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(54) Clothes dryer

Wäschetrockner

Sèche-linge

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(56) References cited:
DE-A1- 4 300 694
DE-A1-102008 054 832
DE-A1-102009 045 470
DE-B1- 2 219 889
DE-B1- 2 232 911
JP-A- 2006 087 672

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Description

[0001] Embodiments of the present disclosure relate to a dryer provided with a heat pump cycle, and more particularly, to a dryer provided with a structure capable of discharging condensed water generated from an evaporator.

[0002] One type of a dryer to dry clothes is provided with a heat pump cycle including a compressor, a condenser, and an evaporator. The dryer as such has a blower passage that allows an air stream to pass in the order of the condenser, a drum to accommodate wet clothes, and the evaporator through a blower. The dryer is configured such that the air stream circulated or taken is heated in the condenser, and the moisture of the clothes in the drum is evaporated by the heat of the heated air, while the evaporator collects the heat from the air that has acquired a large amount of moisture by passing through the drum. However, if the evaporator collects the heat from the air, the temperature of the air is lowered, so the moisture contained in the air is condensed, producing condensed water.

[0003] The condensed water is temporarily stored in a condensed water storage installed at a lower portion of the dryer or the evaporator, and is discarded by a user at a later time, or, if the dryer is configured as an integral unit with a washing machine, is discharged together with the washing water. For example, in a case of Japan, a drain mechanism is provided at a floor of the room where a washing machine or a dryer is installed, so the condensed water is flown downward by gravity from the condensed water storage to a drain-outlet.

[0004] Meanwhile, in the houses of Europe and the United States, different from Japan, a washing machine or a dryer is commonly installed at a basement where a drain mechanism such as a drainage fan is not installed. Accordingly, in order to have the condensed water of the dryer to flow through a drainpipe that is installed near to the ground, the condensed water needs to be pumped upward about 3 meters to be near the ground.

[0005] A technology of pumping condensed water W, while the height of water raised is low, is disclosed in the Japanese Unexamined Patent No. 2006-087672 that includes a drain mechanism in which a drain pump 6 raises the condensed water W stored in a condensed water storage 3 (see FIG. 5) to a height where a drum 14 is installed, such that the condensed water W is dropped and flown at an inside a drain hose 7 connected to a drain-outlet of the floor.

[0006] However, a structure of raising the condensed water W through a drain pump (see FIG. 6) disclosed in the Japanese Unexamined Patent No. 2006-087672 has a drain mechanism including a water storage tank 3 to store the condensed water W at a lower portion of the evaporator 13, and a drain pump 6 using a high power to raise the condensed water W by 3 meters at the point of time when the condensed water W is fully filled in the water storage tank 3 and to drain the condensed water W. The drain mechanism as such has the following drawbacks.

[0007] First, as shown in FIG. 6, the water storage tank 3 is configured to store the condensed water W, which is generated from the evaporator 13, in a manner to drop the condensed water W by gravity. The storage tank 3 is needed to be installed at a lower portion of the drum 14 or the evaporator 13. Since the height of the drum 14 is established in advance due to the limitation for use, the height of the water storage tank 3 is difficult to be increased as a means to enlarge the volume available for storage, thereby resulting in the smallness of the volume of the water storage tank 3.

[0008] As shown in (a) of FIG. 6, the condensed water (W) fully filled and stored in the water storage tank 3 is drained through the drain hose 7 by the drain pump 6 using a high power, but as shown in (b) of FIG. 6, at the point of time when the condensed water W is completely drained from the water storage tank 3, the drain pump 6 is needed to be stopped to prevent the idling, the malfunction, or the noise. As shown in (c) of FIG. 6, the stopping of the drain pump 6, commonly having a length of about 3m and an inner diameter of about 13mm, causes a large amount of condensed water W, for example, 0.4L to return back to the water storage tank 3. That is, once the drain tank 3 starts the draining, most of the water storage tank 3 makes a dead volume, causing the condensed water W to be kept stored without being drained, so that the amount of condensed water W to be stored is becoming reduced. Along with the limitation of a volume of the water storage tank 3, the volume of the water storage tank 3 acting for draining is reduced, so that the water storage tank 3 is rapidly filled with the condensed water W, while having a demand for operating the drain pump 6 in more frequent manner. Since the ON/OFF frequency per unit time is increased, the drain pump 6 is broken earlier. In addition, noise is increased due to the frequent operation of the drain pump 6 using a high power.

[0009] German patent application DE102008041832 discloses a device wherein condensed water is collected at a sink, which then subsequently flows through a fibrous material filter into a condensate container.

[0010] Therefore, it is an aspect of the present disclosure to provide a dryer capable of reducing the number of operations of raising the condensed water generated from an evaporator up to a high position, and capable of reducing the malfunction and the noise of a drain pump.

[0011] The dryer according to this aspect of the present disclosure is defined in independent claim 1. Further preferred embodiments are the subject-matter of the dependent claims.

[0012] Additional aspects of the disclosure will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the disclosure.

[0013] These and/or other aspects of the disclosure will become apparent and more readily appreciated from

the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a view illustrating the configuration of a dryer in accordance with a first embodiment of the present disclosure;

FIG. 2 is a graph showing the amount of condensed water generated according to the drying time in accordance with the first embodiment of the present disclosure;

FIG. 3 is a view illustrating the configuration of a dryer in accordance with a second embodiment of the present disclosure;

FIGs. 4A and 4B are a views illustrating the configuration of a dryer in accordance with a third embodiment of the present disclosure;

FIG. 5 is a view illustrating an example of raising and draining condensed water in a conventional dryer; and

FIGs. 6A to 6C are views illustrating a back flow of the condensed water generated in a case where a drain mechanism of the conventional dryer is used to drain the condensed water at a high position.

[0014] Reference will now be made in detail to the embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0015] Hereinafter, the first embodiment of the present disclosure will be described with reference to drawings.

[0016] A dryer 100 in accordance with the first embodiment of the present disclosure uses a heat pump cycle 1 including a compressor 11, a condenser 12, and an evaporator 13, and is configured to dry wet clothes.

[0017] As shown in FIG. 1, the dryer 100 is provided with a blower passage 2 that allows an air stream to pass through in the order of the condenser 12, a drum 14 to accommodate clothes, and the evaporator 13. The air stream is formed by a blower mechanism 14 installed at a lower portion of the evaporator 13. According to the configuration as such, the air stream is heated by the heat received from the condenser 12, and evaporates moisture in the clothes in the drum 14. The air stream containing the moisture is exhausted from the blower mechanism 15 while being deprived of the heat at the evaporator 13. In addition, as the temperature of the air stream is lowered, condensed water S is condensed at the evaporator 13.

The dryer 100 in accordance with the first embodiment of the present disclosure is provided with a drain mechanism 200 to discharge the condensed water W generated at the evaporator 13 to an outside. In addition, the draining of the dryer 100 is not performed toward a drain-outlet that is positioned lower than the dryer 100, but is performed by raising condensed water W to a drainage portion that is installed higher than the dryer 100 by about 3 meters and by discharging the condensed water W.

[0018] The drain mechanism 200, as shown in FIG. 1, includes a first water storage tank 3, a delivery pump 4, a second water storage pump 5, a drain pump 6, and a drain hose 7 that are installed from the evaporator 13 to a drainage portion to an outside the dryer 100. In addition, the drain mechanism 200 is provided with a drain control unit (not shown) to control the delivery pump 4 and the drain pump 6. The components of the dryer 100 will be described in brief. The first water storage tank 3 is configured to temporarily accommodate the condensed water W generated at the evaporator 13. The condensed water W is delivered by the delivery pump 4 from the first water storage tank 3 to the second water storage tank 5 at the point of time when the condensed water W is fully filled in the first water storage tank 3 or reaches a predetermined amount. The delivery of the condensed water W is repeated in a number of times, and if the condensed water W is fully filled in the second water storage tank 5 or reaches a predetermined amount, the condensed water W is discharged by the drain pump 6 or by the drain hose 7 of an outside the dryer 100. In addition, the drain hose 7 has one end opening at a position higher than the installation position of the second water storage tank 5 by about 3 meters, and the other end installed at the drain pump 6.

