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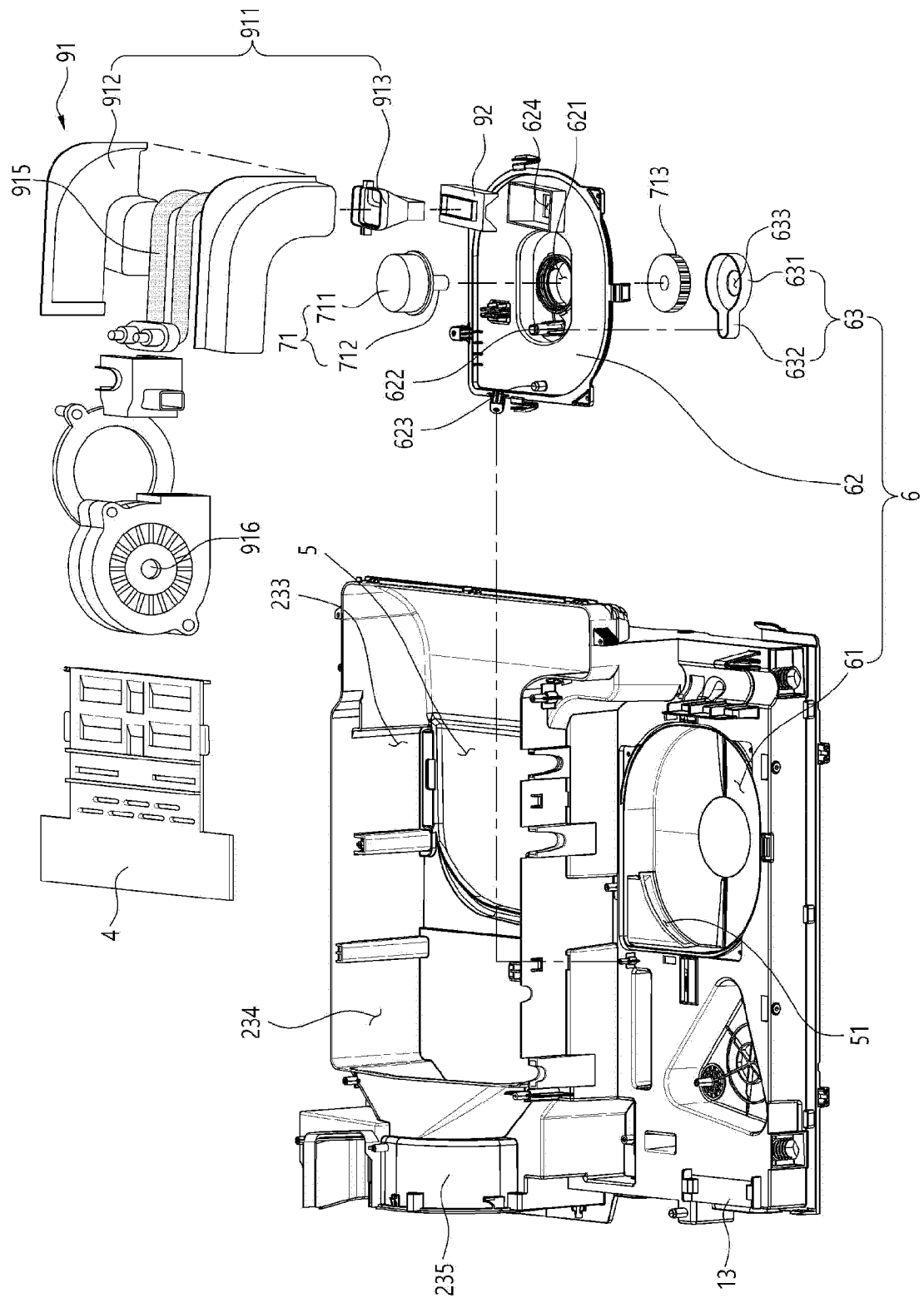
(54) **CLOTHING PROCESSING APPARATUS AND METHOD FOR CONTROLLING CLOTHING PROCESSING APPARATUS**

(57) The present application relates to a clothing processing apparatus comprising: a drum that provides a space in which an object to be dried is accommodated; a circulation flow passage through which air discharged from the drum is supplied to the drum again; a heat exchange unit that includes a circulation fan which moves air along the circulation flow passage, a first heat exchanger which dehumidifies air moving along the circula-

tion flow passage, and a second heat exchanger which heats air having passed through the first heat exchanger; a water collection unit which is connected to the circulation flow passage and in which condensate water discharged from air passing through the first heat exchanger is stored; and a condensate water removal unit that supplies heated air to the water collection unit to remove condensate water in the water collection unit.

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【Fig. 5】



Description

TECHNICAL FIELD

[0001] The present disclosure relates to a laundry treatment apparatus and a control method for the same.

BACKGROUND ART

[0002] *Laundry treatment apparatus* is a generic term for apparatuses capable of performing washing of a washable article (an object to be washed), drying of a dryable article (an object to be dried), and washing and drying of the objects.

[0003] A conventional laundry treatment apparatus, which can perform drying, has a structure including a drum configured to provide a space for receiving laundry, a circulation flow passage configured to guide, to the drum, air discharged from the drum, a fan configured to move air along the circulation flow passage, and a heat exchange unit configured to sequentially execute dehumidification and heating of the air introduced into the circulation flow passage.

[0004] The heat exchange unit provided at the above-mentioned structure is configured to include a first heat exchanger configured to cool air present in the circulation flow passage, and a second heat exchanger configured to heat air emerging from the first heat exchanger. Since the air discharged from the drum is condensed while passing around the first heat exchanger, a water collection unit for collection of condensate is provided at the inside or outside of the circulation flow passage. The condensate stored in the water collection unit is discharged to the outside of the laundry treatment apparatus through a drain pump or is stored in a drain tank provided in the laundry treatment apparatus (Korean Unexamined Patent Publication No. 10-2021-0063873).

[0005] The drain pump should be configured to include a housing provided with an inlet, and an impeller provided within the housing. In this case, the inlet and a bottom surface of the water collection unit should be maintained to be spaced apart from each other. For this reason, the conventional laundry treatment apparatus has a problem in that the condensate remains within the water collection unit.

DISCLOSURE

TECHNICAL TASK

[0006] One technical task of the present disclosure devised to solve the problem lies in a laundry treatment apparatus and a control method for the same which are capable of minimizing residual condensate within a water collection unit.

[0007] Another technical task of the present disclosure devised to solve the problem lies in a laundry treatment apparatus and a control method for the same which are

capable of minimizing residual condensate within a water collection unit through evaporation of the condensate.

[0008] Another technical task of the present disclosure devised to solve the problem lies in a laundry treatment apparatus and a control method for the same which are capable of minimizing leakage of hot air supplied to an object, to be dried, into a supply flow passage, to which hot air for evaporation of condensate is supplied, by controlling opening and closing of the supply flow passage.

TECHNICAL SOLUTIONS

[0009] The present disclosure provides a laundry treatment apparatus including a drum configured to provide a space for accommodating an object to be dried therein, a circulation flow passage configured to again supply, to the drum, air discharged from the drum, a heat exchange unit configured to sequentially execute humidification and heating of air along the circulation flow passage, a water collection unit connected to the circulation flow passage and to store condensate released from air passing around the first heat exchanger, and a condensate removal unit configured to evaporate the condensate present in the water collection unit.

[0010] The present disclosure provides a laundry treatment apparatus including a drum configured to provide a space for accommodating an object to be dried therein, a circulation flow passage configured to again supply, to the drum, air discharged from the drum, a heat exchange unit configured to sequentially execute humidification and heating of air along the circulation flow passage, a water collection unit connected to the circulation flow passage and to store condensate released from air passing around the first heat exchanger, and a condensate removal unit configured to supply heated air to the water collection unit, thereby removing the condensate within the water collection unit.

[0011] In addition, the present disclosure provides a laundry treatment apparatus including a drum configured to provide a space for accommodating an object to be dried therein, a circulation flow passage configured to again supply, to the drum, air discharged from the drum, a heat exchange unit including a circulation fan configured to move air along the circulation flow passage, a first heat exchanger configured to dehumidify air moving along the circulation flow passage, and a second heat exchanger configured to heat air emerging from the first heat exchanger, a water collection unit connected to the circulation flow passage and to store condensate released from air passing around the first heat exchanger, and a condensate removal unit configured to supply heated air to the water collection unit, thereby removing the condensate within the water collection unit.

[0012] The condensate removal unit may include a supply flow passage configured to supply ambient air to the water collection unit, a supply fan configured to introduce ambient air to the supply flow passage, and a

heater configured to heat the air introduced into the supply flow passage.

[0013] The water collection unit may include a storage body configured to store the condensate released from the air passing around the first heat exchanger, a cover configured to form an upper surface of the storage body, and a communication hole extending through the cover.

[0014] The supply flow passage may include a supply duct fixed to the communication hole, and a heating duct connected to the supply duct and configured for the heater to be mounted thereto.

