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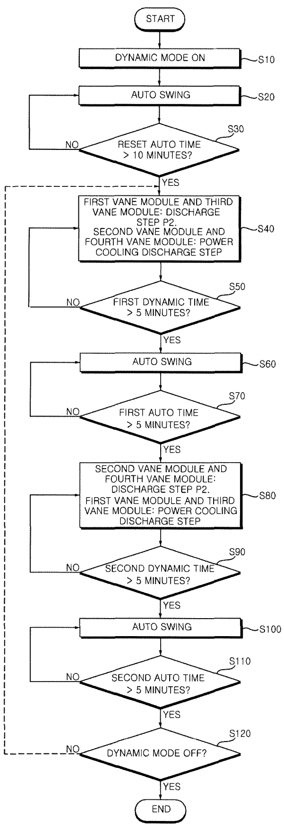
(54) **CEILING-MOUNTED INDOOR UNIT FOR AIR CONDITIONER**

(57) Opposite two of four vane modules constitute a first discharge pair, the other two constitute a second discharge pair, and the first discharge pair and the second discharge pair alternately provide indirect wind and direct wind, whereby it is possible to rapidly cool a room. In addition, the first discharge pair and the second discharge pair discharge air at different angles, whereby it is possible to minimize a dead zone that discharged air does not reach.

Fig. 23



Description

[Technical Field]

[0001] The present disclosure relates to a method of controlling a ceiling type indoor unit of an air conditioner, and more particularly a method of controlling a ceiling type indoor unit capable of controlling first, second, third, and fourth vane module at the time of indoor cooling.

[Background Art]

[0002] In general, an air conditioner includes a compressor, a condenser, an evaporator, and an expander, and supplies cool air or hot air to a building or a room using an air conditioning cycle.
[0003] Based on the structure thereof, the air conditioner is classified as a separable air conditioner configured such that a compressor is disposed outdoors or an integrated air conditioner configured such that a compressor is integrally manufactured.
[0004] In the separable air conditioner, an indoor heat exchanger is installed in an indoor unit, an outdoor heat exchanger and a compressor are installed in an outdoor unit, and the two separated units are connected to each other via a refrigerant pipe.
[0005] In the integrated air conditioner, an indoor heat exchanger, an outdoor heat exchanger, and a compressor are installed in a single case. Examples of the integrated air conditioner include a window type air conditioner installed at a window and a duct type air conditioner installed outside a room in the state in which a suction duct and a discharge duct are connected to each other.
[0006] The separable air conditioner is generally classified depending on the form in which the indoor unit is installed.
[0007] An air conditioner configured such that an indoor unit is vertically installed in a room is called a stand type air conditioner, an air conditioner configured such that an indoor unit is installed at the wall of a room is called a wall mounted air conditioner, and an air conditioner configured such that an indoor unit is installed at the ceiling of a room is called a ceiling type air conditioner.
[0008] In addition, there is a system air conditioner capable of providing air-conditioned air to a plurality of spaces as a kind of separable air conditioner.
[0009] The system air conditioner is classified as a type of air conditioner including a plurality of indoor units in order to air-condition rooms or a type of air conditioner capable of supplying air-conditioned air to respective spaces through ducts.
[0010] The plurality of indoor units provided in the system air conditioner may be stand type indoor units, wall mounted indoor units, or ceiling type indoor units.
[0011] A conventional ceiling type indoor unit includes a case installed at a ceiling so as to be suspended therefrom and a front panel configured to cover the lower surface of the case, the front panel being installed at the same surface as the ceiling.
[0012] A suction port is disposed at the center of the front panel, and a plurality of discharge ports is disposed outside the suction port, and a discharge vane is installed at each discharge port.
[0013] In the conventional ceiling type indoor unit, the discharge vane is repeatedly rotated in a discharge vane auto swing mode. Also, in the ceiling type indoor unit, the discharge vane remains stationary at a specific position in a discharge vane fixing mode.
[0014] In the conventional ceiling type indoor unit, therefore, the discharge vane is simply controlled at the time of indoor cooling, whereby it is difficult to satisfy desires of a person in a room.

[Prior Art Document]

[Patent Document]

[0015] Korean Registered Patent No. 10-0679838 B1

[Disclosure]

[Technical Problem]

[0016] It is an object of the present disclosure to provide a method of controlling a ceiling type indoor unit capable of controlling four vane modules to rapidly cool a room.
[0017] It is another object of the present disclosure to provide a method of controlling a ceiling type indoor unit, wherein

opposite two of four vane modules constitute a first discharge pair, the other two constitute a second discharge pair, and the first discharge pair and the second discharge pair discharge air at different angles to cool a room.

[0018] It is another object of the present disclosure to provide a method of controlling a ceiling type indoor unit, wherein opposite two of four vane modules constitute a first discharge pair, the other two constitute a second discharge pair, and the first discharge pair and the second discharge pair discharge air in different directions to cool a room.

[0019] It is another object of the present disclosure to provide a method of controlling a ceiling type indoor unit, wherein opposite two of four vane modules constitute a first discharge pair, the other two constitute a second discharge pair, one of the first discharge pair and the second discharge pair provides indirect wind, and the other provides direct wind to cool a room.

[0020] It is a further object of the present disclosure to provide a method of controlling a ceiling type indoor unit, wherein opposite two of four vane modules constitute a first discharge pair, the other two constitute a second discharge pair, and the first discharge pair and the second discharge pair alternately provide indirect wind and direct wind to cool a room.

[0021] Objects of the present disclosure are not limited to the aforementioned objects, and other unmentioned objects will be clearly understood by those skilled in the art based on the following description.

[Technical Solution]

[0022] In the present disclosure, opposite two of four vane modules may constitute a first discharge pair, the other two may constitute a second discharge pair, and the first discharge pair and the second discharge pair may discharge air at different angles at the time of cooling a room.

[0023] In the present disclosure, opposite two of four vane modules may constitute a first discharge pair, the other two may constitute a second discharge pair, and the first discharge pair and the second discharge pair may discharge air in different directions at the time of cooling a room.

[0024] In the present disclosure, opposite two of four vane modules may constitute a first discharge pair, the other two may constitute a second discharge pair, one of the first discharge pair and the second discharge pair may provide indirect wind, and the other may provide direct wind at the time of cooling a room.

[0025] In the present disclosure, opposite two of four vane modules may constitute a first discharge pair, the other two may constitute a second discharge pair, and the first discharge pair and the second discharge pair may alternately provide indirect wind and direct wind at the time of cooling a room.

[0026] The present disclosure provides a method of controlling a ceiling type indoor unit of an air conditioner, the ceiling type indoor unit including:

a case installed at a ceiling of a room so as to be suspended therefrom, the case having a suction port formed at the lower surface thereof, a first discharge port, a second discharge port, a third discharge port, and a fourth discharge port being formed at the edge of the suction port; and

a first vane module disposed at the first discharge port, the first vane module being disposed in a 12 o’clock direction based on the suction port, the first vane module constituting one of a first discharge pair, the first vane module being configured to discharge air in a first discharge direction; a second vane module disposed at the second discharge port, the second vane module being disposed in a 3 o’clock direction based on the suction port, the second vane module constituting one of a second discharge pair, the second vane module being configured to discharge air in a second discharge direction; a third vane module disposed at the third discharge port, the third vane module being disposed in a 6 o’ clock direction based on the suction port, the third vane module constituting the other of the first discharge pair, the third vane module being configured to discharge air in a third discharge direction; and a fourth vane module disposed at the fourth discharge port, the fourth vane module being disposed in a 9 o’clock direction based on the suction port, the fourth vane module constituting the other of the second discharge pair, the fourth vane module being configured to discharge air in a fourth discharge direction, wherein

each vane module includes: a module body installed at the case, at least a portion of the module body being exposed to the discharge port; a vane motor assembled to the module body, the vane motor being configured to provide driving force; a driving link assembled to the module body so as to be rotatable relative thereto, the driving link being coupled to the vane motor, the driving link being configured to be rotated by the driving force of the vane motor, the driving link including a first driving link body and a second driving link body having a predetermined angle therebetween; a first vane link located further forwards than the driving link, the first vane link being assembled to the module body so as to be rotatable relative thereto; a second vane link assembled to the second driving link body so as to be rotatable relative thereto; a first vane disposed at each discharge port, the first vane being disposed forwards in a discharge direction of air discharged from the discharge port, the first vane being assembled to each of the first driving link body and the first vane link so as to be rotatable relative thereto; and a second vane disposed at each discharge port, the second vane being assembled to the module body so as to be rotatable relative thereto by the second vane shaft, the second vane being assembled to the second vane link so as to be rotatable relative thereto, the first vane module, the second vane module, the third vane module, and the fourth vane module are set to be operated in one of discharge steps P1 to P6,

based on a horizon, the inclination of the first vane satisfies "0 degrees < inclination of the first vane in discharge step P1 < inclination of the first vane in discharge step P2 < inclination of the first vane in discharge step P3 < inclination of the first vane in discharge step P4 < inclination of the first vane in discharge step P5 < inclination of the first vane in discharge step P6 < 90 degrees,"

based on the horizon, the inclination of the second vane satisfies "0 degrees < inclination of the second vane in discharge step P1 < inclination of the second vane in discharge step P2 < inclination of the second vane in discharge step P3 < inclination of the second vane in discharge step P4 < inclination of the second vane in discharge step P5 < inclination of the second vane in discharge step P6 < 90 degrees,"

in each discharge step, the inclination of the second vane is set to always be greater than the inclination of the first vane, and

the method includes: a step (S10) of turning on a dynamic cooling mode; a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step in the case in which step S10 is satisfied; a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time; a first auto swing step (S60) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section in the case in which step S50 is satisfied; a step (S70) of determining whether the first auto swing step (S60) exceeds a first auto time; a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2 in the case in which step S70 is satisfied; a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time; a step (S120) of determining whether the dynamic cooling mode is turned off after step S90; and a step of finishing the dynamic cooling mode in the case in which step S120 is satisfied.

[0027] In discharge step P2, the first vane may have an inclination of 16 to 29 degrees and the second vane may have an inclination of 57 to 67 degrees, and in the power cooling discharge step, the first vane may have an inclination of 35 to 44 degrees and the second vane may have an inclination of about 70 to 72 degrees.

