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(71) Applicant: **Samsung Electronics Co., Ltd.**
Suwon-si, Gyeonggi-do 16677 (KR)

(72) Inventors:

- **YEOM, Changbae**
Suwon-si Gyeonggi-do 16677 (KR)

- **CHOI, Hankyu**
Suwon-si Gyeonggi-do 16677 (KR)
- **LEE, Yeonju**
Suwon-si Gyeonggi-do 16677 (KR)
- **CHA, Hyemin**
Suwon-si Gyeonggi-do 16677 (KR)
- **LEE, Kisu**
Suwon-si Gyeonggi-do 16677 (KR)
- **JANG, Jonghyun**
Suwon-si Gyeonggi-do 16677 (KR)

(74) Representative: **Gulde & Partner**
Patent- und Rechtsanwaltskanzlei mbB
Wallstraße 58/59
10179 Berlin (DE)

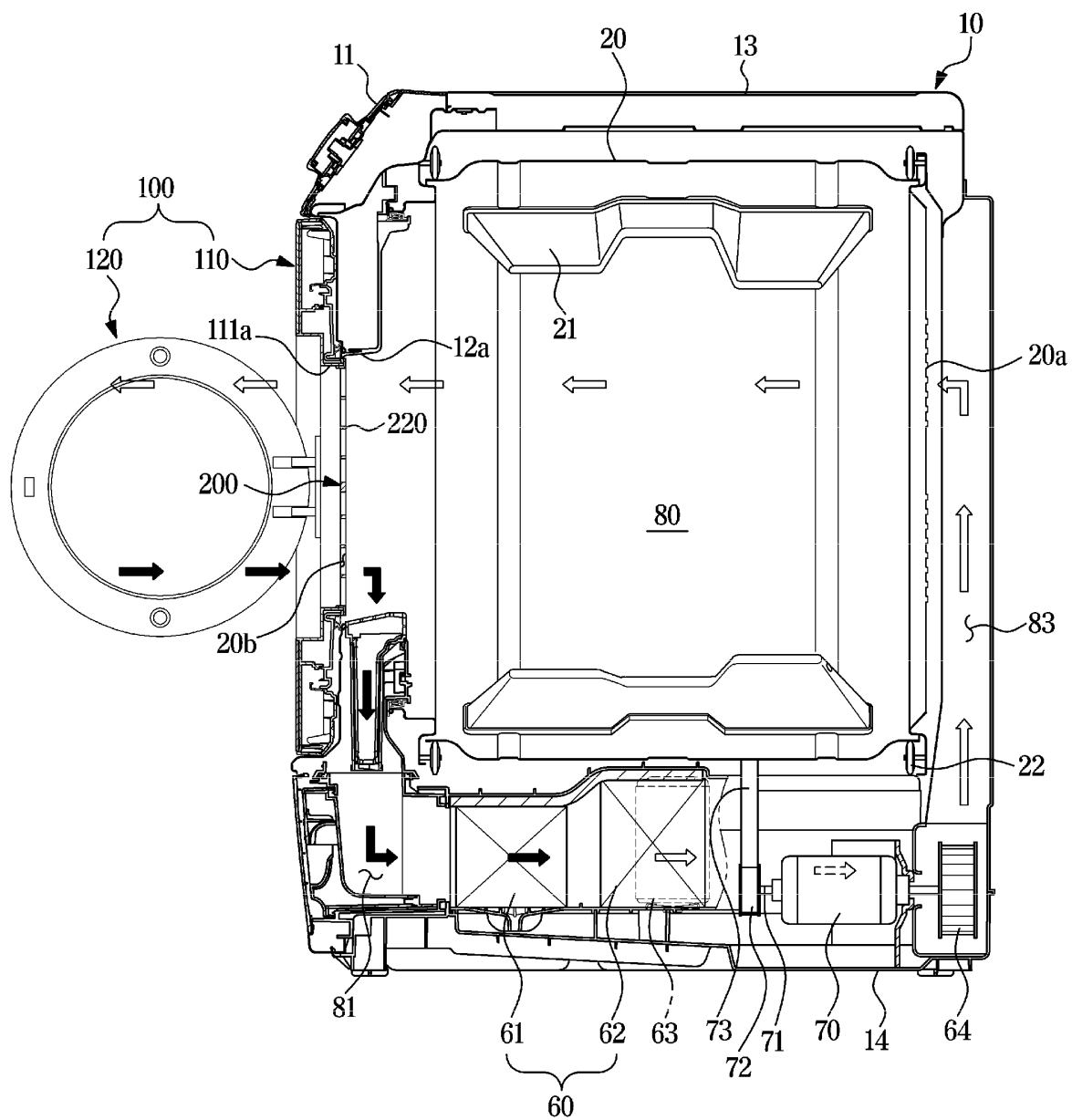
(54) **CLOTHES DRYER**

(57) Disclosed herein is a clothes dryer including a dehumidification function. The clothes dryer comprises: a cabinet; a drum provided inside the cabinet so as to accommodate an object to be dried; an opening provided on the front surface of the cabinet, so as to allow the object to be dried to be inserted into the drum; a heat exchanger provided inside the cabinet so as to perform

heat exchange heat with air; and a door provided on the cabinet so as to open and close the opening, wherein the door discharge air, discharged from the drum, to the outside of the cabinet and maintains an open state of the opening so as to supply external air to the heat exchanger.

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FIG. 5



Description

[Technical Field]

[0001] The present disclosure relates to a clothes dryer, and more particularly, to a clothes dryer including a dehumidification function.

[Background Art]

[0002] In general, a clothes dryer is a home appliance for drying wet items to be dried and is configured to dry the items to be dried inside a drum by allowing hot air to pass through the drum while rotating the drum accommodating the items to be dried at a low speed.

[0003] In general, a clothes dryer is installed and used in a separate laundry room or a multi-purpose room in a house, and the laundry room or the multi-purpose room has no windows or is not well ventilated due to its narrowness. When a humidity in the laundry room or the multi-purpose room is high, the clothes dryer installed in the laundry room or the multi-purpose room may be corroded and a user who uses the place may feel uncomfortable.

[0004] The clothes dryer may dry an object to be dried using a refrigerant cycle.

[0005] Particularly, the clothes dryer may remove moisture from humid air flowing out of the drum, raise a temperature, and then send the hot and dry air back to the drum to circulate. That is, because the clothes dryer dries the object through air circulation, a closed flow path is formed inside a main body.

[0006] Meanwhile, a dehumidifier is a device used to remove moisture. The dehumidifier sucks air from the outside to remove moisture, raises a temperature, and then discharges the dehumidified air to the outside. That is, an open flow path is formed inside the dehumidifier.

[0007] As mentioned above, an additional dehumidifier may be installed to control the humidity in the space where the clothes dryer is installed. The laundry room or the multi-purpose room may have a small space and thus it is not enough to install the dehumidifier. In addition, it is a very inefficient to purchase an additional dehumidifier.

[Disclosure]

[Technical Problem]

[0008] The present disclosure is directed to providing a clothes dryer including a dehumidification function.

[0009] Further, the present disclosure is directed to providing a clothes dryer including a function of dehumidifying a surrounding space.

[0010] Further, the present disclosure is directed to providing a clothes dryer capable of drying an object to be dried as well as dehumidifying a surrounding space.

[Technical Solution]

[0011] One aspect of the present disclosure provides a clothes dryer including a cabinet, a drum provided inside the cabinet to accommodate an object to be dried, an opening provided on a front surface of the cabinet to input an object to be dried into the drum; a heat exchanger provided inside the cabinet to exchange heat with air, and a door provided in the cabinet to open and close the opening. The door opening member provided to cover at least a portion of the opening in response to the opening being opened to discharge air, which passes through the heat exchanger and then discharged to an outside of the drum, to an outside of the cabinet and to supply outside air to the heat exchanger.

[0012] The door may include a door opening member provided to cover at least a portion of the opening.

[0013] The door opening member may be arranged between the door and the opening, and may include at least one of a mesh or a grill.

[0014] The door may include a first door rotatably provided to seal an outer edge of the opening, and a second door provided to be coupled to the first door, and rotatably provided in front of the first door to open and close the first door. The door opening member may be arranged in the first door.

[0015] The door may include a first door including a hole formed by penetrating at a portion of the first door, and a second door rotatably coupled to the first door to open and close the hole. The door opening member may be arranged in the hole.

[0016] The door opening member may further include a separation prevention member provided to connect between the door and the opening.

[0017] The separation prevention member may further include a plurality of ribs provided to connect the door and the opening.

[0018] Another aspect of the present disclosure provides a clothes dryer including a cabinet, a drum provided inside the cabinet to accommodate an object to be dried, an opening provided on a front surface of the cabinet to input an object to be dried into the drum, a heat exchanger provided inside the cabinet to exchange heat with air, and a door provided in the cabinet to open and close the opening. The door includes a door opening member provided to cover at least a portion of the opening in response to the opening being opened to discharge air, which is discharged to an outside of the drum, to an outside of the cabinet and to supply outside air to the heat exchanger.

[0019] The door opening member may be arranged between the door and the opening, and may include at least one of a mesh or a grill.

[0020] The clothes dryer may further include an automatic opening and closing device configured to control the door to open the opening, and a controller configured to control the automatic opening and closing device. The controller may be configured to control the automatic

opening and closing device to allow the door to be open in a dehumidification mode.

[0021] The clothes dryer may further include a door sensor configured to detect an open and closed state of the door. The controller may be configured to control the automatic opening and closing device to allow the door to be open in response to detecting the door being closed in the dehumidification mode.

[0022] The controller may be configured to control a motor to allow the drum to rotate in the dehumidification mode.

[0023] The door may include a first door rotatably provided to seal an outer edge of the opening, and a second door provided to be coupled to the first door, and rotatably provided in front of the first door to open and close the first door. The controller may be configured to control the automatic opening and closing device to allow the second door to be open in response to detecting the second door being closed in the dehumidification mode.

[Advantageous Effects]

[0024] A clothes dryer may perform a dehumidification function as well as a drying function.

[0025] In addition, a clothes dryer may dehumidify a surrounding space without installing a separate dehumidifier.