[0015] The supply duct may extend toward an upper portion of the cover, and the heating duct may extend from one end of the supply duct in a longitudinal direction of the drum.

[0016] The laundry treatment apparatus may further include a valve configured to control opening and closing of the communication hole or the supply duct.

[0017] The condensate removal unit may further include a connection tube configured to interconnect the circulation flow passage and the water collection unit, thereby guiding a part of air emerging from the second heat exchanger to the water collection unit.

[0018] The condensate removal unit may further include an actuator configured to form a flow of water within the water collection unit or to vibrate the condensate stored in the water collection unit.

[0019] The present disclosure provides a control method for a laundry treatment apparatus including a drum configured to provide a space for accommodating an object to be dried therein, a circulation flow passage configured to again supply, to the drum, air discharged from the drum, a heat exchange unit including a circulation fan configured to move air along the circulation flow passage, a compressor configured to move refrigerant along a refrigerant tube, a first heat exchanger fixed to the refrigerant tube and configured to dehumidify air moving along the circulation flow passage, and a second heat exchanger fixed to the refrigerant tube and configured to heat air emerging from the first heat exchanger, a water collection unit connected to the circulation flow passage and to store condensate released from air passing around the first heat exchanger, and a condensate removal unit including a supply fan configured to supply ambient air to the water collection unit through a supply flow passage, a heater configured to heat air introduced into the supply flow passage, and a valve configured to control opening and closing of the supply flow passage.

[0020] The control method may include sterilization of closing the supply flow passage by the valve, and supplying air to an interior of the drum by operating the compressor and the circulation fan, flow passage opening of controlling the valve to open the supply flow passage during execution of the sterilization, and condensate removal of supplying heated air to the water collection unit by operating the supply fan and the heater when the supply flow passage is opened.

[0021] The flow passage opening may start after the

sterilization is executed for a first predetermined time.

[0022] The condensate removal may include a first period in which the heater operates continuously, and a second period in which operation and stop of the heater is repeated after completion of the first period.

[0023] The control method may further include residual water removal of removing condensate present within the water collection unit by stopping operation of the compressor and the supply fan and operating the circulation fan and the heater after ending of the sterilization and the condensate removal.

[0024] The heater may be configured to repeat operation and stop thereof during the residual water removal.

ADVANTAGEOUS EFFECTS

[0025] The present disclosure provides a laundry treatment apparatus and a control method for the same which are capable of minimizing residual condensate in the water collection unit.

[0026] The present disclosure provides a laundry treatment apparatus and a control method for the same which are capable of minimizing residual condensate within a water collection unit through evaporation of the condensate.

[0027] The present disclosure provides a laundry treatment apparatus and a control method for the same which are capable of minimizing leakage of hot air supplied to an object, to be dried, into a supply flow passage, to which hot air for evaporation of condensate is supplied, by controlling opening and closing of the supply flow passage.

DESCRIPTION OF DRAWINGS

[0028]

FIG. 1, FIG. 2, and FIG. 3 show an example of a laundry treatment apparatus.

FIG. 4 shows examples of a circulation flow passage and a heat exchange unit.

FIG. 5 and FIG. 6 show examples of a support unit and a drain unit.

FIG. 7 and FIG. 8 show an example of a condensate removal unit.

FIG. 9 shows another embodiment of the condensate removal unit.

FIG. 10 shows an example of a control method for the laundry treatment apparatus.

BEST MODE FOR DISCLOSURE

[0029] Hereinafter, preferred embodiments of a laun-

dry treatment apparatus and a control method for the same will be described in detail with reference to the accompanying drawings.

[0030] As shown in FIG. 1, a laundry treatment apparatus 100 may be configured to include a cabinet 1. Within the cabinet, an accommodation unit provided within the cabinet 1 to accommodate an object to be dried (referred to as laundry hereinafter), a circulation flow passage and a heat exchange unit, which are configured to remove moisture from the laundry in the accommodation unit, and a heat exchange unit.

[0031] The cabinet 1 may be configured to include a front surface 11 disposed at a front side of the laundry treatment apparatus, a rear surface disposed at a rear side of the laundry treatment apparatus, and a base 13 configured to form a bottom surface of the laundry treatment apparatus.

[0032] A control panel may be provided at the front surface 11. The control panel may be configured to include a display 114 configured to display a control command selectable by the user, and an input unit 113 configured to enable the user to select the control command displayed on the display 114.

[0033] As shown in FIG. 2, a cabinet access port 111 for loading and unloading of laundry is provided at the front surface 11. The cabinet access port 111 may be configured to be closed by a door 115 pivotably mounted to the front surface 11.

[0034] As shown in FIG. 3, the accommodation unit may be constituted by a drum 17 rotatably provided within the cabinet 1. The drum 17 may be configured to include a cylindrical drum body 171 opened at a front surface and a rear surface thereof.

[0035] In order to rotatably support the drum body 171, the cabinet 1 may be configured to include a front panel 14 configured to rotatably support the front surface of the drum body 171 and a rear panel 15 configured to rotatably support the rear surface of the drum body 171.

[0036] The front panel 14 may be configured to include a front panel body 141 fixed to the front surface 11 or the cabinet 1, a drum access port 142 configured to extend through the front panel body 141, and a drum exhaust hole 143 configured to discharge air in the drum body 171 into the circulation flow passage 2.

[0037] The drum access port 142 may be configured to be connected to the cabinet access port 111. Accordingly, when the door 115 opens the cabinet access port 111, the user may load laundry in the drum body 171 or may unload laundry from the drum body 171 through the cabinet access port 111 and the drum access port 142.

[0038] For filtration of air discharged from the drum body 171, a filter attachable to or detachable from the front panel body 141 may be provided at the drum exhaust hole 143.

[0039] The rear panel 15 may be configured to include a rear panel body 151 fixed to the rear surface 12 or the cabinet 1, and a drum supply hole 152 configured to extend through the rear panel body 151.

[0040] The drum body 171 is rotatable by a driver 18 provided within the cabinet 1. The driver 18 may be configured through inclusion of a drum motor 181 fixed to the base 13, and a belt 182 configured to interconnect a rotation shaft of the drum motor 181 and a circumferential surface of the drum body 171.

[0041] In order to agitate laundry in the drum body 171, a lifter 172 may be further provided within the drum body 171. The lifter 172 may be constituted by a board protruding from the circumferential surface of the drum body 171 toward a rotation center of the drum body 171.

[0042] The circulation flow passage 2 may be configured to include a first duct 21 connected to the drum exhaust hole 143, a second duct 22 connected to the drum supply hole 152, and a third duct 23 (a connection duct) configured to interconnect the first duct 21 and the second duct 22. The connection duct 23 may be configured to be fixed to the base 13.

[0043] As shown in FIG. 4, the heat exchange unit 3 may be configured to include a circulation fan 36 configured to move air along the circulation flow passage 2, and a heat pump 31-32-33-34-35 configured to sequentially execute dehumidification and heating of air moving along the circulation flow passage 2.

[0044] The circulation fan 36 may be configured to include a fan impeller 361 disposed at the inside of the circulation flow passage 2, and a fan motor 362 disposed at the outside of the circulation flow passage 2 to rotate the fan impeller 361.

[0045] The heat pump may be configured to include a refrigerant tube 33 configured to form a flow path through which refrigerant circulates, a compressor 34 configured to force the refrigerant to move along the refrigerant tube 33, a first heat exchanger 31 fixed to the refrigerant tube 33 to transfer heat of air introduced into the connection duct 23 to the refrigerant, a second heat exchanger 32 fixed to the refrigerant tube 33 to transfer heat of the refrigerant to air emerging from the first heat exchanger 31, and a control valve 35 configured to adjust the pressure of the refrigerant.

[0046] The connection duct 23 may be configured to include a duct body 231 fixed to the base 13, and a duct cover 232 configured to form an upper surface of the duct body 231. As shown in FIG. 5, the duct body 231 may be configured to include a first mounting portion 233, to which the first heat exchanger 31 is mounted, a second mounting portion 234, to which the second heat exchanger 32 is mounted, and a third mounting portion 235 (a fan mounting portion), in which the fan impeller 361 is rotatably received.

[0047] Air introduced into the connection duct 23 is condensed while passing around the first heat exchanger 31, is heated while passing around the second heat exchanger 32, and is then moved to the drum body 171 through the second duct 22 and the drum supply hole 152.

[0048] A support unit 4 configured to support a bottom surface of the first heat exchanger 31 may be provided at

the circulation flow passage 2. The support unit 4 divides an interior of the connection duct 23 into a mounting space 233a, in which the first heat exchanger 31 is disposed, and a drain space 233b configured to guide condensate to the outside of the circulation flow passage 2 (see FIG. 4). The drain space 233b is disposed under the mounting space 233a, and a drain flow passage 5 is provided at the drain space 233b.

