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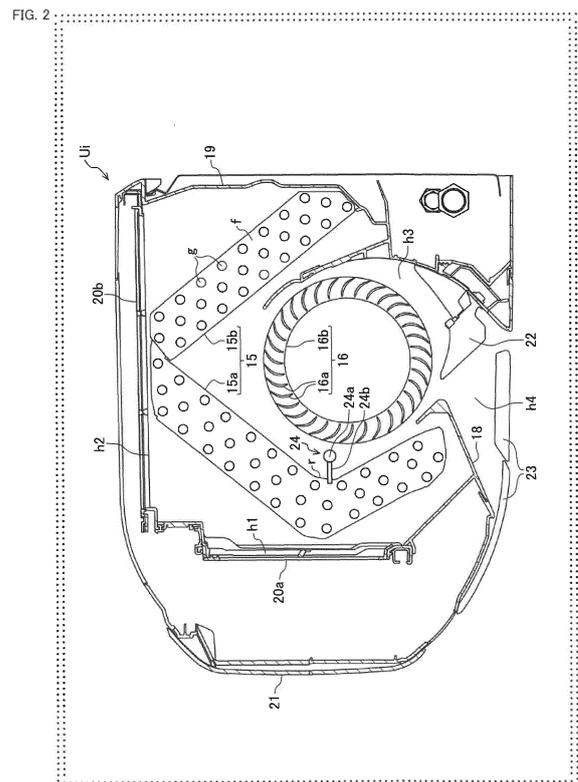
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(54) **AIR CONDITIONER**

(57) Provided is an air-conditioner configured to clean a fan and a heat exchanger. The air-conditioner includes an indoor heat exchanger (15), an indoor fan (16), a fan cleaning section (24) configured to clean the indoor fan (16), and a control section configured to control at least the indoor fan (16) and the fan cleaning section (24). The control section causes, after cleaning of the indoor fan (26) by the fan cleaning section (24), the indoor heat exchanger (15) to function as an evaporator to freeze or form dew on the indoor heat exchanger (15).



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Description

TECHNICAL FIELD

[0001] The present invention relates to an air-conditioner.

BACKGROUND ART

[0002] For example, Patent Literature 1 describes, as the technique of cleaning an indoor fan of an air-conditioner, one including a fan cleaning device for removing dust on a fan.

CITATION LIST

PATENT LITERATURE

[0003] PATENT LITERATURE 1: Japanese Patent No. 4046755

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] As described above, Patent Literature 1 describes the configuration for cleaning the indoor fan (the fan). However, on the other hand, Patent Literature 1 fails to describe a configuration for washing an indoor heat exchanger (a heat exchanger). That is, both of the indoor fan and the indoor heat exchanger are preferably brought into a clean state, but such a configuration is not described in Patent Literature 1.

[0005] For this reason, the present invention is intended to provide an air-conditioner configured to clean a fan and a heat exchanger.

SOLUTIONS TO THE PROBLEMS

[0006] In order to solve the above-described problem, an air-conditioner according to the present invention includes: a heat exchanger; a fan; a fan cleaning section configured to clean the fan; and a control section configured to control at least the fan and the fan cleaning section. The control section causes, after cleaning of the fan by the fan cleaning section, the heat exchanger to function as an evaporator to freeze or form dew on the heat exchanger.

EFFECTS OF THE INVENTION

[0007] According to the present invention, the air-conditioner configured to clean the fan and the heat exchanger can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a configuration diagram of an air-conditioner according to a first embodiment of the present invention.

Fig. 2 is a longitudinal sectional view of an indoor unit included in the air-conditioner according to the first embodiment of the present invention.

Fig. 3 is a partially-cutout perspective view of the indoor unit included in the air-conditioner according to the first embodiment of the present invention.

Fig. 4 is a functional block diagram of the air-conditioner according to the first embodiment of the present invention.

Fig. 5 is a flowchart of processing executed by a control section of the air-conditioner according to the first embodiment of the present invention.

Fig. 6A is a view for describing a state during cleaning of an indoor fan in the air-conditioner according to the first embodiment of the present invention.

Fig. 6B is a view for describing a state during defrosting of an indoor heat exchanger in the air-conditioner according to the first embodiment of the present invention.

Fig. 7 is a flowchart of processing executed by a control section of an air-conditioner according to a second embodiment of the present invention.

Fig. 8 is a time chart regarding operation states of a compressor and an indoor fan in the air-conditioner according to the second embodiment of the present invention.

Fig. 9 is a perspective view of filters and a filter cleaning section included in an indoor unit of an air-conditioner according to a third embodiment of the present invention.

Fig. 10 is a flowchart of processing executed by a control section of an air-conditioner according to a third embodiment of the present invention.

Fig. 11 is a time chart regarding cleaning of an indoor fan and washing of an indoor heat exchanger in an air-conditioner according to a fourth embodiment of the present invention.

Fig. 12 is a flowchart of the processing of setting the frequency of cleaning of the indoor fan and the frequency of washing of the indoor heat exchanger in the air-conditioner according to the fourth embodiment of the present invention.

Fig. 13 is a flowchart of processing regarding cancellation of cleaning of an indoor fan and washing of an indoor heat exchanger in an air-conditioner according to a fifth embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

<<First Embodiment>>

<Configuration of Air-Conditioner>

[0009] Fig. 1 is a configuration diagram of an air-con-

ditioner 100 according to a first embodiment.

[0010] Note that solid arrows in Fig. 1 indicate the flow of refrigerant in air-heating operation.

[0011] On the other hand, dashed arrows in Fig. 1 indicate the flow of refrigerant in air-cooling operation.

[0012] Moreover, in Fig. 1, e.g., a later-described fan cleaning section 24 (see Fig. 2) and a later-described control section 30 (see Fig. 4) are not shown.

[0013] The air-conditioner 100 is equipment configured to perform air-conditioning such as the air-heating operation or the air-cooling operation. As illustrated in Fig. 1, the air-conditioner 100 includes a compressor 11, an outdoor heat exchanger 12, an outdoor fan 13, and an expansion valve 14. Moreover, the air-conditioner 100 includes, in addition to the above-described configurations, an indoor heat exchanger 15 (a heat exchanger), an indoor fan 16 (a fan), and a four-way valve 17.

[0014] The compressor 11 is equipment configured to compress low-temperature low-pressure gas refrigerant to discharge high-temperature high-pressure gas refrigerant, and includes a compressor motor 11a as a drive source.

[0015] The outdoor heat exchanger 12 is a heat exchanger configured to exchange heat between refrigerant flowing in a heat transfer pipe (not shown) of the heat exchanger and external air sent from the outdoor fan 13.

[0016] The outdoor fan 13 is a fan configured to send the external air into the outdoor heat exchanger 12. The outdoor fan 13 includes an outdoor fan motor 13a as a drive source, and is arranged in the vicinity of the outdoor heat exchanger 12.

[0017] The expansion valve 14 is a valve configured to depressurize refrigerant condensed in a "condenser" (one of the outdoor heat exchanger 12 or the indoor heat exchanger 15). Note that the refrigerant depressurized in the expansion valve 14 is guided to an "evaporator" (the other one of the outdoor heat exchanger 12 or the indoor heat exchanger 15).

[0018] The indoor heat exchanger 15 is a heat exchanger configured to exchange heat between refrigerant flowing in a heat transfer pipe g (see Fig. 2) of the heat exchanger and indoor air (air in an air-conditioning target space) sent from the indoor fan 16.

[0019] The indoor fan 16 is a fan configured to send the indoor air into the indoor heat exchanger 15. The indoor fan 16 has an indoor fan motor 16c (see Fig. 4) as a drive source, and is arranged in the vicinity of the indoor heat exchanger 15.

[0020] The four-way valve 17 is a valve configured to switch a refrigerant flow path according to an operation mode of the air-conditioner 100. For example, in the air-cooling operation (see the dashed arrows in Fig. 1), in a refrigerant circuit Q in which the compressor 11, the outdoor heat exchanger 12 (the condenser), the expansion valve 14, and the indoor heat exchanger 15 (the evaporator) are sequentially connected to each other through the four-way valve 17, refrigerant circulates in a refrigeration cycle.

[0021] On the other hand, in the air-heating operation (see the solid arrows in Fig. 1), in the refrigerant circuit Q in which the compressor 11, the indoor heat exchanger 15 (the condenser), the expansion valve 14, and the outdoor heat exchanger 12 (the evaporator) are sequentially connected to each other through the four-way valve 17, refrigerant circulates in the refrigeration cycle.

[0022] That is, in the refrigerant circuit Q in which refrigerant sequentially circulates through the compressor 11, the "condenser," the expansion valve 14, and the "evaporator," one of the "condenser" or the "evaporator" as described above is the outdoor heat exchanger 12, and the other one of the "condenser" or the "evaporator" is the indoor heat exchanger 15.

[0023] Note that in an example illustrated in Fig. 1, the compressor 11, the outdoor heat exchanger 12, the outdoor fan 13, the expansion valve 14, and the four-way valve 17 are placed in an outdoor unit Uo. On the other hand, the indoor heat exchanger 15 and the indoor fan 16 are placed in an indoor unit Ui.

[0024] Fig. 2 is a longitudinal sectional view of the indoor unit Ui.

[0025] Note that Fig. 2 illustrates a state in which cleaning of the indoor fan 16 by the fan cleaning section 24 is not performed.

[0026] In addition to the indoor heat exchanger 15 and the indoor fan 16 as described above, the indoor unit Ui includes a drain pan 18, a housing base 19, filters 20a, 20b, a front panel 21, a right-left wind deflector 22, an upper-lower wind deflector 23, and the fan cleaning section 24.

[0027] The indoor heat exchanger 15 includes multiple fins f and the multiple heat transfer pipes g penetrating these fins f. Moreover, from another point of view, the indoor heat exchanger 15 includes a front indoor heat exchanger 15a arranged on a front side of the indoor fan 16, and a back indoor heat exchanger 15b arranged on a back side of the indoor fan 16. As illustrated in Fig. 2, an upper end portion of the front indoor heat exchanger 15a and an upper end portion of the back indoor heat exchanger 15b are connected to each other in an inverted V-shape.

[0028] The indoor fan 16 is, for example, a cylindrical cross-flow fan, and is arranged in the vicinity of the indoor heat exchanger 15. The indoor fan 16 includes multiple fan blades 16a, a partition plate 16b on which these fan blades 16a are placed, and the indoor fan motor 16c (see Fig. 4) as the drive source.

[0029] The drain pan 18 is configured to receive condensed water from the indoor heat exchanger 15, and is arranged below the indoor heat exchanger 15 (in an example illustrated in Fig. 2, the front indoor heat exchanger 15a).

[0030] The housing base 19 is a housing in which equipment such as the indoor heat exchanger 15 and the indoor fan 16 is placed.

[0031] The filters 20a, 20b are configured to collect dust from air flowing toward the indoor heat exchanger

15 in association with drive of the indoor fan 16. One filter 20a is arranged on the front side of the indoor heat exchanger 15, and the other filter 20b is arranged on an upper side of the indoor heat exchanger 15.

[0032] The front panel 21 is a panel placed to cover the front filter 20a, and is turnable forward about a lower end as an axis. Note that it may be configured such that the front panel 21 is not turnable.

[0033] The right-left wind deflector 22 is a plate-shaped member configured to adjust the right-left flow of air blown into a room in association with rotation of the indoor fan 16. The right-left wind deflector 22 is arranged at an air blow path h3, and is turnable in a right-left direction by a right-left wind deflector motor 25 (see Fig. 4).