[Description of Drawings]

[0026]

FIG. 1 is a perspective view of a clothes dryer according to one embodiment of the present disclosure.

FIG. 2 is a cross-sectional view of the clothes dryer according to one embodiment of the present disclosure.

FIGS. 3 and 4 are views illustrating a door opening member mounted on a door according to one embodiment of the present disclosure.

FIG. 5 is a view illustrating a dehumidifying operation state of the clothes dryer by the door opening member according to one embodiment of the present disclosure.

FIGS. 6 and 7 are views illustrating a door opening member installed on a door according to another embodiment of the present disclosure.

FIGS. 8 and 9 are views illustrating a door opening member installed on a door according to still another embodiment of the present disclosure.

FIG. 10 is a control block diagram of the clothes dryer

according to one embodiment of the present disclosure.

FIG. 11 is a flowchart of a method for controlling the clothes dryer according to one embodiment of the present disclosure.

[Modes of the Invention]

[0027] Embodiments described in the disclosure and configurations shown in the drawings are merely examples of the embodiments of the disclosure, and may be modified in various different ways at the time of filing of the present application to replace the embodiments and drawings of the disclosure.

[0028] In addition, the same reference numerals or signs shown in the drawings of the disclosure indicate elements or components performing substantially the same function.

[0029] Also, the terms used herein are used to describe the embodiments and are not intended to limit and / or restrict the disclosure. The singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. In this disclosure, the terms "including", "having", and the like are used to specify features, numbers, steps, operations, elements, components, or combinations thereof, but do not preclude the presence or addition of one or more of the features, elements, steps, operations, elements, components, or combinations thereof. Shapes and sizes of elements in the drawings may be exaggerated for clear description.

[0030] It will be understood that, although the terms first, second, third, etc., may be used herein to describe various elements, but elements are not limited by these terms. These terms are only used to distinguish one element from another element. For example, without departing from the scope of the disclosure, a first element may be termed as a second element, and a second element may be termed as a first element. The term of "and / or" includes a plurality of combinations of relevant items or any one item among a plurality of relevant items.

[0031] In the following detailed description, the terms of "front end", "rear end", "upper portion", "lower portion", "upper end", "lower end" and the like may be defined by the drawings, but the shape and the location of the component is not limited by the term.

[0032] FIG. 1 is a perspective view of a clothes dryer according to one embodiment of the present disclosure, and FIG. 2 is a cross-sectional view of the clothes dryer according to one embodiment of the present disclosure.

[0033] As illustrated in FIGS. 1 and 2, a clothes dryer 1 may include a cabinet 10 forming an exterior of the clothes dryer 1 and a drum 20 rotatably installed in the cabinet 10.

[0034] The cabinet 10 may be formed in a substantially hexahedral shape. An opening 12a provided to insert or withdraw clothes (not shown), which is an object to be

dried, into or from the drum 20 may be formed on a front surface of the cabinet 10. The opening 12a may be opened and closed by a door 100. The door 100 may be hinged to one side of the opening 12a of the cabinet 10 so as to be rotatable.

[0035] A control panel 11 configured to control an operation of the clothes dryer 1 may be provided on an upper front side of the cabinet 10. An inputter formed in the form of a rotatable jog dial to receive an operation of the clothes dryer 1, and a display provided to display various information regarding the clothes dryer 1 may be provided in the control panel 11. However, it is not limited thereto, and the control panel may include various types of inputters and displays.

[0036] The drum 20 having a cylindrical shape may be provided inside the cabinet 10. The drum 20 may be configured to be rotated by receiving power from a driving device.

[0037] The cabinet 10 may include a front panel 12 forming a front surface, a top cover 13 forming an upper surface, and a base 14 forming a bottom surface. According to one embodiment of the present disclosure, the front cover, the top cover, and the base forming the cabinet are separately formed and assembled to each other, but it is not limited thereto. For example, at least a portion of the front cover, the top cover, and the base may be integrally formed with each other.

[0038] The clothes dryer 1 may include the door 100 configured to open and close the opening 12a formed by opening the front panel 12. After a user opens the door 100, the user can insert or withdraw laundry into or from the drum 20 through the opening 12a.

[0039] The drum 20 may be arranged inside the cabinet 10 so as to be rotatable about a rotating axis that is provided substantially horizontally with the ground. The drum 20 may have a substantially cylindrical shape in which an opening is formed on front and rear surfaces, respectively. The front surface of the drum 20 may be provided with an opening through which an object to be dried is inserted or withdrawn.

[0040] The drum 20 may include an inlet 20a through which air is introduced into the drum 20 and an outlet 20b through which air is discharged from the inside of the drum to the outside of the drum (refer to FIG. 4). The inlet 20a may be formed on one side of the drum 20, and the outlet 20b may be formed on the other side of the drum 20. Particularly, the inlet 20a may be a rear side opening of the drum 20, and the outlet may be a front side opening of the drum 20.

[0041] A lifter 21 may be provided on an inner peripheral surface of the drum 20 to lift clothes in response to a rotation of the drum 20. As the drum 20 rotates, the clothes may be repeatedly lifted and dropped by the lifter 21. A roller 22 provided to support the drum 20 to allow the drum 20 to rotate smoothly may be provided on an outer peripheral surface of the drum.

[0042] The drum 20 may be installed to be rotated by receiving power by the driving device. The driving device

may be arranged at an inner lower portion of the cabinet 10. The driving device may be mounted to the base 14.

[0043] The driving device may include a motor 70, and a pulley 72 and a belt 73 configured to transmit the power of the motor 70 to the drum 20. The pulley 72 may be connected to a rotating shaft 71 connected to the motor 70. In response to the rotation of the rotating shaft 71 by the motor 70, the pulley 72 may be rotated together with the rotating shaft 71. The belt 73 may be installed to be wound around an outer surface of the pulley 72 and an outer surface of the drum 20. In response to the rotation of the belt 73 by a driving force of the motor 70, the drum 20 may be rotated together with the belt 73.

[0044] The drum 20 is provided to accommodate an object to be dried therein, so as to dry the object. A heat exchanger 60, a compressor 63, an expansion device (not shown), etc., which form a refrigerant cycle, may be mounted on the base 14 under the drum 20.

[0045] A fan 64 may be provided on the base 14. The fan 64 may generate a blowing force to form a flow path. For example, the fan 64 is configured to discharge air in a radial direction.

[0046] Inside the cabinet 10, the refrigerant cycle for heating and condensing air may be formed. A refrigerant may be circulated through a series of processes composed of compression-condensation-expansion-evaporation. Particularly, the refrigerant cycle may include the heat exchanger 60, the compressor 63, and the expansion device. The heat exchanger 60 may exchange heat with air and may include an evaporator 61 and a condenser 62.

[0047] The compressor 63 compresses and discharges a refrigerant in a high-temperature and high-pressure state, and the discharged refrigerant flows into the condenser 62. The condenser 62 may condense the compressed refrigerant and discharge heat to surroundings through a condensation process. In addition, the expansion device (not shown) expands the refrigerant from a high-temperature and high-pressure state condensed in the condenser 62 to a low-pressure state. The evaporator 61 evaporates the expanded refrigerant and may take heat from the surroundings through an evaporation process.

[0048] When an object to be dried is put into the clothes dryer 1 and the clothes dryer 1 is operated in a drying mode, high-temperature and high-humidity air discharged from the drum 20 may pass through the evaporator 61. Accordingly, the high-temperature and high-humidity air discharged from the drum 20 is cooled while passing through the evaporator 61, and thus the high-temperature and high-humidity air may be changed into low-temperature and low-humidity air. At this time, condensed water may be generated as the high-temperature and high-humidity air is cooled in the evaporator 61. The condensed water may be moved to a return water container (not shown) or drained to the outside of the cabinet 10.

[0049] In addition, air, which is dried at a low temper-

ature after passing through the evaporator, may pass through the condenser 62. Accordingly, because the low-temperature and low-humidity air discharged from the evaporator is heated while passing through the condenser 62, the low-temperature and low-humidity air may be changed into high-temperature and low-humidity air. The high-temperature and low-humidity air may be introduced into the drum 20 through the inlet 20a to dry the object to be dried. As the object to be dried is dried, high-temperature and high-humidity air containing a large amount of moisture may be discharged through the outlet 20b. The discharged air may pass through the evaporator 61 again. The air may dry the object accommodated in the drum 20 while circulating inside the cabinet 10.

[0050] A circulation flow path 80 for circulating the dry air may be formed in the cabinet 10. In addition, the blowing fan 64 may be provided in a rear portion of the base 14 of the cabinet 10 to move air along the circulation flow path 80.

[0051] The circulation flow path 80 may include a discharge flow path 81 provided to discharge air from the inside of the drum 20 to the outside of the drum 20, a connection flow path 82 provided to dry the air discharged from the drum 20, and a supply flow path 83 provided to supply the dry air to the inside of the drum 20.

[0052] A filter 85 may be arranged on the discharge flow path 81 so as to filter out foreign substances contained in the air inside the drum 20. The heat exchanger 60 may be arranged in the connection flow path 82. Air may become hot and dry while passing through the connection flow path 82. Foreign substances in the air are filtered out and the air becomes hot and dry while the air passes through the connection flow path 82. The hot and dry air may be supplied back into the drum 20 through the supply flow path 83. The clothes inside the drum 20 may be dried by the hot and dry air. The air after drying the clothes may become a high-temperature and high-humidity state, and the high-temperature and high-humidity air in the drum 20 may be discharged to the outside of the drum 20 through the discharge flow path 81.

[0053] The clothes dryer 1 may dry the clothes inside the drum 20 while repeating the above process.

[0054] In general, a closed flow path may be formed inside the cabinet 10 of the clothes dryer 1 in the drying mode. The closed flow path may be an air movement path (the circulation flow path 80) configured to circulate air inside the cabinet 10 through the heat exchanger 60 and the drum 20. The closed flow path may not communicate with the outside of the cabinet 10 and thus air outside the cabinet 10 may not flow in or out. That is, the flow of air may form a closed loop.

