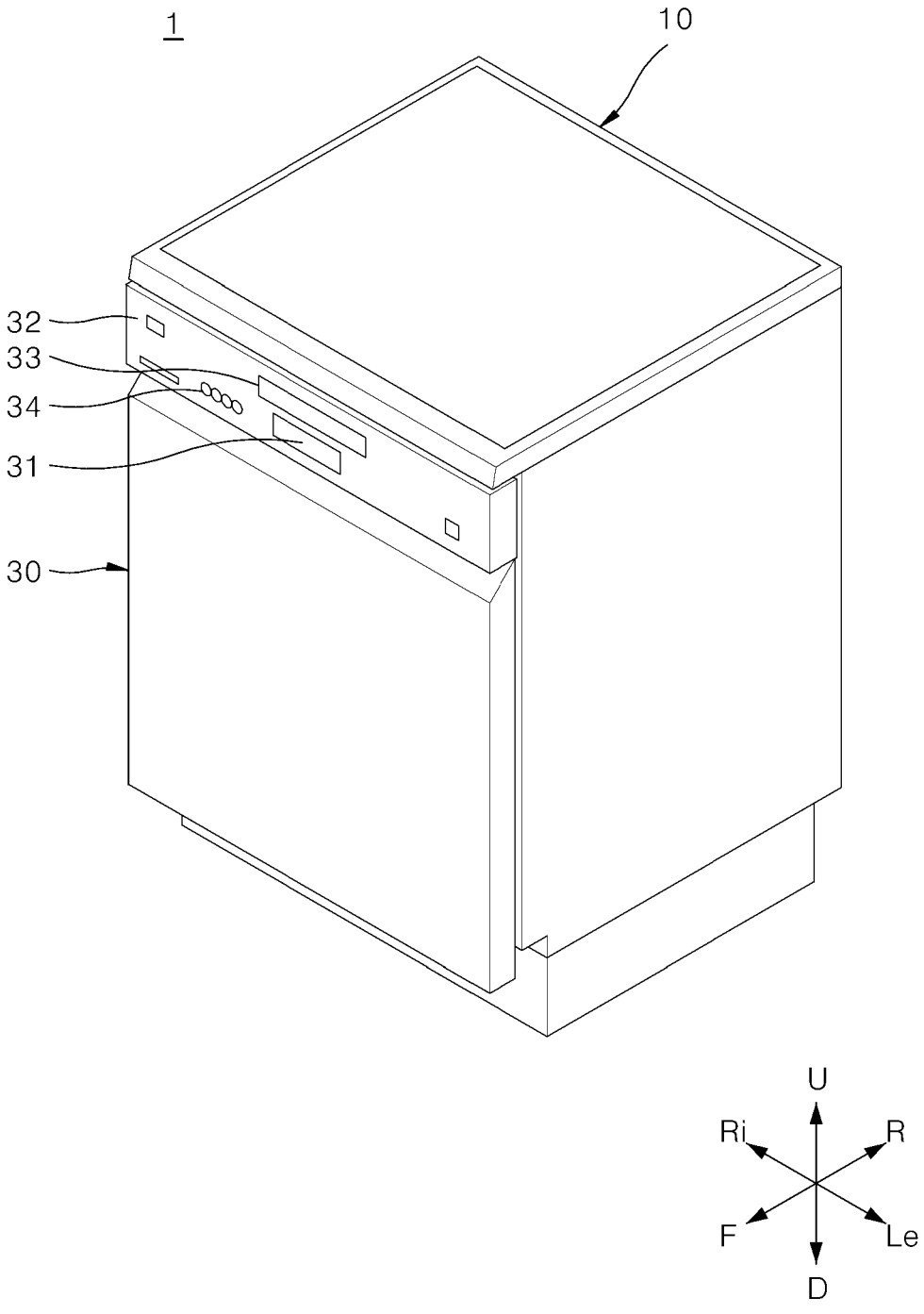

FIG. 2

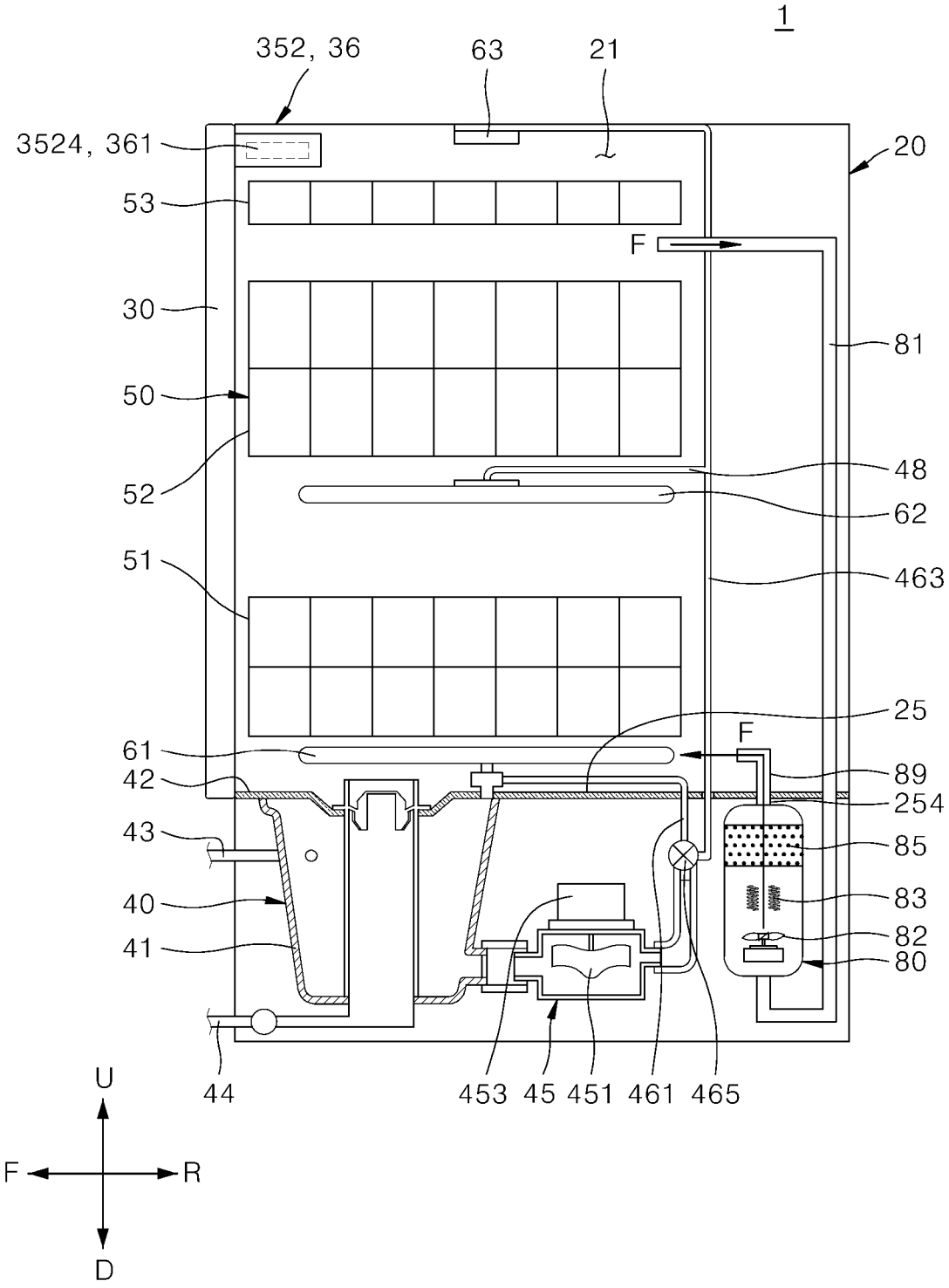
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