[0049] As shown in FIG. 6, the support unit 4 may be configured to include a support body 41 configured to support the bottom surface of the first heat exchanger 31, an extension body 42 configured to extend from the support body 41 toward the second heat exchanger 32, and a fastener 43-44 configured to fasten the support body 41 and the extension body 42 to the connection duct 23.

[0050] FIG. 6 shows, as an example, the case in which the fastener is configured through inclusion of fastening protrusions 43 protruding from opposite lateral surfaces of the support body 41, and fastening grooves 44 provided at the connection duct 23 to receive the fastening protrusion 43.

[0051] A support body through hole 411 is provided at the support body 41, and an extension body through hole 421 is provided at the extension body 42. Accordingly, an inner space of the connection duct 23 (a space in which the first mounting portion is disposed) is divided into the mounting space 233a and the drain space 233b by the support body 41 and the extension body 42. However, the condensate present in the mounting space 233a may move to the drain space 233b through the support body through hole 411 and the extension body through hole 421.

[0052] The support body through hole 411 may be configured to be disposed under the first exchanger 31, and the extension body through hole 421 may be configured to be disposed between the first heat exchanger 31 and the second heat exchanger 32. These configurations are intended to prevent the condensate, which could not move to the drain space 233b through the support body through hole 411, from moving to the second heat exchanger 32 along a flow of air in the connection duct 23.

[0053] A water collection unit 6 configured to store condensate produced during condensation of air passing around the first heat exchanger 31 may be provided at the base 13.

[0054] As shown in FIG. 5, the water collection unit 6 may be disposed at the outside of the circulation flow passage 2. In this case, the water collection unit 6 may be connected to the drain space 233b through a drain port 51 configured to extend through the connection duct 23. It is preferred that the drain flow passage 5 be provided at a bottom surface of the connection duct 23 and be configured to guide condensate to the drain port 51.

[0055] For natural drainage of the condensate (in order to enable the condensate in the drain flow passage to move to the water collection unit by gravity), a bottom

surface of the water collection unit 6 may be disposed at a lower level than the drain port 51, and the drain flow passage 5 may be configured to have an inclined surface downwardly inclined toward the drain port 51.

[0056] As shown in FIG. 3, the condensate stored in the water collection unit 6 may be discharged into a drain tank 8 through the drain unit 7. The drain tank 8 may be configured to be disposed at a higher level than the water collection unit 6.

[0057] The drain tank 8 may be configured to include a drawer 81 configured to be withdrawable from the cabinet 1 and to provide a space in which condensate is stored, and a drawer through hole 82 configured to extend through an upper surface of the drawer 81.

[0058] An access port 112 for withdrawal of the drawer 81 may be provided at the front surface 11, and a tank housing 16 configured to provide a space in which the drawer 81 is accommodated may be provided within the cabinet 1.

[0059] The condensate discharged from the water collection unit 6 through the drain unit 7 may move to the tank housing 16 through a supply tube 72, and the condensate discharged from the supply tube 72 may move to an interior of the drawer 81 through the drawer through hole 82.

[0060] Meanwhile, when the condensate is supplied in an excessive amount to the drawer 81, the condensate present in the drawer 81 may be discharged into the tank housing 16 through the drawer through hole 82. To this end, a recovery tube 72 may be further provided at the drain unit 7. The recovery tube 72 is configured to interconnect a bottom surface of the tank housing 16 and the water collection unit 6 and, as such, to guide the condensate discharged from the drawer 81 to the water collection unit 6.

[0061] As shown in FIG. 5, the water collection unit 6 may be configured to include a storage body 61 provided at the base 13 and configured to store condensate therein, and a cover 62 configured to close an opened upper surface of the storage body 61. The drain port 51 is provided at a circumferential surface of the storage body 61 and, as such, communicates with an interior of the circulation flow passage 2 through the drain port 51.

[0062] A supply port 622 and a recovery port 623 are provided at the cover 62. The supply tube 72 is connected to the supply port 622, and the recovery tube 73 is connected to the recovery port 623.

[0063] In addition, a cover through hole 621 and a chamber 63, in which a drain pump 71 of the drain unit 7 is mounted, are provided at the cover 62. The chamber 63 is fixed to the cover 62 such that the chamber 63 is disposed within the storage body 61. As shown in the drawing, the chamber 63 may be configured to include a chamber body 631 configured to have a cylindrical shape surrounding the cover through hole 621, and a supply body 632 configured to connect an inner space of the chamber body 631 to the supply port 622.

[0064] In this case, the drain pump 71 may be config-

ured to include a drain motor 711 fixed to the cover 62, and an impeller 713 fixed to a rotation shaft 712 of the drain motor 711 and disposed within the chamber body 631.

[0065] A chamber inlet 633 is provided at a bottom surface of the chamber body 631 and, as such, condensate present in the storage body 61 is introduced into the chamber body 631 and is then moved to the supply port 622 through the supply body 632 during rotation of the impeller 713. The condensate moving to the supply port 622 may then move to the drain tank 8 through the supply tube 72.

[0066] The recovery port 623 extends through the cover 62 to communicate with the storage body 61 and, as such, the condensate discharged from the drain tank 8 may move to the storage body 61 through the recovery tube 73 and the recovery port 623.

[0067] The laundry treatment apparatus having the above-described structure inevitably encounters a phenomenon in which condensate remains within the storage body 61 because a space should be maintained between the chamber inlet 633 and a bottom surface of the storage body 61. The phenomenon in which condensate remains within the storage body 61 may become a factor making it difficult to hygienically manage the storage body 61, the heat exchange unit 3, and the drum 17.

[0068] In order to minimize problems caused by residual condensate in the water collection unit 6, the laundry treatment apparatus 100 may further include a condensate removal unit 9.

[0069] The condensate removal unit 9 is a means fixed to the base 13 or the cover 62 and configured to supply heated air to the water collection unit 6, thereby evaporating condensate present in the water collection unit 6. FIG. 5 shows, as an example, the case in which the condensate removal unit 9 is fixed to the cover 62 to supply heated air to a communication hole 624 of the cover 62.

[0070] As shown in FIG. 7, the condensate removal unit 9 may be configured to include a hot air supplier 91 configured to supply heated air to the water collection unit 6, and a valve 92 configured to control opening/closing of the hot air supplier 91.

[0071] As shown in FIG. 8, the hot air supplier 91 may be configured to include a supply flow passage 911 configured to supply ambient air to the water collection unit 6, a supply fan 916 configured to introduce ambient air to the supply flow passage 911, and a heater 915 configured to heat the air introduced into the supply flow passage 911.

[0072] The supply flow passage 911 may be configured to include a supply duct 913 fixed to the communication hole 624, and a heating duct 912 connected to the supply duct 913. The heater 915 is mounted to the heating duct 912. In this case, the supply duct 913 may extend toward an upper portion of the cover 62 (along a Y-axis), and the heating duct 912 may extend from one end of the supply duct 913 in a longitudinal direction of the

drum 17 (along a Z-axis).

[0073] When the heating duct 912 extends in the longitudinal direction of the drum 17, it may be possible to set the heating duct 912 to have a great length. The reason why the heating duct 912 is set to have a great length is to enable air introduced into the heating duct 912 to sufficiently exchange heat with the heater 915 (to increase the temperature of air supplied to the supply duct).

[0074] The heating duct 912 may be configured to guide air present at the inside of the cabinet 1 or air present at the outside of the cabinet 1 to the supply duct 913. FIG. 8 shows, as an example, the heating duct configured to guide air present at the inside of the cabinet 1 to the supply duct 913. The supply fan 916 may be provided at an inlet of the heating duct 912.

[0075] Under the condition that the supply flow passage 911 is always maintained in an opened state, a part of air emerging from the first heat exchanger 31 may be discharged through the water collection unit 6 and the supply flow passage 911 when the heat exchange unit 3 operates to dry laundry loaded in the drum 17. The valve 91 is a means for solving such a problem.

[0076] The valve 92 may be configured to open and close the communication hole 624 provided at the cover 62 or to open and close the supply flow passage 911. FIG. 8 shows, as an example, the case in which the valve 92 is configured to open and close an exhaust port 914 of the supply duct 913.

[0077] The valve 92 of FIG. 8 may be configured to include a valve body 921 having a shape capable of opening and closing the exhaust port 914, and a valve motor 922 configured to control a rotation angle of the valve body 921.

[0078] When a drying procedure for drying of laundry or a sterilization procedure for sterilization of the drum or the heat exchangers is executed, condensate is stored in the storage body 61. The condensate in the storage body 61 is discharged into the drain tank 8 through the supply port 622 during rotation of the impeller 713. The condensate remaining in the storage body 61 after rotation of the impeller 713 is stopped may be removed through operation of the heater 915 and the supply fan 916 in an opened state of the supply flow passage 911.

[0079] As shown in FIG. 9, the condensate removal unit 9 may be further provided with a connection tube 917 configured to interconnect the circulation flow passage 2 and the water collection unit 6 and, as such, to guide a part of air emerging from the second heat exchanger 32 to the water collection unit 6. Differently from the case shown in the drawing, the condensate removal unit 9 may be configured to include only the connection tube 917 without the hot air supplier 91.