[0034] The upper-lower wind deflector 23 is a plate-shaped member configured to adjust the upper-lower flow of air blown into the room in association with rotation of the indoor fan 16. The upper-lower wind deflector 23 is arranged in the vicinity of an air blow port h4, and is turnable in an upper-lower direction by an upper-lower wind deflector motor 26 (see Fig. 4).

[0035] Air sucked through air suction ports h1, h2 exchanges heat with refrigerant flowing in the heat transfer pipe g of the indoor heat exchanger 15, and the heat-exchanged air is guided to the air blow path h3. The air flowing in the air blow path h3 is guided in a predetermined direction by the right-left wind deflector 22 and the upper-lower wind deflector 23, and is further blown into the room through the air blow port h4.

[0036] Note that most of dust flowing toward the air suction ports h1, h2 along the flow of air is collected by the filters 20a, 20b. However, in some cases, fine dust passes through the filters 20a, 20b, and adheres to the indoor heat exchanger 15 and the indoor fan 16. For this reason, the indoor heat exchanger 15 and the indoor fan 16 are preferably cleaned on a regular basis. Thus, in the present embodiment, washing of the indoor heat exchanger 15 is performed after cleaning of the indoor fan 16 by the fan cleaning section 24.

[0037] The fan cleaning section 24 illustrated in Fig. 2 is configured to clean the indoor fan 16, and is arranged between the indoor heat exchanger 15 and the indoor fan 16. More specifically, the fan cleaning section 24 is arranged in a recessed portion r of the front indoor heat exchanger 15a having a doglegged shape as viewed in a longitudinal section.

[0038] Fig. 3 is a partially-cutout perspective view of the indoor unit Ui.

[0039] In addition to a shaft portion 24a and a brush 24b illustrated in Fig. 3, the fan cleaning section 24 includes a fan cleaning motor 24c (see Fig. 4). The shaft portion 24a is a rod-shaped member parallel to an axial direction of the indoor fan 16, and is pivotably supported at portions in the vicinity of both ends.

[0040] The brush 24b is configured to remove dust adhering to the fan blades 16a, and is placed on the shaft portion 24a. The fan cleaning motor 24c (see Fig. 4) is, for example, a stepping motor, and has the function of

rotating the shaft portion 24a by a predetermined angle.

[0041] Upon cleaning of the indoor fan 16, the shaft portion 24a and the brush 24b are turned such that the brush 24b contacts the indoor fan 16, and thereafter, the indoor fan 16 rotates backward (see Fig. 6A). Then, after the end of cleaning of the indoor fan 16, the shaft portion 24a and the brush 24b are turned such that the brush 24b is separated from the indoor fan 16 (see Fig. 2).

[0042] Note that in a state in which the fan cleaning section 24 is separated from the indoor fan 16, the vicinity of a tip end of the brush 24b preferably contacts the indoor heat exchanger 15 as illustrated in Fig. 2. This is because not only dust on the indoor heat exchanger 15 but also dust on the brush 24b are washed away by washing of the indoor heat exchanger 15 as described later.

[0043] Fig. 4 is a functional block diagram of the air-conditioner 100.

[0044] In addition to the above-described configurations, the indoor unit Ui illustrated in Fig. 4 includes a remote controller transmission/reception section 27 and an indoor control circuit 31.

[0045] The remote controller transmission/reception section 27 is configured to exchange predetermined information with a remote controller 40 via, e.g., infrared communication.

[0046] Although not shown in the figure, the indoor control circuit 31 includes electronic circuits such as a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), and various interfaces. A program stored in the ROM is read and loaded into the RAM, and the CPU executes various types of processing.

[0047] As illustrated in Fig. 4, the indoor control circuit 31 includes a storage section 31a and an indoor control section 31b.

[0048] In addition to a predetermined program, the storage section 31a stores, e.g., data received via the remote controller transmission/reception section 27 and detection values of various sensors (not shown).

[0049] Based on the data stored in the storage section 31a, the indoor control section 31b controls, e.g., the fan cleaning motor 24c, the indoor fan motor 16c, the right-left wind deflector motor 25, and the upper-lower wind deflector motor 26.

[0050] In addition to the above-described configurations, the outdoor unit Uo includes an outdoor control circuit 32. Although not shown in the figure, the outdoor control circuit 32 includes electronic circuits such as a CPU, a ROM, a RAM, and various interfaces. The outdoor control circuit 32 is connected to the indoor control circuit 31 via a communication line. As illustrated in Fig. 4, the outdoor control circuit 32 includes a storage section 32a and an outdoor control section 32b.

[0051] In addition to a predetermined program, the storage section 32a stores, e.g., data received from the indoor control circuit 31. Based on the data stored in the storage section 32a, the outdoor control section 32b controls, e.g., the compressor motor 11a, the outdoor fan motor 13a, and the expansion valve 14. Hereinafter, the

indoor control circuit 31 and the outdoor control circuit 32 will be collectively referred to as the "control section 30."

[0052] Fig. 5 is a flowchart of processing executed by the control section 30.

[0053] Note that air-conditioning operation is not performed at "START" of Fig. 5, and the tip end of the brush 24b faces the front indoor heat exchanger 15a (a state illustrated in Fig. 2).

[0054] At a step S101 of Fig. 5, the control section 30 causes the fan cleaning section 24 to clean the indoor fan 16. Note that a trigger for starting cleaning of the indoor fan 16 includes, e.g., a condition where cumulative time of the air-conditioning operation from previous cleaning reaches predetermined time.

[0055] Fig. 6A is a view for describing a state during cleaning of the indoor fan 16.

[0056] Note that Fig. 6A illustrates the indoor heat exchanger 15, the indoor fan 16, and the drain pan 18, and does not show other configurations.

[0057] Upon cleaning of the indoor fan 16, the control section 30 turns the brush 24b about the shaft portion 24a such that the tip end of the brush 24b faces the indoor fan 16. Accordingly, the brush 24b contacts the fan blade 16a of the indoor fan 16. Then, the control section 30 rotates the indoor fan 16 in a direction opposite to that in normal air-conditioning operation.

[0058] When the indoor fan 16 rotates backward as described above, the brush 24b bends in association with movement of the fan blade 16a, and is pressed to rub a back surface of the fan blade 16a. Then, dust adhering to the fan blade 16a is rubbed off by the brush 24b.

[0059] As illustrated in Fig. 6A, dust j rubbed off from the indoor fan 16 is guided to the drain pan 18 through a clearance between the front indoor heat exchanger 15a and the indoor fan 16. Thus, blowing of the dust j into the room during subsequent air-conditioning operation can be prevented.

[0060] Note that there is also a probability that part of the dust j rubbed off from the indoor fan 16 adheres to the front indoor heat exchanger 15a without dropping onto the drain pan 18. The dust j adhering to the front indoor heat exchanger 15a as described above is washed away with water obtained by defrosting of the indoor heat exchanger 15 at a later-described step S102.

[0061] After the end of the processing of the step S101, the control section 30 moves, although not shown in Fig. 5, the fan cleaning section 24 to separate the brush 24b from the indoor fan 16. That is, the control section 30 turns the brush 24b about the shaft portion 24a such that the tip end of the brush 24b faces the indoor heat exchanger 15 (see Fig. 6B). Thus, noise upon subsequent drive of the indoor fan 16 can be reduced.

[0062] At the step S102, the control section 30 sequentially performs freezing/defrosting of the indoor heat exchanger 15. First, the control section 30 causes, after cleaning of the indoor fan 16 by the fan cleaning section 24, the indoor heat exchanger 15 to function as the evaporator,

thereby freezing the indoor heat exchanger 15.

[0063] For example, the control section 30 decreases the degree of opening of the expansion valve 14 (see Fig. 1) as compared to that in the air-cooling operation, and accordingly, low-pressure refrigerant having a low evaporation temperature flows into the indoor heat exchanger 15. Thus, moisture in air easily forms frost on the indoor heat exchanger 15, and such frost and ice (a reference character i illustrated in Fig. 6B) are easily grown. Thus, during subsequent defrosting, the indoor heat exchanger 15 can be washed with a great amount of water.

[0064] Note that the duration of cleaning of the indoor fan 16 by the fan cleaning section 24 is preferably shorter than the duration (time until stop after the start of drive of the compressor 11 for freezing) of freezing of the indoor heat exchanger 15. Thus, the duration of freezing of the indoor heat exchanger 15 can be sufficiently ensured, and a great amount of frost and ice can adhere to the indoor heat exchanger 15. Moreover, in cleaning of the indoor fan 16, the control section 30 does not drive the indoor fan motor 16c (see Fig. 4) for unnecessarily long time, and therefore, abrasion of the brush 24b can be reduced.

[0065] After the indoor heat exchanger 15 has been frozen (S102 of Fig. 5) as described above, the control section 30 defrosts the indoor heat exchanger 15 (S102). For example, when the indoor heat exchanger 15 is defrosted after freezing of the indoor heat exchanger 15, the control section 30 brings equipment (e.g., the compressor 11) including the indoor fan 16 into a stop state. Thus, the indoor heat exchanger 15 is naturally defrosted at a room temperature. Since the indoor fan 16 is in the stop state as described above, there is no probability that water droplets caused due to defrosting come out to the room together with air.

[0066] Fig. 6B is a view for describing a state during defrosting of the indoor heat exchanger 15.

[0067] By defrosting of the indoor heat exchanger 15, frost and ice on the indoor heat exchanger 15 are melted, and a great amount of water w flows down to the drain pan 18 along the fin f. Thus, the dust j adhering to the indoor heat exchanger 15 during the air-conditioning operation can be washed away. Moreover, the brush 24b in contact with the indoor heat exchanger 15 is also washed.

[0068] Further, the dust j adhering to the front indoor heat exchanger 15a due to cleaning of the indoor fan 16 is also washed away, and flows down to the drain pan 18 (see an arrow in Fig. 6B). The water w having flowed down to the drain pan 18 as described above is, together with the dust j, discharged to the outside through a drain hose (not shown).

[0069] Note that although not shown in Fig. 5, the control section 30 may perform the air-heating operation or air blowing operation after freezing/defrosting (S102) of the indoor heat exchanger 15 to dry the inside of the indoor unit Ui. Thus, growth of bacteria in, e.g., the indoor

heat exchanger 15 can be reduced.

<Advantageous Effects>

[0070] According to the present embodiment, freezing/defrosting (S102) of the indoor heat exchanger 15 is performed after the indoor fan 16 has been cleaned by the fan cleaning section 24 (S101 of Fig. 5). Thus, both of the indoor fan 16 and the indoor heat exchanger 15 are brought into a clean state. Consequently, a user's effort and a maintenance expense necessary for cleaning of the indoor heat exchanger 15 and the indoor fan 16 can be reduced as compared to a typical case.

[0071] Note that when the order of cleaning (S101 of Fig. 5) of the indoor fan 16 and freezing/defrosting (S102) of the indoor heat exchanger 15 is reversed, the following situation might occur. That is, the inside of the indoor unit U1 is cooled in association with freezing of the indoor heat exchanger 15. For this reason, water vapor contained in air is condensed, and moisture adheres to a surface of the indoor fan 16. When cleaning of the indoor fan 16 is performed thereafter, the moisture on the surface of the indoor fan 16 and dust are together mixed by the brush 24b, and for this reason, it is difficult to remove the dust. As a result, it is difficult to rub off the dust from the indoor fan 16 by the brush 24b, leading to a probability that the dust remains on the indoor fan 16 with the dust sticking together.