[0028] When providing discharge step P1, the rear end of the second vane may be located higher than the discharge port, the front end of the second vane may be located lower than the discharge port, the rear end of the first vane may be located lower than the front end of the second vane, and the front end of the first vane may be located lower than the rear end of the first vane.

[0029] In discharge step P1, the upper surface of the second vane may be located higher than the upper surface of the first vane.

[0030] When providing discharge step P1, the rear end of the first vane may be located higher than the front end of the second vane.

[0031] When providing discharge step P6, the rear end of the second vane may be s located higher than the discharge port, the front end of the second vane may be located lower than the discharge port, the rear end of the first vane may be located higher than the front end of the second vane and may be located higher than the discharge port, and the front end of the first vane may be located lower than the front end of the second vane.

[0032] The driving link may include: a core body; the core link shaft disposed at the core body, the core link shaft being rotatably coupled to the module body, the core link shaft protruding toward the vane motor, the core link shaft being coupled to the vane motor; a first driving link body extending from the core body; a first driving link shaft disposed at the first driving link body, the first driving link shaft protruding toward a first vane body, the first driving link shaft being rotatably coupled to the first vane; a second driving link body extending from the core body, a predetermined angle (E) being defined between the second driving link body and the first driving link body; and a second driving link shaft disposed at the second driving link body, the second driving link shaft protruding in an identical direction to the first driving link shaft, the second driving link shaft being rotatably coupled to the second vane link,

the first vane link may include: a first vane link body; a 1-1 vane link shaft disposed at one side of the first vane link body, the 1-1 vane link shaft being assembled to the first vane, the 1-1 vane link shaft being configured to be rotated relative to the first vane; and a 1-2 vane link shaft disposed at the other side of the first vane link body, the 1-2 vane link shaft being assembled to the module body, the 1-2 vane link shaft being configured to be rotated relative to the module body,

the second vane link may include: a second vane link body; a 2-1 vane link shaft disposed at one side of the second vane link body, the 2-1 vane link shaft being assembled to the second vane, the 2-1 vane link shaft being configured to be rotated relative to the second vane; and a 2-2 vane link journal disposed at the other side of the second vane link body, the 2-2 vane link journal being assembled to the driving link, the 2-2 vane link journal being configured to be rotated relative to the driving link, and

when providing the power cooling discharge step, the angle defined between an imaginary straight line (D-D’) joining the core link shaft and the first driving link shaft to each other and an imaginary straight line (B-B’) joining the first driving link shaft and the 1-1 vane link shaft to each other may be an obtuse angle of greater than 180 degrees.

[0033] When providing one of discharge steps P2 to P5, the rear end of the first vane may be located higher than the front end of the second vane and may be located level with or lower than the 2-1 vane link shaft.

[0034] When providing one of discharge steps P1 to P3, the angle formed by the core link shaft, the first driving link shaft, and the 1-1 vane link shaft in a clockwise direction with respect to the imaginary straight line (D-D') joining the core link shaft and the first driving link shaft to each other may be an acute angle.

[0035] In discharge step P1, the vane motor may be rotated by a P1 rotational angle, and the first vane may have a first vane P1 inclination and the second vane may have a second vane P1 inclination by rotation of the vane motor,

in discharge step P2, the vane motor may be rotated by a P2 rotational angle greater than the P1 rotational angle, and the first vane may have a first vane P2 inclination and the second vane may have a second vane P2 inclination by rotation of the vane motor,

in discharge step P3, the vane motor may be rotated by a P3 rotational angle greater than the P2 rotational angle, and the first vane may have a first vane P3 inclination and the second vane may have a second vane P3 inclination by rotation of the vane motor,

in discharge step P4, the vane motor may be rotated by a P4 rotational angle greater than the P3 rotational angle, and the first vane may have a first vane P4 inclination and the second vane may have a second vane P4 inclination by rotation of the vane motor,

in discharge step P5, the vane motor may be rotated by a P5 rotational angle greater than the P4 rotational angle, and the first vane may have a first vane P5 inclination and the second vane may have a second vane P5 inclination by rotation of the vane motor,

in discharge step P6, the vane motor may be rotated by a P6 rotational angle greater than the P5 rotational angle, and the first vane may have a first vane P6 inclination and the second vane may have a second vane P6 inclination by rotation of the vane motor, and

the first vane P1 inclination may be set to 16 degrees or more and the first vane P6 inclination may be set to 57 degrees or less.

[0036] The P1 rotational angle may be set to 78 degrees or more, and the P6 rotational angle may be set to 110 degrees or less.

[0037] In the power cooling discharge step, the first vane may have an inclination of 35 to 44 degrees and the second vane may have an inclination of about 70 to 72 degrees.

[0038] The method may further include: a reset auto swing step (S20) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section after step S10; and a step (S30) of determining whether the reset auto swing step (S20) exceeds a reset auto time, wherein the first dynamic cooling step (S40) may be performed in the case in which step S30 is satisfied.

[0039] The reset auto time may be set to be longer than the first auto time.

[0040] The method may further include: a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section in the case in which step S90 is satisfied; and a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time, wherein step S120 may be performed in the case in which step S110 is satisfied.

[0041] The first auto time and the second auto time may be set to be equal to each other.

[0042] Returning to the first dynamic cooling step (S40) may be performed in the case in which step S50 is not satisfied, and returning to the second dynamic cooling step (S80) may be performed in the case in which step S90 is not satisfied.

[0043] The first dynamic time and the second dynamic time may be set to be equal to each other.

[0044] The method may further include: a reset auto swing step (S20) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section after step S10; a step (S30) of determining whether the reset auto swing step (S20) exceeds a reset auto time, the first dynamic cooling step (S40) being performed in the case in which step S30 is satisfied; a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section in the case in which step S90 is satisfied; and a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time, wherein step S120 may be performed in the case in which step S110 is satisfied.

[0045] The reset auto time may be set to be longer than the first auto time, the first auto time and the second auto time may be set to be equal to each other, and the first dynamic time and the second dynamic time may be set to be equal to each other.

[0046] The present disclosure provides a method of controlling a ceiling type indoor unit of an air conditioner, the ceiling type indoor unit including:

a case installed at a ceiling of a room so as to be suspended therefrom, the case having a suction port formed at the lower surface thereof, a first discharge port, a second discharge port, a third discharge port, and a fourth discharge port being formed at the edge of the suction port; and

a first vane module disposed at the first discharge port, the first vane module being disposed in a 12 o'clock direction based on the suction port, the first vane module constituting one of a first discharge pair, the first vane module being configured to discharge air in a first discharge direction; a second vane module disposed at the second discharge port, the second vane module being disposed in a 3 o'clock direction based on the suction port, the second vane module constituting one of a second discharge pair, the second vane module being configured to discharge air in a second discharge direction; a third vane module disposed at the third discharge port, the third vane module being disposed in a 6 o' clock direction based on the suction port, the third vane module constituting the other of the first discharge pair, the third vane module being configured to discharge air in a third discharge direction; and a fourth vane module disposed at the fourth discharge port, the fourth vane module being disposed in a 9 o'clock direction based on the suction port, the fourth vane module constituting the other of the second discharge pair, the fourth vane module being configured to discharge air in a fourth discharge direction, wherein

each vane module includes: a module body installed at the case, at least a portion of the module body being exposed to the discharge port; a vane motor assembled to the module body, the vane motor being configured to provide driving force; a driving link assembled to the module body so as to be rotatable relative thereto, the driving link being coupled to the vane motor, the driving link being configured to be rotated by the driving force of the vane motor, the driving link including a first driving link body and a second driving link body having a predetermined angle therebetween; a first vane link located further forwards than the driving link, the first vane link being assembled to the module body so as to be rotatable relative thereto; a second vane link assembled to the second driving link body so as to be rotatable relative thereto; a first vane disposed at each discharge port, the first vane being disposed forwards in a discharge direction of air discharged from the discharge port, the first vane being assembled to each of the first driving link body and the first vane link so as to be rotatable relative thereto; and a second vane disposed at each discharge port, the second vane being assembled to the module body so as to be rotatable relative thereto by the second vane shaft, the second vane being assembled to the second vane link so as to be rotatable relative thereto,

the first vane module, the second vane module, the third vane module, and the fourth vane module are set to be operated in one of discharge steps P1 to P6,

based on a horizon, the inclination of the first vane satisfies "0 degrees < inclination of the first vane in discharge step P1 < inclination of the first vane in discharge step P2 < inclination of the first vane in discharge step P3 < inclination of the first vane in discharge step P4 < inclination of the first vane in discharge step P5 < inclination of the first vane in discharge step P6 < 90 degrees,"

based on the horizon, the inclination of the second vane satisfies "0 degrees < inclination of the second vane in discharge step P1 < inclination of the second vane in discharge step P2 < inclination of the second vane in discharge step P3 < inclination of the second vane in discharge step P4 < inclination of the second vane in discharge step P5 < inclination of the second vane in discharge step P6 < 90 degrees,"

in each discharge step, the inclination of the second vane is set to always be greater than the inclination of the first vane, and

the method includes: a step (S10) of turning on a dynamic cooling mode; a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step after step S10; a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time; a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2 in the case in which step S50 is satisfied; a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time; a step (S120) of determining whether the dynamic cooling mode is turned off in the case in which step S90 is satisfied; and a step of finishing the dynamic cooling mode in a case in which step S120 is satisfied, wherein the first vane has an inclination of 35 to 57 degrees in the power cooling discharge step.

[Advantageous Effects]

[0047] The method of controlling the ceiling type indoor unit according to the present disclosure has one or more of the following effects.

[0048] First, in the present disclosure, opposite two of four vane modules may constitute a first discharge pair, the other two may constitute a second discharge pair, and the first discharge pair and the second discharge pair may alternately provide indirect wind and direct wind, whereby it is possible to rapidly cool a room.

[0049] Second, in the present disclosure, the first discharge pair and the second discharge pair may discharge air at different angles, whereby it is possible to minimize a dead zone that discharged air does not reach.

[0050] Third, in the present disclosure, the first discharge pair and the second discharge pair may discharge air in different directions, whereby it is possible to minimize a dead zone that discharged air does not reach.

[0051] Fourth, in the present disclosure, one of the first discharge pair and the second discharge pair may provide indirect wind and the other may provide direct wind, whereby it is possible to simultaneously supply discharged air over a long distance and a short distance based on the indoor unit.