[0080] Furthermore, in order to reduce the time taken to remove the condensate in the water collection unit 6, an actuator 93 may be further provided within the water collection unit 6. The actuator 93 may be constituted by an impeller (a water collection unit impeller) provided at the bottom surface of the storage body 61 and configured

to be rotated by a motor (disposed outside the water collection unit), an ultrasonic generator provided within the storage body 61, or the like.

[0081] FIG. 10 shows an example of a control method for the laundry treatment apparatus 100 as described above. The control method includes sterilization, flow passage opening, and condensate removal.

[0082] The sterilization is a procedure for supplying high-temperature dry air (air having a higher temperature than room temperature while having a lower humidity than the humidity of a space in which the laundry treatment apparatus is installed, by operating the compressor 34 and the circulation fan 36. It is preferred that, in the sterilization, the supply flow passage 911 be maintained in a closed state. Accordingly, during execution of the sterilization, the valve 92 is controlled to maintain the supply flow passage 911 in the closed state.

[0083] The flow passage opening is a procedure for opening the supply flow passage 911 by the valve 92. The flow passage opening may be configured to start after the sterilization is executed for a predetermined reference time.

[0084] The condensate removal may start when the supply flow passage 911 is opened through the flow passage opening. The condensate removal is a procedure for supplying heated air to the interior of the water collection unit 6 by operating the supply fan 916 and the heater 915.

[0085] The condensate removal may be configured to include a first period in which the heater 915 operates continuously, and a second period in which the heater 915 repeats operation and stop thereof. The condensate removal may be configured to end simultaneously with the sterilization.

[0086] When the sterilization and the condensate removal end, the control method executes residual water removal. The residual water removal is a procedure for removing a residual condensate remaining in the water collection unit 6 by operating the circulation fan 36 and the heater 915 while stopping operation of the compressor 34 and the supply fan 916. The residual water removal may be configured to repeat operation and stop of the heater 915.

[0087] The residual water removal as described above is configured to be executed for a predetermined time after the sterilization ends. Accordingly, the control method of FIG. 10 may prevent or minimize residual of the condensate in the water collection unit.

[0088] The structure and the control method of the laundry treatment apparatus as described above have been described as an example of the present disclosure. Accordingly, the scope of the present disclosure is not limited to the above-described structure and control method.

Claims

1. A laundry treatment apparatus comprising:

a drum configured to provide a space for accommodating an object to be dried therein;
a circulation flow passage configured to again supply, to the drum, air discharged from the drum;
a heat exchange unit comprising a circulation fan configured to move air along the circulation flow passage, a first heat exchanger configured to dehumidify air moving along the circulation flow passage, and a second heat exchanger configured to heat air emerging from the first heat exchanger;
a water collection unit connected to the circulation flow passage and to store condensate released from air passing around the first heat exchanger; and
a condensate removal unit configured to supply heated air to the water collection unit, thereby removing the condensate within the water collection unit.

2. The laundry treatment apparatus according to claim 1, wherein the condensate removal unit comprises: a supply flow passage configured to supply ambient air to the water collection unit; a supply fan configured to introduce ambient air to the supply flow passage; and a heater configured to heat the air introduced into the supply flow passage.

3. The laundry treatment apparatus according to claim 2, wherein:

the water collection unit comprises a storage body configured to store the condensate released from the air passing around the first heat exchanger, a cover configured to form an upper surface of the storage body, and a communication hole extending through the cover; and
the supply flow passage comprises a supply duct fixed to the communication hole, and a heating duct connected to the supply duct and configured for the heater to be mounted thereto.

4. The laundry treatment apparatus according to claim 3, wherein the supply duct extends toward an upper portion of the cover, and the heating duct extends from one end of the supply duct in a longitudinal direction of the drum.

5. The laundry treatment apparatus according to claim 3, further comprising: a valve configured to control opening and closing of the communication hole or the supply duct.

6. The laundry treatment apparatus according to claim 2, wherein the condensate removal unit further comprises a connection tube configured to interconnect the circulation flow passage and the water collection unit, thereby guiding a part of air emerging from the second heat exchanger to the water collection unit.

7. The laundry treatment apparatus according to claim 2, wherein the condensate removal unit further comprises an actuator configured to form a flow of water within the water collection unit or to vibrate the condensate stored in the water collection unit.

8. A control method for a laundry treatment apparatus comprising a drum configured to provide a space for accommodating an object to be dried therein, a circulation flow passage configured to again supply, to the drum, air discharged from the drum, a heat exchange unit comprising a circulation fan configured to move air along the circulation flow passage, a compressor configured to move refrigerant along a refrigerant tube, a first heat exchanger fixed to the refrigerant tube and configured to dehumidify air moving along the circulation flow passage, and a second heat exchanger fixed to the refrigerant tube and configured to heat air emerging from the first heat exchanger, a water collection unit connected to the circulation flow passage and to store condensate released from air passing around the first heat exchanger, and a condensate removal unit comprising a supply fan configured to supply ambient air to the water collection unit through a supply flow passage, a heater configured to heat air introduced into the supply flow passage, and a valve configured to control opening and closing of the supply flow passage, the control method comprising:

sterilization of closing the supply flow passage by the valve, and supplying air to an interior of the drum by operating the compressor and the circulation fan;

flow passage opening of controlling the valve to open the supply flow passage during execution of the sterilization; and

condensate removal of supplying heated air to the water collection unit by operating the supply fan and the heater when the supply flow passage is opened.

9. The control method according to claim 8, wherein the flow passage opening starts after the sterilization is executed for a first predetermined time.

10. The control method according to claim 8, wherein the condensate removal comprises:

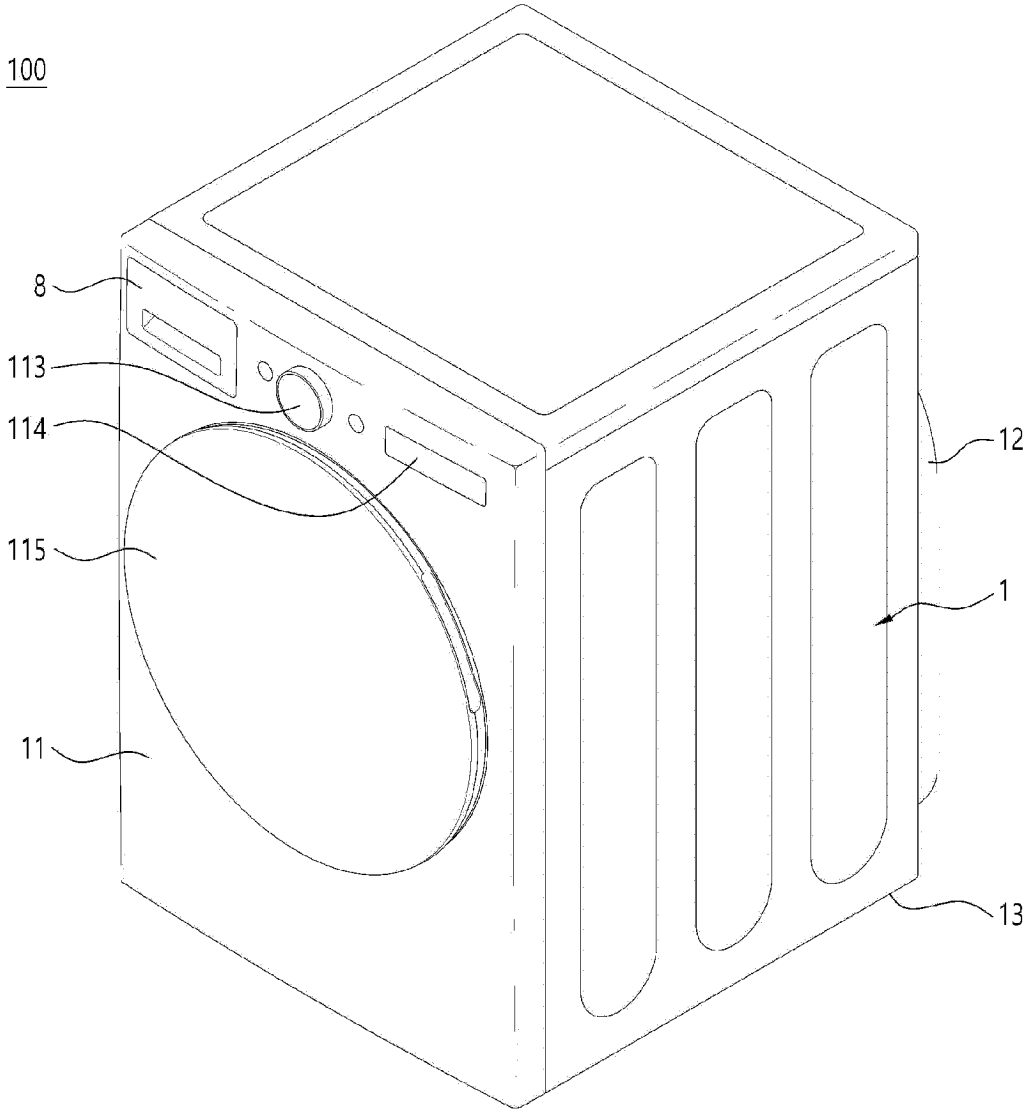
a first period in which the heater operates continuously; and

a second period in which operation and stop of the heater is repeated after completion of the first period.