[0019] Hereinafter, the components of the dryer 100 will be described in detail.

[0020] The first water storage tank 3 connects between an evaporator case 131 to accommodate the evaporator 13 and the drain pump 6 through a pipe. The first water storage tank 3 is installed at a lower side of the evaporator 13. That is, the water droplets of the condensed water W generated at the evaporator 13 is collected at the first water storage tank 3 through a movement by gravity. As for the shape and the size of the first water storage tank 3, the first water storage tank 3 is provided in a rectangular parallel-piped shape available to be accommodated a lower side of the evaporator 13 inside a housing of the dryer 100. The first water storage tank 3 has a volume smaller than the second water storage tank 5, that is to be described later, and is sufficiently small to be disposed at a position suitable for collecting the condensed water W from the evaporator 13. A first water level detection unit 31 is provided at an upper side of the first water storage tank 3 to detect whether the condensed water W is fully filled or reaches a first predetermined amount in the first water storage tank 3. A liquid level detecting sensor may be used as an example of the first water level detection unit 31. The first water level detection unit 31 in accordance with the embodiment serves to detect whether a water level of the first water storage tank 3 corresponds to the first predetermined water level, but the present disclosure is not limited thereto, and the first water level detection unit in accordance with another em-

bodiment may sequentially detect other water levels.

[0021] The delivery pump 4 is a small capacity-compact type pump when compared to the drain pump 6 that is to be described later, and is configured to deliver the condensed water W from the first water storage tank 3 to the second water storage tank 5. The delivery pump 4 has a capability to raise the condensed water W to a position of the housing of the dryer 100, but lower than 3 meters.

[0022] The second water storage tank 5 is installed at a portion assuring a large space while avoiding the lower side of the evaporator 13 inside the housing of the dryer 100, so as to have a volume larger than that of the first water storage tank 3. If the first water storage tank 3 has a volume of about 0.1L, the second water storage tank 5 may have a volume of about 1.0L. That is, the second water storage tank 5 is configured to have a volume about ten times larger than that of the first water storage tank 3. The first water storage tank 3 and the second water storage tank 5 have sizes set based on an assumption, as shown in FIG. 2, the 3.6kg of clothes is dried as the total amount of the condensed water W is about 1000mL, and the amount of condensed water W generated for one minute is about 50mL/min. In addition, the second water storage tank 5 is also configured to a rectangular parallelpiped shape, and a second water level detection unit 51 is installed at an upper side of the second water storage tank 5 to detect whether the condensed water W is fully filled or reaches a second predetermined amount in the second water storage tank 5. A liquid level detecting sensor may be used as an example of the second water level detection unit 31. Alternatively, a water level detector or a water quantity detector may be used as an example of the second water level detection unit 31.

[0023] When described for the installation position of the second water level detection unit 51 in more detail, the second predetermined level is provided at a position lower than a maximum water level of the second water storage tank 5 by a predetermined level, such that the second water level detection unit 51, while the condensed water W is being discharged from the drain hose 7 to an outside by the drain pump 6, absorbs the condensed water W in spite of a backflow of the amount of a volume of the condensed water W contained in the drain hose 7, that is, the amount of a volume of the drain hose 7. In addition, an opening is provided at an upper surface of the second water storage tank 5 to discharge the inside air to an outside even if the condensed water W is introduced into the inside the second water storage tank 5. An air discharge pipe 52 is installed at the opening. The air discharge pipe 52 is installed so as to join the drain hose 7 at a position which is higher than the maximum water level of the second water storage tank 5.

[0024] The drain pump 6 has a capability to raise the condensed water W collected in the second water tank 5 by 3 meters, and to discharge the condensed water W to an outside. That is, when compared to the delivery pump 4, the drain pump 6 has a higher head and a larger flow rate. In detail, the delivery pump 4 has a head of about 0.5m and a flow rate of about 0.5L/min, while the drain pump 6 has a head of about 3m and a flow rate of about 10L/min.

[0025] The drain control unit is configured to control the operation of the delivery pump 4 and the drain pump 6, and is implemented using a computer or a microcomputer provided with input/output parts, for example, a central processing unit (CPU), a memory, and an A/D converter. In detail, the drain control unit is configured to operate the delivery pump 4 or the drain pump 6 for a first predetermined time in a case when the water level of the first water storage tank 3 is detected as the first predetermined water level by the first water level detection unit 31, such that the condensed water W is delivered from the first water storage tank 3 to the second water storage tank 5, and to operate the drain pump 6 for a second predetermined time in a case when the water level of the second water storage tank 5 is detected as a second predetermined water level by the second water level detection unit 51, such that the condensed water W is discharged from the second water storage tank 5 to an outside.

[0026] The first predetermined time represents a time taken for the water level of the first water storage tank 3 to change from the first predetermined water level to nearly zero as the delivery pump 4 is driven, and the first predetermined time may be set through an experiment. In addition, the second predetermined time represents a time taken for the water level of the second water storage tank 6 to change from the second predetermined water level to nearly zero as the drain pump 6 is driven, and the second predetermined time may be set through an experiment. As described above, the draining operation is controlled not on the basis of the water level measured when the delivery pump 4 and the drain pump 6 having been operated are stopped, but on the basis of the time of the operation of the delivery pump 4 and the drain pump 6. Accordingly, the condensed water W is effectively discharged in a simple configuration.

[0027] In addition, the drain control unit, upon starting of an initial operation of the dryer 100, is configured to drive the drain pump 6 for a third predetermined time regardless of the output of the first water level detection unit 31 and the output of the second water level detection unit 51. By driving the drain pump 6 for the third predetermined time at the starting of the initial operation of the dryer 100, the second water storage tank 5 empties the second water storage tank 5 to store a reasonable amount of condensed water W. Accordingly, both of the delivery pump 4 and the drain pump 6 are prevented from being driven due to the mismatch in a starting timing of the delivery pump 4 and the drain pump 6, thereby preventing the noise from occurring as both of the delivery pump 4 and the drain pump 6 are driven.

[0028] As described above, the dryer 100 in accordance with the first embodiment of the present disclosure, the condensed water W generated at the evaporator 13

is collected in the first water storage tank 3, which is installed at a lower side of the evaporator 13 and having a small size, by gravity without using a driving force. In addition, whenever the condensed water W is stored to the first predetermined water level in the first water storage tank 3, the condensed water W is delivered to the second water storage tank 5 by the delivery pump 4 having a small size and a small output to be added into a large amount, and the large amount of condensed water W is raised high to be discharged to an outside. That is, the condensed water W is not raised in small units, but is collected into a large amount in the second water storage tank 5 and is discharged, thereby reducing the number of operation times of the drain pump 6. Accordingly, the lifespan of the drain pump 6 is prevented from being decreased due to the frequent operation of the drain pump 6 while significantly reducing the noise of the drain pump 6 generated from the many of operation times of the drain pump 6.

[0029] In addition, the second water storage tank 5 has a large volume when compared to the first water storage tank 3, and has a capability to a large amount of condensed water W until the discharge, thereby significantly reducing the ratio of the volume of the condensed water W, which flows backward from a higher position to the second water storage tank 5 when the drain pump 6 is stopped, to the volume of the condensed water W, which is discharged at a single discharge, and also reducing the volume of the condensed water W making the dead volume. Accordingly, the drain hose 7 has an end opening at a higher position when compared to the conventional cloth dryer, and the condensed water W is effectively discharged to an outside even in a case when the condensed water W is needed to be raised to a high position to be discharged.

[0030] In addition, since the dryer 100 is provided with the first water storage tank 3 and the second water storage tank 5, the first water storage tank 3 is configured to be miniaturized so as to be installed at a small area suitable for collecting the condensed water W generated at the evaporator 13 while the second water storage tank 5 is configured to be as large as possible to store the condensed water W.

[0031] Accordingly, despite the limitation in installing a main member, such as the drum 14 or the housing inside the dryer 100, the first water storage tank 3 having a small size is installed. That is, the design flexibility of the first water storage tank 3 and the second water storage tank 5 are improved.