[0052] Fifth, in the present disclosure, a reset auto swing step (S20) of reciprocating the first discharge pair and the second discharge pair within a predetermined section may be performed before a dynamic cooling step, whereby it is possible to minimize temperature deviation of indoor air.

[0053] Sixth, in the present disclosure, operation times of a first dynamic cooling step (S40) and a second dynamic cooling step (S80) may be set to be equal to each other, whereby it is possible to minimize temperature deviation around the indoor unit and to prevent one side from being more cooled than the other side based on the indoor unit.

[0054] Seventh, in the present disclosure, a dynamic cooling mode may be provided for a place which people frequently enter and leave or at which it is necessary to rapidly decrease temperature, whereby it is possible to provide a comfortable sensation to a user who stays at the place for a short time.

[0055] Eighth, in the dynamic cooling mode according to the present disclosure, the first discharge pair and the second discharge pair may alternately discharge indirect wind and direct wind, whereby it is possible to discharge cooled discharged air to different heights and over different distances.

[Description of Drawings]

[0056]

FIG. 1 is a perspective view showing an indoor unit of an air conditioner according to an embodiment of the present disclosure.
FIG. 2 is a sectional view of FIG. 1.
FIG. 3 is an exploded perspective view showing a front panel of FIG. 1.
FIG. 4 is an exploded perspective view showing the upper part of the front panel of FIG. 1.
FIG. 5 is a perspective view of a vane module shown in FIG. 3.
FIG. 6 is a perspective view of FIG. 5 when viewed in another direction.
FIG. 7 is a perspective view of the vane module of FIG. 5 when viewed from above.
FIG. 8 is a front view of the vane module shown in FIG. 3.
FIG. 9 is a rear view of the vane module shown in FIG. 3.
FIG. 10 is a plan view of the vane module shown in FIG. 3.
FIG. 11 is a perspective view showing the operation structure of the vane module shown in FIG. 5.
FIG. 12 is a front view of a driving link shown in FIG. 11.
FIG. 13 is a front view of a first vane link shown in FIG. 11.
FIG. 14 is a front view of a second vane link shown in FIG. 11.
FIG. 15 is a bottom view of the front panel of FIG. 1 in the state in which a suction grill is separated from the front panel.
FIG. 16 is a side sectional view of the vane module shown in FIG. 2.
FIG. 17 is an illustrative view of discharge step P1 according to a first embodiment of the present disclosure.
FIG. 18 is an illustrative view of discharge step P2 according to a first embodiment of the present disclosure.
FIG. 19 is an illustrative view of discharge step P3 according to a first embodiment of the present disclosure.
FIG. 20 is an illustrative view of discharge step P4 according to a first embodiment of the present disclosure.
FIG. 21 is an illustrative view of discharge step P5 according to a first embodiment of the present disclosure.
FIG. 22 is an illustrative view of discharge step P6 according to a first embodiment of the present disclosure.
FIG. 23 is a flowchart showing a control method at the time of cooling according to a first embodiment of the present disclosure.
FIG. 24 is a flowchart showing a control method at the time of cooling according to a second embodiment of the present disclosure.
FIG. 25 is a flowchart showing a control method at the time of cooling according to a third embodiment of the present disclosure.
FIG. 26 is a flowchart showing a control method at the time of cooling according to a fourth embodiment of the present disclosure.
FIG. 27 is a flowchart showing a control method at the time of cooling according to a fifth embodiment of the present disclosure.

[Best Mode]

[0057] Advantages and features of the present disclosure and a method of achieving the same will be more clearly understood from embodiments described below with reference to the accompanying drawings. However, the present disclosure is not limited to the following embodiments and may be implemented in various different forms. The embodiments are provided merely to complete the present disclosure and to fully provide a person having ordinary skill in the art to which the present disclosure pertains with the category of the present disclosure. The present disclosure is defined only by the category of the claims. Wherever possible, the same reference numerals will be used throughout the specification to refer to the same or like elements.

[0058] Hereinafter, the present disclosure will be described in detail with reference to the accompanying drawings.

[0059] FIG. 1 is a perspective view showing an indoor unit of an air conditioner according to an embodiment of the present disclosure. FIG. 2 is a sectional view of FIG. 1. FIG. 3 is an exploded perspective view showing a front panel of FIG. 1. FIG. 4 is an exploded perspective view showing the upper part of the front panel of FIG. 1. FIG. 5 is a perspective view of a vane module shown in FIG. 3. FIG. 6 is a perspective view of FIG. 5 when viewed in another direction. FIG. 7 is a perspective view of the vane module of FIG. 5 when viewed from above. FIG. 8 is a front view of the vane module shown in FIG. 3. FIG. 9 is a rear view of the vane module shown in FIG. 3. FIG. 10 is a plan view of the vane module shown in FIG. 3. FIG. 11 is a perspective view showing the operation structure of the vane module shown in FIG. 5. FIG. 12 is a front view of a driving link shown in FIG. 11. FIG. 13 is a front view of a first vane link shown in FIG. 11. FIG. 14 is a front view of a second vane link shown in FIG. 11. FIG. 15 is a bottom view of the front panel of FIG. 1 in the state in which a suction grill is separated from the front panel. FIG. 16 is a side sectional view of the vane module shown in FIG. 2. FIG. 17 is an illustrative view of discharge step P1 according to a first embodiment of the present disclosure. FIG. 18 is an illustrative view of discharge step P2 according to a first embodiment of the present disclosure. FIG. 19 is an illustrative view of discharge step P3 according to a first embodiment of the present disclosure. FIG. 20 is an illustrative view of discharge step P4 according to a first embodiment of the present disclosure. FIG. 21 is an illustrative view of discharge step P5 according to a first embodiment of the present disclosure. FIG. 22 is an illustrative view of discharge step P6 according to a first embodiment of the present disclosure. FIG. 23 is a flowchart showing a control method at the time of cooling according to a first embodiment of the present disclosure.

<Construction of indoor unit>

[0060] The indoor unit of the air conditioner according to this embodiment includes a case 100 having a suction port 101 and a discharge port 102, an indoor heat exchanger 130 disposed in the case 100, and an indoor blowing fan 140 disposed in the case 100 to blow air to the suction port 101 and the discharge port 102.

<Construction of case>

[0061] In this embodiment, the case 100 includes a case housing 110 and a front panel 300. The case housing 110 is installed at the ceiling of a room via a hanger (not shown) so as to be suspended therefrom, and the lower side of the case housing is open. The front panel 300 covers the open surface of the case housing 110, is disposed so as to face the floor of the room, is exposed in the room, and has the suction port 101 and the discharge port 102.

[0062] The case 100 may be variously realized depending on the form of manufacture, and construction of the case 100 does not limit the idea of the present disclosure.

[0063] The suction port 101 is disposed in the center of the front panel 300, and the discharge port 102 is disposed outside the suction port 101. The number of suction ports 101 or the number of discharge ports 102 is irrelevant to idea of the present disclosure. In this embodiment, a single suction port 101 is formed, and a plurality of discharge ports 102 is disposed.

[0064] In this embodiment, the suction port 101 is formed so as to have a quadrangular shape when viewed from below, and four discharge ports 102 are disposed so as to be spaced apart from edges of the suction port 101 by a predetermined distance.

<Construction of indoor heat exchanger>

[0065] The indoor heat exchanger 130 is disposed between the suction port 101 and the discharge port 102, and the indoor heat exchanger 130 partitions the interior of the case 100 into an inner interior and an outer interior. In this embodiment, the indoor heat exchanger 130 is disposed vertically.

[0066] The indoor blowing fan 140 is located inside the indoor heat exchanger 130.

[0067] When viewed in a top view or a bottom view, the indoor heat exchanger has an overall shape of "□", a portion of which may be separated.

[0068] The indoor heat exchanger 130 is disposed such that air discharged from the indoor blowing fan 140 perpendicularly enters the indoor heat exchanger.

[0069] A drain pan 132 is installed in the case 100, and the indoor heat exchanger 130 is held by the drain pan 132. Condensate water generated in the indoor heat exchanger 130 may flow to the drain pan 132 and then be stored. A

drain pump (not shown) configured to discharge collected condensate water to the outside is disposed in the drain pan 132.
[0070] The drain pan 132 may be provided with an inclined surface having directivity in order to collect and store condensate water falling from the indoor heat exchanger 130 in one side.

<Construction of indoor blowing fan>

[0071] The indoor blowing fan 140 is located in the case 100, and is disposed at the upper side of the suction port 101. A centrifugal blower configured to suction air to the center thereof and discharging the air in the circumferential direction is used as the indoor blowing fan 140.
[0072] The indoor blowing fan 140 includes a bell mouth 142, a fan 144, and a fan motor 146.
[0073] The bell mouth 142 is disposed at the upper side of a suction grill 320, and is located at the lower side of the fan 144. The bell mouth 142 guides air that has passed through the suction grill 320 to the fan 144.
[0074] The fan motor 146 rotates the fan 144. The fan motor 146 is fixed to the case housing 110. The fan motor 146 is disposed at the upper side of the fan 144. At least a portion of the fan motor 146 is located higher than the fan 144.
[0075] A motor shaft of the fan motor 146 is disposed so as to face downwards, and the fan 144 is coupled to the motor shaft.
[0076] The indoor heat exchanger 130 is located outside the edge of the fan 144. The fan 144 and at least a portion of the indoor heat exchanger 130 are disposed on the same horizontal line. At least a portion of the bell mouth 142 is inserted into the fan 144. In the upward-downward direction, at least a portion of the bell mouth 142 overlaps the fan 144.