[0072] On the other hand, according to the present embodiment, cleaning (S101) of the indoor fan 16 is, as described above, performed in advance of freezing/defrosting (Fig. 5: S102) of the indoor heat exchanger 15. Thus, the fan cleaning section 24 cleans the indoor fan 16 with the indoor fan 16 being relatively dried, and therefore, dust adhering to the indoor fan 16 can be properly rubbed off by the brush 24b.

<<Variations of First Embodiment>>

[0073] In the first embodiment, the processing of washing the indoor heat exchanger 15 by freezing/defrosting (S102 of Fig. 5) of the indoor heat exchanger 15 has been described, but the present invention is not limited to such processing. That is, the control section 30 may cause, after cleaning of the indoor fan 16 by the fan cleaning section 24, the indoor heat exchanger 15 to function as the evaporator, thereby forming dew on the indoor heat exchanger 15. For example, the control section 30 calculates the dew point of the indoor air based on the temperature and relative humidity of the indoor air. Then, the control section 30 controls, e.g., the degree of opening of the expansion valve 14 (see Fig. 1) such that the temperature of the indoor heat exchanger 15 is equal to or lower than the above-described dew point and is higher than a predetermined freezing temperature.

[0074] The above-described "freezing temperature" is a temperature at which moisture contained in the indoor air starts freezing on the indoor heat exchanger 15 when

the temperature of the indoor air is decreased. By such dew formation on the indoor heat exchanger 15, dust on the indoor heat exchanger 15 can be washed away with such dew condensation water.

[0075] Note that the duration of cleaning of the indoor fan 16 by the fan cleaning section 24 is preferably shorter than the duration (time until stop after the start of drive of the compressor 11 for dew formation) of dew formation on the indoor heat exchanger 15. Thus, the indoor heat exchanger 15 is washed with a sufficient amount of dew condensation water.

[0076] Moreover, upon dew formation on the indoor heat exchanger 15, the control section 30 preferably brings the indoor fan 16 into the stop state. This can prevent the dew condensation water and air from coming out to the room.

[0077] Further, in, e.g., a case where washing by freezing/defrosting of the indoor heat exchanger 15 is performed, washing by dew formation on the indoor heat exchanger 15 may be performed next time. That is, washing by freezing/defrosting of the indoor heat exchanger 15 and washing by dew formation on the indoor heat exchanger 15 may be alternately performed.

<<Second Embodiment>>

[0078] A second embodiment is different from the first embodiment in that air blowing operation is performed in advance of cleaning of an indoor fan 16 in the case of performing such cleaning after air-conditioning operation. Note that other points (e.g., the configuration of an air-conditioner 100: see Figs. 1 to 4) are similar to those in the first embodiment. Thus, differences from the first embodiment will be described, and description of overlapping contents will be omitted.

[0079] Fig. 7 is a flowchart of processing executed by a control section 30 of the air-conditioner according to the second embodiment (see Fig. 2, as necessary).

[0080] At a step S201, the control section 30 executes predetermined air-conditioning operation according to an operation command from a remote controller 40 (see Fig. 4). Such air-conditioning operation includes, e.g., dehumidification operation in addition to air-cooling operation and air-heating operation. Then, after the air-conditioning operation has been stopped in response to a stop command from the remote controller 40, the processing of the control section 30 proceeds to a step S202. Note that upon the stop of the air-conditioning operation, predetermined conditions for performing cleaning (S203) of the indoor fan 16 and washing (S204) of an indoor heat exchanger 15 are satisfied.

[0081] At the step S202, the control section 30 executes the air blowing operation. Note that during the air blowing operation of the step S202, the control section 30 preferably brings an upper-lower wind deflector 23 into a closed state or preferably upwardly turns the upper-lower wind deflector 23 with respect to the horizontal direction to drive the indoor fan 16 at a lower speed than

that in normal air-conditioning operation. Thus, drive noise of the indoor fan 16 is reduced during the air blowing operation after the stop command from the remote controller 40 (see Fig. 4), and therefore, a user's feeling of discomfort and strangeness is reduced.

[0082] Then, after the air blowing operation of the step S202 has been performed for predetermined time, the processing of the control section 30 proceeds to the step S203.

[0083] The processing of the steps S203, S204 is similar to the processing of the steps S101, S102 (see Fig. 5) described in the first embodiment. That is, in the case of performing cleaning of the indoor fan 16 by a fan cleaning section 24 (S203) after the air-cooling operation, the dehumidification operation, or the air-heating operation (S201), the control section 30 performs the air blowing operation (S202) in advance of cleaning of the indoor fan 16 by the fan cleaning section 24.

[0084] For example, the indoor heat exchanger 15 is cooled right after the air-cooling operation or the dehumidification operation (S201). Thus, there is, in some cases, a probability that dew is formed on the indoor fan 16 in the vicinity of the indoor heat exchanger 15 and moisture adheres to the indoor fan 16. For this reason, in the second embodiment, the control section 30 performs the air blowing operation (S202) in advance of cleaning of the indoor fan 16, thereby drying the indoor fan 16. Thus, a brush 24b contacts the indoor fan 16 in a dried state during cleaning of the indoor fan 16, and therefore, dust on the indoor fan 16 can be properly rubbed off.

[0085] Moreover, the indoor heat exchanger 15 is at a high temperature right after the air-heating operation (S201), and therefore, the indoor fan 16 in the vicinity of the indoor heat exchanger 15 is also at a high temperature. If the brush 24b contacts the indoor fan 16 in such a state, there is a probability that resin bristles of the brush 24b are, due to heat, softened and become unruly or are damaged accordingly. For this reason, in the second embodiment, the control section 30 performs the air blowing operation (S202) in advance of cleaning of the indoor fan 16 such that the indoor fan 16 restores a room temperature (a temperature at which there is no problem in contact of the brush 24b). After cleaning (S203) of the indoor fan 16 has been performed as described above, the control section 30 performs freezing/thawing (S204) of the indoor heat exchanger 15.

[0086] Next, operation states of a compressor 11 and the indoor fan 16 in the processing of the steps S201 to S204 of Fig. 7 will be described.

[0087] Fig. 8 is a time chart regarding the operation states of the compressor 11 and the indoor fan 16 (see Fig. 2, as necessary).

[0088] Note that "ON" illustrated in Fig. 8 indicates that the compressor 11 and the like are operated, and "OFF" indicates that the compressor 11 and the like are stopped. Moreover, the horizontal axis of Fig. 8 is time.

[0089] In an example illustrated in Fig. 8, the air-con-

ditioning operation (until time t1), a stop state (the time t1 to t2) of each type of equipment, the air blowing operation (the time t2 to t3), the stop state (the time t3 to t4) of each type of equipment, and cleaning (the time t4 to t5) of the indoor fan 16 are sequentially performed. Note that the air blowing operation may be performed right after the air-conditioning operation.

[0090] For example, in the case of freezing the indoor heat exchanger 15 (S204) after the air-heating operation (S201 of Fig. 7) as one type of the air-conditioning operation, a refrigerant circulation direction is opposite to that in the air-heating operation. When the refrigerant circulation direction is changed as described above, the compressor 11 is preferably brought into the stop state (OFF) for predetermined time to stabilize a refrigeration cycle.

[0091] In the second embodiment, e.g., freezing (S204) of the indoor heat exchanger 15 is, as described above, performed after the air blowing operation (S202) and cleaning (S203) of the indoor fan 16 have been sequentially performed after the stop of the air-conditioning operation (S201). At this point, the compressor 11 is in the stop state during the air blowing operation or cleaning of the indoor fan 16, and therefore, such time (the time t1 to t5 illustrated in Fig. 8) can be utilized as time for stabilizing the refrigeration cycle. That is, time until the start of freezing of the indoor heat exchanger 15 after the air-conditioning operation can be utilized with no waste.

<Advantageous Effects>

[0092] According to the second embodiment, in the case of cleaning the indoor fan 16 after the air-conditioning operation, the control section 30 performs the air blowing operation (S202 of Fig. 7), and thereafter, cleans the indoor fan 16 (S203). The air blowing operation is, as described above, performed in advance of cleaning of the indoor fan 16, and therefore, the indoor fan 16 can be dried or can restore the room temperature. Thus, subsequent cleaning of the indoor fan 16 can be properly performed.

[0093] Moreover, as described above, the compressor 11 is stopped during the air blowing operation or cleaning of the indoor fan 16 (see Fig. 8), and therefore, such time can be utilized as the time for stabilizing the refrigeration cycle. Thus, time until the end of freezing/thawing of the indoor heat exchanger 15 after the stop of the air-conditioning operation can be shortened.

<<Third Embodiment>>

[0094] A third embodiment is different from the first embodiment in that a filter cleaning section 28 (see Fig. 9) configured to clean filters 20a, 20b is provided. Moreover, the third embodiment is different from the first embodiment in that a control section 30 performs, e.g., cleaning of an indoor fan 16 after cleaning of the filters 20a, 20b. Note that other points are similar to those in the first embodiment. Thus, differences from the first embodiment

will be described, and description of overlapping contents will be omitted.

[0095] Fig. 9 is a perspective view of the filters 20a, 20b and the filter cleaning section 28 included in an indoor unit Ui.

[0096] The indoor unit Ui includes the movably-operable filter cleaning section 28 configured to clean the filters 20a, 20b. The filter cleaning section 28 illustrated in Fig. 9 has a frame body 28a, a filter cleaning brush 28b, and a filter cleaning motor (not shown).

[0097] The frame body 28a has an inverted L-shape, and is arranged outside the filters 20a, 20b. Moreover, by drive of the filter cleaning motor (not shown), the frame body 28a moves in a right-left direction. The filter cleaning brush 28b is a brush for rubbing off dust adhering to the filters 20a, 20b, and is placed on the frame body 28a.

[0098] Fig. 10 is a flowchart of processing executed by the control section 30 (see Figs. 2 and 4, as necessary).

[0099] At a step S301, the control section 30 performs cleaning of the filters 20a, 20b. That is, the control section 30 moves the filter cleaning section 28 (see Fig. 9) in the right-left direction to remove dust adhering to the filters 20a, 20b.

[0100] Note that during cleaning of the filters 20a, 20b, the control section 30 may drive the indoor fan 16. Thus, when dust is rubbed off by the filter cleaning section 28, falling of such dust to the outside of the indoor unit Ui can be prevented. Moreover, the control section 30 drives the indoor fan 16 in advance of cleaning (S302) of the indoor fan 16, and therefore, the indoor fan 16 is dried and the temperature of the indoor fan 16 approaches a room temperature. Thus, cleaning of the indoor fan 16 can be properly performed without damage of a brush 24b of a fan cleaning section 24.

[0101] The processing of subsequent steps S302, S303 is similar to the processing of the steps S101, S102 (see Fig. 5) described in the first embodiment. That is, the control section 30 sequentially performs cleaning (S301) of the filters 20a, 20b by the filter cleaning section 28 and cleaning (S302) of the indoor fan 16 by the fan cleaning section 24, and thereafter, freezes (or forms dew on) an indoor heat exchanger 15 (S303).