[0032] According to a modified example of the first embodiment, differently from the first embodiment of the present disclosure where the delivery pump 4 is driven only if the water level of the first water storage tank 3 reaches the first predetermined water level for a predetermined time, the delivery pump 4 may be driven at all times if the noise is small..

[0033] Hereinafter, a dryer 100 in accordance with the second embodiment of the present disclosure will be described. Identical elements as in the previous embodiment of the present disclosure have been designated by the same reference numerals.

[0034] As shown in FIG. 3, a drain mechanism of the dryer 100 in accordance with the second embodiment of the present disclosure has a first water storage tank 3 installed in a different manner from the first embodiment of the present disclosure. In detail, in the second embodiment of the present disclosure, the first water storage water tank 3 is integrally installed with a lower portion of the evaporator case 131, differently from the first embodiment of the present disclosure wherein the evaporator case 131 is separately installed from the first water storage tank 3.

[0035] According to the structure as above, the first water storage tank 3 is further miniaturized and the condensed water W is effectively collected. In addition, the integral installation of the first water storage tank 3 eliminates the need to install a pipe connecting the evaporator case 131 to the first water storage tank 3 or to install a seal configured to prevent water leakage, thereby assuring a simpler structure.

[0036] Hereinafter, a dryer 100 in accordance with the third embodiment of the present disclosure will be described. Identical elements as in the previous embodiment of the present disclosure have been designated by the same reference numerals.

[0037] A drain mechanism 200 of the dryer 100 in accordance with the third embodiment of the present disclosure is different from the first embodiment in a way that the delivery pump 4 is not installed, and by the use of the drain pump 5 only, the delivery from the first water storage tank 3 to the second water storage tank 5 and the discharge of the condensed water W to an outside are achieved.

[0038] That is, the drain mechanism 200 is provided with a conversion mechanism to convert between a first state, in which the drain pump 6 is connected to the second water storage tank 5 and the drain hose, and a second state, in which the drain pump 6 is connected to the first water storage tank 3 and the second water storage tank 5.

[0039] In detail, as shown in FIG. 4, the first water storage tank 3 is connected to the drain pump 6 and a lower portion of the second water storage tank 5 via a pipe through a first conversion valve 81 that is represented as a three-way valve. In addition, the drain pump 6 is connected to the other end of the drain hose 7 and to an upper portion of the second water storage tank 5 via a pipe through a second conversion valve 82. In addition, the drain control unit is configured to control the conversion of the connection of each member by controlling the direction of the first conversion valve 81 and the second conversion valve 82.

[0040] The drain control unit, if the first water storage tank 3 reaches the first predetermined water level and the condensed water W is delivered from the first water storage tank 3 to the second water storage tank 5 as

shown in (a) of FIG. 4, controls the first conversion valve 81 such that the first water storage tank 3 is communicated with the drain pump 6 while the pipe directed toward the second water storage tank 5 is closed. In addition, as shown in (b) of FIG. 4, the drain control unit controls the second conversion valve 82 such that the drain pump 6 is communicated with the second water storage tank 5 while the pipe directed toward the drain hose 7 is closed. Thereafter, the drain control unit operates the drain pump 6.

[0041] The drain control unit, if the condensed water W is delivered from the second water storage tank 5 to the outside through the drain hose 7, controls the first conversion valve 81 such that the second water storage tank 5 is communicated with the drain pump 6 and the pipe directed toward the first water storage tank 3, and controls the second conversion valve 82 such that the drain pump 6 is communicated with the drain hose 7 while the pipe directed toward to the second water storage tank 5 is closed. Thereafter, the drain control unit discharges the condensed water W to an outside by operating the drain pump 6.

[0042] According to the dryer 100 in accordance with the present disclosure, the delivery from the first water storage tank 3 to the second water storage tank 5 and the discharge of the condensed water W to an outside from the second water storage tank 5 are performed while reducing the number of pumps.

[0043] Hereinafter, other embodiments of the present disclosure will be described. The drain hose has been provided as a drain passage to discharge the condensed water W from the second water storage tank to an outside, but according to another embodiment of the present disclosure, a drain pipe may be implemented as the drain passage.

[0044] In addition, the shape of the first water storage tank and the second storage tank is not limited thereto, and may be alternately modified depending on the disposition of the drum or the evaporator as long as the volume of the second water storage tank is configured to be larger than the volume of the first water storage tank.

[0045] Although a few embodiments of the present disclosure have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles of the disclosure, the scope of which is defined in the claims and their equivalents.

Claims

1. A dryer (100) provided with a heat pump cycle having a compressor, a condenser (12) and an evaporator (13); and a blower passage (2) to allow an air stream to pass in an order of the condenser, a drum (14) to accommodate clothes to be dried, and the evaporator, the dryer comprising:
   a first water storage tank (3) configured to store condensed water generated as the air stream passes through the evaporator;
   a second water storage tank (5) connected to the first water storage tank, having a capacity larger than a capacity of the first water storage tank, and configured to store the condensed water transferred from the first water storage tank;
   a drain pipe (7) having one end opening to the outside of the dryer at a position higher than the second water storage tank;
   a drain pump (6) connected to the second water storage tank and the other end of the drain pipe, and configured to discharge the condensed water stored in the second water storage tank through the other end of the drain pipe to the outside of the dryer;
   a second water level detection unit (51) configured to detect a water level of the second water storage tank; and
   a drain control unit configured to operate the drain pump for a predetermined time in a case when the water level of the second water storage tank is detected as a second predetermined water level by the second water level detection unit, such that the condensed water is discharged from the second water storage tank to the outside of the dryer; wherein
   the second predetermined water level is set to be lower than a highest water level of the second storage tank by a water level corresponding to a volume of the drain pipe.

2. The dryer (100) of claim 1, wherein the first water storage tank (3) is integrally installed with a lower portion of an evaporator case (131) that accommodates the evaporator (13).

3. The dryer (100) of claim 1 or 2, further comprising a delivery pump (4) arranged to deliver the condensed water from the first water storage tank (3) to the second water storage tank (5).

4. The dryer (100) of claim 3, wherein the drain pump (6) has a higher head and a large flow rate when compared to the delivery pump (4).

5. The dryer (100) of claim 1 or claim 2, further comprising a converter mechanism configured to convert between a first state, in which the drain pump (6) is connected to the second water storage tank (5) and the drain pipe (7), and a second state, in which the drain pump is connected to the first water storage tank (3) and the second water storage tank.

6. The dryer (100) of any one of claims 1 to 5, further comprising:

a first water level detection unit (31) configured to detect a water level of the first water storage tank (3); and wherein
the drain control unit is configured to operate the drain pump (6) for a first predetermined time in a case when the water level of the first water storage tank is detected as a first predetermined water level by the first water level detection unit, such that the condensed water is delivered from the first water storage tank to the second water storage tank.

7. The dryer (100) of any one of the preceding claims, wherein the drain control unit, upon starting of an initial operation of the dryer, is configured to operate the drain pump (6) for a third predetermined time regardless of an output of the second water level detection unit (51).

8. The dryer (100) of claim 3 or claim 4, further comprising:

a first water level detection unit (31) configured to detect a water level of the first water storage tank (3);
and wherein
the drain control unit is configured to operate the delivery pump (4) for a first predetermined time in a case when the water level of the first water storage tank is detected as a first predetermined water level by the first water level detection unit, such that the condensed water is delivered from the first water storage tank to the second water storage tank.

9. The dryer (100) of any one of claims 1 to 8, wherein the second water storage tank (5) has an air discharge pipe (52).

10. The dryer (100) of claim 9, wherein the air discharge pipe (52) is connected to the drain pipe (7) at a position higher than a highest water level of the second water storage tank (5).