[0055] FIGS. 3 and 4 are views illustrating a door opening member mounted on a door according to one embodiment of the present disclosure, and FIG. 5 is a view illustrating a dehumidifying operation state of the clothes dryer by the door opening member according to one embodiment of the present disclosure.

[0056] Referring to FIGS. 3 to 5, the door 100 of the

clothes dryer 1 may be provided to allow the opening 12a of the cabinet 10 to be maintained in an open state.

[0057] The door 100 may further include a door opening member 200 provided to allow the opening 12a of the cabinet 10 to be maintained in the open state.

[0058] The door opening member 200 may be provided to prevent an object to be dried inside the drum 20 from escaping to the outside when the door 100 of the clothes dryer 1 is in the open state.

[0059] The door 100 of the clothes dryer 1 may include a first door 110 and a second door 120 rotatably provided in front of the first door 110 to open and close the first door 110.

[0060] The first door 110 may be rotatably provided at the front of the cabinet 10 and rotatably supported by a hinge (not shown) provided on one side of the first door 110.

[0061] The first door 110 may include a door opening 111a smaller than the opening 12a of the cabinet 10. The second door 120 may be rotatably provided in front of the first door 110 and rotatable in the same direction as the rotation direction of the first door 110. The second door 120 may be configured to open and close the door opening 111a of the first door 110.

[0062] The door opening member 200 may be provided in the door opening 111a of the first door 110. The door opening member 200 may be provided to cover at least a portion of the door opening 111a. The door opening member 200 may include a mesh or grill shape.

[0063] The door opening member 200 may be arranged in the door opening 111a to prevent the object to be dried inside the drum 20 from escaping to the outside when the second door 120 is in the open state. In the embodiment of the present disclosure, it is illustrated that the door opening member 200 is integrally provided on the rear surface of the first door 110, but it is not limited thereto. For example, the door opening member may be detachably installed on the door.

[0064] The door opening member 200 may include at least one of a mesh or a grill.

[0065] The door opening member 200 may include a first member 210 provided to be fixed to the first door 110, and a second member 220 connected to the first member 210 and including at least one of a mesh or a grill.

[0066] The first member 210 may be formed in a size and shape corresponding to the first door 110. The first member 210 may be provided to be fixed to the rear surface of the first door 110 or an inner surface of the door opening 111a formed in the first door 110.

[0067] When the second door 120 is in the open state, the second member 220 of the door opening member 200 may cover at least a portion of the door opening 111a so as to prevent the object to be dried from escaping from the drum 20 through the open opening 12a, and so as to allow the inside of the drum 20 to communicate with the outside of the drum 20.

[0068] The clothes dryer 1 may include an open flow path as the door 100 is in the open state. The clothes

dryer 1 may include the open flow path by mounting the door opening member 200 to the door 100. As the door opening member 200 is mounted on the door 100 and the opening 12a of the cabinet 10, the clothes dryer 1 may include the open flow path. The open flow path may be an air movement path (an arrow in FIG. 5). Alternatively, the open flow path may be an air movement path provided to allow outside air to be sucked into the clothes dryer 1, to pass through the heat exchanger 60, and then to be discharged to the outside of the clothes dryer 1. Both ends of the open flow path may communicate with the outside of the cabinet 10, respectively, and the flow of air may form an open loop.

[0069] When the clothes dryer 1 is in a dehumidification mode in a state in which the second door 120 of the clothes dryer 1 is open, external humid air, that is, the air before dehumidification, may be introduced into the drum 20 through the open opening 12a that is the outlet 12b.

[0070] The introduced air may pass through the heat exchanger 60 along the circulation flow path 80. Particularly, the air may exchange heat with the evaporator 61 and the condenser 62 while passing through the evaporator 61 and the condenser 62. The air passing through the heat exchanger 60 may become hot and dry air.

[0071] The air, from which moisture is removed while passing through the heat exchanger 60, may be moved by the fan 64 and pass through the inlet 20a of the drum 20, the inside of the drum 20, and the inlet 20a, and then be discharged to the drum 20 again. The air discharged from the drum 20 may be dehumidified and heated while passing through the heat exchanger 60, and may be the hot and dry air that is discharged by passing through the drum 20. The hot and dry air may be discharged to the outside of the cabinet 10 through the open second door 120.

[0072] Therefore, the air before dehumidification may be introduced from the outside and then dehumidified by the heat exchange with the heat exchanger 60 inside the clothes dryer 1, and the air after dehumidification may be discharged to the outside of the clothes dryer 1. A dehumidifying operation (dehumidification mode) may be performed by the flow of air.

[0073] FIGS. 6 and 7 are views illustrating a door opening member installed on a door according to another embodiment of the present disclosure. Reference numerals not shown refer to FIGS. 1 to 5.

[0074] Referring to FIGS. 6 and 7, a clothing dryer 1 may perform a dehumidifying operation when a door 100A is in an open state.

[0075] The door 100A may include a door opening member 200A provided to allow an opening 12a of a cabinet 10 to be maintained in an open state. The door opening member 200A may be provided to prevent an object to be dried inside a drum 20 from escaping to the outside when the door 100A of the clothes dryer 1 is in the open state.

[0076] The door 100A of the clothes dryer 1 may be configured to open and close the opening 12a of the cab-

inet 10. The door 100A of the clothes dryer 1 may include a first door 110A formed in a size corresponding to the opening 12A so as to open and close the opening.

[0077] The first door 110A may be rotatably provided at the front of the cabinet 10 and rotatably supported by a hinge (not shown) provided on one side of the first door 110A.

[0078] The first door 110A may further include a hole 111A formed by penetrating a portion of the first door 110A. The hole 111A of the first door 110A may be opened and closed by a second door 120A. The hole 111A of the first door 110A may be provided to be freely opened and closed independently of the first door 110A during a drying process.

[0079] The second door 120A may be rotatably coupled to the first door 110A. The second door 120A may be rotatably coupled to the first door 110A by a hinge 130A. The second door 120A may be configured to open and close the hole 111A of the first door 110A.

[0080] The door opening member 200A may be provided in the hole 111A of the first door 110A. The door opening member 200A may be provided to cover at least a portion of the hole 111A. The door opening member 200A may include a mesh or grill shape.

[0081] The door opening member 200A may be arranged in the hole 111A to prevent an object to be dried inside the drum 20 from escaping to the outside when the second door 120A is in the open state.

[0082] When the clothes dryer 1 is in the dehumidification mode in a state in which the second door 120A of the clothes dryer 1 is open, external humid air, that is, the air before dehumidification, may be introduced into the drum 20 through the hole 111A of the open first door 110A.

[0083] In the embodiment of the present disclosure, it is illustrated that the door opening member 200A is installed in the hole 111A of the first door 110A to prevent an object to be dried inside the drum from escaping in the dehumidification mode, but it is not limited thereto. For example, it is possible to perform the dehumidifying operation even when the door opening member 200A is not installed in the hole 111A.

[0084] FIGS. 8 and 9 are views illustrating a door opening member installed on a door according to still another embodiment of the present disclosure. Reference numerals not shown refer to FIGS. 1 to 5.

[0085] Referring to FIGS. 8 and 9, a clothing dryer 1 may perform a dehumidifying operation when a door 100B is in an open state.

[0086] The door 100B may include a door opening member 200B provided to allow an opening 12a of a cabinet 10 to be maintained in an open state. The door opening member 200B may be provided to prevent an object to be dried inside a drum 20 from escaping to the outside when the door 100B of the clothes dryer 1 is in the open state.

[0087] The door 100B of the clothes dryer 1 may be configured to open and close the opening 12a of the cab-

inet 10. The door 100B of the clothes dryer 1 may be formed in a size corresponding to the opening 12a.

[0088] The door 100B may be rotatably provided at the front of the cabinet 10 and rotatably supported by a hinge (not shown) provided on one side of the door 100B.

[0089] When the door 100B is in the open state, a predetermined gap G may be formed between the door 100B and the opening 12a.

[0090] The door opening member 200B may be arranged at the predetermined distance G between the door 100B and the opening 12a. The door opening member 200B may be provided to cover at least a portion of the gap G. The door opening member 200B may include a mesh or grill shape.

[0091] When the door 100B is in the open state, the door opening member 200B may prevent an object to be dried inside the drum 20 from escaping through the gap G between the opening 12a and the door 100B.

[0092] The door opening member 200B may include a frame 210B provided to be fixed to the door 100B and a front panel 12 of the cabinet 10, and a separation prevention member 220B provided on the frame 210B.

[0093] The frame 210B may be provided to be fixed between a rear surface of the door 100B and the front panel 12 of the cabinet 10. The separation prevention member 220B may include at least one of a plurality of ribs, a mesh, or a grill. The separation prevention member 220B may be formed in a size and shape corresponding to the gap G between the door 100B and the opening 12a.

[0094] The separation prevention member 220B connected to the frame 210B may be provided to cover between the door 100B and the opening 12a of the front panel 12. The separation prevention member 220B may include a plurality of ribs 221B provided between the door 100B and the opening 12a of the front panel 12.

[0095] The door opening member 200B may be provided to prevent objects to be dried inside the drum 20 from escaping through the gap G formed between the door 100B and the opening 12a of the front panel 12.

[0096] When the door 100B is in the open state, the door opening member 200B may prevent an object to be dried from escaping from inside the drum 20 through the opening 12a, and allow the inside and outside of the drum 20 to be connected to each other.

[0097] Therefore, when the door opening member 200B is mounted between the door 100B and the front panel 12 in the state in which the door 100B of the clothes dryer 1 is open, and when the clothes dryer 1 is in the dehumidification mode, external humid air, that is, the air before dehumidification, may be introduced into the drum 20 through the opening 12a of the open door 100B.

[0098] FIG. 10 is a control block diagram of the clothes dryer according to one embodiment of the present disclosure.

[0099] An inputter for inputting an operation of the clothes dryer 1 and provided in the form of a rotatable jog dial, and a display for displaying various types of information about the clothes dryer 1 may be provided in

the control panel 11. However, it is not limited thereto, and the control panel may include various types of inputters and displays.