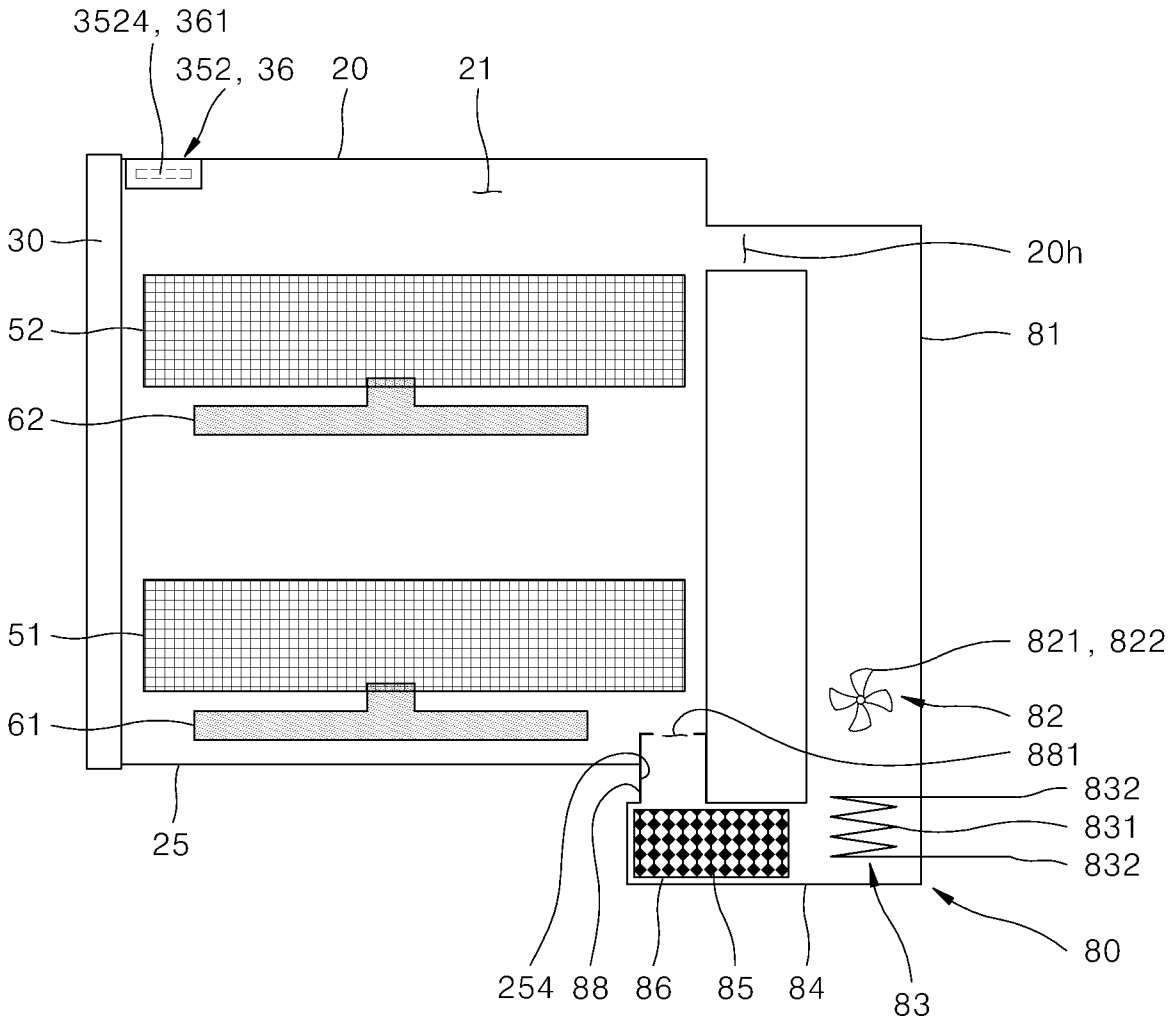
FIG. 3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84
83