Patentansprüche

1. Wäschetrockner (100), der mit einem Wärmepumpenzyklus mit einem Kompressor, einem Kondensator (12) und einem Verdampfer (13); und einen Gebläsedurchgang (2) versehen ist, um einem Luftstrom zu ermöglichen, in einer Reihenfolge des Kondensators, einer Trommel (14) zum Aufnehmen zu trocknender Wäsche, und den Verdampfer zu durchlaufen, wobei der Wäschetrockner umfasst:

einen ersten Wasservorratstank (3), der konfiguriert ist, Kondenswasser zu speichern, das beim Durchlauf des Luftstroms durch den Verdampfer erzeugt wird;
einen zweiten Wasservorratstank (5), der mit dem ersten Wasservorratstank verbunden ist, mit einem Fassungsvermögen, das größer als ein Fassungsvermögen des ersten Wasservorratstanks ist, und konfiguriert ist, das aus dem ersten Wasservorratstank transferierte Kondenswasser zu speichern;
ein Ablaufrohr (7) wovon sich ein Ende zur Außenseite des Wäschetrockners in einer Position öffnet, die höher als der zweite Wasservorratstank ist;
eine Ablaufpumpe (6), die mit dem zweiten Wasservorratstank und dem anderen Ende des Ablaufrohrs verbunden ist, und konfiguriert ist, das im zweiten Wasservorratstank gespeicherte Kondenswasser durch das andere Ende des Ablaufrohrs zur Außenseite des Wäschetrockners zu entleeren;
eine zweite Detektionseinheit (51) für Wasserstand, die konfiguriert ist, einen Wasserstand im zweiten Wasservorratstank zu detektieren; und
eine Ablaufregeleinheit, die konfiguriert ist, die Ablaufpumpe für eine vorbestimmte Zeit in einem Fall zu betreiben, wenn der Wasserstand des zweiten Wasservorratstanks von der zweiten Detektionseinheit für Wasserstand als ein zweiter vorbestimmter Wasserstand detektiert wird, derart, dass das Kondenswasser aus dem zweiten Wasservorratstank zur Außenseite des Wäschetrockners entleert wird; wobei
der zweite vorbestimmte Wasserstand eingestellt wird, niedriger als ein höchster Wasserstand des zweiten Vorratstanks um einen Wasserstand zu sein, der einem Volumen des Ablaufrohrs entspricht.

2. Wäschetrockner (100) nach Anspruch 1, wobei der erste Wasservorratstank (3) integral mit einem unteren Teil eines Verdampfergehäuses (131) installiert ist, das den Verdampfer (13) aufnimmt.

3. Wäschetrockner (100) nach Anspruch 1 oder 2, der ferner eine Förderpumpe (4) umfasst, die eingerichtet ist, das Kondenswasser vom ersten Wasservorratstank (3) zum zweiten Wasservorratstank (5) zu fördern.

4. Wäschetrockner (100) nach Anspruch 3, wobei die Ablaufpumpe (6) einen höhere Förderhöhe und eine größere Durchflussmenge im Vergleich zur Förderpumpe (4) aufweist.

5. Wäschetrockner (100) nach Anspruch 1 oder Anspruch 2, der ferner einen Wandlermechanismus umfasst, der konfiguriert ist, zwischen einem ersten Zustand, in dem die Ablaufpumpe (6) mit dem zwei-

ten Wasservorratstank (5) und dem Ablaufrohr (7) verbunden ist, und einem zweiten Zustand umzuwandeln, in dem die Ablaufpumpe mit dem ersten Wasservorratstank (3) und dem zweiten Wasservorratstank verbunden ist.

6. Wäschetrockner (100) nach einem der Ansprüche 1 bis 5, ferner umfassend:

eine erste Detektionseinheit (31) für Wasserstand, die konfiguriert ist, einen Wasserstand im ersten Wasservorratstank (3) zu detektieren; und wobei
die Ablaufregeleinheit konfiguriert ist, die Ablaufpumpe (6) für eine erste vorbestimmte Zeit in einem Fall zu betreiben, wenn der Wasserstand des ersten Wasservorratstanks von der ersten Detektionseinheit für Wasserstand als ein erster vorbestimmter Wasserstand detektiert wird, derart, dass das Kondenswasser aus dem ersten Wasservorratstank zum zweiten Wasservorratstank gefördert wird.

7. Wäschetrockner (100) nach einem der vorhergehenden Ansprüche, wobei die Ablaufregeleinheit, nach dem Starten eines anfänglichen Arbeitsablaufs des Wäschetrockners, konfiguriert ist, die Ablaufpumpe (6) für eine dritte vorbestimmte Zeit, ungeachtet einer Ausgabe der zweiten Detektionseinheit (51) für Wasserstand, zu betreiben.

8. Wäschetrockner (100) nach Anspruch 3 oder Anspruch 4, ferner umfassend:

eine erste Detektionseinheit (31) für Wasserstand, die konfiguriert ist, einen Wasserstand des ersten Wasservorratstanks (3) zu detektieren;
und wobei
die Ablaufregeleinheit konfiguriert ist, die Förderpumpe (4) für eine erste vorbestimmte Zeit in einem Fall zu betreiben, wenn der Wasserstand des ersten Wasservorratstanks von der ersten Detektionseinheit für Wasserstand als ein erster vorbestimmter Wasserstand detektiert wird, derart, dass das Kondenswasser aus dem ersten Wasservorratstank zum zweiten Wasservorratstank gefördert wird.

9. Wäschetrockner (100) nach einem der Ansprüche 1 bis 8, wobei der zweite Wasservorratstank (5) ein Luft-Entlüftungsrohr (52) aufweist.

10. Wäschetrockner (100) nach Anspruch 9, wobei das Luft-Entlüftungsrohr (52) mit dem Ablaufrohr (7) in einer Position verbunden ist, die höher als ein Höchstwasserstand des zweiten Wasservorratstanks (5) ist.

Revendications

1. Sèche-linge (100) comportant un cycle de pompe à chaleur ayant un compresseur, un condenseur (12) et un évaporateur (13) ; et un passage de soufflante (2) permettant à un flux d'air de passer selon un ordre au travers du condenseur, d'un tambour (14) servant à recevoir des vêtements devant être séchés, et de l'évaporateur, le sèche-linge comportant :

un premier réservoir de stockage d'eau (3) configuré pour stocker de l'eau condensée générée au fur et à mesure que le flux d'air passe au travers de l'évaporateur ;
un deuxième réservoir de stockage d'eau (5) raccordé au premier réservoir de stockage d'eau, ayant une capacité supérieure à une capacité du premier réservoir de stockage d'eau, et configuré pour stocker l'eau condensée transférée en provenance du premier réservoir de stockage d'eau ;
un tuyau de vidange (7) ayant une extrémité s'ouvrant vers l'extérieur du sèche-linge au niveau d'une position supérieure par rapport au deuxième réservoir de stockage d'eau ;
une pompe de vidange (6) raccordée au deuxième réservoir de stockage d'eau et à l'autre extrémité du tuyau de vidange, et configurée pour décharger l'eau condensée stockée dans le deuxième réservoir de stockage d'eau au travers de l'autre extrémité du tuyau de vidange jusqu'à l'extérieur du sèche-linge ;
une deuxième unité de détection de niveau d'eau (51) configurée pour détecter un niveau d'eau du deuxième réservoir de stockage d'eau ; et
une unité de commande de vidange configurée pour actionner la pompe de vidange pendant une durée prédéterminée dans un cas de figure où le niveau d'eau du deuxième réservoir de stockage d'eau est détecté comme étant un deuxième niveau d'eau prédéterminé par la deuxième unité de détection de niveau d'eau, de telle sorte que l'eau condensée est déchargée du deuxième réservoir de stockage d'eau jusqu'à l'extérieur du sèche-linge ; dans lequel le deuxième niveau d'eau prédéterminé est réglé pour être inférieur à un niveau d'eau le plus élevé du deuxième réservoir de stockage selon un niveau d'eau correspondant à un volume du tuyau de vidange.

2. Sèche-linge (100) selon la revendication 1, dans lequel le premier réservoir de stockage d'eau (3) est installé d'une seule pièce avec une partie inférieure d'un caisson d'évaporateur (131) qui loge l'évaporateur (13).

3. Sèche-linge (100) selon la revendication 1 ou la revendication 2, comportant par ailleurs une pompe d'alimentation (4) agencée pour alimenter l'eau condensée depuis le premier réservoir de stockage d'eau (3) jusqu'au deuxième réservoir de stockage d'eau (5).