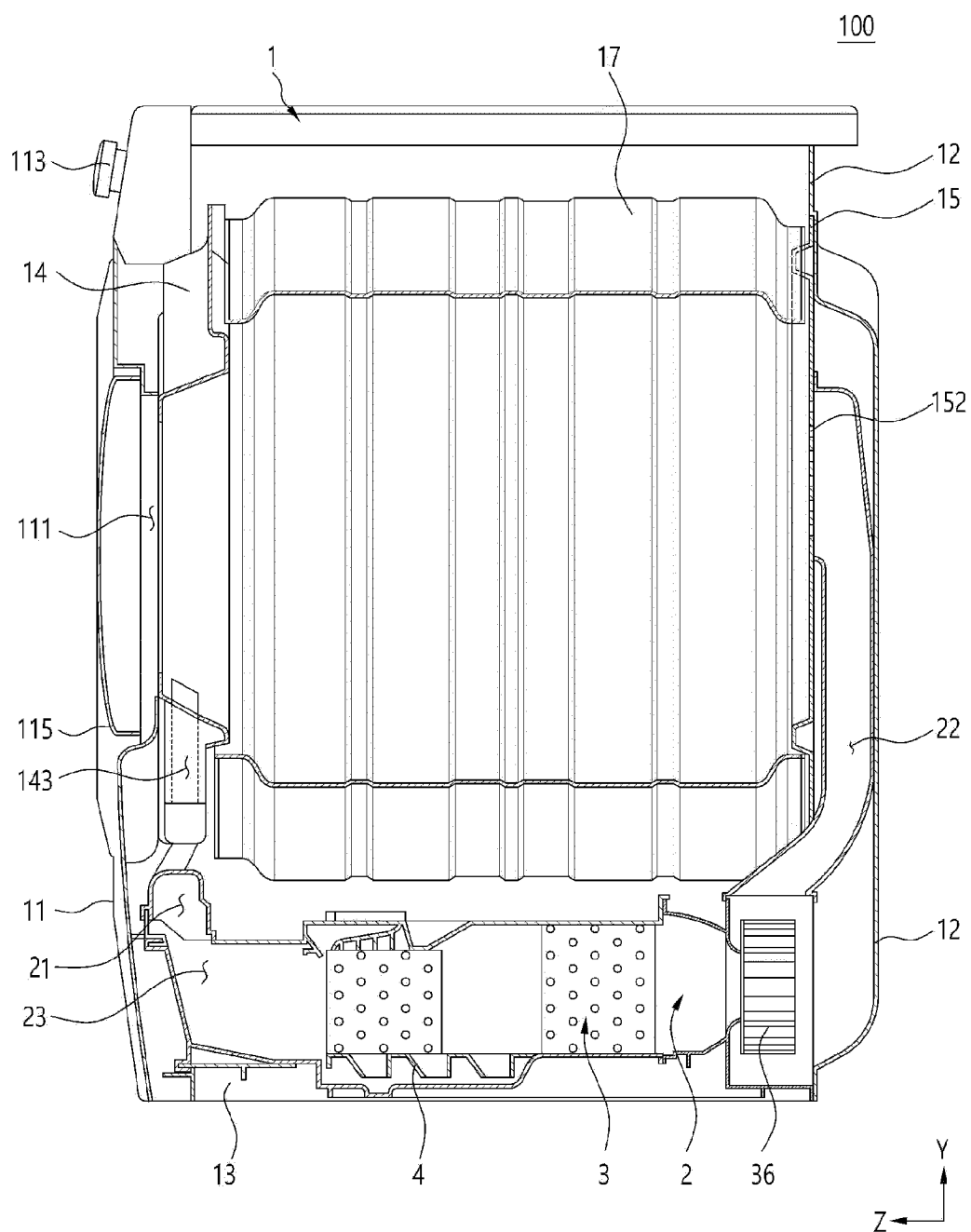
11. The control method according to claim 8, further comprising:
residual water removal of removing condensate present within the water collection unit by stopping operation of the compressor and the supply fan and operating the circulation fan and the heater after ending of the sterilization and the condensate removal.

12. The control method according to claim 11, wherein the heater is configured to repeat operation and stop thereof during the residual water removal.