<Construction of channel>

[0077] The indoor heat exchanger 130 is disposed in the case hosing 110, and partitions the space in the case housing 110 into an inner space and an outer space.
[0078] The inner space surrounded by the indoor heat exchanger 130 is defined as a suction channel 103, and the outer space outside the indoor heat exchanger 130 is defined as a discharge channel 104.
[0079] The indoor blowing fan 140 is disposed in the suction channel 103. The discharge channel 104 is located between the outside of the indoor heat exchanger 130 and the sidewall of the case housing 110.
[0080] When viewed in a top view or a bottom view, the suction channel 103 is an inside surrounded by "□" of the indoor heat exchanger, and the discharge channel 104 is an outside of "□" of the indoor heat exchanger.
[0081] The suction channel 103 communicates with the suction port 101, and the discharge channel 104 communicates with the discharge port 103. Air flows from the lower side to the upper side of the suction channel 103, and flows from the upper side to the lower side of the discharge channel 104. The flow direction of air is changed 180 degrees based on the indoor heat exchanger 130.
[0082] The suction port 101 and the discharge port 102 are formed in the same surface of the front panel 300.
[0083] The suction port 101 and the discharge port 102 are disposed so as to face in the same direction. In this embodiment, the suction port 101 and the discharge port 102 are disposed so as to face the floor of the room.
[0084] In the case in which the front panel 300 is bent, the discharge port 102 may be formed so as to have a slight side inclination; however, the discharge port 102 connected to the discharge channel 104 is formed so as to face downwards.
[0085] A vane module 200 is disposed to control the direction of air that is discharged through the discharge port 102.

<Construction of front panel>

[0086] The front panel 300 includes a front body 310 coupled to the case housing 110, the front body having the suction port 101 and the discharge port 102, a suction grill 320 having a plurality of grill holes 321, the suction grill being configured to cover the suction port 101, a pre-filter 330 separably assembled to the suction grill 320, and a vane module 200 installed at the front body 310, the vane module being configured to control the air flow direction of the discharge port 102.
[0087] The suction grill 320 is installed so as to be separable from the front body 310. The suction grill 320 may be elevated from the front body 310 in the upward-downward direction. The suction grill 320 covers the entirety of the suction port 101.
[0088] In this embodiment, the suction grill 320 has a plurality of grill holes 321 formed in the shape of a lattice. The grill holes 321 communicate with the suction port 101.
[0089] The pre-filter 330 is disposed at the upper side of the suction grill 320. The pre-filter 330 filters air suctioned into the case 100. The pre-filter 330 is located at the upper side of grill holes 321, and filters air that has passed through the suction grill 320.
[0090] The discharge port 102 is formed along the edge of the suction port 101 in the form of a long slit. The vane

module 200 is located on the discharge port 102, and is coupled to the front body 310.

[0091] In this embodiment, the vane module 200 may be separated downwards from the front body 310. That is, the vane module 200 may be disposed irrespective of the coupling structure of the front body 310, and may be separated independently from the front body 310. The structure thereof will be described in more detail.

<Construction of front body>

[0092] The front body 310 is coupled to the lower side of the case housing 110, and is disposed so as to face the room. The front body 310 is installed at the ceiling of the room, and is exposed in the room.

[0093] The front body 310 is coupled to the case housing 110, and the case housing 110 supports load of the front body 310. The front body 310 supports load of the suction grill 320 and the pre-filter 330.

[0094] When viewed in a top view, the front body 310 is formed so as to have a quadrangular shape. The shape of the front body 310 may be varied.

[0095] The upper surface of the front body 310 may be formed horizontally so as to be in tight contact with the ceiling, and the edge of the lower surface of the front body may be slightly curved.

[0096] A suction port 101 is disposed in the center of the front body 310, and a plurality of discharge ports 102 is disposed outside the edge of the suction port 101.

[0097] When viewed in a top view, the suction port 101 may be formed in a square shape, and each discharge port 102 may be formed in a rectangular shape. The discharge port 102 may be formed in a slit shape having a greater length than the width thereof.

[0098] The front body 310 includes a front frame 312, a side cover 314, and a corner cover 316.

[0099] The front frame 312 provides load and stiffness of the front panel 300, and is fixed to the case housing 110 by fastening. The suction port 101 and the four discharge ports 102 are formed in the front frame 312.

[0100] In this embodiment, the front frame 312 includes a side frame 311 and a corner frame 313.

[0101] The corner frame 313 is disposed at each corner of the front panel 300. The side frame 311 is coupled to two corner frames 313. The side frame 311 includes an inner side frame 311a and an outer side frame 311b.

[0102] The inner side frame 311a is disposed between the suction port 101 and the discharge port 102, and couples two corner frames 313 to each other. The outer side frame 311b is disposed outside the discharge port 102.

[0103] In this embodiment, four inner side frames 311a and four outer side frames 311b are provided.

[0104] The suction port 101 is located inside the four inner side frames 311a. The discharge port 102 is formed so as to be surrounded by two corner frames 313, the inner side frame 311a, and the outer side frame 311b.

[0105] The side cover 314 and the corner cover 316 are coupled to the lower surface of the front frame 312. The side cover 314 and the corner cover 316 are exposed to a user, and the front frame 312 is not visible to the user.

[0106] The side cover 314 is disposed at the edge of the front frame 312, and the corner cover 316 is disposed at the corner of the front frame 312.

[0107] The side cover 314 is made of a synthetic resin material, and is fixed to the front frame 312 by fastening. Specifically, the side cover 314 is coupled to the side frame 311, and the corner cover 316 is coupled to the corner frame 313.

[0108] In this embodiment, four side covers 314 and four corner covers 316 are provided. The side covers 314 and the corner covers 316 are coupled to the front frame 312 to form a single structure. The four side covers 314 and the four corner covers 316 form a single edge of the front panel 300.

[0109] The side cover 314 is disposed at the lower side of the side frame 311, and the corner cover 316 is disposed at the lower side of the corner frame 313.

[0110] The four side covers 314 and the four corner covers 316 are assembled to form a quadrangular frame. The four side covers 314 and the four corner covers 316 connected to each other are defined as a front decoration 350.

[0111] The front decoration 350 has a decoration outer border 351 and a decoration inner border 352.

[0112] When viewed in a top view or a bottom view, the decoration outer border 351 is formed in a quadrangular shape, and the decoration inner border 352 is generally formed in a quadrangular shape. However, the corner of the decoration inner border has predetermined curvature.

[0113] The suction grill 320 and four vane modules 200 are disposed inside the decoration inner border 352. The suction grill 320 and four vane modules 200 abut the decoration inner border 352.

[0114] In this embodiment, four side cover 314 are disposed, and each side cover 314 is coupled to the front frame 312. The outer edge of the side cover 314 defines a portion of the decoration outer border 351, and the inner edge of the side cover 314 defines a portion of the decoration inner border 352.

[0115] In particular, the inner edge of the side cover 314 defines the outer border of the discharge port 102. The inner edge of the side cover 314 is defined as a side decoration inner border 315.

[0116] In this embodiment, four corner covers 316 are disposed, and each corner cover 316 is coupled to the front frame 312. The outer edge of the corner cover 316 defines a portion of the decoration outer border 351, and the inner edge of the corner cover 316 defines a portion of the decoration inner border 352.

[0117] The inner edge of the corner cover 316 is defined as a corner decoration inner border 317.

[0118] The corner decoration inner border 317 may be disposed so as to contact the suction grill 320. In this embodiment, the inner edge of the corner cover 316 is disposed so as to face the suction grill 320, and is spaced apart therefrom by a predetermined distance to form a gap 317a.

[0119] The side decoration inner border 315 is also spaced apart from the vane module 200 to form a gap 315a, and is disposed so as to face the outer edge of the vane module 200.

[0120] Consequently, the decoration inner border 352 is spaced apart from the outer edges of the four vane modules 200 and the suction grill 320 to form a continuous gap.

[0121] A continuous gap defined by four side decoration inner border gaps 315a and four corner decoration inner border gaps 317a is defined as a front decoration gap 350a.

[0122] The front decoration gap 350a is formed at the inner edge of the front decoration 350. Specifically, the front decoration gap 350a is formed as the result of the outer edges of the vane module 200 and the suction grill 320 and the inner edge of the front decoration 350 being spaced apart from each other.

[0123] When the vane module 200 is not operated (when the indoor unit is stopped), the front decoration gap 350a allows the suction grill 320 and the vane module 200 to be seen as a single structure.

<Construction of suction grill>

[0124] The suction grill 320 is located at the lower side of the front body 310. The suction grill 320 may be moved downwards in the state of being in tight contact with the lower surface of the front body 310.

[0125] The suction grill 320 includes a grill body 322 and a plurality of grill holes 321 formed through the grill body 322 in the upward-downward direction.

[0126] The suction grill 320 includes a grill body 322 disposed at the lower side of the suction port 101, the grill body communicating with the suction port 101 through a plurality of grill holes 321, the grill body being formed in a quadrangular shape, and a grill corner portion 327 formed at the corners of the grill body 322 so as to extend in the diagonal direction.

[0127] The lower surface of the grill body 322 and the lower surface of a first vane 210 may define a continuous surface. In addition, the lower surface of the grill body 322 and the lower surface of the corner cover 316 may define a continuous surface.

[0128] A plurality of grills 323 is disposed inside the grill body 322 in the shape of a lattice. The lattice-shaped grills 323 define quadrangular grill holes 321. The portion at which the grills 323 and the grill holes 321 are formed is defined as a suction portion.

[0129] The grill body 322 includes a suction portion configured to communicate with air and a grill body portion 324 disposed so as to surround the suction portion. When viewed in a top view or a bottom view, the suction portion is generally formed in a quadrangular shape.

[0130] Each corner of the suction portion is disposed so as to face a corresponding corner of the front panel 300, and more specifically is disposed so as to face the corner cover 316.

[0131] When viewed in a bottom view, the grill body 322 is formed in a quadrangular shape.

[0132] The outer edge of the grill body portion 324 is disposed so as to face the discharge port 102 or the front decoration 350.

[0133] The outer edge of the grill body portion 324 includes a grill corner border 326 disposed so as to face the corner cover 316 and a grill side border 325 defining the discharge port 102, the grill side border being disposed so as to face the side cover 314.

[0134] The grill corner border 326 may have curvature formed about the inside of the suction grill 320, and the grill side border 325 may have curvature formed about the outside of the suction grill 320,

[0135] The grill body portion 324 further includes a grill corner portion 327 surrounded by the grill corner border 326 and two grill side borders 325. The grill corner portion 327 is formed at the grill body portion 324 so as to protrude toward the corner cover 316.

[0136] The grill corner portion 327 is disposed at each corner of the grill body 322. The grill corner portion 327 extends toward each corner of the front panel 300.

[0137] In this embodiment, four grill corner portions 327 are disposed. For convenience of description, the four grill corner portions 327 are defined as a first grill corner portion 327-1, a second grill corner portion 327-2, a third grill corner portion 327-3, and a fourth grill corner portion 327-4.