4. Sèche-linge (100) selon la revendication 3, dans lequel la pompe de vidange (6) a une hauteur d'élévation supérieure et un débit d'écoulement élevé par rapport à la pompe d'alimentation (4).

5. Sèche-linge (100) selon la revendication 1 ou la revendication 2, comportant par ailleurs un mécanisme convertisseur configuré pour convertir entre un premier état, dans lequel la pompe de vidange (6) est raccordée au deuxième réservoir de stockage d'eau (5) et au tuyau de vidange (7), et un deuxième état, dans lequel la pompe de vidange est raccordée au premier réservoir de stockage d'eau (3) et au deuxième réservoir de stockage d'eau.

6. Sèche-linge (100) selon l'une quelconque des revendications 1 à 5, comportant par ailleurs :

une première unité de détection de niveau d'eau (31) configurée pour détecter un niveau d'eau du premier réservoir de stockage d'eau (3) ; et dans lequel
l'unité de commande de vidange est configurée pour actionner la pompe de vidange (6) pendant une première durée prédéterminée dans un cas de figure où le niveau d'eau du premier réservoir de stockage d'eau est détecté comme étant un premier niveau d'eau prédéterminé par la première unité de détection de niveau d'eau, de telle sorte que l'eau condensée est alimentée depuis le premier réservoir de stockage d'eau jusqu'au deuxième réservoir de stockage d'eau.

7. Sèche-linge (100) selon l'une quelconque des revendications précédentes, dans lequel l'unité de commande de vidange, lors du démarrage d'un fonctionnement initial du sèche-linge, est configurée pour actionner la pompe de vidange (6) pendant une troisième durée prédéterminée indépendamment d'une sortie de la deuxième unité de détection de niveau d'eau (51).

8. Sèche-linge (100) selon la revendication 3 ou la revendication 4, comportant par ailleurs :

une première unité de détection de niveau d'eau (31) configurée pour détecter un niveau d'eau du premier réservoir de stockage d'eau (3) ;
et dans lequel
l'unité de commande de vidange est configurée pour actionner la pompe d'alimentation (4) pendant une première durée prédéterminée dans un cas de figure où le niveau d'eau du premier réservoir de stockage d'eau est détecté comme étant un premier niveau d'eau prédéterminé par la première unité de détection de niveau d'eau, de telle sorte que l'eau condensée est alimentée depuis le premier réservoir de stockage d'eau jusqu'au deuxième réservoir de stockage d'eau.

9. Sèche-linge (100) selon l'une quelconque des revendications 1 à 8, dans lequel le deuxième réservoir de stockage d'eau (5) a une tuyau d'évacuation d'air (52).

10. Sèche-linge (100) selon la revendication 9, dans lequel le tuyau d'évacuation d'air (52) est raccordé au tuyau de vidange (7) au niveau d'une position supérieure à un niveau d'eau le plus élevé du deuxième réservoir de stockage d'eau (5).