FIG. 4

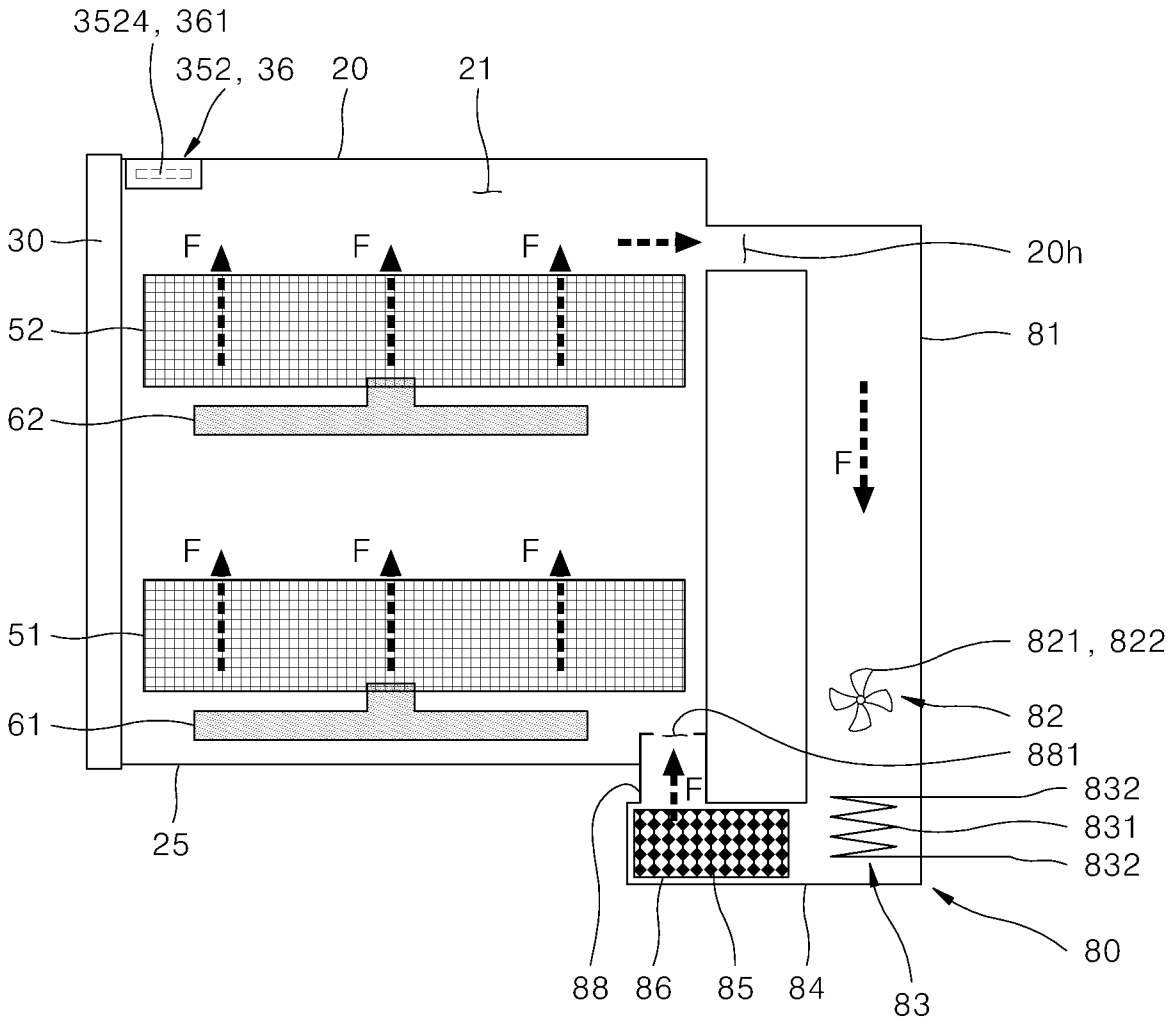
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FIG. 5