[0138] The grill side border 325 is formed so as to be concave from the outside to the inside.

[0139] The discharge port 102 is formed between the side cover 314 and the suction grill 320. More specifically, one discharge port 102 is formed between the side decoration inner border 315 of the side cover 314 and the grill side border 325 of the grill body 322. Discharge ports 102 are formed between side decoration inner borders 315 and grill side borders 325 disposed in four directions of the suction grill 320.

[0140] In this embodiment, the length of the grill corner border 326 is equal to the length of the corner decoration inner border 317. That is, the width of the corner cover 316 is equal to the width of the grill corner portion 327.
[0141] In addition, the width of the inside of the side cover 314 is equal to the width of the grill side border 325.
[0142] The grill side border 325 will be described in more detail.
[0143] The grill side border 325 defines the inner border of the discharge port 102. The side decoration inner border 315 and the corner decoration inner border 317 define the outer border of the discharge port 102.
[0144] The grill side border 325 includes a long straight section 325a extending long in the longitudinal direction of the discharge port 102, the long straight section being formed in a straight line, a first curved section 325b connected to one side of the long straight section 325a, the first curved section having the center of curvature outside the suction grill 320, a second curved section 325c connected to the other side of the long straight section 325a, the first curved section having the center of curvature outside the suction grill 320, a first short straight section 325d connected to the first curved section, and a second short straight section 325e connected to the second curved section 325c.

<Construction of vane module>

[0145] The vane module 200 is installed in the discharge channel 104, and controls the flow direction of air that is discharged through the discharge port 102.
[0146] The vane module 200 includes a module body 400, a first vane 210, a second vane 220, a vane motor 230, a driving link 240, a first vane link 250, and a second vane link 260. The first vane 210, the second vane 220, the vane motor 230, the driving link 240, the first vane link 250, and the second vane link 260 are all installed at the module body 400. The module body 400 is installed integrally at the front panel 300. That is, all of the components of the vane module 200 are modularized and are installed at the front panel 300 at once.
[0147] Since the vane module 200 is modularized, it is possible to reduce assembly time and to achieve easy replacement at the time of trouble.
[0148] In this embodiment, a stepper motor is used as the vane motor 230.

<Construction of module body>

[0149] The module body 400 may be constituted by a single body. In this embodiment, the module body is manufactured using two separate parts in order to minimize installation space and to minimize manufacturing cost.
[0150] In this embodiment, the module body 400 includes a first module body 410 and a second module body 420.
[0151] The first module body 410 and the second module body 420 are formed in horizontal symmetry. In this embodiment, the first module body 410 is described by way of example.
[0152] Each of the first module body 410 and the second module body 420 is fastened to the front body 310. Specifically, each of the first module body 410 and the second module body 420 is installed at the corner frame 313.
[0153] In the horizontal direction, the first module body 410 is installed at the corner frame 313 disposed at one side of the discharge port 102, and the second module body 420 is installed at the corner frame 313 disposed at the other side of the discharge port 102.
[0154] In the vertical direction, each of the first module body 410 and the second module body 420 is in tight contact with the lower surface of the corner frame 313, and is fastened thereto via a fastening member 401.
[0155] Consequently, the first module body 410 and the second module body 420 are disposed at the lower side of the front body 310. In the state in which the indoor unit is installed, the direction in which the first module body 410 and the corner frame 313 are fastened to each other is disposed so as to be directed from the lower side to the upper side, and the direction in which the second module body 420 and the corner frame 313 are fastened to each other is also disposed so as to be directed from the lower side to the upper side.
[0156] In the above structure, the entirety of the vane module 200 may be easily separated from the front body 310 during repair.
[0157] The vane module 200 includes a first module body 410 disposed at one side of the discharge port 102, the first module body being located at the lower side of the front body 310, the first module body being assembled to the front body 310 so as to be separable downwards therefrom, a second module body 420 disposed at the other side of the discharge port 102, the second module body being located at the lower side of the front body 310, the second module body being assembled to the front body 310 so as to be separable downwards therefrom, at least one vane 210 and 220 having one side and the other side coupled to the first module body 410 and the second module body 420, respectively, the vane being configured to be rotated relative to the first module body 410 and the second module body 420, a vane motor 230 installed at at least one of the first module body 410 or the second module body 420, the vane motor being configured to provide driving force to the vane, a first fastening hole 403-1 disposed at the first module body 410, the first fastening hole being disposed so as to face downwards, the first fastening hole being formed through the first module body 410, a first fastening member 401-1 fastened to the front body 310 through the first fastening hole 403-1, a second

fastening hole 403-2 disposed at the second module body 420, the second fastening hole being disposed so as to face downwards, the second fastening hole being formed through the second module body 420, and a second fastening member 401-2 fastened to the front body through the second fastening hole 403-2.

[0158] In particular, since the first module body 410 and the second module body 420 are located at the lower side of the front body 310, only the main module 200 may be separated from the front body 310 in the state in which the front body 310 is installed at the case housing 110. This is commonly applied to all of the four vane modules 200.

[0159] In the case in which the module body 400 is separated from the front body 310, the entirety of the vane module 200 is separated downwards from the front body 310.

[0160] The first module body 410 includes a module body portion 402 coupled to the front body 310 and a link installation portion 404 protruding upwards from the module body portion 402.

[0161] The module body portion 402 is fastened to the front body 310 via a fastening member 401 (not shown). Unlike this embodiment, the module body portion 402 may be coupled to the front body 310 by hook coupling or interference fitting.

[0162] In this embodiment, the module body portion 402 is securely fastened to the front body 310 in order to minimize generation of vibration or noise due to the first vane 210, the second vane 220, the vane motor 230, the driving link 240, the first vane link 250, and the second vane link 260.

[0163] The fastening member 401 provided to fix the module body portion 402 is in the state of being fastened from the lower side to the upper side, and may be separated from the upper side to the lower side.

[0164] A fastening hole 403, through which the fastening member 401 is inserted, is formed in the module body portion 402.

[0165] In the case in which it is necessary to distinguish between the fastening hole formed in the first module body 410 and the fastening hole formed in the second module body 420 for convenience of description, the fastening hole formed in the first module body 410 is referred to as a first fastening hole 403-1, and the fastening hole formed in the second module body 420 is referred to as a second fastening hole 403-1.

[0166] Also, in the case in which it is necessary to distinguish between the fastening members 401, the fastening member 401 installed in the first fastening hole 403-1 is defined as a first fastening member 401-1, and the fastening member 401 installed in the second fastening hole 403-1 is defined as a second fastening member 401-2.

[0167] The first fastening member 401-1 is fastened to the front body 310 through the first fastening hole. The second fastening member 401-2 is fastened to the front body 310 through the second fastening hole.

[0168] Before fixing the module body 400 by fastening, a module hook 405 configured to temporarily fix the position of the module body 400 is disposed.

[0169] The module hook 405 is coupled to the front panel 300, specifically the front body 310. Specifically, the module hook 405 and the front body 310 are caught by each other.

[0170] A plurality of module hooks 405 may be disposed at one module body. In this embodiment, module hooks are disposed at the outer edge and the front edge of the module body portion 402. That is, module hooks 405 are disposed outside the first module body 410 and the second module body 420, and the module hooks 405 are symmetrical with each other in the leftward-rightward direction.

[0171] The vane module 200 may be temporarily fixed to the frame body 310 by the module hook 405 of the first module body 410 and the module hook 405 of the second module body 420.

[0172] In the case of fixing using the module hooks 405, a slight gap may be generated due to the coupling structure thereof. The fastening member 401 securely fixes the temporarily fixed module body 400 to the front body 310.

[0173] The fastening hole 403, in which the fastening member 401 is installed, may be located between the module hooks 405. The fastening hole 403 of the first module body 410 and the fastening hole 403 of the second module body 420 are disposed between one module hook 405 and the other module hook 405.

[0174] In this embodiment, the module hooks 405 and the fastening holes 403 are disposed in a line.

[0175] Even when the fastening members 401 are removed, the state in which the vane module 200 is coupled to the frame body 310 may be maintained by the module hooks 405.

[0176] When it is necessary to separate the vane module at the time of repair or trouble, the state in which the vane module 200 is coupled to the frame panel 300 is maintained even when the fastening member 401 is removed. As a result, a worker does not need to separately support the vane module 200 at the time of removing the fastening member 401.

[0177] Since the vane module 200 is primarily fixed by the module hook 405 and is secondary fixed by the fastening member 401, it is possible to greatly improve work convenience at the time of repair.

[0178] The module body portion 402 is disposed horizontally, and the link installation portion 404 is disposed vertically. In particular, the link installation portion 404 protrudes upwards from the module body portion 402 in the state of being installed.

[0179] The link installation portion 404 of the first module body 410 and the link installation portion 404 of the second module body 420 are disposed so as to face each other. The first vane 210, the second vane 220, the driving link 240, the first vane link 250, and the second vane link 260 are installed between the link installation portion 404 of the first module body 410 and the link installation portion 404 of the second module body 420. The vane motor 230 is disposed outside the link installation portion 404 of the first module body 410 or the link installation portion 404 of the second module body 420.

[0180] The vane motor 230 may be installed at only one of the first module body 410 and the second module body 420. In this embodiment, the vane motor 230 may be installed at each of the first module body 410 and the second module body 420.

[0181] The first vane 210, the second vane 220, the driving link 240, the first vane link 250, and the second vane link 260 are coupled between the first module body 410 and the second module body 420, whereby the vane module 200 is integrated.

[0182] In order to install the vane motor 230, a vane motor installation portion 406 protruding outside the link installation portion 404 is disposed. The vane motor 230 is fixed to the vane motor installation portion 406 by fastening. The vane motor installation portion 406 is formed in the shape of a boss, and the vane motor 230 is fixed to the vane motor installation portion 406. By the provision of the vane motor installation portion 406, the link installation portion 404 and the vane motor 230 are spaced apart from each other by a predetermined distance.

[0183] A driving link coupling portion 407 to which the driving link 240 is assembled and which provides the center of rotation to the driving link 240, a first vane link coupling portion 408 to which the first vane link 250 is assembled and which provides the center of rotation to the first vane link 250, and a second vane coupling portion 409 which is coupled with the second vane 220 and which provides the center of rotation to the second vane 220 are disposed at the link installation portion 404.