FIG. 1

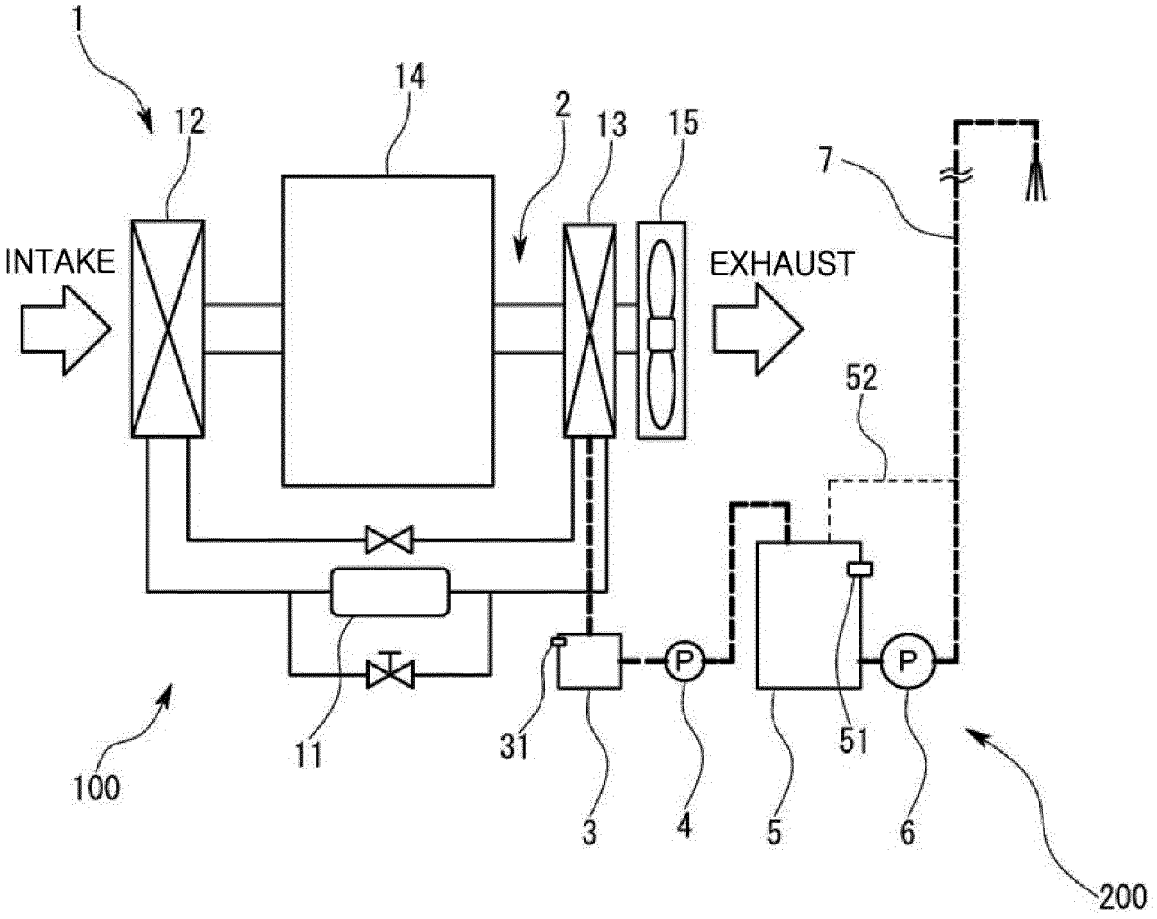


FIG. 2

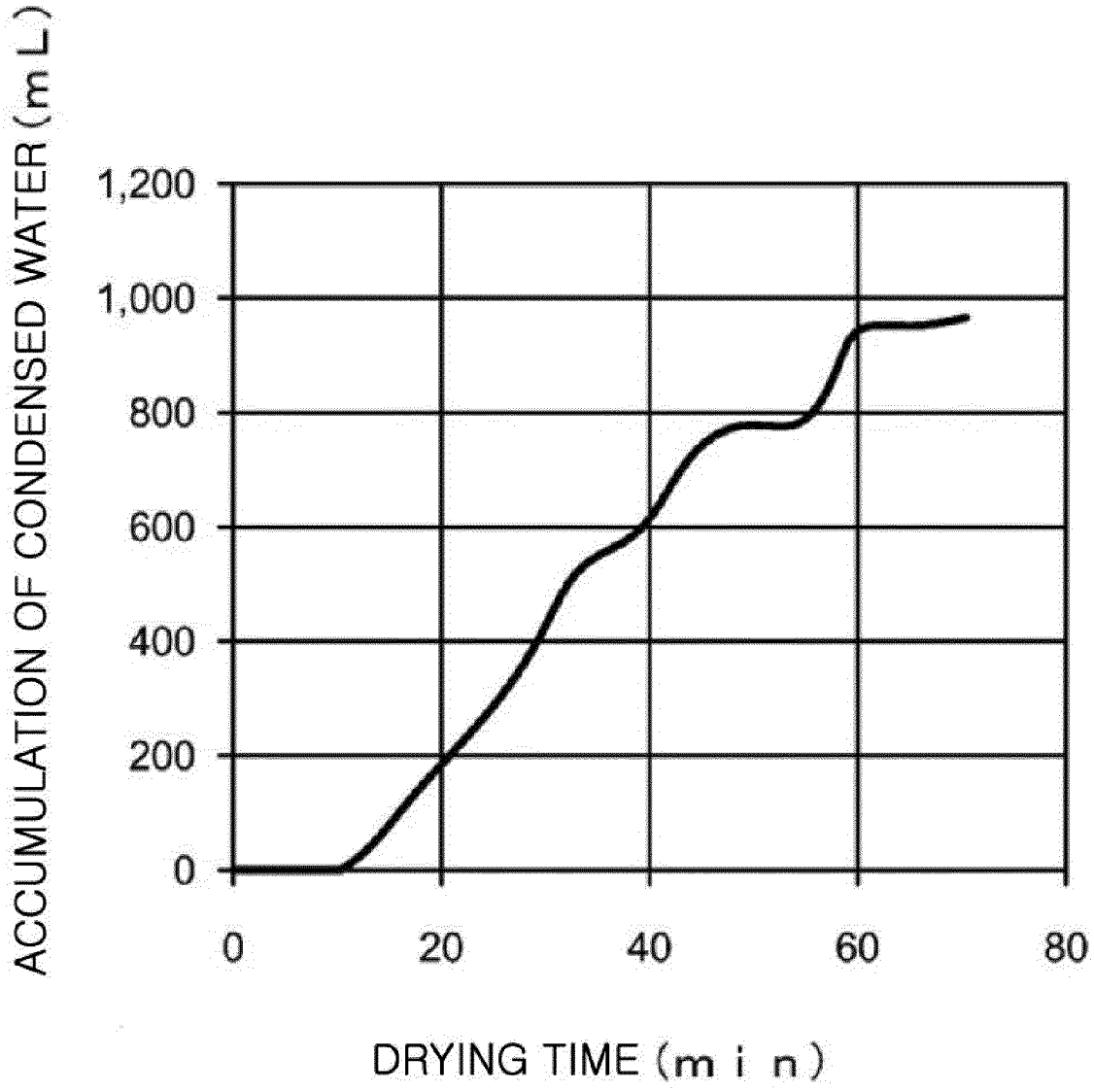

ACCUMULATION OF CONDENSED WATER (mL)
1,200
1,000
800
600
400
200
0
0
20
40
60
80
DRYING TIME (min)