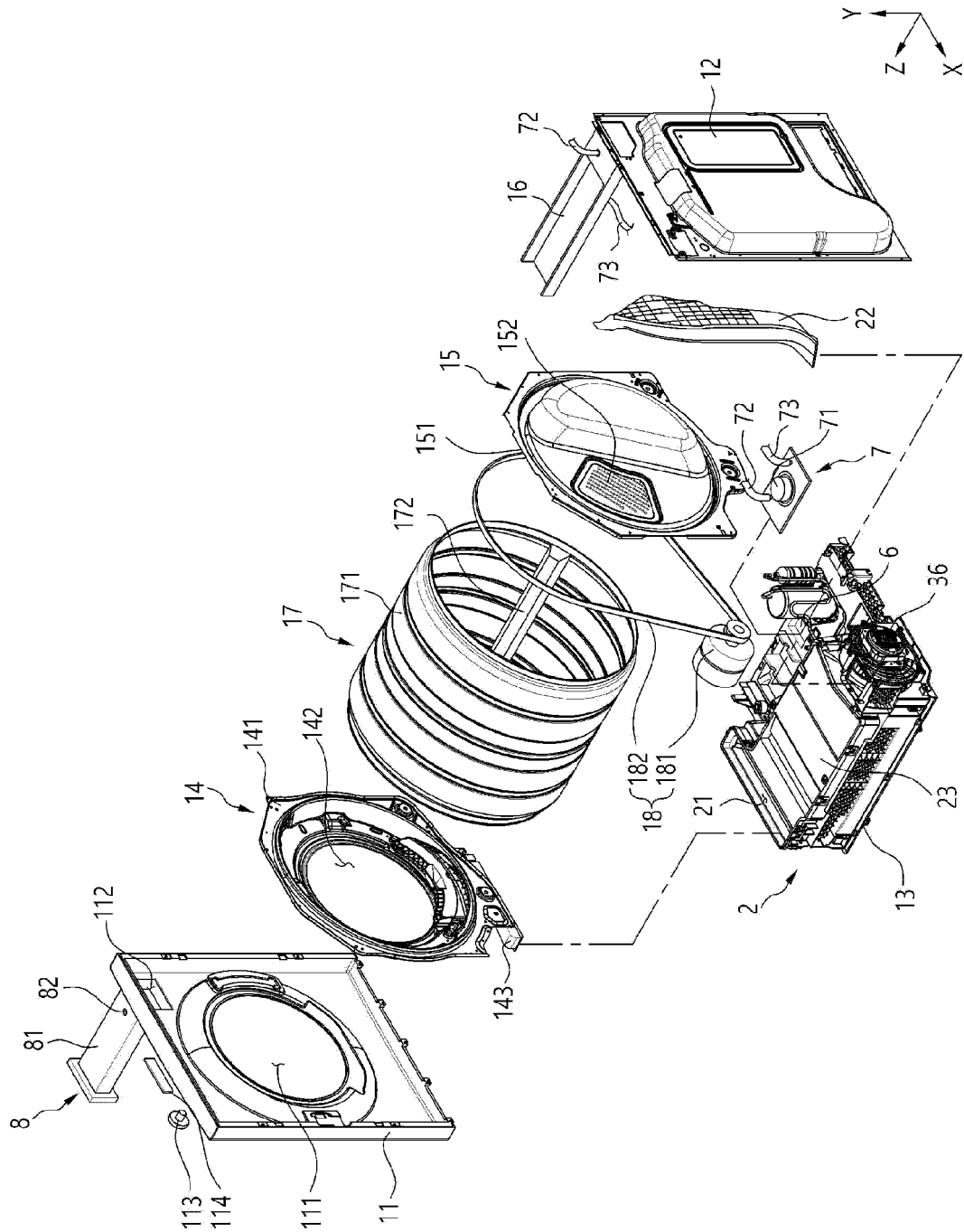
【Fig. 1】



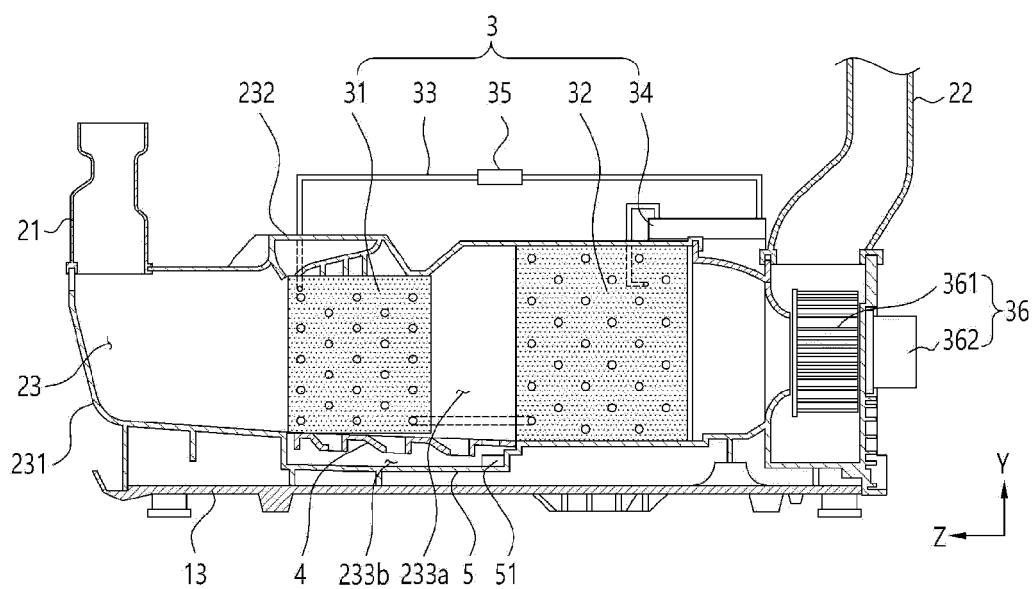
【Fig. 2】



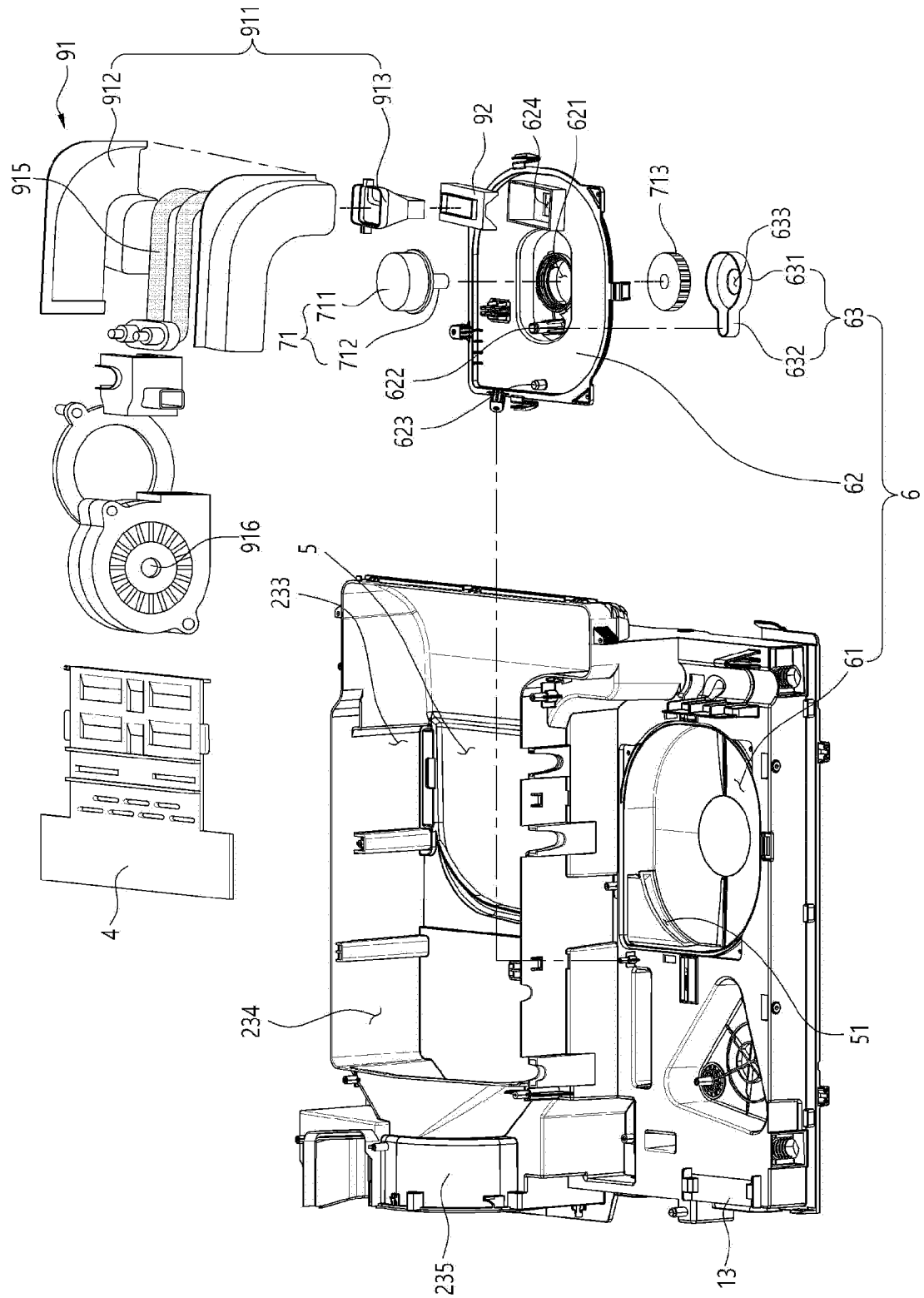
【Fig. 3】



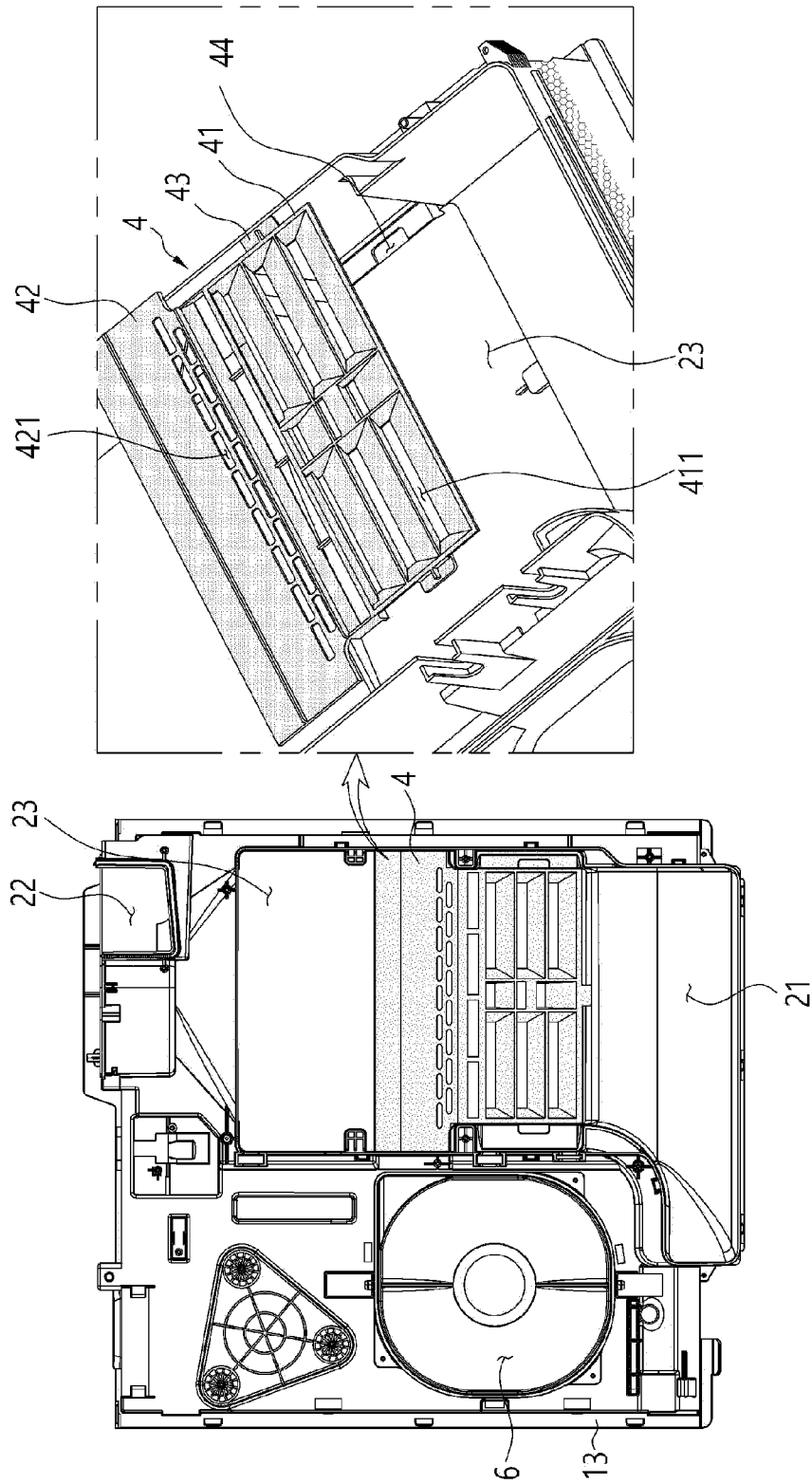
【Fig. 4】



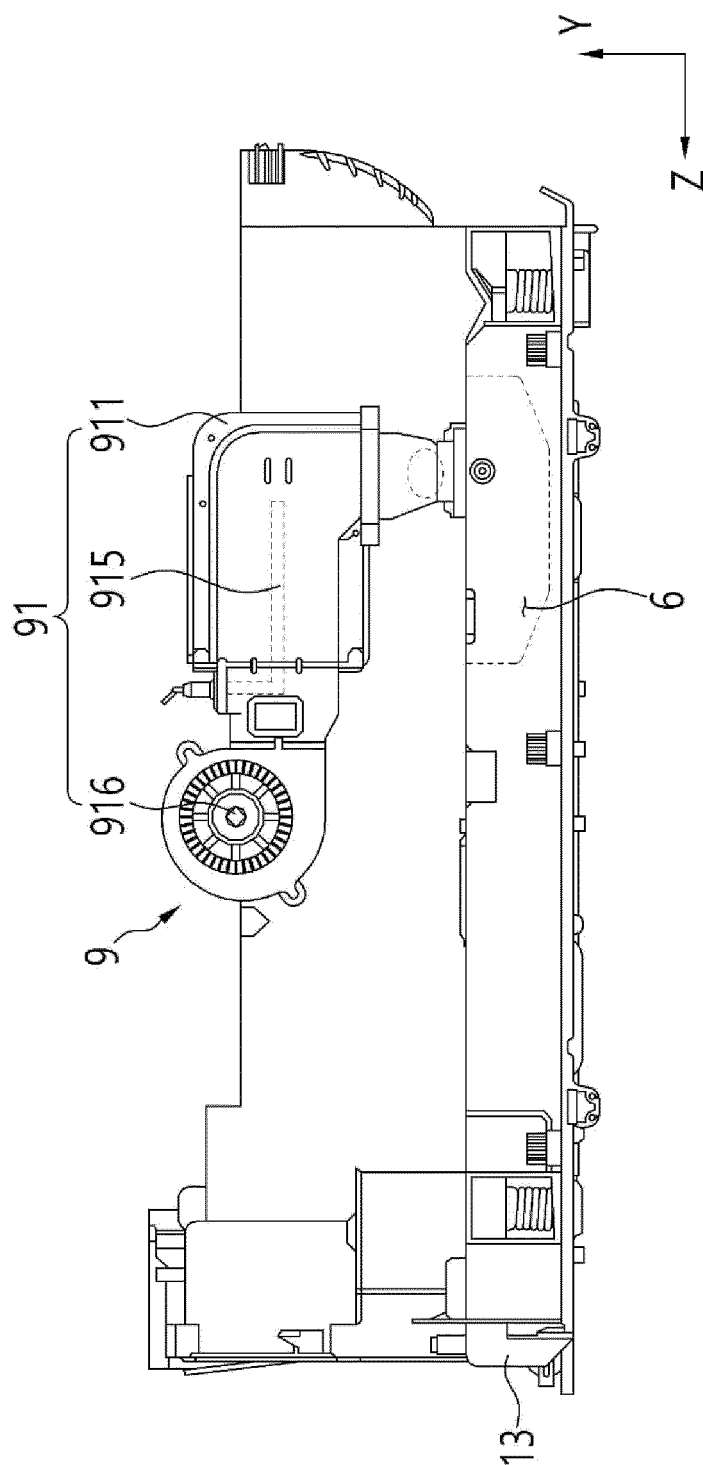
【Fig. 5】



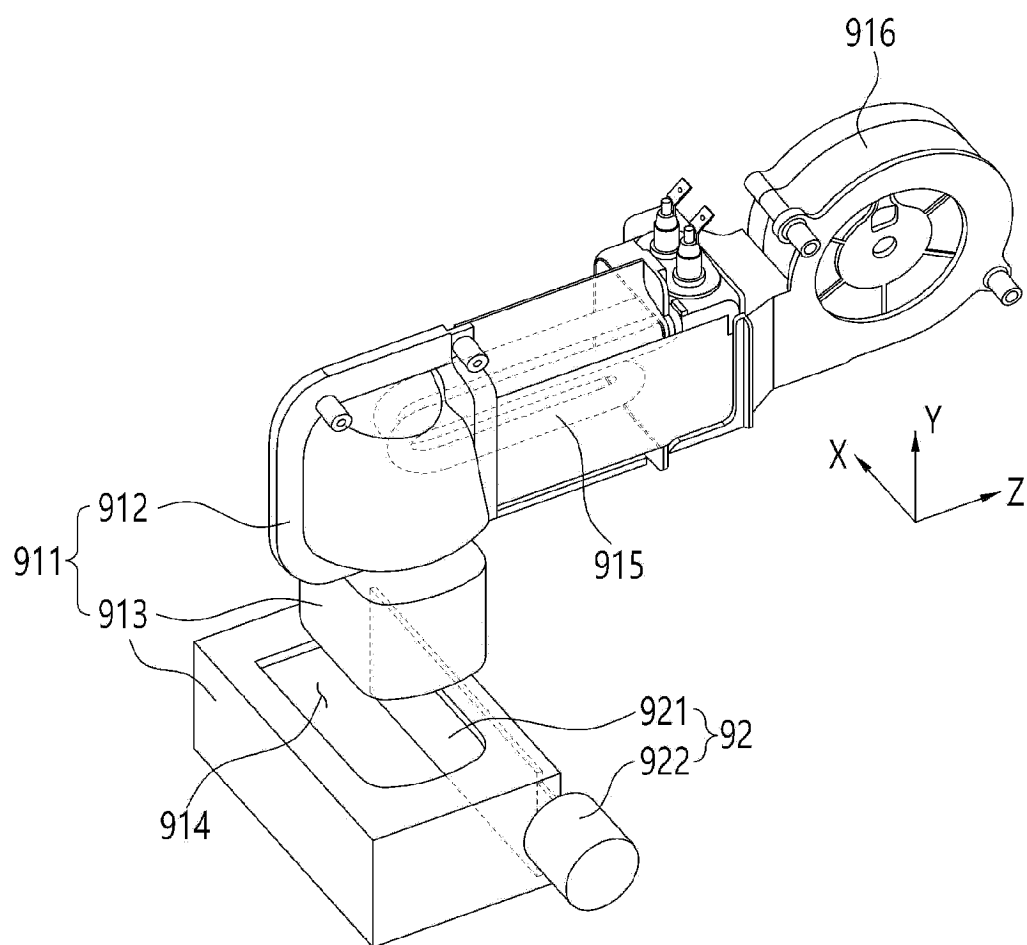
【Fig. 6】



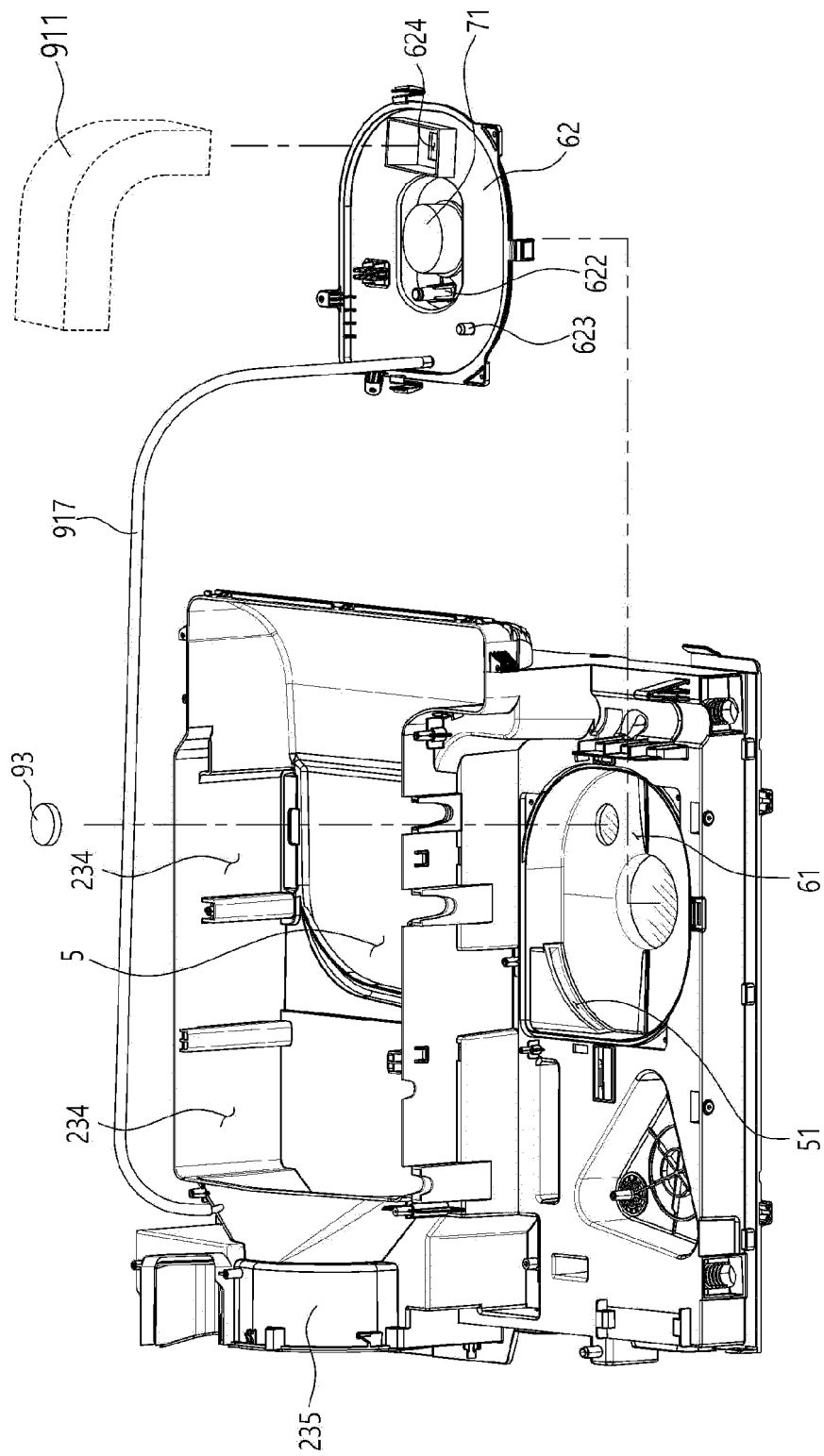
【Fig. 7】



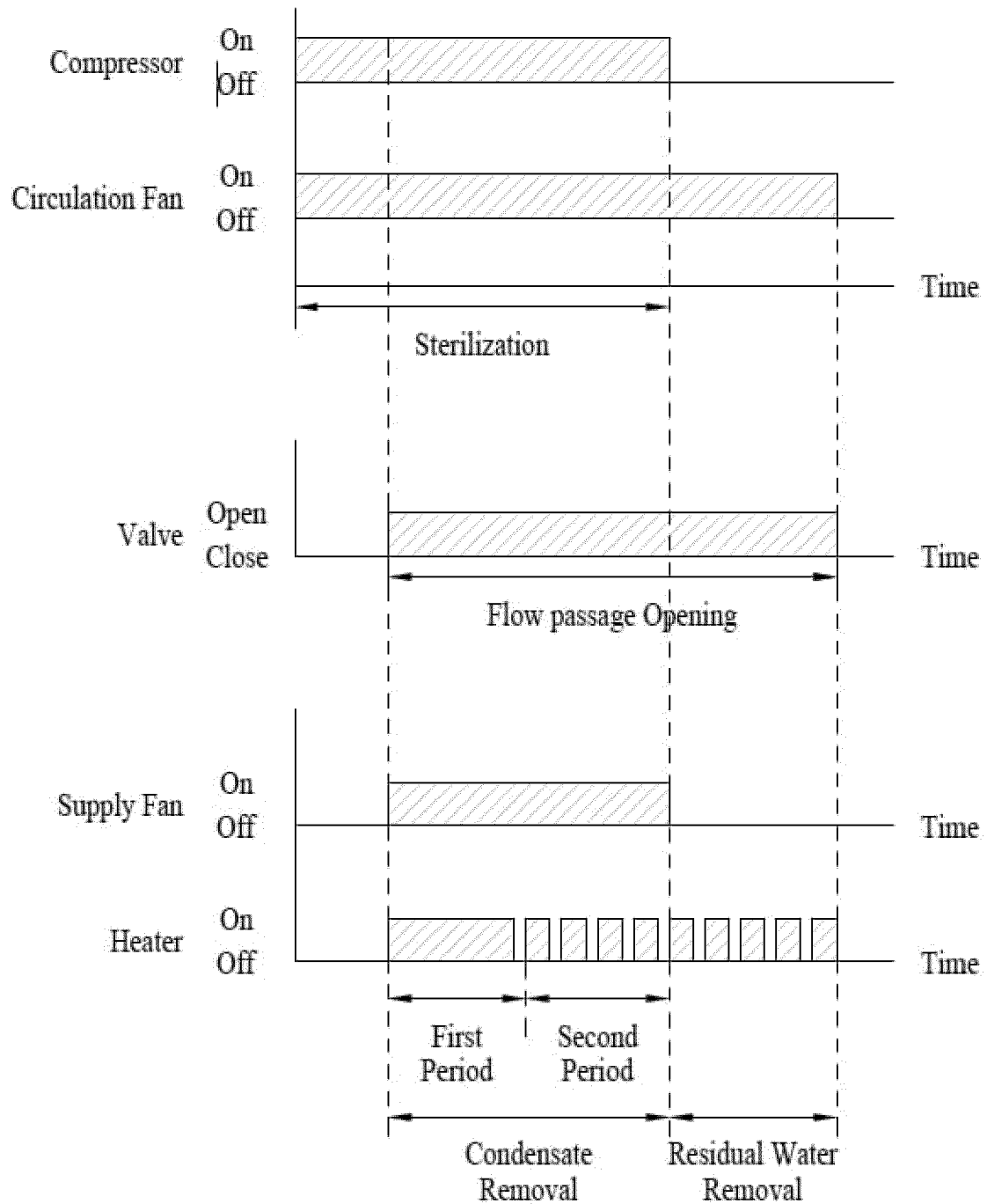
【Fig. 8】



【Fig. 9】



【Fig. 10】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/010784

A. CLASSIFICATION OF SUBJECT MATTER

D06F 58/26(2006.01)i; D06F 58/20(2006.01)i; D06F 58/24(2006.01)i; D06F 58/38(2020.01)i; D06F 58/45(2020.01)i;
D06F 33/69(2020.01)i; D06F 105/28(2020.01)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 58/26(2006.01); A47L 15/42(2006.01); A47L 15/44(2006.01); D06F 33/69(2020.01); D06F 58/10(2006.01);
D06F 58/20(2006.01); D06F 58/24(2006.01); D06F 58/45(2020.01); F26B 25/04(2006.01); F26B 9/08(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: 의류처리장치(clothing treatment device), 응축수(condensed water), 공기(air), 밸브