[0184] In this embodiment, each of the driving link coupling portion 407, the first vane link coupling portion 408, and the second vane coupling portion 409 is formed in the shape of a hole. Unlike this embodiment, the same may be formed in the shape of a boss, and may be realized as any of various forms that provide a rotary shaft.

[0185] Meanwhile, a stopper 270 configured to limit the rotational angle of the driving link 240 is disposed at the link installation portion 404. The stopper 270 is disposed so as to protrude toward the opposite link installation portion 404.

[0186] In this embodiment, the stopper 270 interferes with the driving link 240 at a specific position at the time of rotation thereof, and limits rotation of the driving link 240. The stopper 270 is located within the radius of rotation of the driving link 240.

[0187] In this embodiment, the stopper 270 is manufactured integrally with the link installation portion 404. In this embodiment, the stopper 270 defines the installation position of the driving link 240, remains in contact with the driving link 240 at the time of rotation thereof, and inhibits vibration or free movement of the driving link 240.

[0188] In this embodiment, the stopper 270 is formed in the shape of an arc.

<Construction of driving link>

[0189] The driving link 240 is directly connected to the vane motor 230. A motor shaft (not shown) of the vane motor 230 is directly coupled to the driving link 240, and the rotation amount of the driving link 240 is determined based on the rotational angle of the rotary shaft of the vane motor 230.

[0190] The driving link 240 is assembled to the vane motor 230 through the link installation portion 404. In this embodiment, the driving link 240 extends through the driving link coupling portion 407.

[0191] The driving link 240 includes a driving link body 245, a first driving link shaft 241 disposed at the driving link body 245, the first driving link shaft being rotatably coupled to the first vane 210, a core link shaft 243 disposed at the driving link body 245, the core link shaft being rotatably coupled to the link installation portion 404 (specifically, the driving link coupling portion 407), and a second driving link shaft 242 disposed at the driving link body 245, the second driving link shaft being rotatably coupled to the second vane link 260.

[0192] The driving link body 245 includes a first driving link body 246, a second driving link body 247, and a core body 248.

[0193] The core link shaft 243 is disposed at the core body 248, the first driving link shaft 241 is disposed at the first driving link body 246, and the core link shaft 243 is disposed at the second driving link body 247.

[0194] The core body 248 connects the first driving link body 246 and the second driving link body 247 to each other. The shape of each of the first driving link body 246 and the second driving link body 247 is not particularly restricted. In this embodiment, however, each of the first driving link body 246 and the second driving link body 247 is generally formed in the shape of a straight line.

[0195] The first driving link body 246 is longer than the second driving link body 247.

[0196] The core link shaft 243 is rotatably assembled to the link installation portion 404. The core link shaft 243 is assembled to the driving link coupling portion 407 formed at the link installation portion 404. The core link shaft 243 may be rotated relative to the driving link coupling portion 407 in the state of being coupled thereto.

[0197] The first driving link shaft 241 is rotatably assembled to the first vane 210. The second driving link shaft 242 is rotatably assembled to the second vane link 260.

[0198] The first driving link shaft 241 and the second driving link shaft 242 protrude in the same direction. The core link shaft 243 protrudes in the direction opposite the first driving link shaft 241 and the second driving link shaft 242.

[0199] The first driving link body 246 and the second driving link body 247 have a predetermined angle therebetween. An imaginary straight line joining the first driving link shaft 241 and the core link shaft 243 to each other and an imaginary straight line joining the core link shaft 243 and the second driving link shaft 242 to each other have a predetermined angle E therebetween. The angle E is greater than 0 degrees and less than 180 degrees.

[0200] The first driving link shaft 241 has a structure in which the driving link body 245 and the first vane 210 can be rotated relative thereto. In this embodiment, the first driving link shaft 241 is formed integrally with the driving link body 245. Unlike this embodiment, the first driving link shaft 241 may be manufactured integrally with the first vane 210 or the joint rib 214.

[0201] The core link shaft 243 has a structure in which the driving link body 245 and the module body (specifically, the link installation portion 404) can be rotated relative thereto. In this embodiment, the core link shaft 243 is formed integrally with the driving link body 245.

[0202] The second driving link shaft 242 has a structure in which the second vane link 260 and the driving link 240 can be rotated relative thereto. In this embodiment, the second driving link shaft 242 is formed integrally with the driving link body 245. Unlike this embodiment, the second driving link shaft 242 may be manufactured integrally with the second vane link 260.

[0203] In this embodiment, the second driving link shaft 242 is disposed at the second driving link body 247. The second driving link shaft 242 is disposed opposite the first driving link shaft 241 on the basis of the core link shaft 243.

[0204] An imaginary straight line joining the first driving link shaft 241 and the core link shaft 243 to each other and an imaginary straight line joining the core link shaft 243 and the second driving link shaft 242 to each other have a predetermined angle E therebetween. The angle E is greater than 0 degrees and less than 180 degrees.

<Construction of first vane link>

[0205] In this embodiment, the first vane link 250 is made of a strong material, and is formed in the shape of a straight line. Unlike this embodiment, the first vane link 250 may be curved.

[0206] The first vane link 250 includes a first vane link body 255, a 1-1 vane link shaft 251 disposed at the first vane link body 255, the 1-1 vane link shaft being assembled to the first vane 210, the 1-1 vane link shaft being configured to be rotated relative to the first vane 210, and a 1-2 vane link shaft 252 disposed at the first vane link body 255, the 1-2 vane link shaft being assembled to the module body 400 (specifically, the link installation portion 404), the 1-2 vane link shaft being configured to be rotated relative to the module body 400.

[0207] The 1-1 vane link shaft 251 protrudes toward the first vane 210. The 1-1 vane link shaft 251 may be assembled to the first vane 210, and may be rotated relative to the first vane 210.

[0208] The 1-2 vane link shaft 252 is assembled to the link installation portion 404 of the module body 400. Specifically, the 1-2 vane link shaft 252 may be assembled to the first vane link coupling portion 408, and may be rotated relative to the first vane link coupling portion 408.

<Construction of second vane link>

[0209] In this embodiment, the second vane link 260 is made of a strong material, and is formed in the shape of a straight line. Unlike this embodiment, the first vane link 250 may be curved.

[0210] The second vane link 260 includes a second vane link body 265, a 2-1 vane link shaft 261 disposed at the second vane link body 265, the 2-1 vane link shaft being assembled to the second vane 220, the 2-1 vane link shaft being configured to be rotated relative to the second vane 220, and a 2-2 vane link journal 262 disposed at the second vane link body 265, the 2-2 vane link journal being assembled to the driving link 240 (specifically, the second driving link shaft 242), the 2-2 vane link journal being configured to be rotated relative to the driving link 240.

[0211] In this embodiment, the 2-2 vane link journal 262 is formed in the shape of a hole formed through the second vane link body 265. Since the 2-2 vane link journal 262 and the second driving link shaft 242 have relative structures, one is formed in the shape of a shaft and the other is formed in the shape of a hole having the center of rotation. Unlike this embodiment, therefore, the 2-2 vane link journal 262 may be formed in the shape of a shaft, and the second driving link shaft may be formed in the shape of a hole.

[0212] In all constructions that can be coupled to the driving link, the first vane link, and the second vane link so as to be rotated relative thereto, substitution of the above construction is possible, and therefore a description of modifiable examples thereof will be omitted.

<Construction of vane>

[0213] For description, the direction in which air is discharged is defined as the front, and the direction opposite thereto is defined as the rear. In addition, the ceiling side is defined as the upper side, and the floor is defined as the lower side.
[0214] In this embodiment, the first vane 210 and the second vane 220 are disposed in order to control the flow direction of air that is discharged from the discharge port 102. The relative disposition and relative angle between the first vane 210 and the second vane 220 are changed according to steps of the vane motor 230. In this embodiment, the first vane 210 and the second vane 220 provide six discharge steps P1, P2, P3, P4, P5, and P6 in pairs according to steps of the vane motor 230.
[0215] The discharge steps P1, P2, P3, P4, P5, and P6 are defined as states in which the first vane 210 and the second vane 220 are stationary, rather than moved. In this embodiment, on the other hand, moving steps may be provided. The moving steps result from a combination of the six discharge steps P1, P2, P3, P4, P5, and P6, and are defined as the current of air provided by the operation of the first vane 210 and the second vane 220.

<Construction of first vane>

[0216] The first vane 210 is disposed between the link installation portion 404 of the first module body 410 and the link installation portion 404 of the second module body 420.
[0217] When the indoor unit is not operated, the first vane 210 covers most of the discharge port 210. Unlike this embodiment, the first vane 210 may be manufactured so as to cover the entirety of the discharge port 210.
[0218] The first vane 210 is coupled to the driving link 240 and the first vane link 250.
[0219] The driving link 240 and the first vane link 250 are disposed at one side and the other side of the first vane 210, respectively.
[0220] The first vane 210 is rotated relative to the driving link 240 and the first vane link 250.
[0221] When it is necessary to distinguish between the positions of the driving link 240 and the first vane link 250, the driving link 240 coupled to the first module body 410 is defined as a first driving link, and the first vane link 250 coupled to the first module body 410 is defined as a 1-1 vane link. The driving link 240 coupled to the second module body 420 is defined as a second driving link, and the first vane link 250 coupled to the second module body 420 is defined as a 1-2 vane link.
[0222] The first vane 210 includes a first vane body 212 formed so as to extend long in the longitudinal direction of the discharge port 102 and a joint rib 214 protruding upwards from the first vane body 212, the driving link 240 and the first vane link 250 being coupled to the joint rib.
[0223] The first vane body 212 may be formed so as to have a gently curved surface.
[0224] The first vane body 212 controls the direction of air that is discharged along the discharge channel 104. The discharged air collides with the upper surface or the lower surface of the first vane body 212, whereby the flow direction thereof may be guided.
[0225] The flow direction of the discharged air and the longitudinal direction of the first vane body 212 are perpendicular to each other or intersect each other.
[0226] The joint rib 214 is an installation structure for coupling between the driving link 240 and the first vane link 250. The joint rib 214 is disposed at each of one side and the other side of the first vane 210.
[0227] The joint rib 214 is formed so as to protrude upwards from the upper surface of the first vane body 212. The joint rib 214 is formed in the flow direction of discharged air, and minimizes resistance to the discharged air. Consequently, the joint rib 214 is perpendicular to or intersects the longitudinal direction of the first vane body 212.
[0228] The joint rib 214 is formed such that the air discharge side (the front) of the joint rib is low and the air entrance side (the rear) of the joint rib is high. In this embodiment, the joint rib 214 is formed such that the side of the joint rib to which the driving link 240 is coupled is high and the side of the joint rib to which the first vane link 250 is coupled is low.
[0229] The joint rib 214 has a second joint portion 217 rotatably coupled with the driving link 240 and a first joint portion 216 rotatably coupled with the first vane link 250.
[0230] The joint rib 214 may be manufactured integrally with the first vane body 212.
[0231] In this embodiment, each of the first joint portion 216 and the second joint portion 217 is formed in the shape of a hole, and is formed through the joint rib 214.
[0232] Each of the first joint portion 216 and the second joint portion 217 is a structure in which axial coupling or hinge coupling is possible, and may be changed into any of various forms.
[0233] When viewed from the front, the second joint portion 217 is located higher than the first joint portion 216.
[0234] The second joint portion 217 is located further rearwards than the first joint portion 216. The first driving link shaft 241 is assembled to the second joint portion 217. The second joint portion 217 and the first driving link shaft 241 are assembled so as to be rotatable relative to each other. In this embodiment, the first driving link shaft 241 is assembled through the second joint portion 217.