FIG. 3

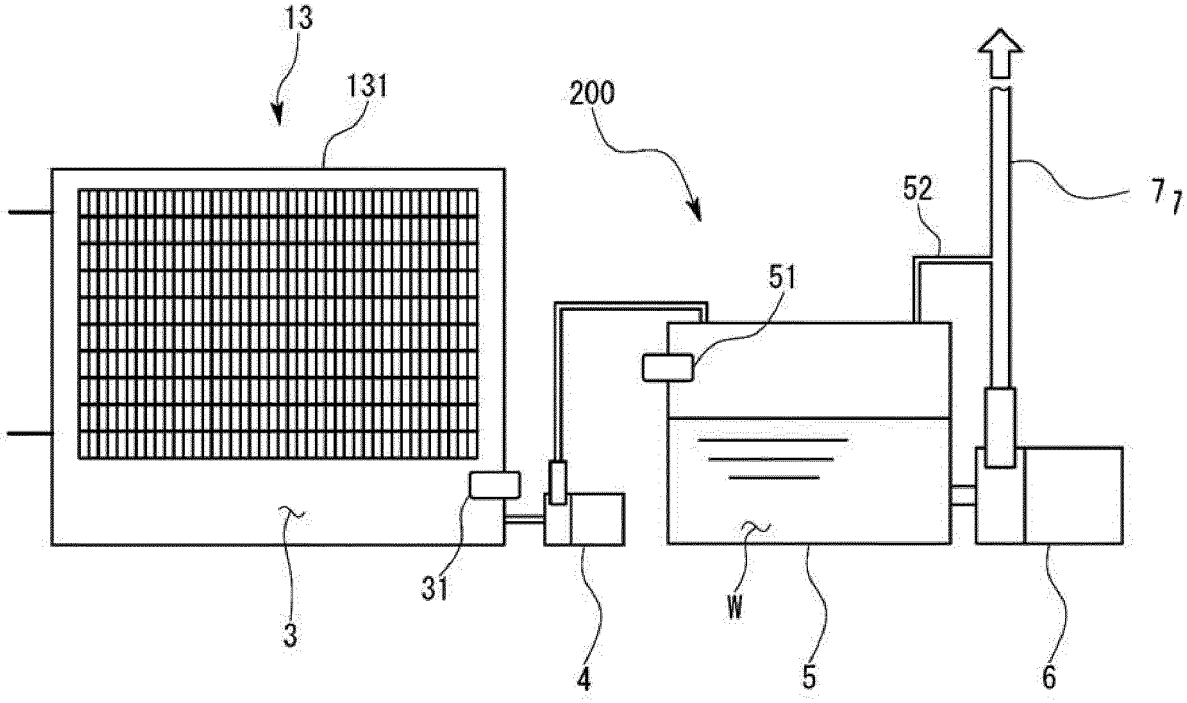


FIG. 4A

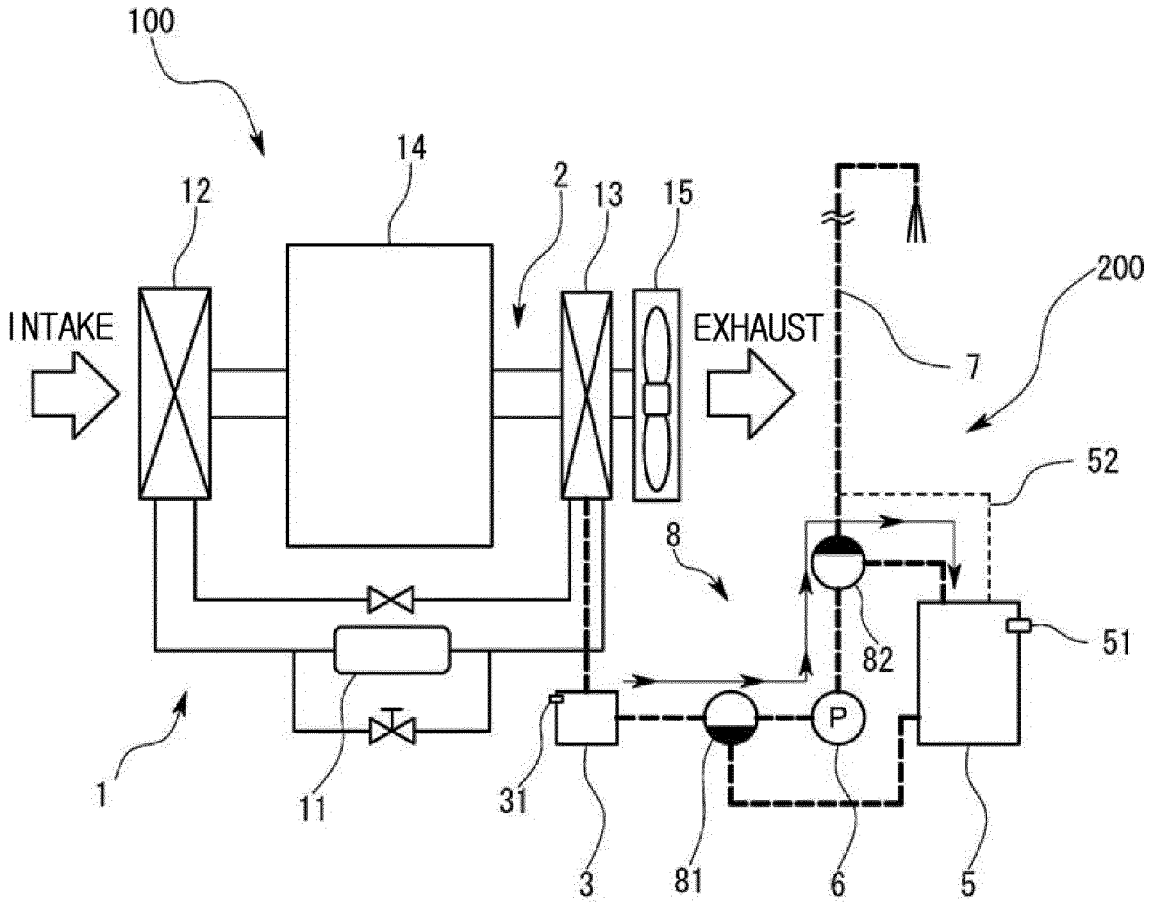


FIG. 4B

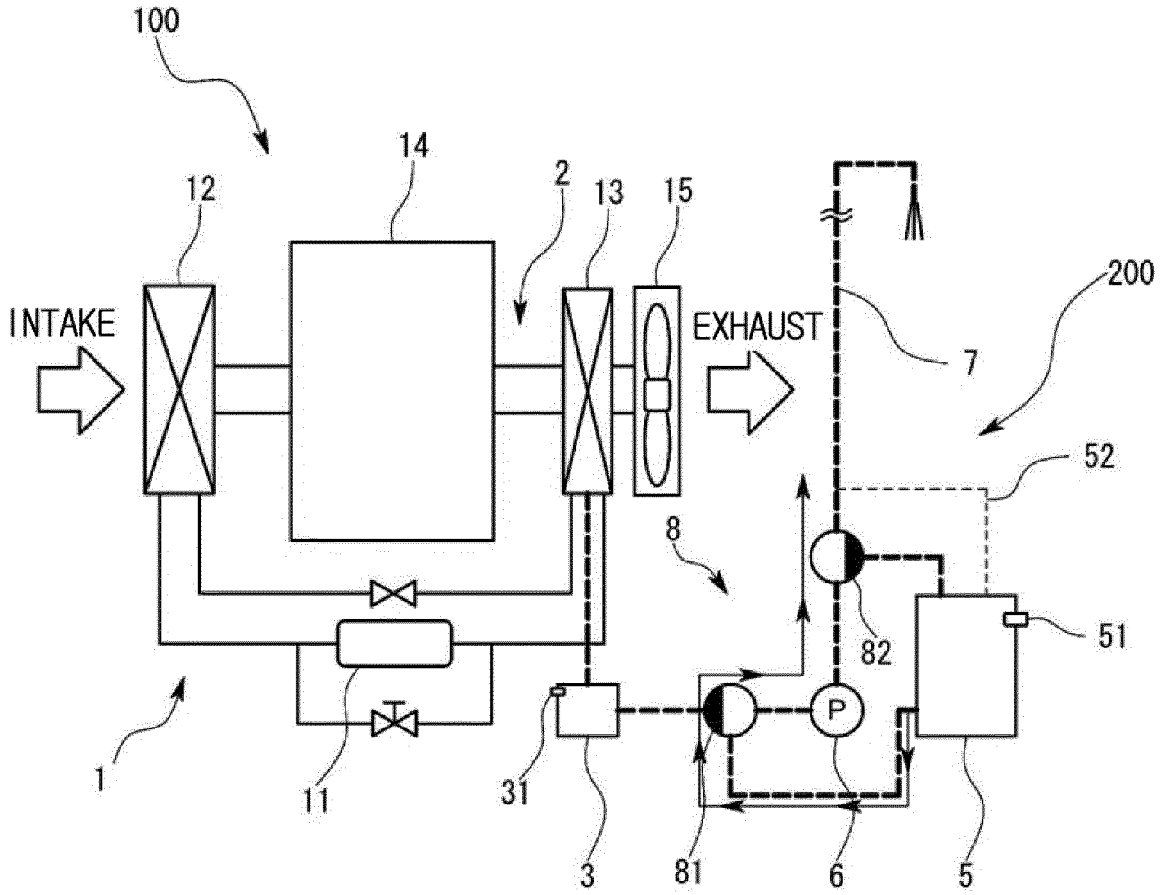


FIG. 5

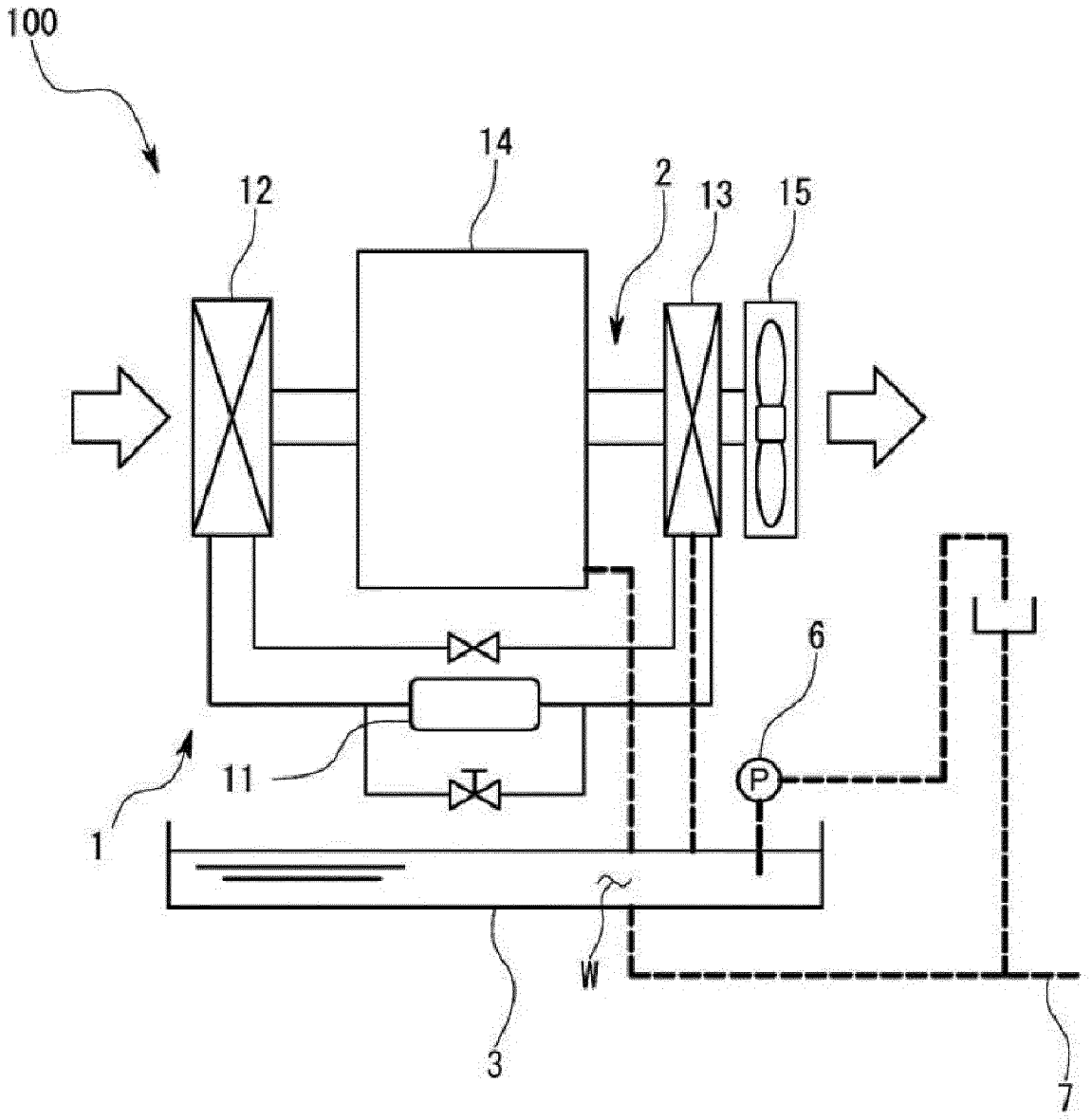


FIG. 6A