[0100] The control panel 11 may receive a user command for selecting the dehumidification mode. When a user selects the dehumidification mode through the control panel 11, the control panel 11 may transmit a control signal corresponding to the dehumidification mode to a controller 400.

[0101] The controller 400 may include a memory (not shown) configured to store programs and data for controlling the operation of the clothes dryer 1, and a processor (not shown) configured to generate a control signal for controlling the operation of the clothes dryer 1 according to the program and data stored in the memory.

[0102] In response to receiving a command for the dehumidification mode through the control panel 11, the controller 400 determines whether it is possible to allow external air to flow through the flow path formed by the fan 64 (FIG. 5). For example, the controller 400 may identify that the door 100 is in the open state through a door sensor 410, and generate a control signal to allow the open flow path to be formed and to allow the dehumidification mode to be performed.

[0103] The door sensor 410 may be provided with a switch (not shown) including at least one contact point, so as to pass or block an electrical signal. For example, the switch may be a reed switch or a micro switch, but a switch configured to pass or block an electrical signal such as a pulse wave may be used as the switch. The contact point of the switch may be in an open state when the door 100 is in the open state, and the contact point of the switch may be in a short-circuit state, that is, in an energized state when the door 100 is in the closed state.

As a result, the controller 400 may determine whether the door 100 is opened or closed based on the state of the contact point, and the controller 400 may determine that it is sufficient to perform the dehumidification mode based on the open state of the door 100. The door sensor 410 may be arranged in various positions of the cabinet 10 as long as the door sensor 410 comes into contact with a part of the door 100.

[0104] Meanwhile, the controller 400 controls an automatic opening and closing device 30 based on a signal detected by the door sensor 410. The automatic opening and closing device 30 may be a device configured to automatically open the door 100 according to a control signal from the controller 400, and may be an actuator arranged on one side of the opening 12a to transmit physical force to the door 100. The automatic opening and closing device 30 may include well-known means such as a rotary motor (not shown) provided on a hinge, which connects the door 100 and the opening 12a, to automatically open or close the door 100, as well as the above-described actuator.

[0105] When the clothes dryer 1 is provided with a single door 100, the controller 400 may control the automatic opening and closing device 30 to open the door 100.

[0106] In addition, when the door 100 of the clothes dryer 1 is provided with the first door 110 and the second door 120, the controller 400 may control the automatic opening and closing device 30 to open only the second door 120.

[0107] When the controller 400 determines that it is possible to perform the dehumidification mode because the open flow path is formed in the clothes dryer 1, the controller 400 may control the drum 20, the heat exchanger 60, and/or the fan 64 to be driven.

[0108] When the dehumidification mode is performed, the controller 400 controls the drum 20 to rotate by providing a current to the motor 70 (refer to FIG. 5). As the drum 20 rotates, the temperature inside the drum 20 rises, thereby increasing the dehumidifying effect.

[0109] The controller 400 supplies a current to the motor 70 for a predetermined time to rotate the drum 20 until the dehumidification mode is completed.

[0110] The fan 64 may share the driving force of the motor 70 provided by the drum 20 and rotate according to the rotation of the drum 20. However, the fan 64 may be configured to rotate independently of the drum 20 as a device such as a separate clutch (not shown) is added to the base 14 or a plurality of motors 70 is provided.

[0111] The heat exchanger 60 may exchange heat with air, and may include the evaporator 61 (refer to FIG. 2) and the condenser 62 (refer to FIG. 2).

[0112] FIG. 11 is a flowchart of a method for controlling the clothes dryer according to one embodiment of the present disclosure.

[0113] The controller 400 receives the dehumidification mode (1101). The control panel 11 receives a user's input for performing the dehumidification mode and transfers a control signal for the dehumidification mode to the controller 400. At this time, the controller 400 may not perform the dehumidification mode immediately upon receiving the control signal, but perform the dehumidification mode through a series of determination processes.

[0114] The controller 400 determines whether the door 100 is opened (1102). Because it is required that the clothes dryer 1 forms the open flow path instead of the closed flow path to perform the dehumidification mode, the clothes dryer 1 may perform the dehumidification mode in the open state of the door 100.

[0115] As described with reference to FIG. 10, when a single door 100 is provided, the controller 400 may determine whether the corresponding door is opened or closed. However, in the state in which the door 100 is provided with the first door 110 and the second door 120, it is possible to form the open flow path even when one of the first door 110 and the second door 120 is opened. Accordingly, the controller 400 may determine that it is possible to perform the dehumidification mode in response to the first door 110 being closed and in response to the second door 120 being open. Further, the controller 400 may determine that it is possible to perform the dehumidification mode in response to the first door 110 being open and in response to the second door 120 being

closed.

[0116] When the controller 400 determines that the door 100 is open, the controller 400 performs the dehumidification mode (1103). When it determines that all the doors 100 are closed, the controller 400 may open the door 100 to allow the open flow path to be formed. At this time, when the door 100 is provided with the first door 110 and the second door 120, the controller 400 may control the automatic opening and closing device 30 to open only the second door 120. In addition, when the door 100 is provided with the first door 110 and the second door 120, the controller 400 may control the automatic opening and closing device 30 to open only the first door 110.

[0117] When the door 100 is opened, the controller 400 performs the dehumidification mode (1103). Particularly, the controller 400 generates a control signal for driving the blowing fan 64 and the compressor 63 to perform the dehumidification mode, and transmits the control signal to the blowing fan 64 and the compressor 63, thereby performing the dehumidification mode.

[0118] The controller 400 performs the dehumidification mode for a predetermined time, and completes the dehumidification mode in response to the expiration of the predetermined time (1106).

[0119] While the present disclosure has been particularly described with reference to exemplary embodiments, it should be understood by those of skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the present disclosure.

Claims

1. A clothes dryer, comprising:

a cabinet;
a drum provided inside the cabinet to accommodate an object to be dried;
an opening provided on a front surface of the cabinet to input an object to be dried into the drum;
a heat exchanger provided inside the cabinet to exchange heat with air; and
a door provided in the cabinet to open and close the opening,
wherein the door comprises:
a door opening member provided to cover at least a portion of the opening in response to the opening being opened to discharge air, which passes through the heat exchanger and then discharged to an outside of the drum, to an outside of the cabinet and to supply outside air to the heat exchanger.

2. The clothes dryer of claim 1, wherein the door opening member is arranged between the

door and the opening and comprises at least one of a mesh or a grill.

3. The clothes dryer of claim 1, wherein the door comprises:

a first door rotatably provided to seal an outer edge of the opening; and

a second door provided to be coupled to the first door, and rotatably provided in front of the first door to open and close the first door, wherein the door opening member is arranged in the first door.

4. The clothes dryer of claim 1, wherein the door comprises:

a first door comprising a hole formed by penetrating at a portion of the first door; and

a second door rotatably coupled to the first door to open and close the hole, wherein the door opening member is arranged in the hole.

5. The clothes dryer of claim 1, wherein the door opening member further comprises a separation prevention member provided to connect between the door and the opening.

6. The clothes dryer of claim 5, wherein the separation prevention member further comprises a plurality of ribs provided to connect the door and the opening.

7. The clothes dryer of claim 1, further comprising:

an automatic opening and closing device configured to control the door to open the opening; and

a controller configured to control the automatic opening and closing device, wherein the controller is configured to control the automatic opening and closing device to allow the door to be open in a dehumidification mode.

8. The clothes dryer of claim 7, further comprising:

a door sensor configured to detect an open and closed state of the door, wherein the controller is configured to control the automatic opening and closing device to allow the door to be open in response to detecting the door being closed in the dehumidification mode.

9. The clothes dryer of claim 7, wherein the controller is configured to control a motor to allow

the drum to rotate in the dehumidification mode.

10. The clothes dryer of claim 7, wherein the door comprises:

a first door rotatably provided to seal an outer edge of the opening; and

a second door provided to be coupled to the first door, and rotatably provided in front of the first door to open and close the first door, wherein the controller is configured to control the automatic opening and closing device to allow the second door to be open in response to detecting the second door being closed in the dehumidification mode.