<Advantageous Effects>

[0102] According to the third embodiment, even when part of dust rubbed off by the filter cleaning section 28 is dropped onto the indoor heat exchanger 15 through a clearance between the filters 20a, 20b, the dust can be washed away by subsequent freezing/defrosting (S303) of the indoor heat exchanger 15. Moreover, time necessary for cleaning of the filters 20a, 20b and time necessary for cleaning of the indoor fan 16 can be utilized for stabilizing a refrigeration cycle.

<<Fourth Embodiment>>

[0103] A fourth embodiment is different from the first

embodiment in that washing of an indoor heat exchanger 15 is performed with a higher frequency than that of cleaning of an indoor fan 16 (see Fig. 11). Moreover, the fourth embodiment is different from the first embodiment in that a user can change the above-described frequencies by operation of a remote controller 40 (see Fig. 4). Note that other points (e.g., the configuration of an air-conditioner 100: see Figs. 1 to 4) are similar to those in the first embodiment. Thus, differences from the first embodiment will be described, and description of overlapping contents will be omitted.

[0104] Fig. 11 is a time chart regarding cleaning of the indoor fan 16 and washing of the indoor heat exchanger 15 (see Figs. 2 and 4, as necessary).

[0105] In Fig. 11, a shaded portion of "CLEANING OF INDOOR FAN" indicates a time period for which cleaning of the indoor fan 16 is performed. Moreover, a shaded portion of "WASHING OF INDOOR HEAT EXCHANGER" indicates a time period for which washing (e.g., freezing/defrosting) of the indoor heat exchanger 15 is performed.

[0106] Further, in an example illustrated in Fig. 11, when neither of cleaning of the indoor fan 16 nor washing of the indoor heat exchanger 15 is performed, predetermined air-conditioning operation is continued.

[0107] A control section 30 performs cleaning of the indoor fan 16 again by a fan cleaning section 24 in a case where a cumulative value of execution time of the air-conditioning operation from previous cleaning of the indoor fan 16 reaches a first threshold $\Delta T1$.

[0108] Moreover, the control section 30 freezes (or forms dew on) the indoor heat exchanger 15 again in a case where the cumulative value of the execution time of the air-conditioning operation from previous freezing of the indoor heat exchanger 15 (or previous dew formation on the indoor heat exchanger 15) reaches a second threshold $\Delta T2$ shorter than the first threshold $\Delta T1$.

[0109] As described above, the control section 30 performs washing of the indoor heat exchanger 15 with a higher frequency than that of cleaning of the indoor fan 16. Thus, the indoor heat exchanger 15 to which more dust tends to adhere as compared to the indoor fan 16 can be properly washed. Moreover, cleaning of the indoor fan 16 is not performed with a high frequency, and therefore, abrasion of a brush 24b of the fan cleaning section 24 can be reduced.

[0110] Note that the first threshold $\Delta T1$ and the second threshold $\Delta T2$ illustrated in Fig. 11 are set in advance, but can be changed by user's operation of the remote controller 40 (see Fig. 4) as described later.

[0111] Moreover, when cleaning of the indoor fan 16 is not performed, predetermined air-conditioning operation is actually performed or is actually stopped. Except for such stop time, the control section 30 cumulates the execution time of the air-conditioning operation (successively calculates the sum of the execution time). Note that the same also applies to washing of the indoor heat exchanger 15.

[0112] Further, in the case of performing not only cleaning of the indoor fan 16 but also freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15), the control section 30 freezes (or forms dew on) the indoor heat exchanger 15 after cleaning of the indoor fan 16 by the fan cleaning section 24. Thus, such cleaning can be performed with a surface of the indoor fan 16 being relatively dried. In addition, even when dust newly adheres to the indoor heat exchanger 15 due to cleaning of the indoor fan 16, the indoor heat exchanger 15 is frozen/defrosted thereafter, and therefore, the above-described dust is washed away.

[0113] Next, a setting change in the above-described first threshold $\Delta T1$ (see Fig. 11) and the above-described second threshold $\Delta T2$ (see the same figure) by a user will be described with reference to Fig. 12.

[0114] Fig. 12 is a flowchart of the processing of setting the frequency of cleaning of the indoor fan 16 and the frequency of washing of the indoor heat exchanger 15.

[0115] At a step S401, the control section 30 determines whether or not the first threshold $\Delta T1$ indicating the frequency of cleaning of the indoor fan 16 and the second threshold $\Delta T2$ indicating the frequency of washing of the indoor heat exchanger 15 have been input to the remote controller 40.

[0116] In a case where the first threshold $\Delta T1$ and the second threshold $\Delta T2$ are input by user's operation of the remote controller 40 (S401: Yes), the processing of the control section 30 proceeds to a step S402. On the other hand, in a case where the first threshold $\Delta T1$ and the second threshold $\Delta T2$ are not input (S401: No), the processing of the control section 30 returns to "START" ("RETURN").

[0117] At the step S402, the control section 30 determines whether or not the first threshold $\Delta T1$ is greater than the second threshold $\Delta T2$. As described above, the first threshold $\Delta T1$ is the threshold (the cumulative value of the execution time of the air-conditioning operation from previous cleaning) as a criterion for determining whether or not cleaning of the indoor fan 16 is to be performed. On the other hand, the second threshold $\Delta T1$ is a threshold as a criterion for determining whether or not washing of the indoor heat exchanger 15 is to be performed. At the step S402, in a case where the first threshold $\Delta T1$ is greater than the second threshold $\Delta T2$ (S402: Yes), the processing of the control section 30 proceeds to a step S403.

[0118] At the step S403, the control section 30 performs a setting change in the first threshold $\Delta T1$ and the second threshold $\Delta T2$. Thus, a user's intention to change the frequency of cleaning of the indoor fan 16 and the frequency of washing of the indoor heat exchanger 15 can be properly reflected. Moreover, washing of the indoor heat exchanger 15 which easily gets dirty can be performed with a higher frequency than that of cleaning of the indoor fan 16.

[0119] On the other hand, at the step S402, in a case where the first threshold $\Delta T1$ is equal to or less than the

second threshold $\Delta T2$ (S402: No), the processing of the control section 30 proceeds to a step S404.

[0120] At the step S404, the control section 30 issues an error notification to the remote controller 40. For example, a notification of please set the first threshold $\Delta T1$ to a greater value (longer time) than the second threshold $\Delta T2$ is issued to the remote controller 40. This can prompt the user to perform washing of the indoor heat exchanger 15 with a higher frequency than that of cleaning of the indoor fan 16.

[0121] After the error notification has been issued at the step S404, the processing of the control section 30 returns to "START" ("RETURN"). Then, in a case where the first threshold $\Delta T1$ and the second threshold $\Delta T2$ are, based on the above-described error notification, newly input to the remote controller 40 such that $\Delta T1 > \Delta T2$ is satisfied (S402: Yes), the control section 30 performs a setting change with these values (S403).

<Advantageous Effects>

[0122] According to the fourth embodiment, the first threshold $\Delta T1$ indicating the frequency of cleaning of the indoor fan 16 and the second threshold $\Delta T2$ indicating the frequency of washing of the indoor heat exchanger 15 can be changed as necessary by user's operation of the remote controller 40. Moreover, in a case where the first threshold $\Delta T1$ is equal to or less than the second threshold $\Delta T2$ (S402 of Fig. 12: No), the control section 30 issues the error notification to the remote controller 40 (S404). This can prompt the user to perform washing of the indoor heat exchanger 15 which easily gets dirty with a higher frequency than that of cleaning of the indoor fan 16.

<<Fifth Embodiment>>

[0123] A fifth embodiment is different from the first embodiment in that cleaning of an indoor fan 16 and washing of an indoor heat exchanger 15 can be cancelled by user's operation of a remote controller 40. Note that other points (the configuration of an air-conditioner 100: see Figs. 1 to 4) are similar to those in the first embodiment. Thus, differences from the first embodiment will be described, and description of overlapping contents will be omitted.

[0124] Fig. 13 is a flowchart of processing regarding cancellation of cleaning of the indoor fan 16 and washing of the indoor heat exchanger 15 (see Figs. 2 and 4, as necessary). Note that cleaning of the indoor fan 16 is not started yet at "START" of Fig. 13.

[0125] At a step S501, a control section 30 determines whether or not the control section 30 has received a command for cancelling cleaning of the indoor fan 16 from the remote controller 40.

[0126] In a case where the command for canceling cleaning of the indoor fan 16 has been received from the remote controller 40 (S501: Yes), the processing of the

control section 30 proceeds to a step S504.

[0127] At the step S504, the control section 30 performs freezing/defrosting of the indoor heat exchanger 15. That is, in a case where the command for canceling cleaning of the indoor fan 16 has been received from the remote controller 40 (S501: Yes) before cleaning of the indoor fan 16 by a fan cleaning section 24 is started, the control section 30 performs freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15) without performing cleaning of the indoor fan 16 (S504). Thus, a user's intention to cancel cleaning of the indoor fan 16 can be properly reflected.

[0128] On the other hand, at the step S501, in a case where the command for canceling cleaning of the indoor fan 16 is not received from the remote controller 40 (S501: No), the processing of the control section 30 proceeds to a step S502.

[0129] At the step S502, the control section 30 determines whether or not the control section 30 has received a command for canceling washing of the indoor heat exchanger 15 from the remote controller 40. In a case where the command for canceling washing of the indoor heat exchanger 15 has been received from the remote controller 40 (S502: Yes), the control section 30 ends a series of processing (END). That is, in a case where a command for canceling freezing of the indoor heat exchanger 15 has been received from the remote controller 40 (S502: Yes) before cleaning of the indoor fan 16 by the fan cleaning section 24 is started, the control section 30 does not perform freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15), and also cancels cleaning of the indoor fan 16 by the fan cleaning section 24.

[0130] Thus, a user's intention to cancel washing of the indoor heat exchanger 15 this time can be properly reflected. Moreover, the control section 30 also cancels cleaning of the indoor fan 16, thereby preventing dust caused due to cleaning of the indoor fan 16 from newly adhering to the indoor heat exchanger 15.

[0131] At the step S502, in a case where there is no command for canceling freezing/defrosting of the indoor heat exchanger 15 (S502: No), the processing of the control section 30 proceeds to a step S503. In this case, cleaning (S503) of the indoor fan 16 and freezing/defrosting (S504) of the indoor heat exchanger 15 are sequentially performed as in the first embodiment.

[0132] Note that although not shown in Fig. 13, there is a probability that the command for cancelling cleaning of the indoor fan 16 is issued from the remote controller 40 during cleaning of the indoor fan 16 by the fan cleaning section 24. In this case, even when the control section 30 receives the command for canceling cleaning of the indoor fan 16 from the remote controller 40, the control section 30 performs freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15) after cleaning of the indoor fan 16 has been continued. Thus, the indoor fan 16 can be brought into a clean state regardless of a user's intention. Moreover, dust

rubbed off from the indoor fan 16 and adhering to the indoor heat exchanger 15 can be washed away.

<Advantageous Effects>

[0133] According to the fifth embodiment, a user's intention to cancel cleaning of the indoor fan 16 and washing of the indoor heat exchanger 15 can be properly reflected. Moreover, in a case where the command for cancelling washing of the indoor heat exchanger 15 has been received (S502 of Fig. 13: Yes), the control section 30 also cancels cleaning of the indoor fan 16 in addition to washing of the indoor heat exchanger 15. This can prevent dust caused due to cleaning of the indoor fan 16 from newly adhering to the indoor heat exchanger 15.