[0235] The 1-1 vane link shaft 251 is assembled to the first joint portion 216.

[0236] The first joint portion 216 and the 1-1 vane link shaft 251 are assembled so as to be rotatable relative to each other. In this embodiment, the 1-1 vane link shaft 251 is assembled through the first joint portion 216.

[0237] When viewed in a top view, the driving link 250 and the first vane link 250 are disposed between the joint rib 214 and the link installation portion 404.

[0238] In this embodiment, the distance between the first joint portion 216 and the second joint portion 217 is less than the distance between the core link shaft 243 and the 1-2 vane link shaft 252.

<Construction of second vane>

[0239] The second vane 220 includes a second vane body 222 formed so as to extend long in the longitudinal direction of the discharge port 102, a joint rib 224 protruding upwards from the second vane body 222, the joint rib 224 being coupled to the second vane link 260 so as to be rotatable relative thereto, and a second vane shaft 221 formed at the second vane body 222, the second vane shaft being rotatably coupled to the link installation portion 404.

[0240] The joint rib 224 is a structure in which axial coupling or hinge coupling is possible, and may be changed into any of various forms. A hole formed in the second joint rib 224 and coupled to the second vane link 220 so as to be rotatable relative thereto is defined as a third joint portion 226.

[0241] In this embodiment, the third joint portion 226 is formed in the shape of a hole, and is formed through the joint rib 224. The third joint portion 226 is a structure in which axial coupling or hinge coupling is possible, and may be changed into any of various forms.

[0242] In the case in which it is necessary to distinguish between the joint rib 214 of the first vane and the joint rib 224 of the second vane, the joint rib of the first vane is defined as a first joint rib 214, and the joint rib of the second vane is defined as a second joint rib 224.

[0243] The second vane 220 may be rotated about the second joint rib 224, and may also be rotated about the second vane shaft 221. That is, the second vane 220 may be rotated relative to each of the second joint rib 224 and the second vane shaft 221.

[0244] When viewed in a top view, the second joint rib 224 is located further forwards than the second vane shaft 221. The second joint rib 224 is moved along a predetermined orbit about the second vane shaft 221.

[0245] The second vane body 222 may be formed so as to be gently curved.

[0246] The second vane body 222 controls the direction of air that is discharged along the discharge channel 104. The discharged air collides with the upper surface or the lower surface of the second vane body 222, whereby the flow direction thereof is guided.

[0247] The flow direction of the discharged air and the longitudinal direction of the second vane body 222 are perpendicular to each other or intersect each other.

[0248] When viewed in a top view, at least a portion of the second vane body 222 may be located between the first joint portions 212 of the first vane 210.

[0249] This is necessary to prevent interference when the second vane 220 is located at the upper side of the first vane 210. The front end of the second vane body 222 is located between the first joint portions 214). That is, the front length of the second vane body 222 is less than the length between the first joint portions 214.

[0250] The second joint rib 224 is an installation structure for assembly with the second vane link 260. The second joint rib 224 is disposed at each of one side and the other side of the second vane body 222.

[0251] The second joint rib 224 is coupled to the second vane link 260 so as to be rotatable relative thereto. In this embodiment, the third joint portion 226 and the second vane link 260 are axially coupled to each other so as to be rotatable relative thereto.

[0252] The second joint rib 224 is formed so as to protrude upwards from the upper surface of the second vane body 222. The second joint rib 224 is preferably formed in the flow direction of discharged air. Consequently, the second joint rib 224 is disposed so as to perpendicular to or intersect the longitudinal direction of the second vane body 222.

[0253] The second vane 220 is rotated about the second vane shaft 221. The second vane shaft 221 is formed at each of one side and the other side of the second vane body 222.

[0254] One second vane shaft 221 protrudes toward the link installation portion 404 disposed at one side, and the other second vane shaft 221 protrudes toward the link installation portion 404 disposed at the other side.

[0255] The second vane coupling portion 411 rotatably coupled to the second vane shaft 221 is disposed at the module body 400. In this embodiment, the second vane coupling portion 411 is formed in the shape of a hole formed through the module body 400.

[0256] The second vane shaft 221 is located further rearwards than the second joint rib 224. The second vane link 260, the driving link 240, and the first vane line 250 are sequentially disposed in front of the second vane shaft 221.

[0257] In addition, the driving link coupling portion 407 and the first vane link coupling portion 408 are sequentially disposed in front of the second vane coupling portion 411.

<Disposition of vane module and suction grill>

[0258] The coupling structure and the separation structure of the vane module will be described in more detail with reference to FIGS. 1 to 4 and 15.

[0259] When the suction grill 320 is separated in the state of FIG. 1, four vane modules 200 are exposed, as shown in FIG. 15. The suction grill 320 is separably assembled to the front body 310.

[0260] The suction grill 320 may be separated from the front body 310 using various methods.

[0261] The suction grill 320 may be separated using a method of separating and rotating one edge of the suction grill on the basis of the other edge of the suction grill. In another method, the suction grill 320 may be separated from the front body 310 through release of catching in the state of being caught by the front body. In a further method, coupling between the suction grill 200 and the front body 310 may be maintained by magnetic force.

[0262] In this embodiment, the suction grill 320 may be moved in the upward-downward direction by an elevator 500 installed at the front body 310. The elevator 500 is connected to the suction grill 320 via a wire (not shown). The wire may be wound or unwound by operation of the elevator 500, whereby the suction grill 320 may be moved downwards or upwards.

[0263] A plurality of elevators 500 is disposed, and the elevators 500 simultaneously move opposite sides of the suction grill 320.

[0264] When the suction grill 320 is moved downwards, the first module body 410 and the second module body 420, hidden by the suction grill 320, are exposed.

[0265] In the state in which the suction grill 320 is assembled to the front body 310, at least one of the first vane 210 or the second vane 220 of the vane module 200 may be exposed.

[0266] When the indoor unit is not operated, only the first vane 210 is exposed to the user. When the indoor unit is operated and air is discharged, the second vane 220 may be selectively exposed to the user.

[0267] In the state in which the suction grill 320 is assembled to the front body 310, the first module body 410 and the second module body 420 of the vane module 200 are hidden by the suction grill 320.

[0268] Since the fastening holes 403 are disposed at the first module body 410 and the second module body 420, the fastening holes 403 are hidden by the suction grill 320 so as not to be visible to the user.

[0269] Since the first module body 410 and the second module body 420 are located at the upper side of the grill corner portion 327 constituting the suction grill 320, the grill corner portion 327 prevents the first module body 410 and the second module body 420 from being exposed outside.

[0270] The grill corner portion 327 also prevents the fastening holes 403 formed in the first module body 410 and the second module body 420 from being exposed outside. Since the grill corner portion 327 is located at the lower side of the fastening holes 403, the fastening holes 403 are hidden by the grill corner portion 327.

[0271] More specifically, the suction grill 320 includes a grill body 322 disposed at the lower side of the suction port 101, the grill body communicating with the suction port 101 through a plurality of grill holes 321, the grill body being formed in a quadrangular shape, and a first grill corner portion 327-1, a second grill corner portion 327-2, a third grill corner portion 327-3, and a fourth grill corner portion 327-4 formed at the corners of the grill body 322 so as to extend in the diagonal direction.

[0272] The vane module 200 includes a first vane module 201 disposed outside one edge of the suction grill 320, the first vane module being disposed between the first grill corner portion 327-1 and the second grill corner portion 327-2, a second vane module 202 disposed outside one edge of the suction grill 320, the second vane module being disposed between the second grill corner portion 327-2 and the third grill corner portion 327-3, a third vane module 203 disposed outside one edge of the suction grill 320, the third vane module being disposed between the third grill corner portion 327-3 and the fourth grill corner portion 327-4, and a fourth vane module 204 disposed outside one edge of the suction grill 320, the fourth vane module being disposed between the fourth grill corner portion 327-4 and the first grill corner portion 327-1.

[0273] The first module body 410 and the second module body 420 disposed between the first vane module 201 and the second vane module 202 are located at the upper side of the first grill corner portion 327-1, and are hidden by the first grill corner portion 327-1. Specifically, the second module body of the first vane module and the first module body of the second vane module are disposed at the upper side of the first grill corner portion.

[0274] The first module body and the second module body disposed between the second vane module 202 and the third vane module 203 are located at the upper side of the second grill corner portion 327-2, and are hidden by the second grill corner portion 327-2. Specifically, the second module body of the second vane module and the first module body of the third vane module are disposed at the upper side of the second grill corner portion.

[0275] The first module body and the second module body disposed between the third vane module 203 and the fourth vane module 204 are located at the upper side of the third grill corner portion 327-3, and are hidden by the third grill corner portion 327-3. Specifically, the second module body of the third vane module and the first module body of the fourth vane module are disposed at the upper side of the third grill corner portion.