FIG. 1

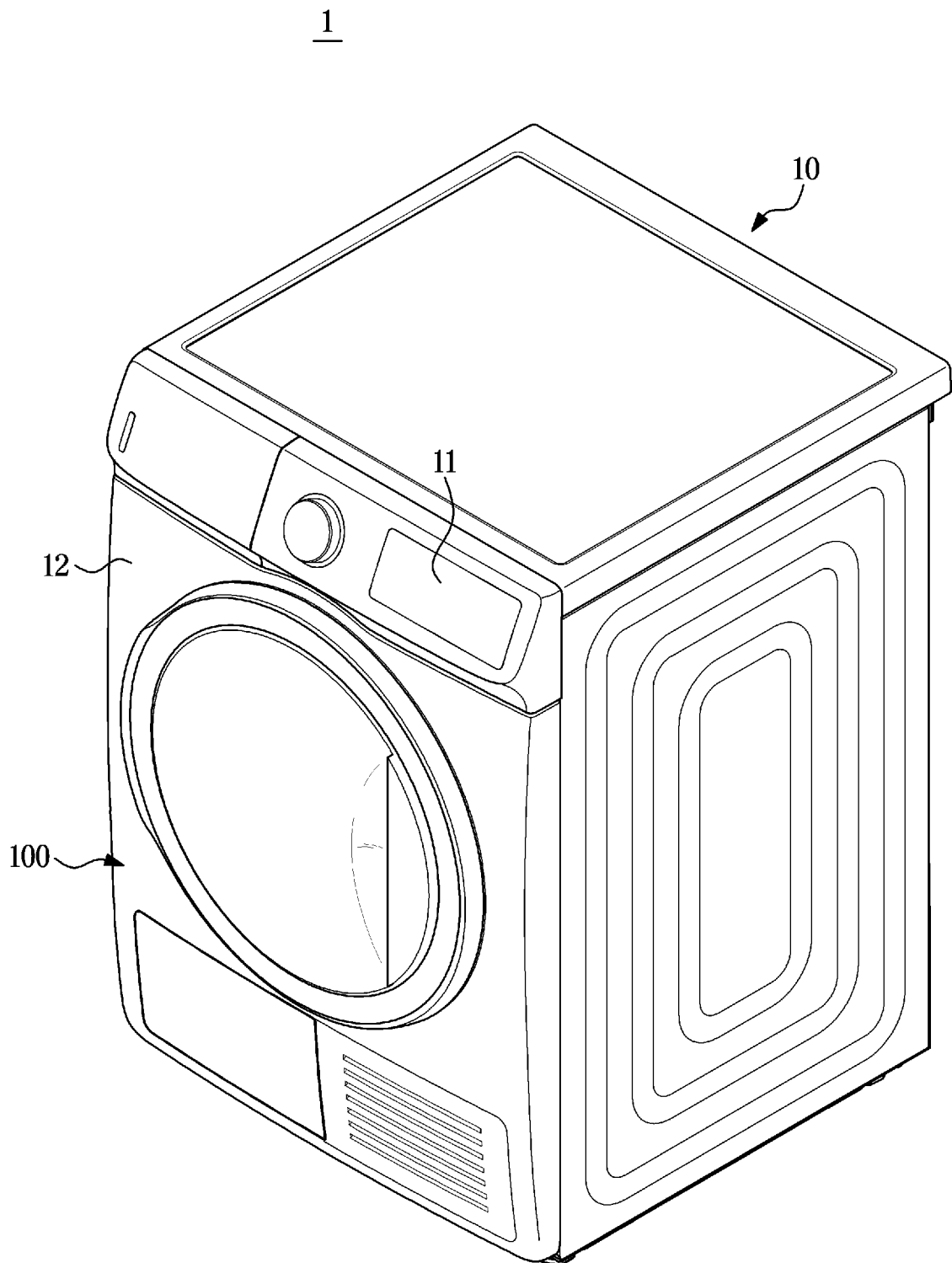


FIG. 2

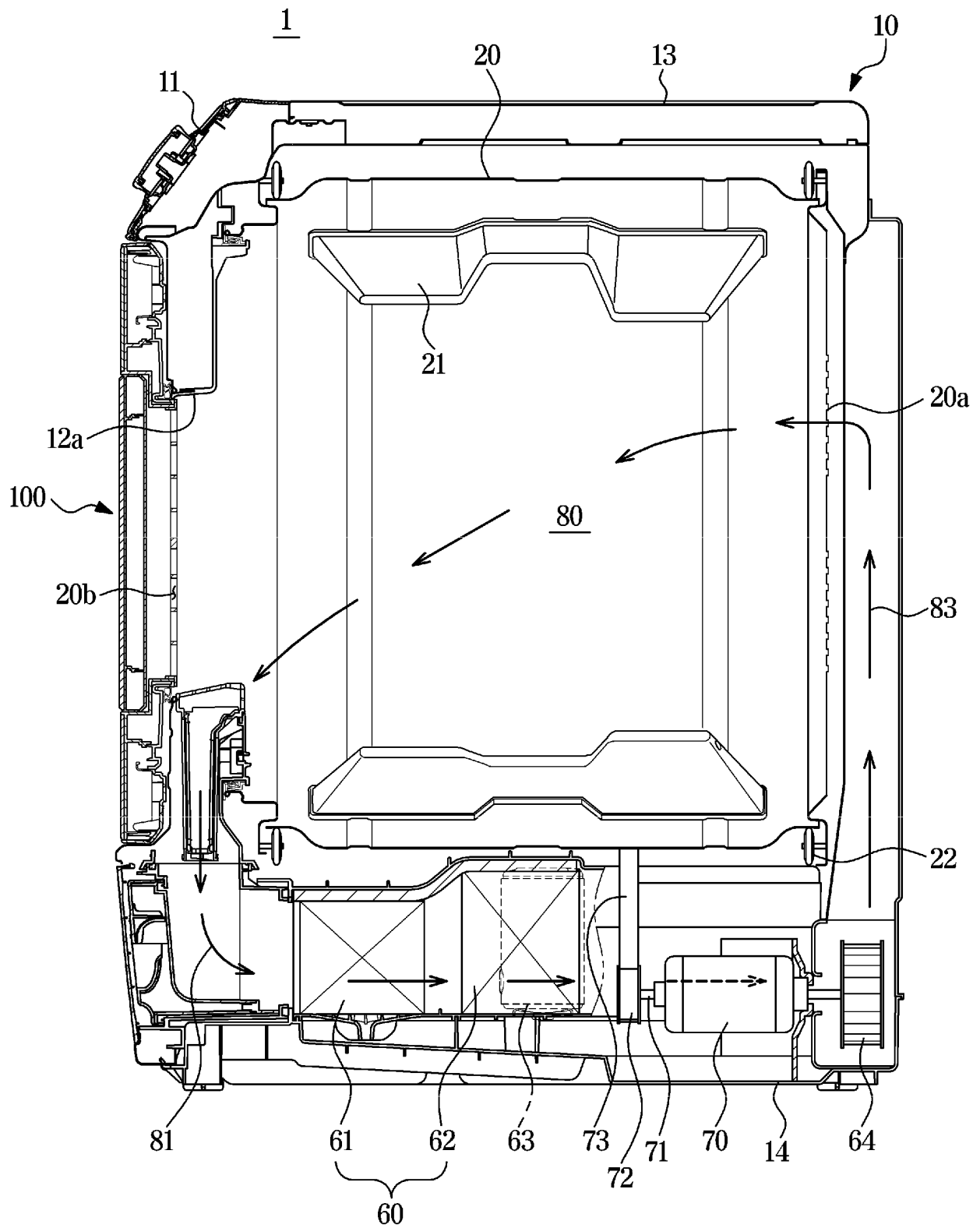


FIG. 3

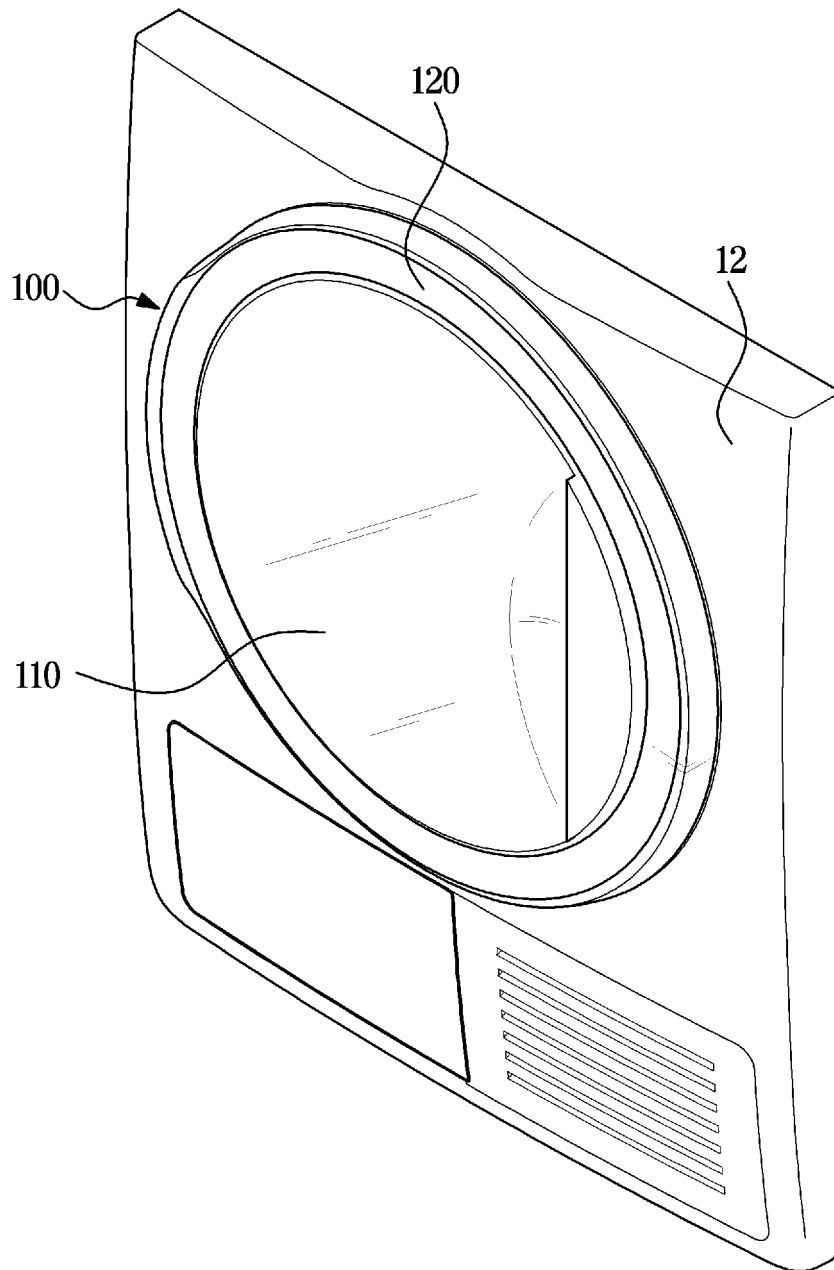


FIG. 4

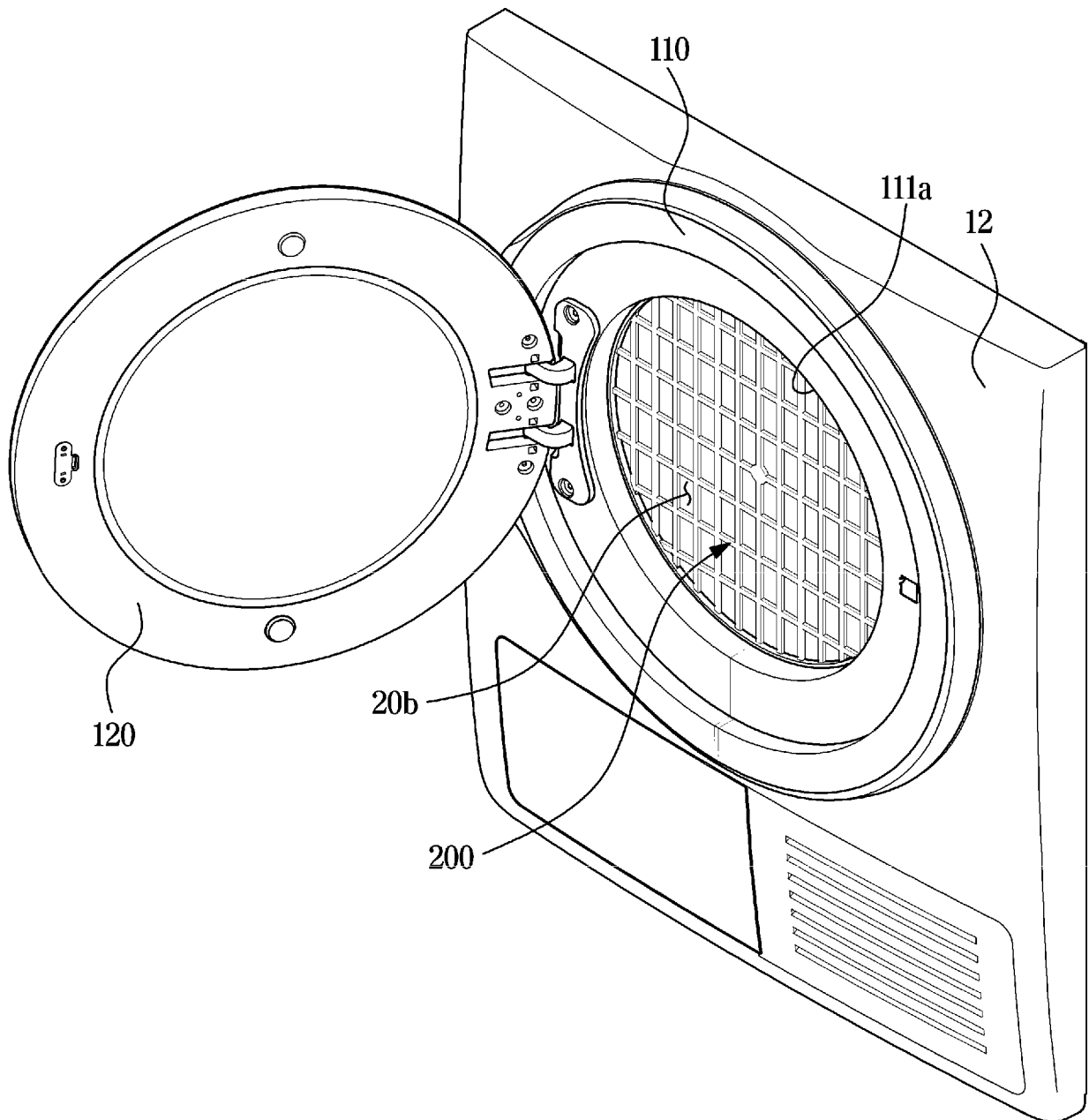


FIG. 5

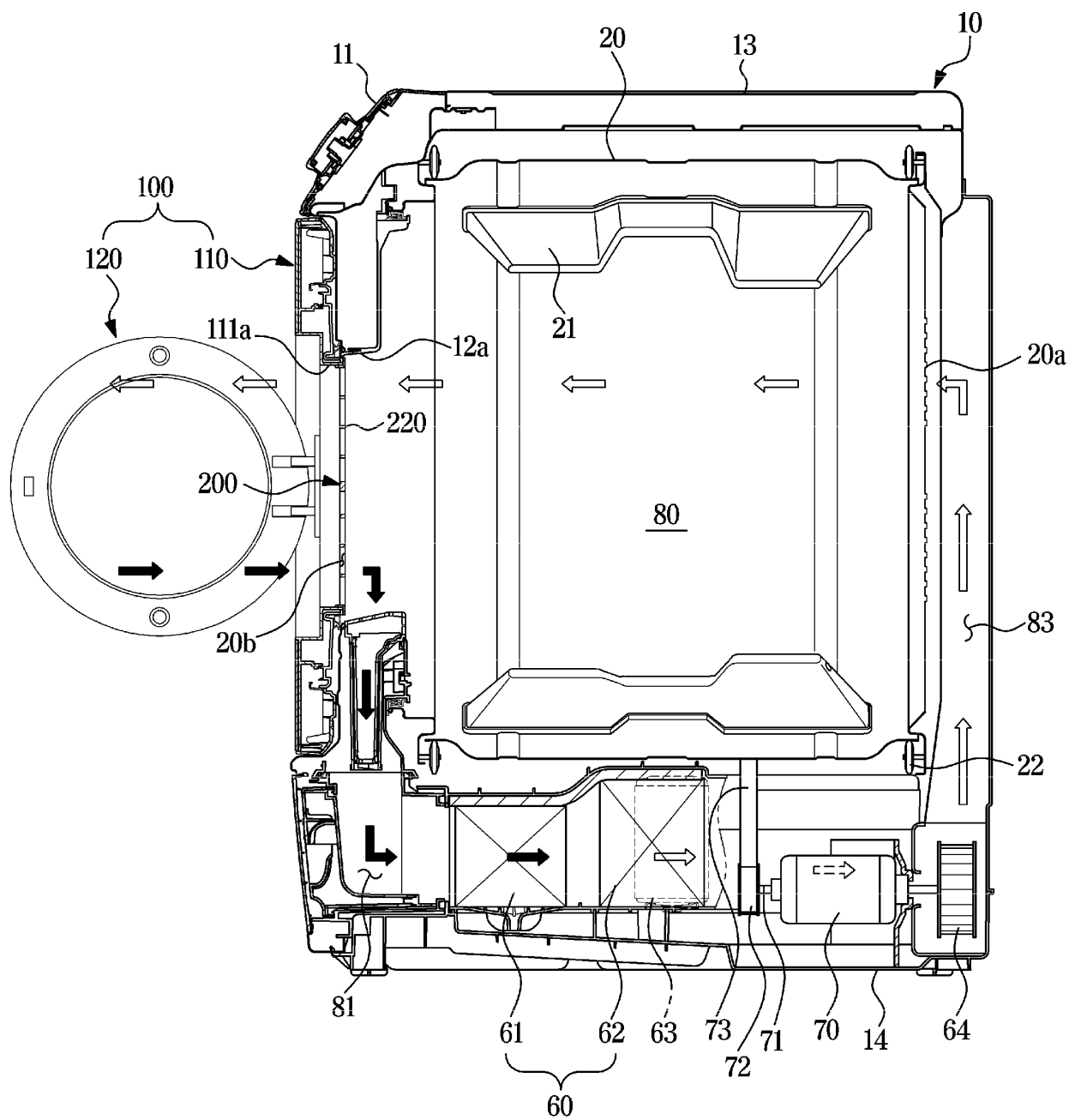


FIG. 6

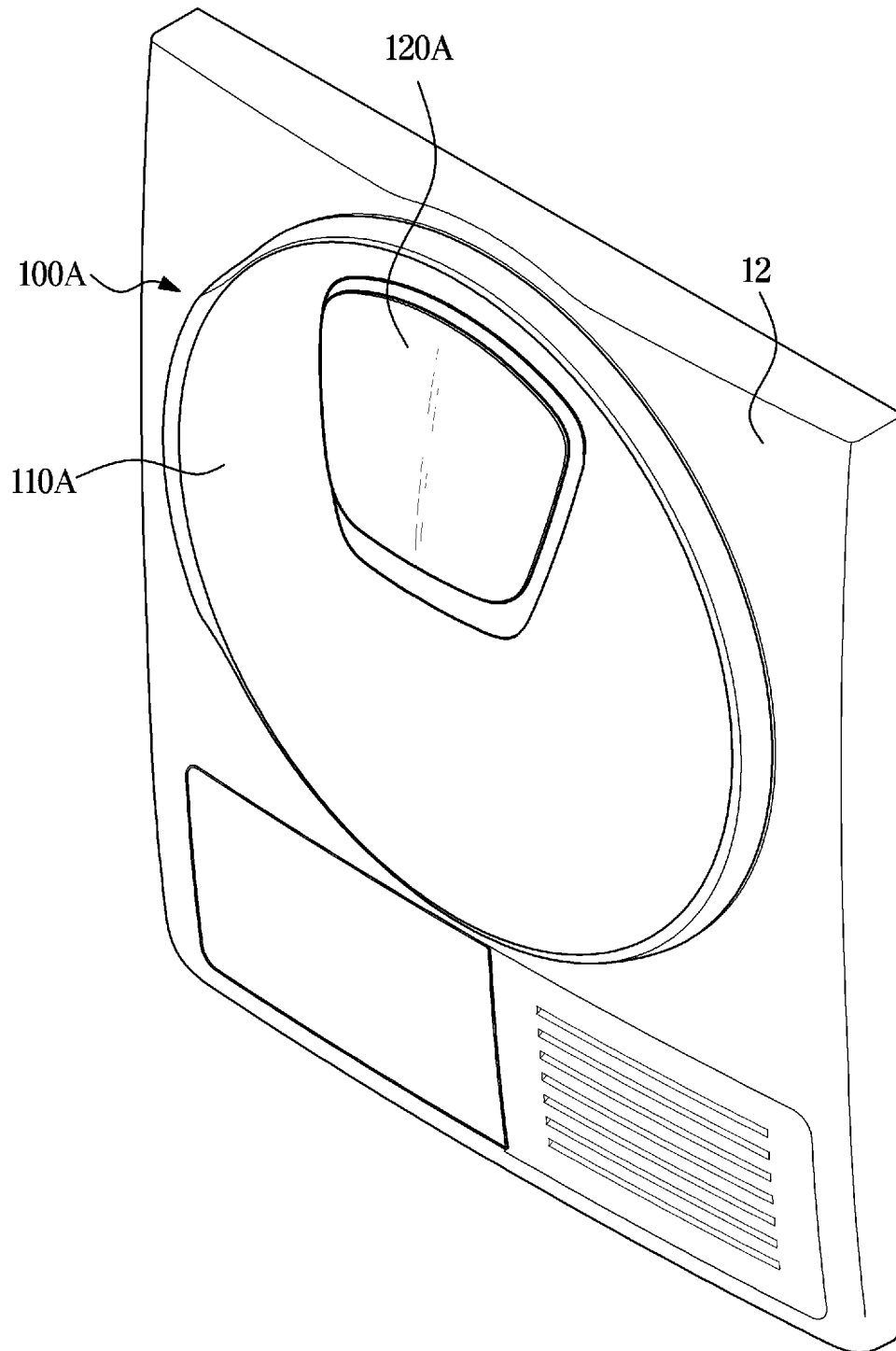


FIG. 7

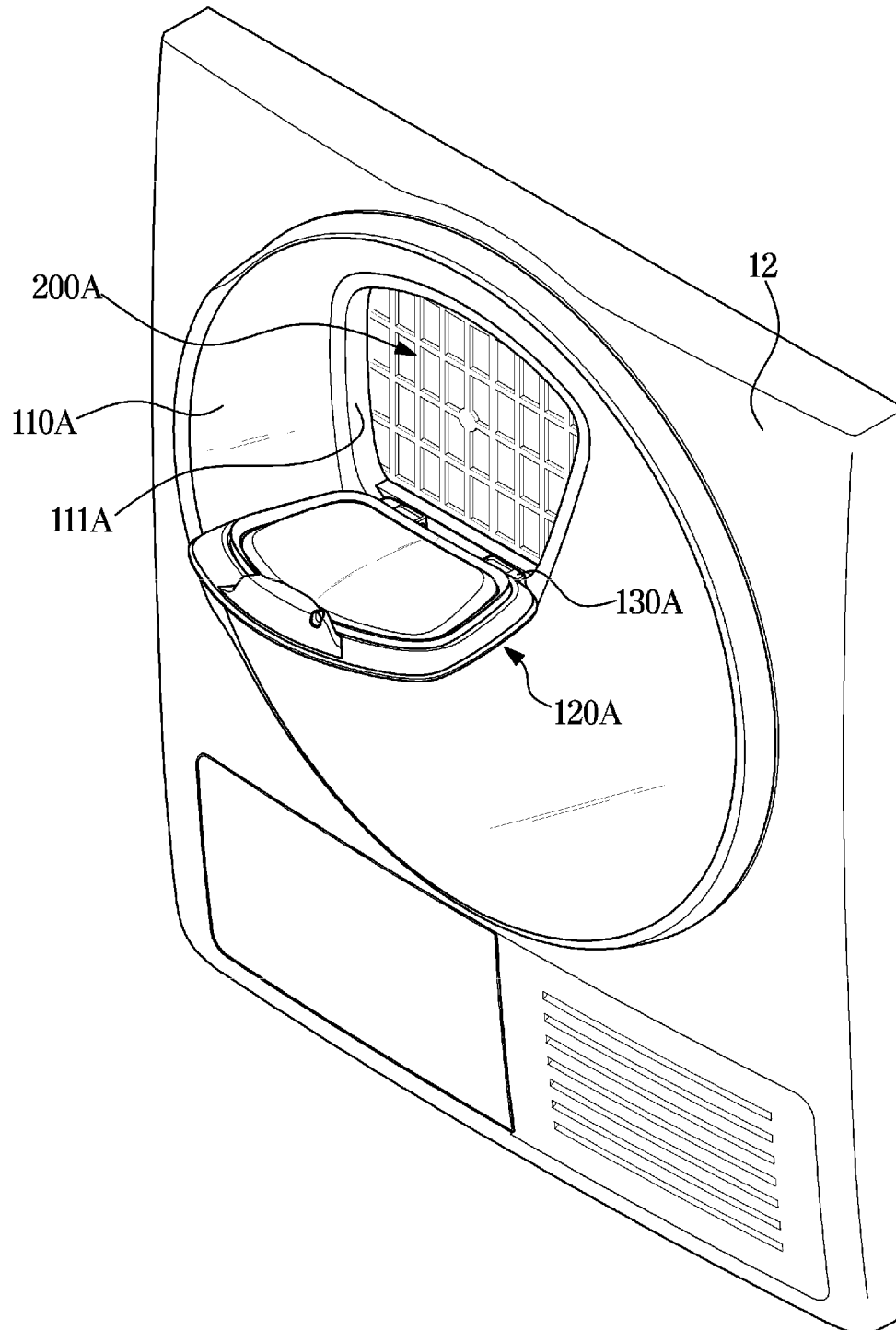


FIG. 8

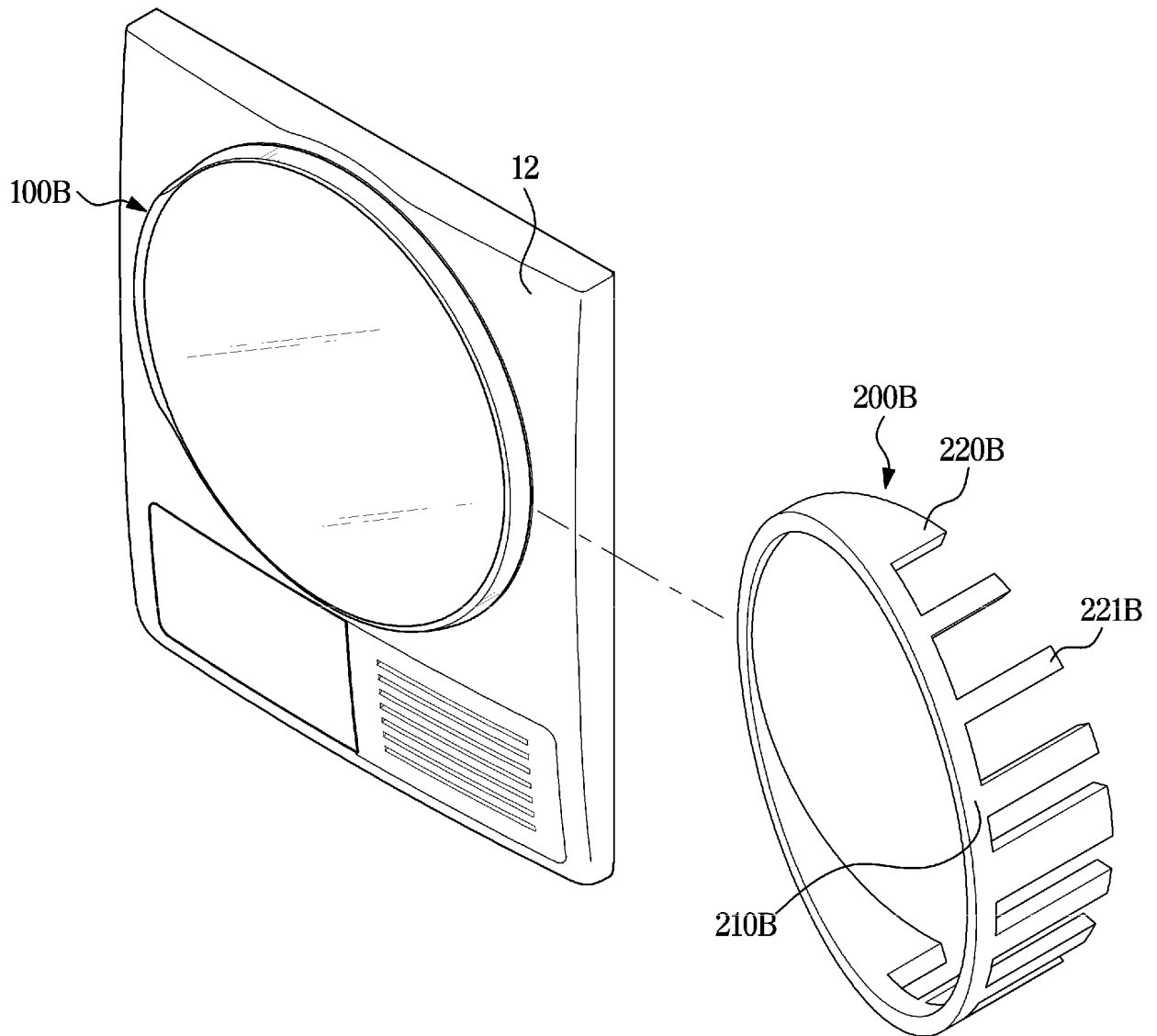


FIG. 9

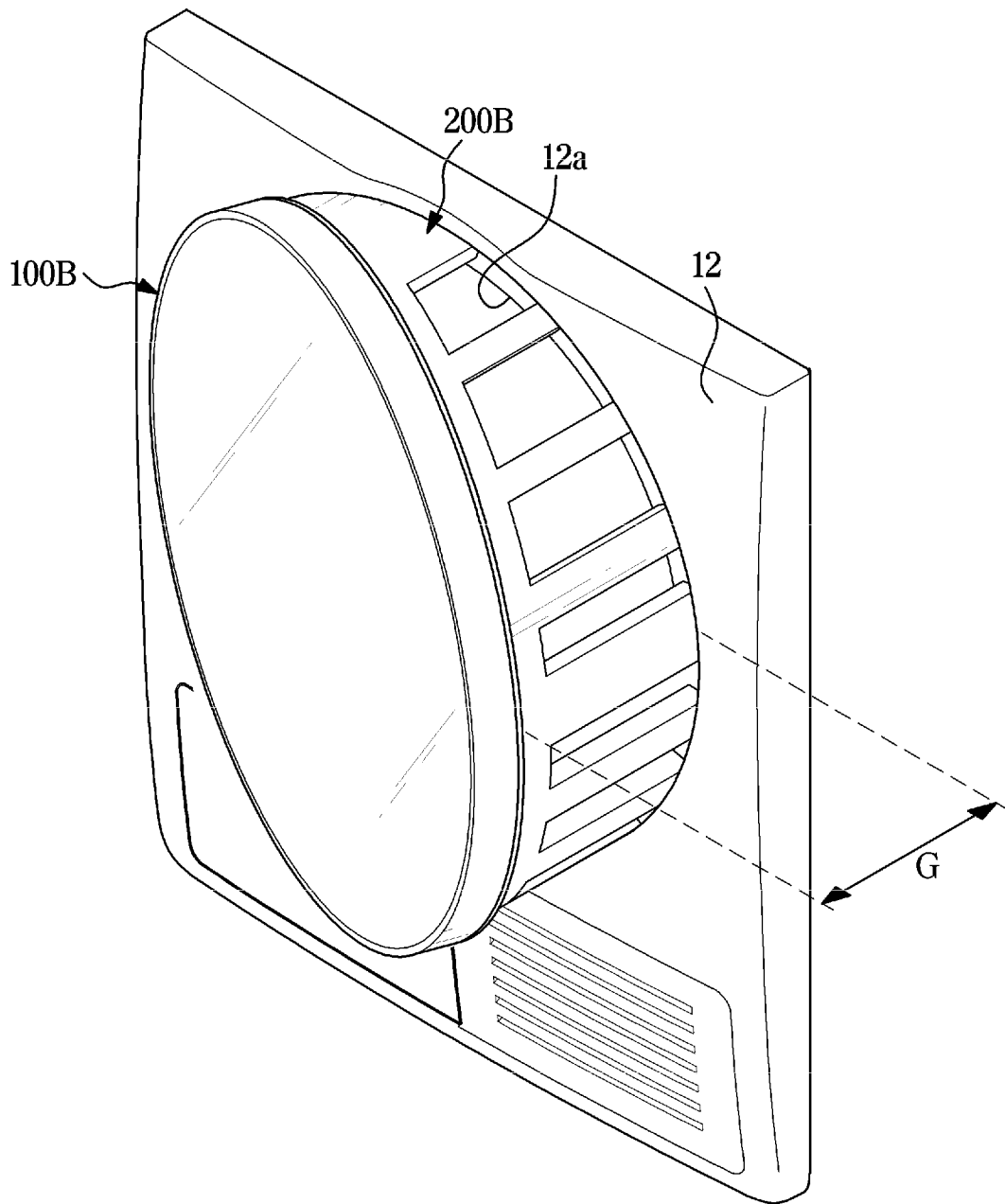


FIG. 10

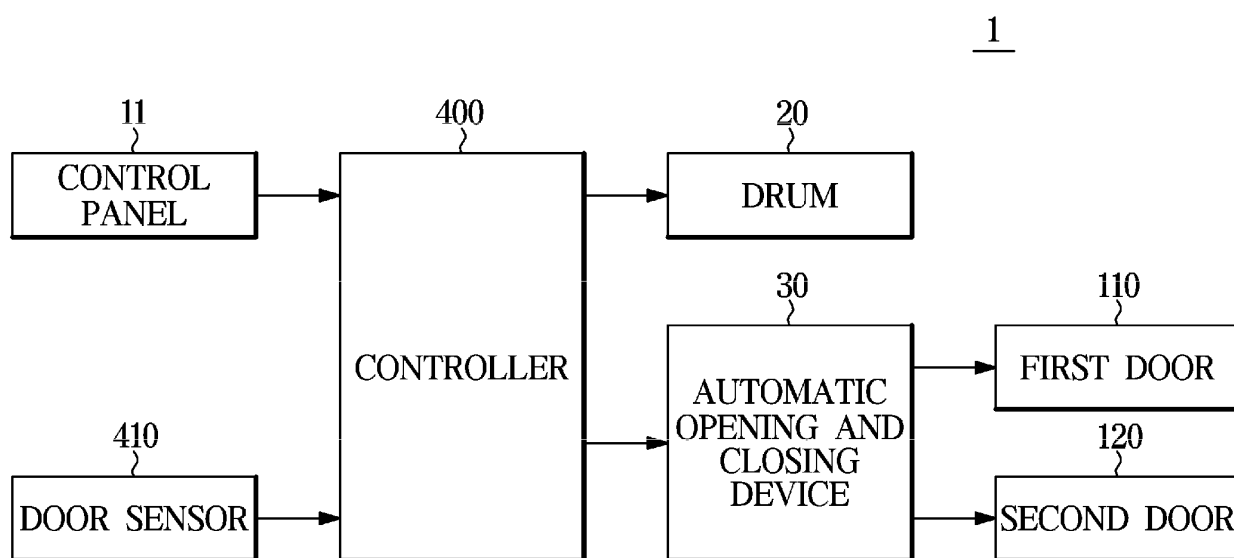
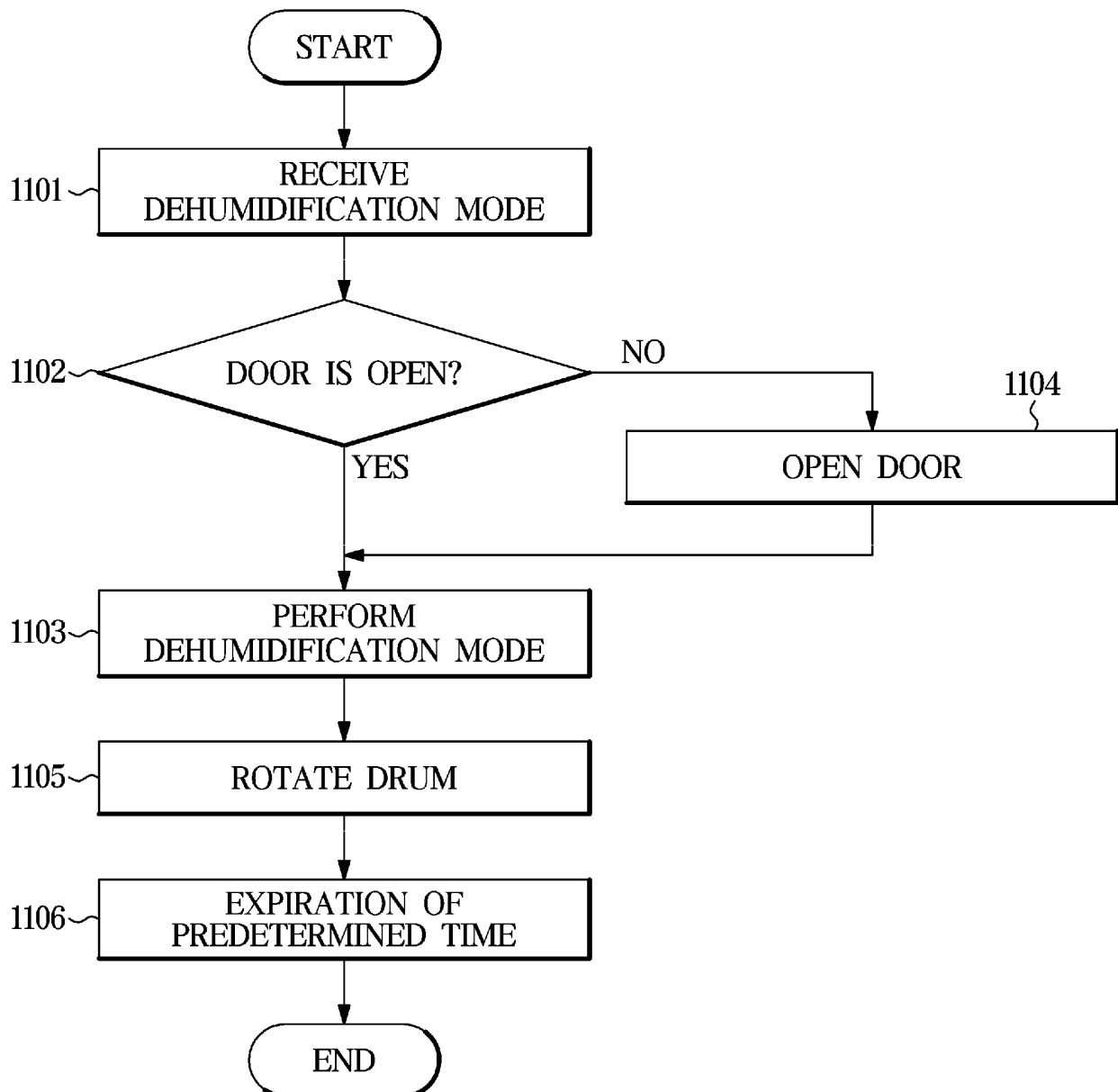


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2021/013016