<<Variations>>

[0134] The air-conditioner according to the present invention has been described above in each embodiment, but the present invention is not limited to such description. Various changes can be made to the present invention.

[0135] For example, in the second embodiment, the processing of sequentially performing the air-conditioning operation (S201 of Fig. 7), the air blowing operation (S202), cleaning (S203) of the indoor fan 16, and freezing/defrosting (S204) of the indoor heat exchanger 15 by the control section 30 has been described, but the present invention is not limited to such processing. That is, in a case where cleaning of the indoor fan 16 by the fan cleaning section 24 is performed after the air-cooling operation, the dehumidification operation, or the air-heating operation, the control section 30 may stop equipment including the indoor fan 16 for predetermined time in advance of cleaning of the indoor fan 16 by the fan cleaning section 24. According to such processing, natural convection of air can dry the indoor fan 16, or can cause the temperature of the indoor fan 16 to approach the room temperature.

[0136] Moreover, in the second embodiment, the control section 30 may perform, e.g., the air blowing operation not right after the air-conditioning operation such as the air-cooling operation but in advance of cleaning of the indoor fan 16. That is, the control section 30 may perform the air blowing operation in advance of cleaning of the indoor fan 16 by the fan cleaning section 24, or may stop the equipment including the indoor fan 16 for predetermined time. Thus, cleaning of the indoor fan 16 can be properly performed.

[0137] Further, in the fourth embodiment (see Fig. 12), the configuration in which the frequency of cleaning of the indoor fan 16 and the frequency of washing of the indoor heat exchanger 15 are changed by the remote controller 40 has been described, but the present invention is not limited to such a configuration. That is, instead of the remote controller 40 (or in addition to the remote controller 40), the above-described frequencies may be changed by operation of a mobile terminal (not shown)

such as a smartphone, a mobile phone, or a tablet. Note that the same applies to the predetermined cancellation command described in the fifth embodiment (see Fig. 13).

[0138] In addition, in the fourth embodiment, the processing of setting, based on the cumulative value of the execution time of the air-conditioning operation, the predetermined thresholds (the first threshold $\Delta T1$ and the second threshold $\Delta T2$ of S401: see Fig. 12) indicating the frequency of cleaning of the indoor fan 16 and the frequency of washing of the indoor heat exchanger 15 has been described, but the present invention is not limited to such processing. For example, instead of the cumulative value of the execution time of the air-conditioning operation, a cumulative value of drive time of the indoor fan 16 may be used.

[0139] The frequency of cleaning of the indoor fan 16 and the frequency of washing of the indoor heat exchanger 15 may be set as follows. That is, the control section 30 may perform cleaning of the indoor fan 16 by the fan cleaning section 24 a first number of times within a predetermined period, and may perform freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15) a second number of times greater than the first number of times within the above-described predetermined period. In a case where cleaning of the indoor fan 16 is performed and freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15) is also performed, the control section 30 may freeze (or form dew on) the indoor heat exchanger 15 after cleaning of the indoor fan 16 by the fan cleaning section 24. By such processing, advantageous effects similar to those of the fourth embodiment are provided.

[0140] Moreover, in a case where the above-described first number of times is set to equal to or greater than the second number of times in the remote controller 40 (or the mobile terminal), a predetermined error notification may be issued in the remote controller 40 (or the mobile terminal). This can prompt the user to perform washing of the indoor heat exchanger 15 which easily gets dirty with a higher frequency than that of cleaning of the indoor fan 16.

[0141] Further, cleaning of the indoor fan 16 and washing of the indoor heat exchanger 15 may be performed with reference to time elapsed from installation of the air-conditioner 100.

[0142] In addition, in the third embodiment (see Fig. 10), the processing of sequentially performing cleaning of the filters 20a, 20b, cleaning of the indoor fan 16, and freezing of the indoor heat exchanger 15 has been described, but the present invention is not limited to such processing. For example, in a case where the control section 30 performs cleaning of the filters 20a, 20b by the filter cleaning section 28 while driving the indoor fan 16, cleaning of the indoor fan 16 by the fan cleaning section 24 is not necessarily subsequently performed. Thus, time for which the indoor fan 16 is driven during the stop of the air-conditioning operation is shortened, and there-

fore, user's comfortableness can be enhanced.

[0143] Moreover, in each embodiment, the control section 30 does not necessarily perform, in a predetermined time period, cleaning of the indoor fan 16 by the fan cleaning section 24 and freezing of the indoor heat exchanger 15 (or dew formation on the indoor heat exchanger 15). Thus, drive noise of the indoor fan 16 and the compressor 11 is not caused in the predetermined time period (e.g., the night), and therefore, the user's comfortableness can be enhanced.

[0144] Further, in each embodiment, the example where the control section 30 rotates the indoor fan 16 backward during cleaning of the indoor fan 16 by the fan cleaning section 24 has been described, but the indoor fan 16 may be rotated forward in the same direction as that in the normal air-conditioning operation.

[0145] In addition, in each embodiment, the configuration in which upon cleaning of the indoor fan 16, the control section 30 rotates the shaft portion 24a of the fan cleaning section 24 by the predetermined angle has been described, but the present invention is not limited to such a configuration. For example, it may be configured such that the shaft portion 24a is, as necessary, moved in parallel.

[0146] Moreover, in the first embodiment, the example where the control section 30 performs freezing/defrosting of the indoor heat exchanger 15 right after cleaning of the indoor fan 16 has been described, but the present invention is not limited to such an example. For example, after cleaning of the indoor fan 16, the control section 30 may perform freezing/defrosting of the indoor heat exchanger 15 after the air blowing operation has been performed for predetermined time. Alternatively, after cleaning of the indoor fan 16, the control section 30 may perform freezing/defrosting of the indoor heat exchanger 15 after each type of equipment including the indoor fan 16 has been stopped for predetermined time. Alternatively, after cleaning of the indoor fan 16, the control section 30 may perform freezing/defrosting of the indoor heat exchanger 15 after predetermined air-conditioning operation has been performed. These types of processing are included in such a matter that "the control section 30 causes, after cleaning of the indoor fan 16 by the fan cleaning section 24, the indoor heat exchanger 15 to function as the evaporator to freeze (or form dew on) the indoor heat exchanger 15."

[0147] Further, in each embodiment, the case where the conditions for starting cleaning of the indoor fan 16 and washing of the indoor heat exchanger 15 are set in advance has been described, but the present invention is not limited to such a case. That is, by user's operation of the remote controller 40 or the mobile terminal (not shown), the control section 30 may start cleaning of the indoor fan 16 by the fan cleaning section 24.

[0148] In addition, in, e.g., a case where a command signal for performing cleaning of the indoor fan 16 by the fan cleaning section 24 has been received from the remote controller 40 or the mobile terminal, the control sec-

tion 30 may freeze or form dew on the indoor heat exchanger 15 after cleaning of the indoor fan 16 by the fan cleaning section 24. Thus, even when dust caused due to cleaning of the indoor fan 16 adheres to the indoor heat exchanger 15, the above-described dust is washed away by, e.g., subsequent freezing of the indoor heat exchanger 15.

[0149] Moreover, in each embodiment, the configuration in which the fan cleaning section 24 includes the brush 24b has been described, but the present invention is not limited to such a configuration. That is, as long as the indoor fan 16 can be cleaned, any member such as a sponge may be used.

[0150] Further, in each embodiment, the configuration in which the single indoor unit U_i (see Fig. 1) and the single outdoor unit U_o (see the same figure) are provided has been described, but the present invention is not limited to such a configuration. That is, multiple indoor units connected in parallel may be provided, or multiple outdoor units connected in parallel may be provided.

[0151] In addition, in each embodiment, the wall-mounted air-conditioner 100 has been described, but the present invention is also applicable to other types of air-conditioners.

[0152] Moreover, each embodiment has been described in detail for the sake of simplicity in description of the present invention, and the present invention is not limited to one including all configurations described above. Further, addition/omission/replacement of other configurations may be made to some of the configurations of each embodiment.

[0153] In addition, the above-described mechanisms and configurations are those considered necessary for description, and all mechanisms and configurations necessary for a product are not necessarily described.

LIST OF REFERENCE NUMERALS

[0154]

100	air-conditioner
11	compressor
12	outdoor heat exchanger
13	outdoor fan
14	expansion valve
15	indoor heat exchanger (heat exchanger)
16	indoor fan (fan)
20a, 20b	filter
24	fan cleaning section
28	filter cleaning section
30	control section
40	remote controller
Q	refrigerant circuit

Claims

1. An air-conditioner comprising:

a heat exchanger;
a fan;
a fan cleaning section configured to clean the fan; and
a control section configured to control at least the fan and the fan cleaning section,

wherein the control section causes, after cleaning of the fan by the fan cleaning section, the heat exchanger to function as an evaporator to freeze or form dew on the heat exchanger.

2. The air-conditioner according to claim 1, wherein duration of cleaning of the fan by the fan cleaning section is shorter than duration of freezing of the heat exchanger or dew formation on the heat exchanger.

3. The air-conditioner according to claim 1, wherein the control section brings the fan into a stop state when the heat exchanger is defrosted after freezing of the heat exchanger or when dew is formed on the heat exchanger.

4. The air-conditioner according to claim 1, wherein the control section performs air blowing operation or stops equipment including the fan for predetermined time in advance of cleaning of the fan by the fan cleaning section.

5. The air-conditioner according to claim 4, wherein in a case where cleaning of the fan by the fan cleaning section is performed after air-cooling operation, dehumidification operation, or air-heating operation, the control section performs the air blowing operation or stops the equipment including the fan for the predetermined time in advance of cleaning of the fan by the fan cleaning section.

6. The air-conditioner according to claim 1, further comprising:

a filter configured to collect dust from air flowing toward the heat exchanger; and
a filter cleaning section configured to clean the filter,

wherein the control section freezes or forms dew on the heat exchanger after cleaning of the filter by the filter cleaning section and cleaning of the fan by the fan cleaning section have been sequentially performed.