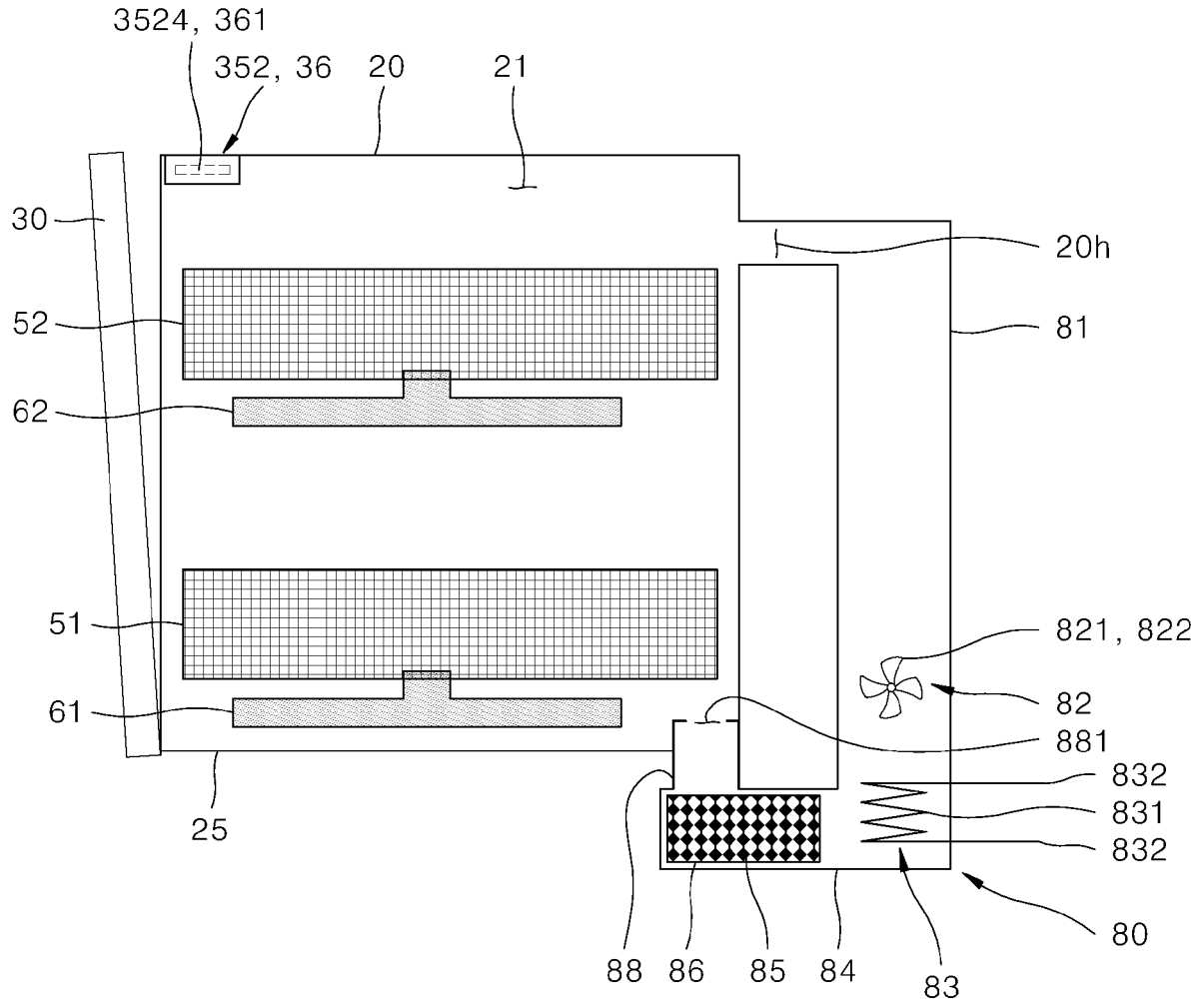
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FIG. 6