(valve), 가열(heating), 살균(sterilization)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2009-0013983 A (LG ELECTRONICS INC.) 06 February 2009 (2009-02-06) See paragraphs [0007]-[0038], claims 1-13 and figures 1-5.	1-12
Y	KR 10-2021-0112168 A (LG ELECTRONICS INC.) 14 September 2021 (2021-09-14) See paragraphs [0011]-[0247], claims 1-20 and figures 1-8.	1-12
Y	KR 10-2021-0111556 A (LG ELECTRONICS INC.) 13 September 2021 (2021-09-13) See paragraphs [0022]-[0177], claims 1-20 and figures 1-34.	5,8-12
Y	KR 10-2022-0102479 A (LG ELECTRONICS INC.) 20 July 2022 (2022-07-20) See paragraphs [0041]-[0094], claims 1-11 and figures 1-6.	7
A	KR 10-2010-0096736 A (JANG, Dong Yeon) 02 September 2010 (2010-09-02) See paragraphs [0019]-[0043], claims 1-5 and figures 1-5.	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

13 November 2023

Date of mailing of the international search report

13 November 2023

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PCT/KR2023/010784

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2021-0087388 A (SAMSUNG ELECTRONICS CO., LTD.) 12 July 2021 (2021-07-12) See paragraphs [0024]-[0340], claims 1-20 and the drawings.	1-12

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2023/010784

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
KR 10-2009-0013983 A	06 February 2009	CN 101387071 A	18 March 2009
		CN 101387071 B	18 May 2011
		DE 102008035377 A1	19 February 2009
		DE 102008035377 B4	16 February 2017
		FR 2919625 A1	06 February 2009
		FR 2919625 B1	01 August 2014
		US 2009-0151193 A1	18 June 2009
		US 8132339 B2	13 March 2012
KR 10-2021-0112168 A	14 September 2021	AU 2021-229883 A1	27 October 2022
		AU 2021-229883 A1	10 September 2021
		CN 115279966 A	01 November 2022
		EP 4116483 A1	11 January 2023
		US 2023-0087630 A1	23 March 2023
		WO 2021-177671 A1	10 September 2021
KR 10-2021-0111556 A	13 September 2021	None	
KR 10-2022-0102479 A	20 July 2022	None	
KR 10-2010-0096736 A	02 September 2010	None	
KR 10-2021-0087388 A	12 July 2021	US 2022-0325463 A1	13 October 2022
		WO 2021-137487 A1	08 July 2021

Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020210063873 [0004]