7. The air-conditioner according to claim 1, wherein the control section performs cleaning of the fan by the fan cleaning section again in a case where a cumulative value of execution time of air-conditioning operation from previous cleaning of the fan reaches a first threshold,

performs freezing of the heat exchanger or dew formation on the heat exchanger in a case where the cumulative value of the execution time of the air-conditioning operation from previous freezing of the heat exchanger or previous dew formation on the heat exchanger reaches a second threshold shorter than the first threshold, and
 5
 freezes or forms dew on the heat exchanger after cleaning of the fan by the fan cleaning section in a case of performing not only cleaning of the fan but also freezing of the heat exchanger or dew formation on the heat exchanger.
 10

8. The air-conditioner according to claim 1, wherein the control section
 15
 performs cleaning of the fan by the fan cleaning section a first number of times within a predetermined period,
 performs freezing of the heat exchanger or dew formation on the heat exchanger a second number of times greater than the first number of times within the predetermined period, and
 20
 freezes or forms dew on the heat exchanger after cleaning of the fan by the fan cleaning section in a case of performing not only cleaning of the fan but also freezing of the heat exchanger or dew formation on the heat exchanger.
 25

9. The air-conditioner according to claim 1, further comprising:
 30
 a filter configured to collect dust from air flowing toward the heat exchanger; and
 a filter cleaning section configured to clean the filter,
 35

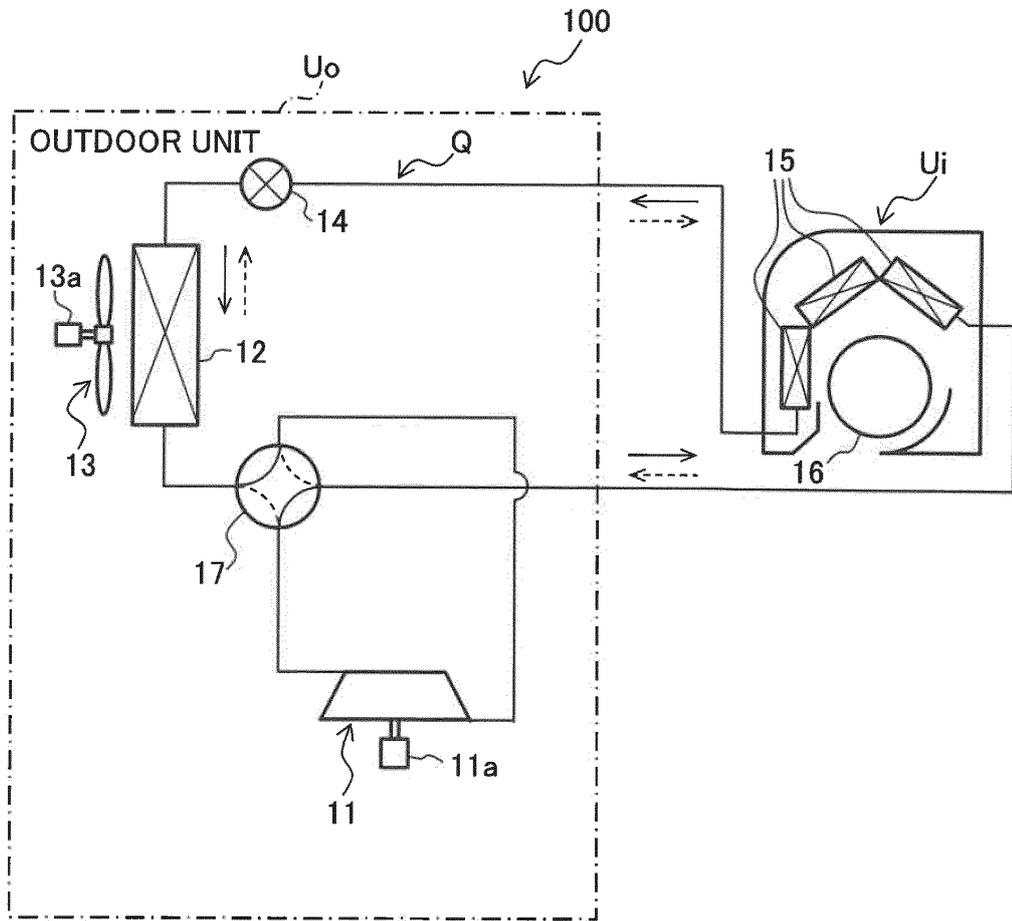
wherein in a case where the control section performs cleaning of the filter by the filter cleaning section while driving the fan, the control section does not perform subsequent cleaning of the fan by the fan cleaning section.
 40

10. The air-conditioner according to any one of claims 1 to 9, wherein the control section performs, in a predetermined time period, neither cleaning of the fan by the fan cleaning section nor freezing of the heat exchanger or dew formation on the heat exchanger.
 45