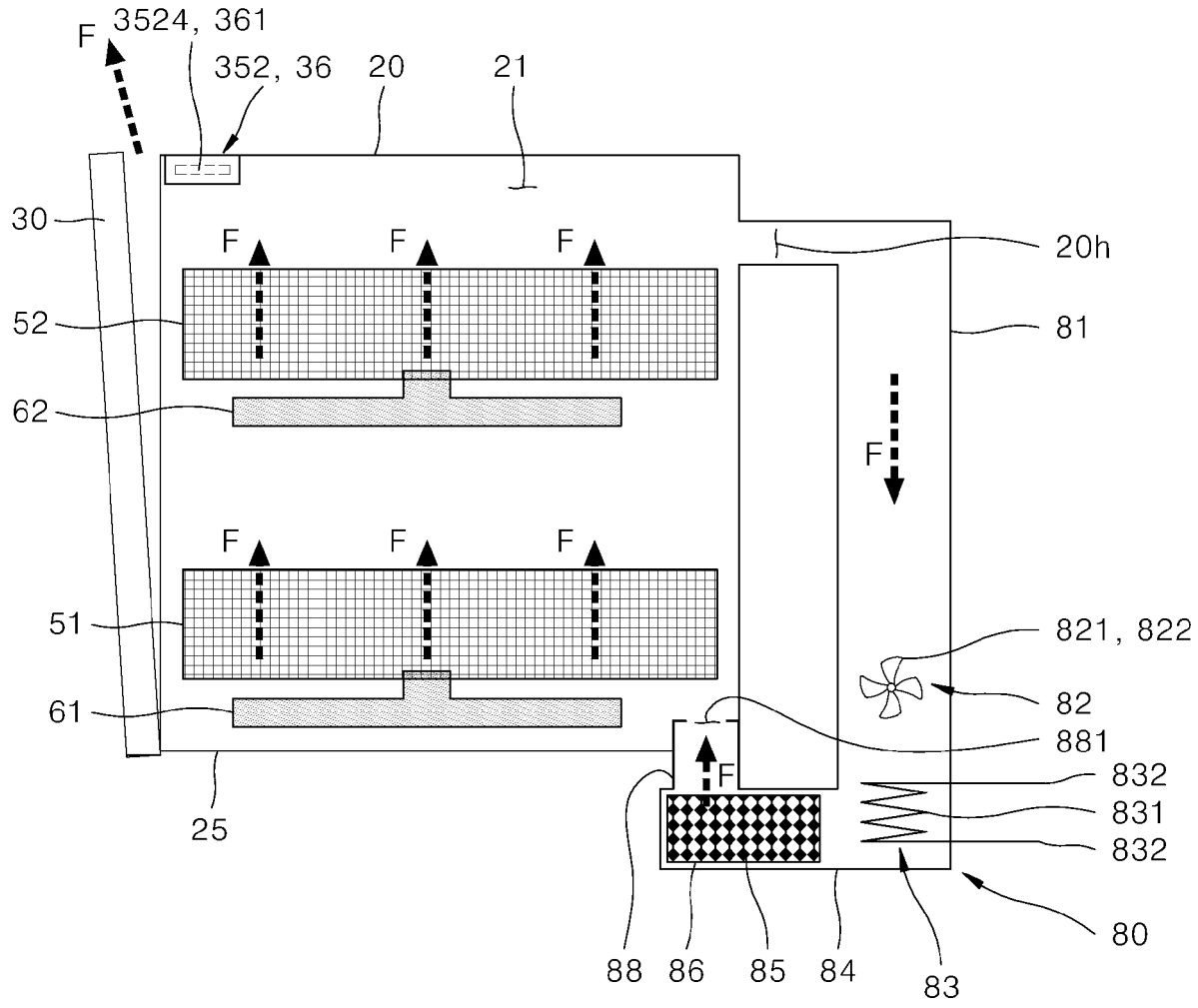
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FIG. 7