A. CLASSIFICATION OF SUBJECT MATTER**D06F 58/24**(2006.01)i; **D06F 58/04**(2006.01)i; **F24F 3/14**(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F 58/24(2006.01); D06F 33/02(2006.01); D06F 37/10(2006.01); D06F 37/18(2006.01); D06F 58/04(2006.01);
D06F 58/10(2006.01); D06F 58/20(2006.01); D06F 58/26(2006.01); D06F 58/28(2006.01)

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

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

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

eKOMPASS (KIPO internal) & keywords: 건조기(dryer), 제습(dehumidification), 도어(door), 자동 제어(automatic control),
메쉬(mesh)**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2013-0005724 A (WINIAMANDO INC.) 16 January 2013 (2013-01-16) See paragraphs [0028]-[0040], claim 2 and figures 1a-2b.	1-10
Y	US 2019-0177905 A1 (WHIRLPOOL CORPORATION) 13 June 2019 (2019-06-13) See paragraphs [0062]-[0068] and figures 3A-4B.	1-10
Y	KR 10-2015-0118230 A (SAMSUNG ELECTRONICS CO., LTD.) 22 October 2015 (2015-10-22) See paragraph [0058] and figures 1-3.	4
Y	KR 10-1999-0066640 A (SAMSUNG ELECTRONICS CO., LTD.) 16 August 1999 (1999-08-16) See claims 1-2.	7-10
A	KR 10-2018-0084545 A (LG ELECTRONICS INC.) 25 July 2018 (2018-07-25) See entire document.	1-10

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

* Special categories of cited documents:

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

18 January 2022

Date of mailing of the international search report

19 January 2022

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2021/013016

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		CN 104975476 B	24 April 2018
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		EP 2930263 B1	02 August 2017
		EP 3239386 A1	01 November 2017
		EP 3239386 B1	27 June 2018
		US 10184200 B2	22 January 2019
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		US 2018-0073178 A1	15 March 2018
		US 9856593 B2	02 January 2018
KR 10-1999-0066640 A	16 August 1999	None	
KR 10-2018-0084545 A	25 July 2018	None	

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