50

55

FIG. 1



—> AIR-HEATING OPERATION
 <--- AIR-COOLING OPERATION

FIG. 3

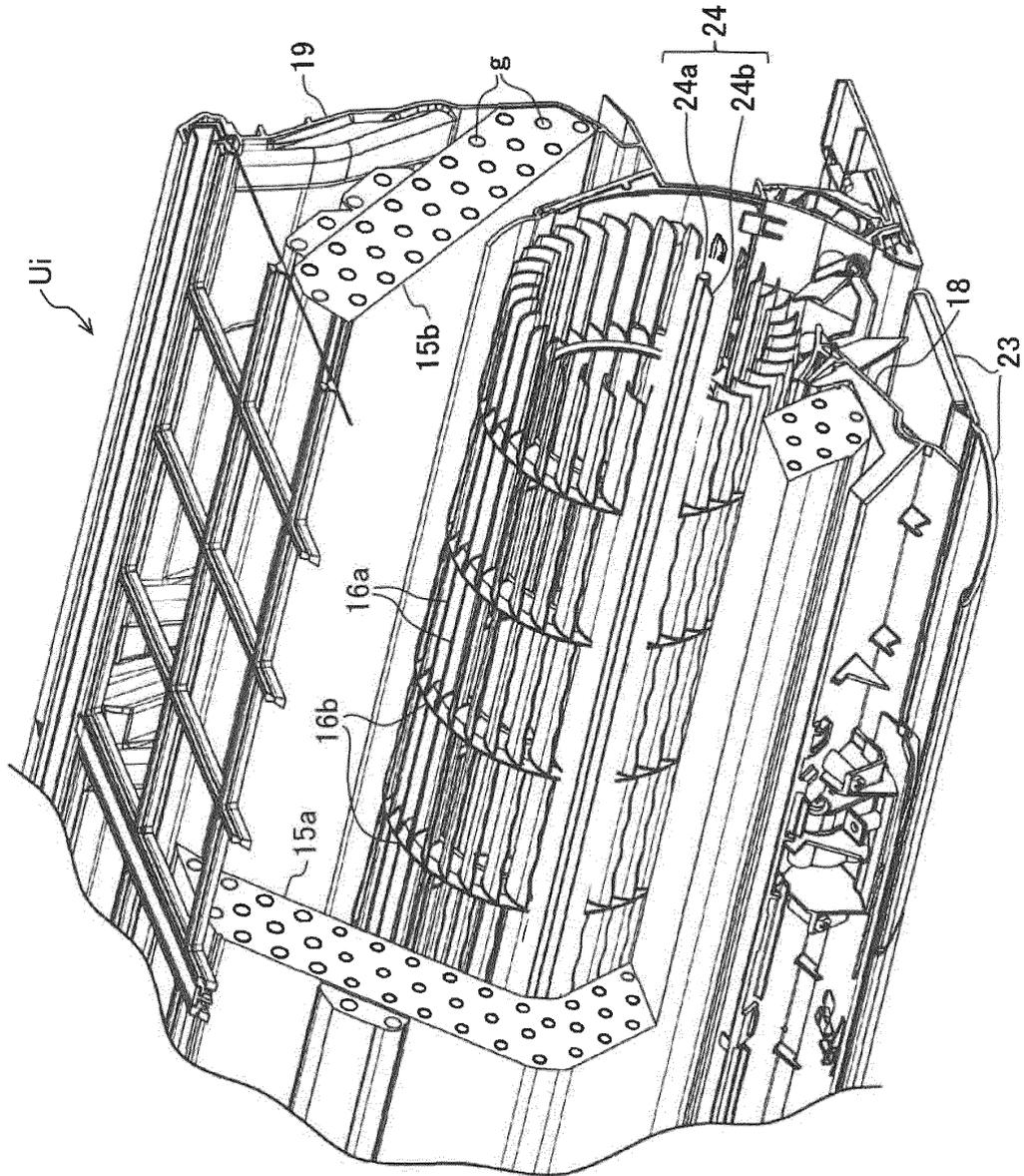


FIG. 4

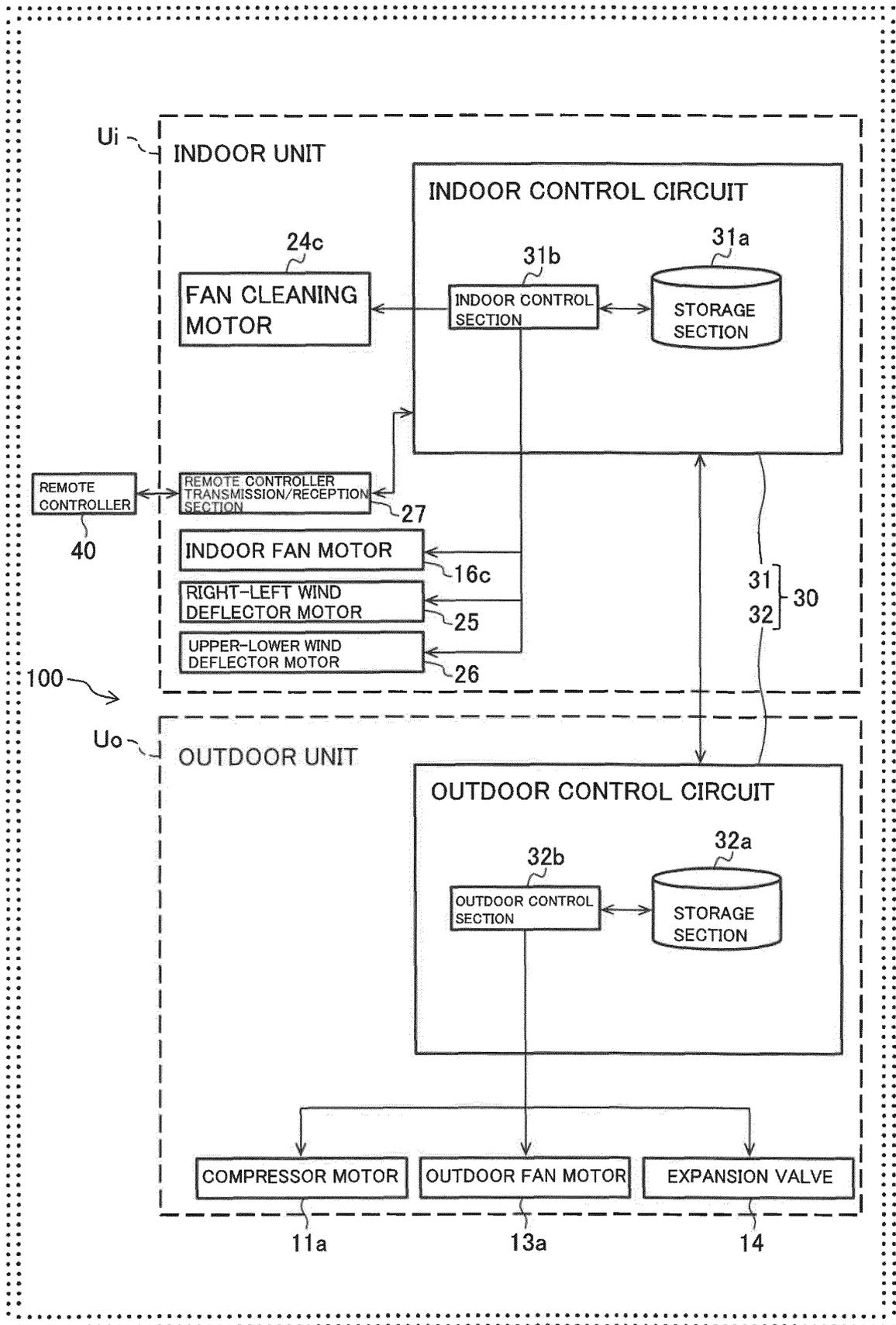


FIG. 5

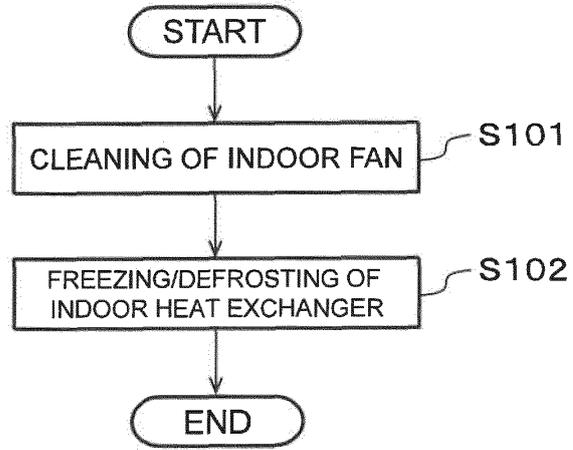


FIG. 6A

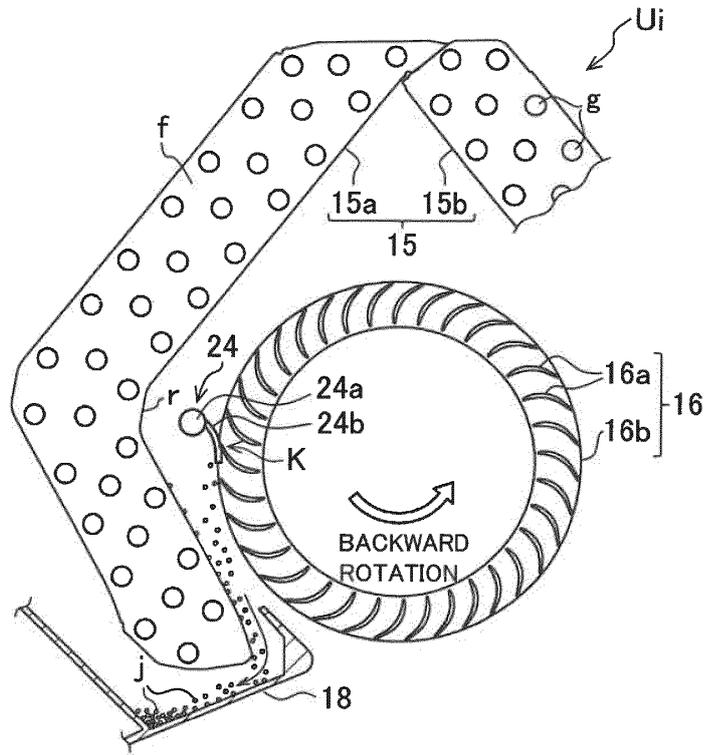


FIG. 6B

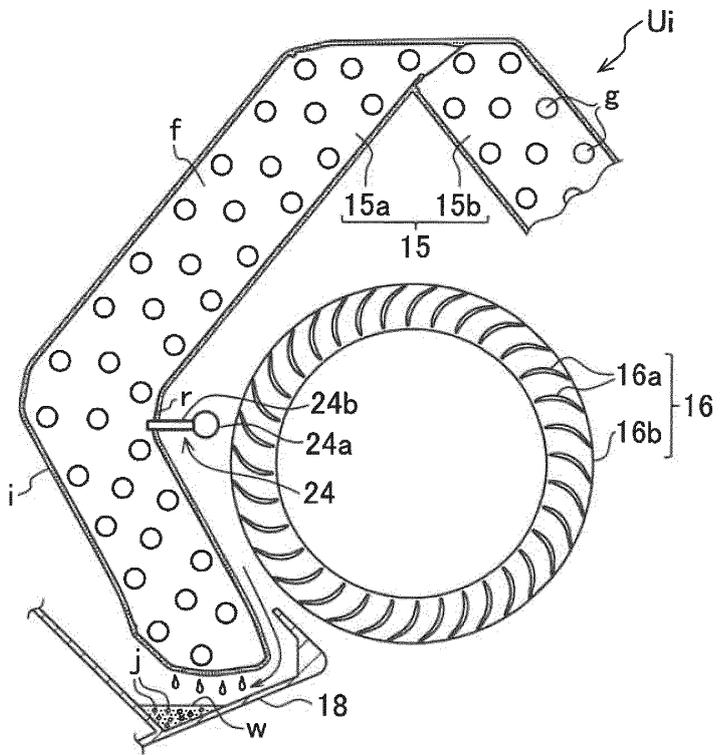


FIG. 7

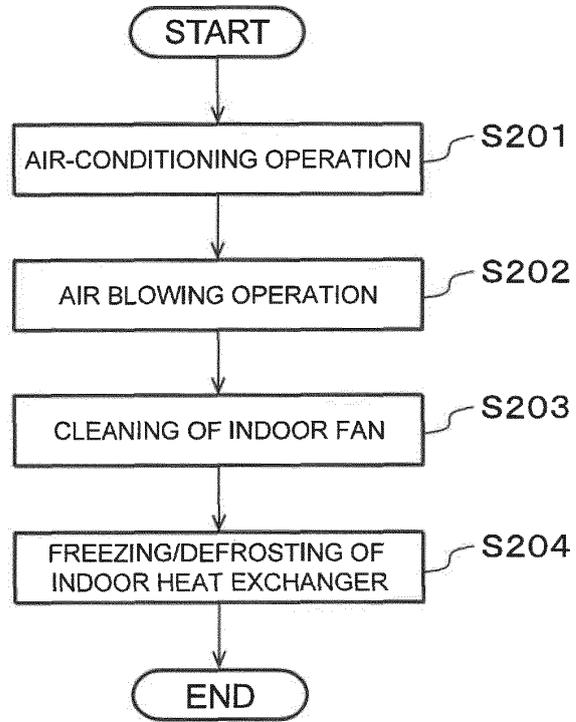


FIG. 8

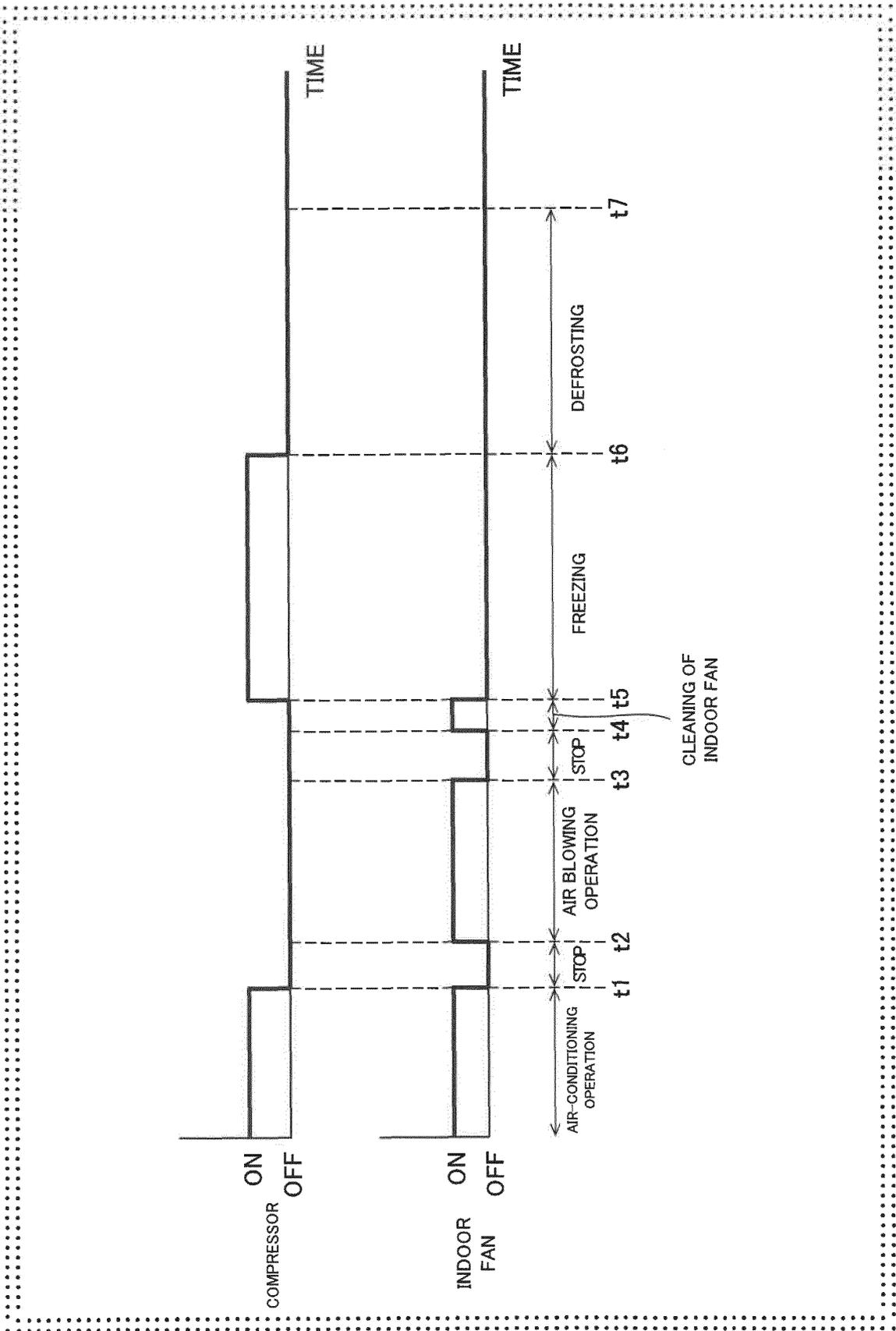


FIG. 9

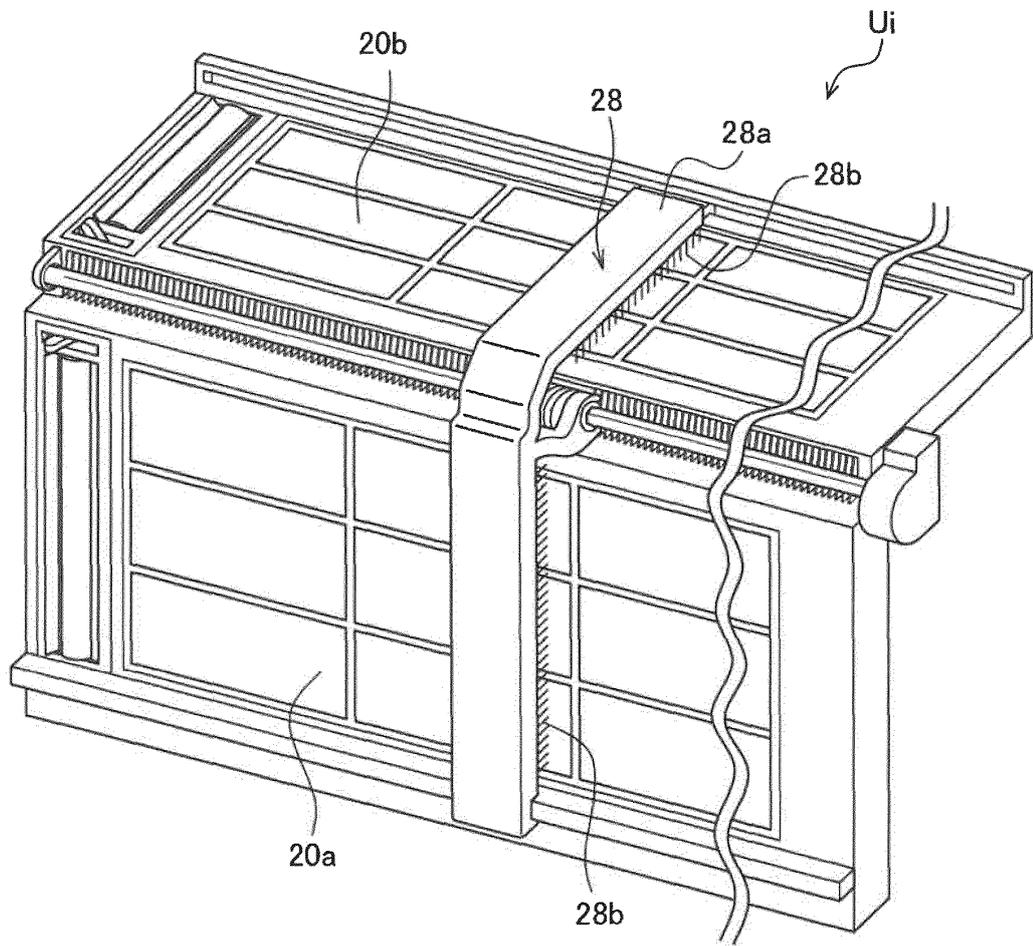


FIG. 10

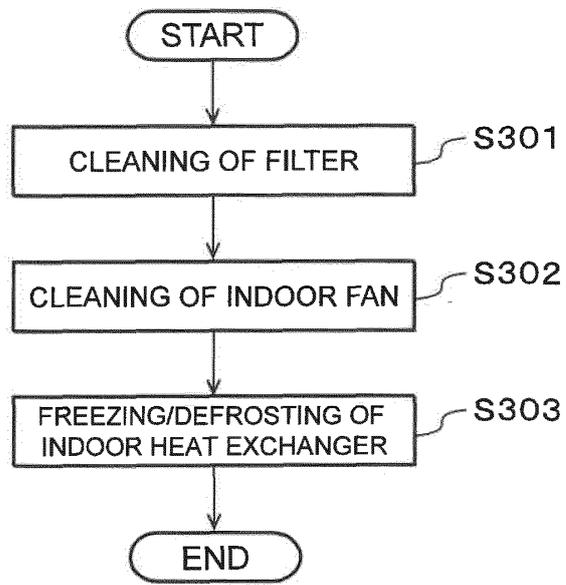


FIG. 11

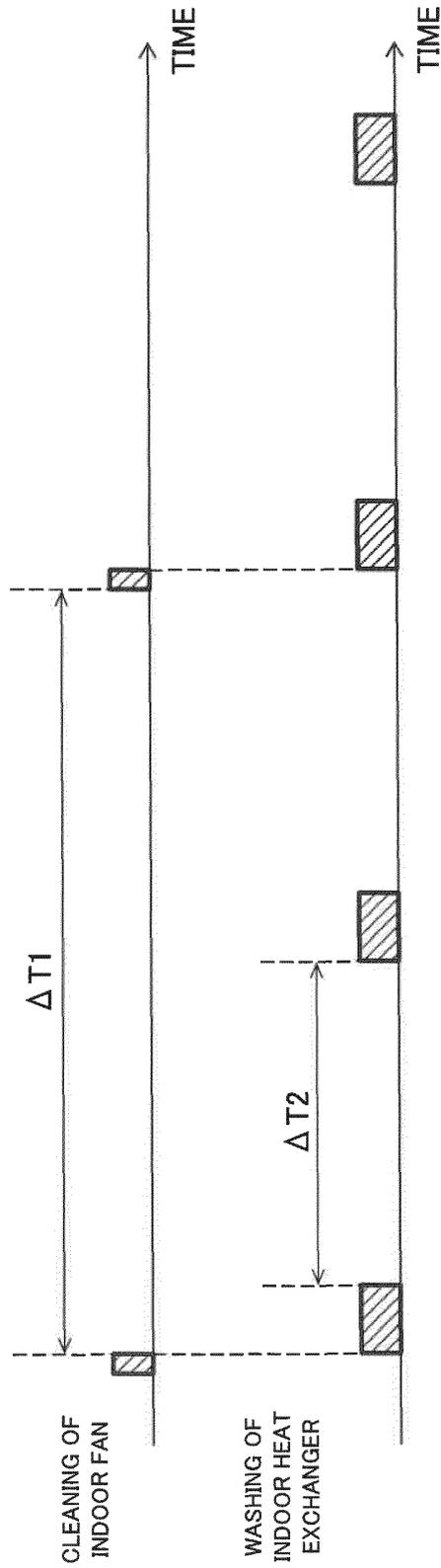


FIG. 12

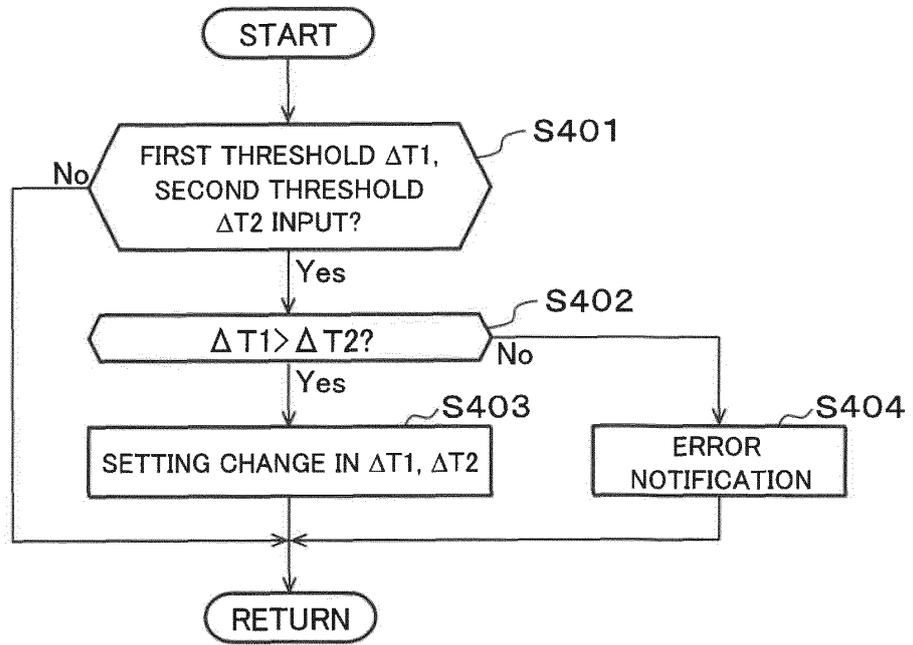
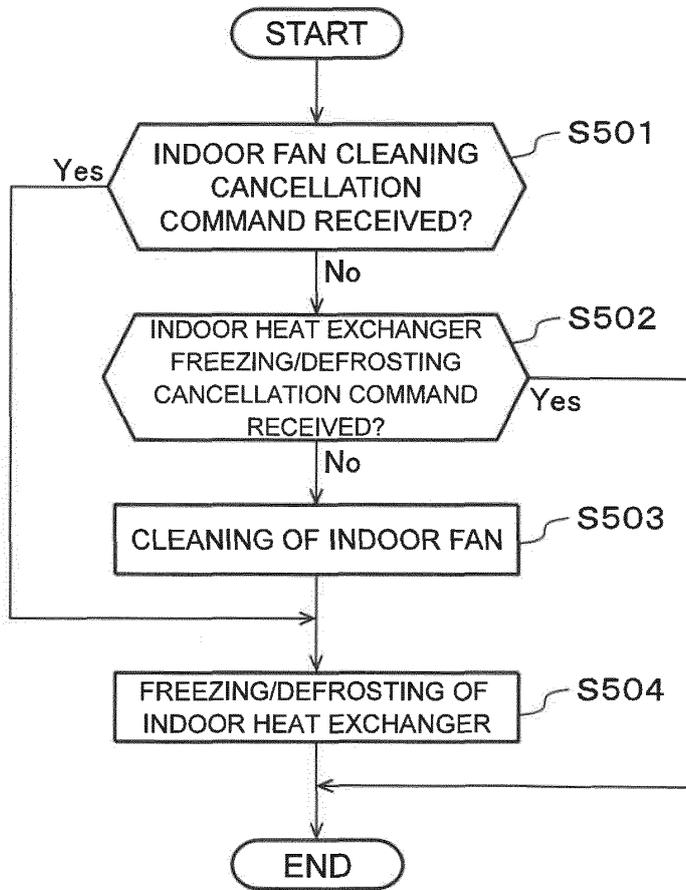


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/018513

5	<p>A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. F24F1/00 (2011.01) i, F24F11/48 (2018.01) i, F24F11/70 (2018.01) i, F24F13/28 (2006.01) i, F24F11/41 (2018.01) n</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>																						
10	<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) Int. Cl. F24F1/00, F24F11/00-11/89, F04D29/70</p>																						
15	<p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2018 Registered utility model specifications of Japan 1996-2018 Published registered utility model applications of Japan 1994-2018</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPI</p>																						
20	<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;">25</td> <td> Y JP 2008-2767 A (TOSHIBA CARRIER CORP.) 10 January A 2008, paragraphs [0001], [0002], [0009]-[0035], fig. 1-5 </td> <td style="vertical-align: top;"> 1-8, 10 9 </td> </tr> <tr> <td style="vertical-align: top;">30</td> <td> Y JP 2010-14288 A (TOSHIBA CARRIER CORP.) 21 January A 2010, paragraphs [0010]-[0073], fig. 1-10 </td> <td style="vertical-align: top;"> 1-8, 10 9 </td> </tr> <tr> <td style="vertical-align: top;">35</td> <td> Y JP 2007-205616 A (TOSHIBA CARRIER CORP.) 16 August 2007, paragraphs [0048]-[0086], fig. 1-12 </td> <td style="vertical-align: top;"> 7, 8, 10 </td> </tr> <tr> <td style="vertical-align: top;">40</td> <td> Y JP 2010-8021 