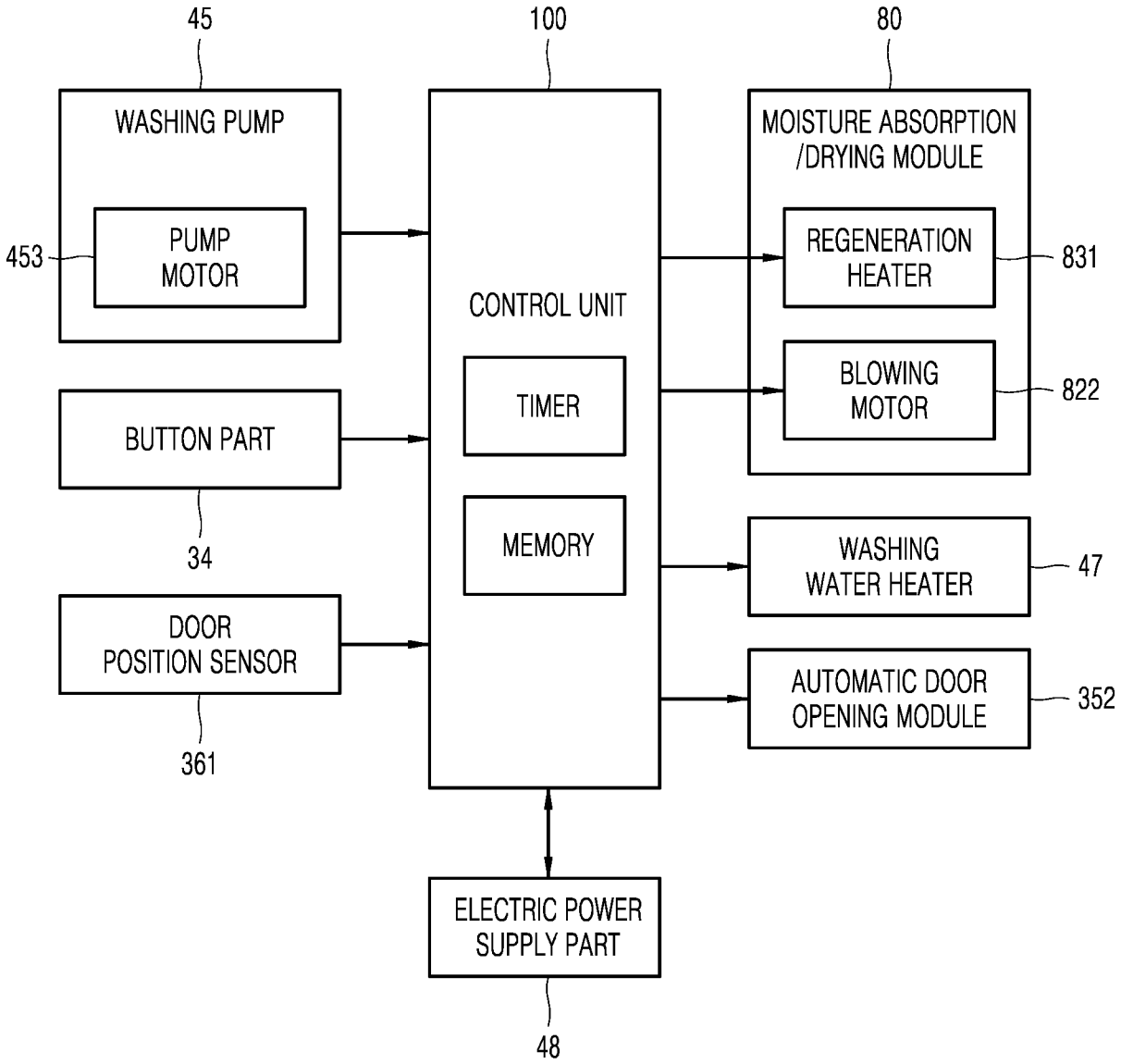

45
100
80
WASHING PUMP
PUMP MOTOR
453
CONTROL UNIT
TIMER
MEMORY
MOISTURE ABSORPTION /DRYING MODULE
REGENERATION HEATER
831
BLOWING MOTOR
822
BUTTON PART
34
WASHING WATER HEATER
47
DOOR POSITION SENSOR
361
AUTOMATIC DOOR OPENING MODULE
352
ELECTRIC POWER SUPPLY PART
48