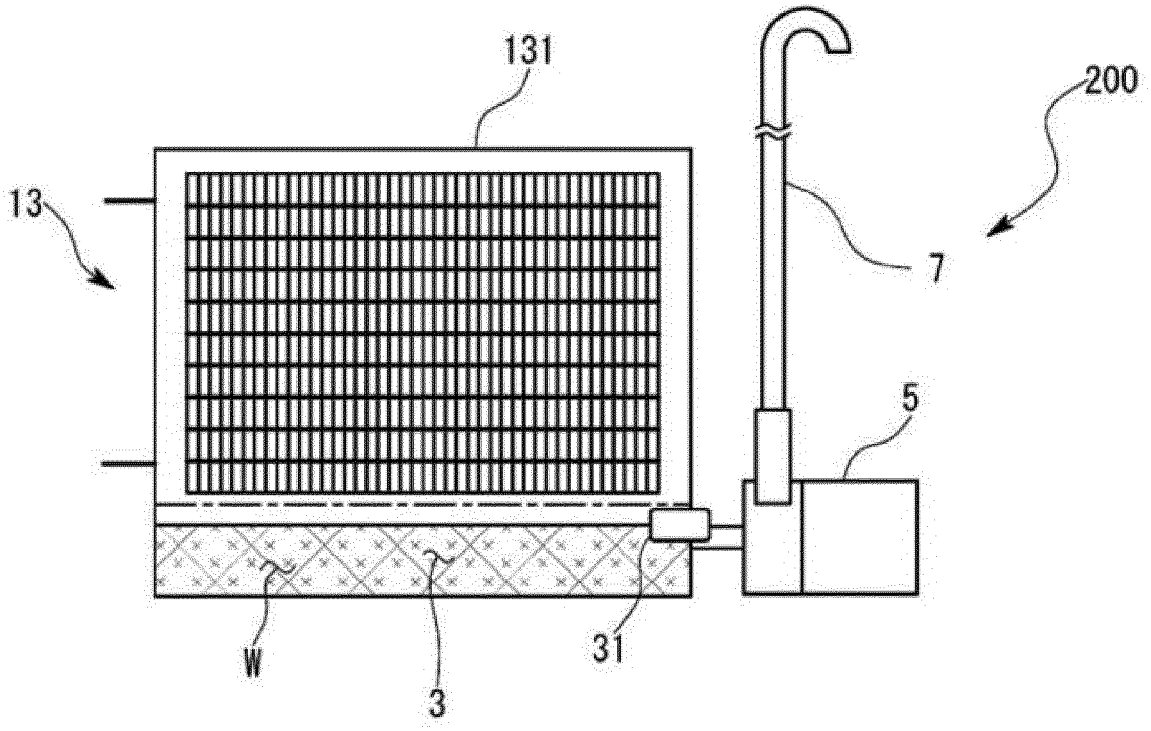


FIG. 6B

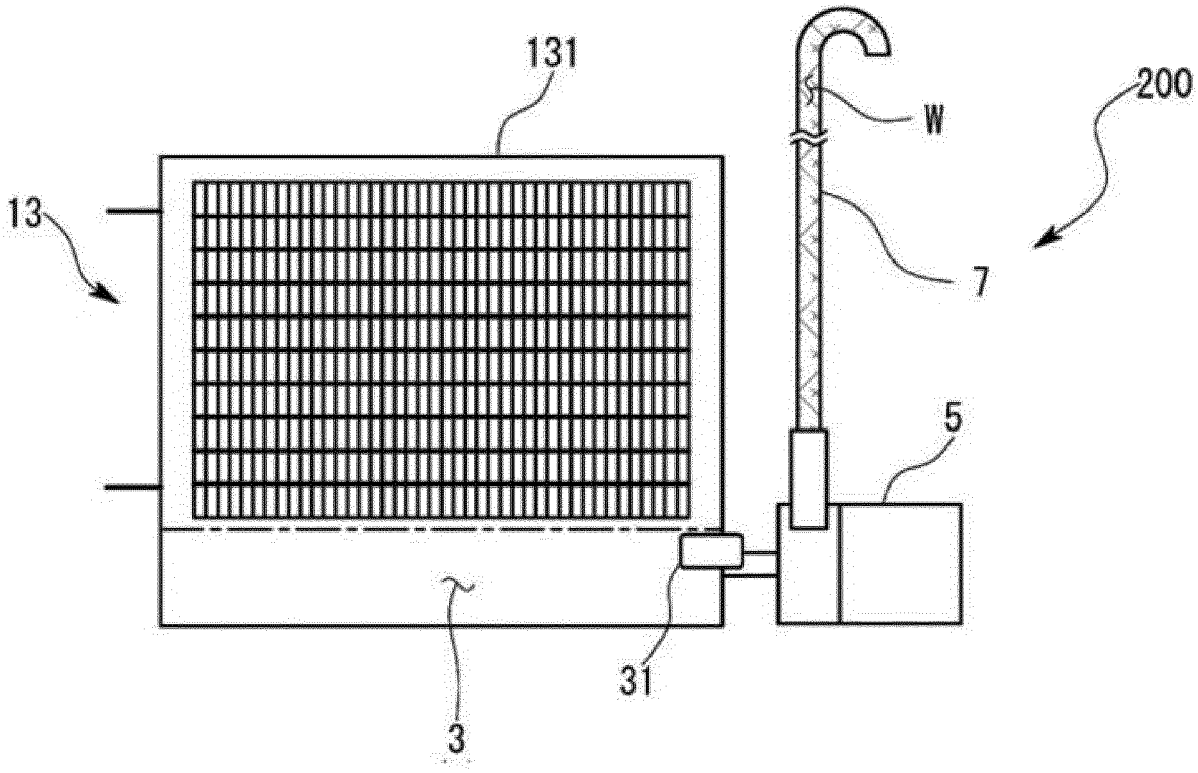
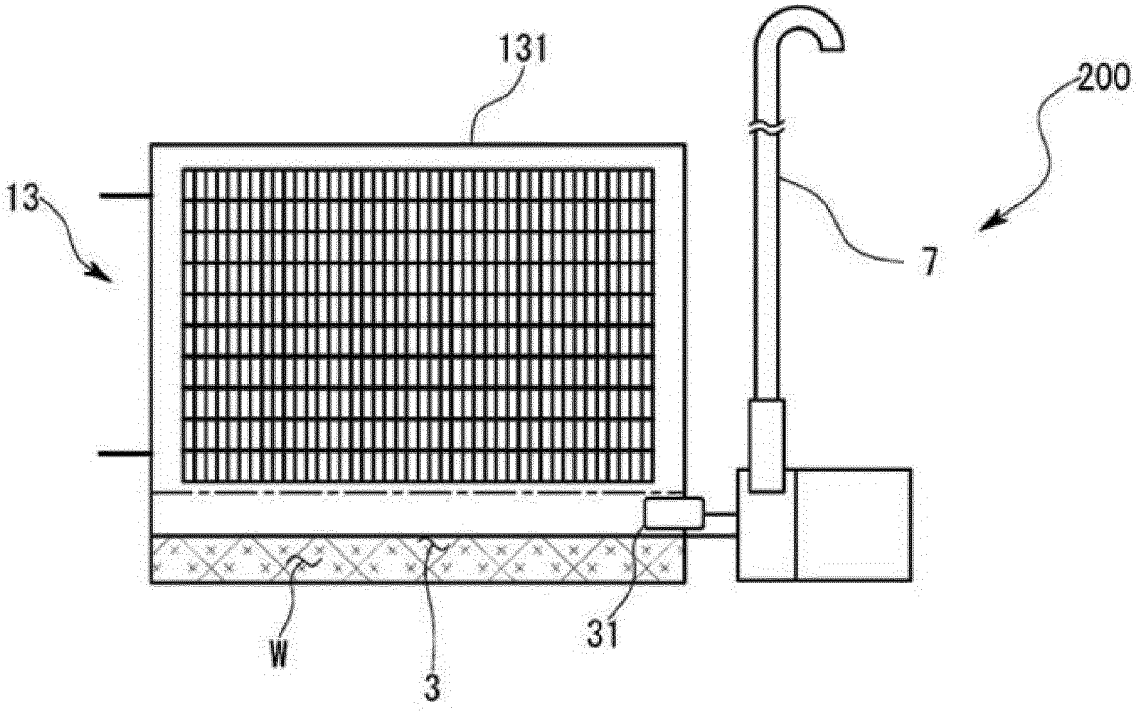


FIG. 6C



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006087672 A **[0005] [0006]**
- DE 102008041832 **[0009]**