A (MITSUBISHI ELECTRIC CORP.) 14 January 2010, paragraphs [0010]-[0025], fig. 1, 2 </td> <td style="vertical-align: top;"> 10 </td> </tr> <tr> <td style="vertical-align: top;">45</td> <td> A JP 2002-267249 A (SHARP CORP.) 18 September 2002, entire text, all drawings </td> <td style="vertical-align: top;"> 1-10 </td> </tr> </tbody> </table> <p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p> <table border="1"> <tr> <td style="vertical-align: top;">45</td> <td> * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "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 </td> <td> "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 </td> </tr> </table>		Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	25	Y JP 2008-2767 A (TOSHIBA CARRIER CORP.) 10 January A 2008, paragraphs [0001], [0002], [0009]-[0035], fig. 1-5	1-8, 10 9	30	Y JP 2010-14288 A (TOSHIBA CARRIER CORP.) 21 January A 2010, paragraphs [0010]-[0073], fig. 1-10	1-8, 10 9	35	Y JP 2007-205616 A (TOSHIBA CARRIER CORP.) 16 August 2007, paragraphs [0048]-[0086], fig. 1-12	7, 8, 10	40	Y JP 2010-8021 A (MITSUBISHI ELECTRIC CORP.) 14 January 2010, paragraphs [0010]-[0025], fig. 1, 2	10	45	A JP 2002-267249 A (SHARP CORP.) 18 September 2002, entire text, all drawings	1-10	45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "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
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50	Date of the actual completion of the international search 11.06.2018	Date of mailing of the international search report 19.06.2018																					
55	Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.																					

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Information on patent family members

International application No. PCT/JP2018/018513
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Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
JP 2008-2767 A	2008.01.10	Family: none	
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JP 2010-8021 A	2010.01.14	Family: none	
JP 2002-267249 A	2002.09.18	Family: none	

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