FIG. 8

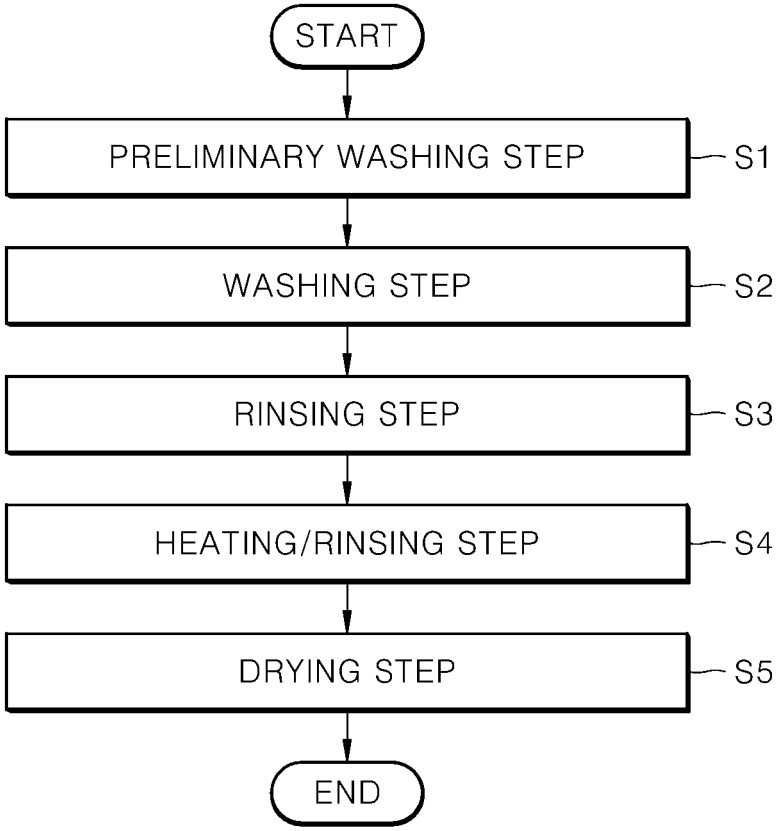

START
PRELIMINARY WASHING STEP
S1
WASHING STEP
S2
RINSING STEP
S3
HEATING/RINSING STEP
S4
DRYING STEP
S5
END

FIG. 9

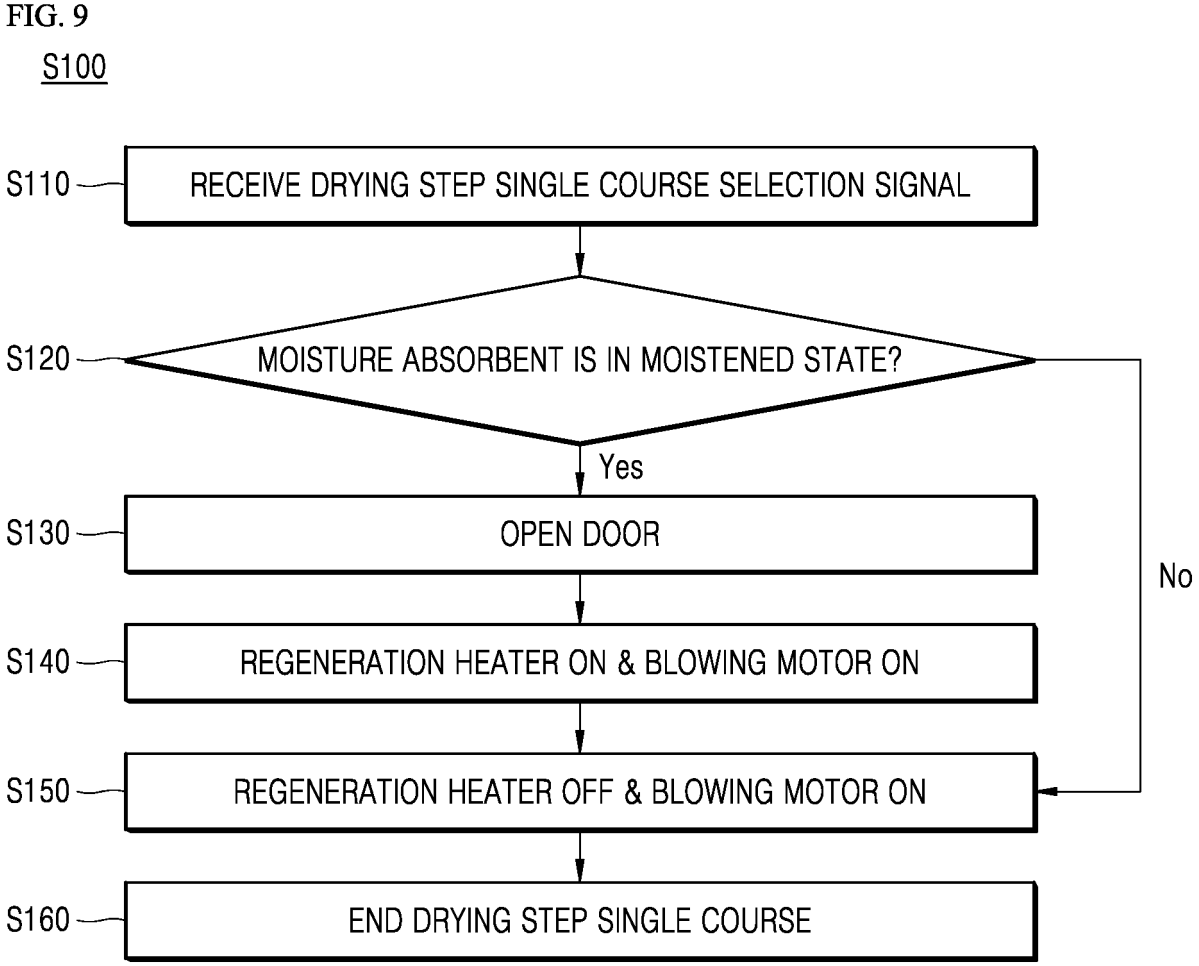

S100
S110
RECEIVE DRYING STEP SINGLE COURSE SELECTION SIGNAL
S120
MOISTURE ABSORBENT IS IN MOISTENED STATE?
Yes
No
S130
OPEN DOOR
S140
REGENERATION HEATER ON & BLOWING MOTOR ON
S150
REGENERATION HEATER OFF & BLOWING MOTOR ON
S160
END DRYING STEP SINGLE COURSE

FIG. 10

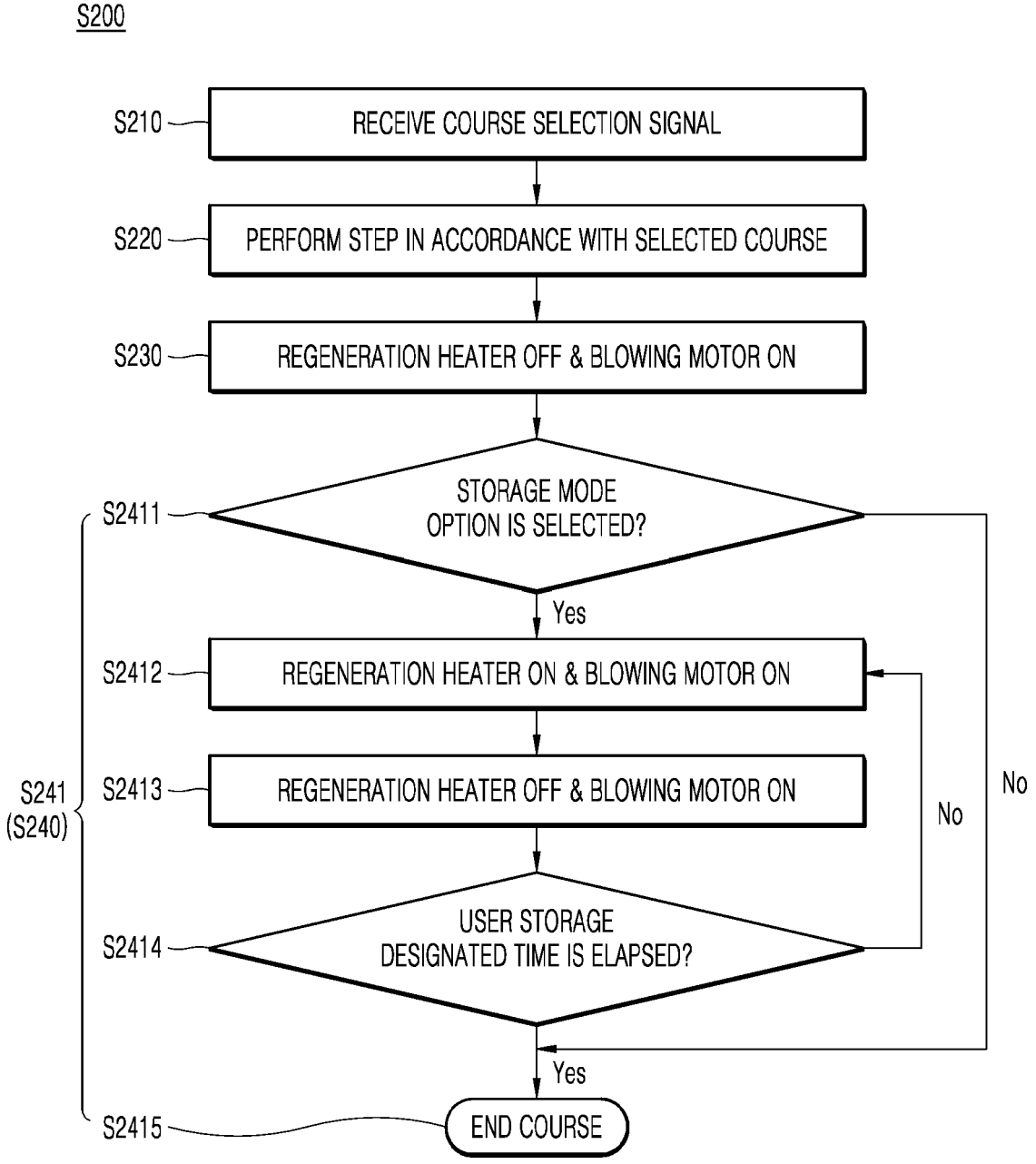
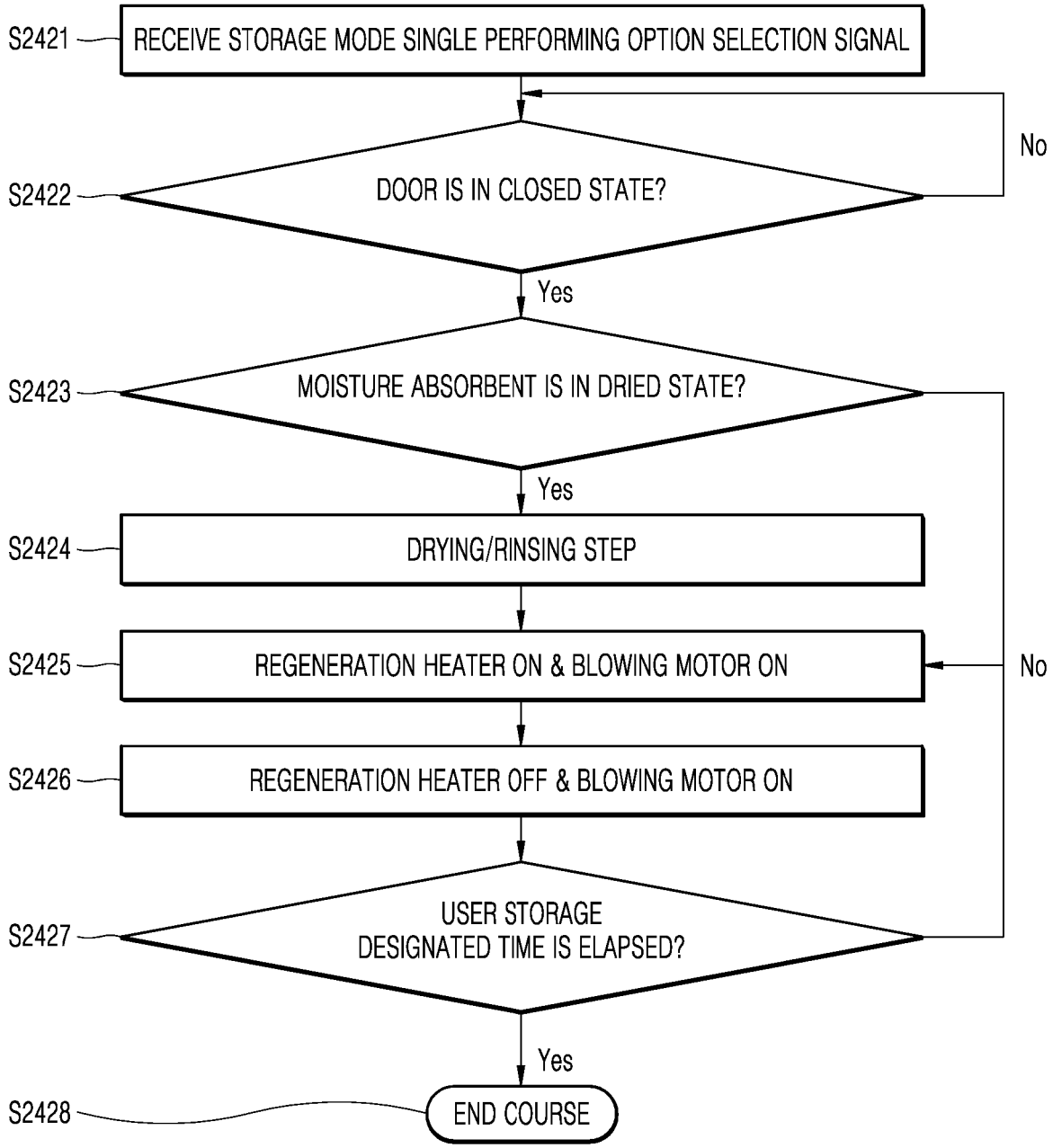

S200
S210
RECEIVE COURSE SELECTION SIGNAL
S220
PERFORM STEP IN ACCORDANCE WITH SELECTED COURSE
S230
REGENERATION HEATER OFF & BLOWING MOTOR ON
S2411
STORAGE MODE OPTION IS SELECTED?
Yes
No
S2412
REGENERATION HEATER ON & BLOWING MOTOR ON
S241 (S240)
S2413
REGENERATION HEATER OFF & BLOWING MOTOR ON
No
S2414
USER STORAGE DESIGNATED TIME IS ELAPSED?
Yes
S2415
END COURSE

FIG. 11

S242(S240)



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Patent documents cited in the description

- EP 1830690 A **[0009] [0010]**