[0276] The first module body and the second module body disposed between the fourth vane module 204 and the first vane module 201 are located at the upper side of the fourth grill corner portion 327-4, and are hidden by the fourth grill corner portion 327-4. Specifically, the second module body of the fourth vane module and the first module body of the first vane module are disposed at the upper side of the fourth grill corner portion.

[0277] Referring to FIG. 15, the vane module 200 disposed in the 12 o'clock direction is defined as a first vane module 201, the vane module 200 disposed in the 3 o'clock direction is defined as a second vane module 202, the vane module 200 disposed in the 6 o'clock direction is defined as a third vane module 203, and the vane module 200 disposed in the 9 o'clock direction is defined as a fourth vane module 204.

[0278] The first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 are disposed at intervals of 90 degrees about the center C of the front panel 300.

[0279] The first vane module 201 and the third vane module 203 are disposed parallel to each other, and the second vane module 202 and the fourth vane module 204 are disposed parallel to each other.

[0280] Four side covers 314 are disposed at the front body 310. For convenience of description, the side cover 314 disposed outside the first vane module 201 is defined as a first side cover 314-1, the side cover 314 disposed outside the second vane module 202 is defined as a second side cover 314-2, the side cover 314 disposed outside the third vane module 203 is defined as a third side cover 314-3, and the side cover 314 disposed outside the fourth vane module 204 is defined as a fourth side cover 314-4.

[0281] Each side cover 314 is assembled to one edge of the front frame 312, is located at the lower side of the front frame 312, is exposed outside, and is disposed outside a corresponding vane module 202.

[0282] The corner cover 316 disposed between the first vane module 201 and second vane module 202 is defined as a first corner cover 316-1. The corner cover 316 disposed between the second vane module 202 and the third vane module 203 is defined as a second corner cover 316-2. The corner cover 316 disposed between the third vane module 203 and the fourth vane module 204 is defined as a third corner cover 316-3. The corner cover 316 disposed between the fourth vane module 204 and the first vane module 201 is defined as a fourth corner cover 316-4.

[0283] The first corner cover 316-1 is assembled to one corner of the front frame 312, is located at the lower side of the front frame 312, is located between the first side cover 314-1 and the second side cover 314-2, and is exposed outside.

[0284] The second corner cover 316-2 is assembled to one corner of the front frame 312, is located at the lower side of the front frame 312, is located between the second side cover 314-2 and the third side cover 314-3, and is exposed outside.

[0285] The third corner cover 316-3 is assembled to one corner of the front frame 312, is located at the lower side of the front frame 312, is located between the third side cover 314-3 and the fourth side cover 314-4, and is exposed outside.

[0286] The fourth corner cover 316-4 is assembled to one corner of the front frame 312, is located at the lower side of the front frame 312, is located between the fourth side cover 314-4 and the first side cover 314-1, and is exposed outside.

[0287] The first corner cover 316-1 and the third corner cover 316-3 are disposed about the center C of the front panel 300 in the diagonal direction, and are disposed so as to face each other. The second corner cover 316-2 and the fourth corner cover 316-4 are disposed about the center C of the front panel 300 in the diagonal direction, and are disposed so as to face each other.

[0288] Imaginary diagonal lines passing through the center of the front panel 300 are defined as P1 and P2. P1 is an imaginary line joining the first corner cover 316-1 and the third corner cover 316-3 to each other, and P2 is an imaginary line joining the second corner cover 316-2 and the fourth corner cover 316-4 to each other.

[0289] A first grill corner portion 327-1, a second grill corner portion 327-2, a third grill corner portion 327-3, and a fourth grill corner portion 327-4 formed so as to extend towards corners are disposed at the suction panel 320.

[0290] On the basis of the grill corner portions, the first vane module 201 is disposed outside one edge of the suction grill 320, and is disposed between the first grill corner portion 327-1 and the second grill corner portion 327-2.

[0291] The second vane module 202 is disposed outside one edge of the suction grill, and is disposed between the second grill corner portion 327-2 and the third grill corner portion 327-3.

[0292] The third vane module 203 is disposed outside one edge of the suction grill, and is disposed between the third grill corner portion 327-3 and the fourth grill corner portion 327-4.

[0293] The fourth vane module 204 is disposed outside one edge of the suction grill, and is disposed between the fourth grill corner portion 327-4 and the first grill corner portion 327-1.

[0294] The first grill corner portion 327-1 is formed so as to extend toward the first corner cover 316-1, and has a surface continuously connected to the outer surface of the first corner cover 316-1.

[0295] The grill corner border 326 of the first grill corner portion 327-1 is opposite the corner decoration inner border 317 of the first corner cover 316-1, and defines a corner decoration inner border gap 317a.

[0296] The grill corner borders 326 of the other grill corner portions 327 are opposite the corner decoration inner borders 317 of the other corner cover 316, and define corner decoration inner border gaps 317a.

[0297] The first module body 410 and the second module body 420 are located inside the corner cover 316 (specifically, at the center C side of the front panel). In particular, the first module body 410 and the second module body 420 are disposed so as to face each other on the basis of the imaginary diagonal lines P1 and P2.

[0298] Specifically, the first module body 410 of the first vane module 201 and the second module body 420 of the fourth vane module 204 are disposed so as to face each other on the basis of the imaginary diagonal line P2.

[0299] The first module body 410 of the second vane module 202 and the second module body 420 of the first vane module 201 are disposed so as to face each other on the basis of the imaginary diagonal line P1.

[0300] The first module body 410 of the third vane module 201 and the second module body 420 of the second vane module 202 are disposed so as to face each other on the basis of the imaginary diagonal line P2.

[0301] The first module body 410 of the fourth vane module 204 and the second module body 420 of the third vane module 203 are disposed so as to face each other on the basis of the imaginary diagonal line P1.

[0302] Meanwhile, the suction grill 320 is located at the lower side of the first module bodies 410 and the second module bodies 420, and conceals the first module bodies 410 and the second module bodies 420 so as not to be exposed. That is, in the case in which the suction grill 320 is in tight contact with the front body 310, the first module bodies 410 and the second module bodies 420 are hidden by the suction grill 320 and thus are not exposed to the user. Since the first module bodies 410 and the second module bodies 420 are hidden, the fastening holes 403 formed in the first module bodies 410 and the second module bodies 420 are hidden by the suction grill 320 and thus are not exposed to the user.

[0303] The suction grill 320 has four grill corner portions 327 disposed so as to face the respective corner covers 316. Each grill corner portion 327 is disposed so as to be opposite a corresponding one of the corner covers 316.

[0304] The grill corner portion 327 disposed so as to be opposite the first corner cover 316-1 is defined as a first grill corner portion 327-1, the grill corner portion 327 disposed so as to be opposite the second corner cover 316-2 is defined as a first grill corner portion 327-2, the grill corner portion 327 disposed so as to be opposite the third corner cover 316-3 is defined as a third grill corner portion 327-3, and the grill corner portion 327 disposed so as to be opposite the fourth corner cover 316-4 is defined as a fourth grill corner portion 327-4.

[0305] When viewed in a bottom view, the plurality of module bodies 400 is located at the upper side of the grill corner portion 327, and is hidden by the grill corner portion 327.

[0306] In particular, the grill side border 325 defining the edge of the grill corner portion 327 is disposed so as to face the corner decoration inner border 317 defining the inner edge of the corner cover 316, and the curved shapes thereof correspond to each other.

[0307] In the same manner, the grill corner border 326 defining the edge of the grill corner portion 327 is disposed so as to face the inner edge of the first vane 210, and the curved shapes thereof correspond to each other.

[0308] Meanwhile, in this embodiment, a permanent magnet 318 and a magnetic force fixing portion 328 are disposed in order to maintain the state in which the suction grill 320 is in tight contact with the front body 310.

[0309] One of the permanent magnet 318 and the magnetic force fixing portion 328 may be disposed at the front body 310, and the other of the magnetic force fixing portion 328 and the permanent magnet 318 may be disposed at the upper surface of each grill corner portion 327.

[0310] The permanent magnet 318 and the magnetic force fixing portion 328 are located at the upper side of each grill corner portion 327, and are hidden by each grill corner portion 327. Since the permanent magnet 318 and the magnetic force fixing portion 328 are located outside each corner of the suction grill 320, the distance between the suction grill 320 and the front body 310 may be minimized.

[0311] In the case in which the suction grill 320 and the front body 310 are spaced apart from each other, pressure in the suction channel 103 is reduced.

[0312] In this embodiment, the permanent magnet 318 is disposed at the front body 310. Specifically, the permanent magnet is disposed at the corner frame 313.

[0313] The magnetic force fixing portion 328 is made of a metal material capable of generating attractive force through interaction with the permanent magnet 318. The magnetic force fixing portion 328 is disposed at the upper surface of the suction grill 320. Specifically, the magnetic force fixing portion 328 is disposed at the upper surface of the grill corner portion 327.

[0314] When the suction grill 320 is moved upwards and approaches the permanent magnet 318, the permanent magnet 318 attracts the magnetic force fixing portion 328 to fix the suction grill 320. Magnetic force of the permanent magnet 318 is less than weight of the suction grill 320. When the suction grill 320 is not pulled by the elevator 500, therefore, coupling between the permanent magnet 318 and the magnetic force fixing portion 328 is released.

[0315] When viewed in a top view or a bottom view, the permanent magnet 318 is disposed on the imaginary diagonal lines P1 and P2. The permanent magnet 318 is located inside the corner cover 316.

[0316] When viewed in a top view or a bottom view, one of four permanent magnets 318 is disposed between the first module body 410 of the first vane module 201 and the second module body 420 of the fourth vane module 204. The other three permanent magnets are also disposed between the first module bodies 410 and the second module bodies 420 of the respective vane modules.

[0317] The permanent magnet 318 and the magnetic force fixing portion 328 are located at the upper side of each grill corner portion 327, and are hidden by each grill corner portion 327.

<Discharge step based on operation of vane motor>

[0318] In this embodiment, when the indoor unit is not operated (the indoor blowing fan is not operated), in each vane module 200, as shown, the second vane 220 is located at the upper side of the first vane 210, and the first vane 210 covers the discharge port 102. The lower surface of the first vane 210 forms a continuous surface with the lower surface of the suction grill 320 and the lower surface of the side cover 314.

[0319] When the indoor unit is not operated, the second vane 220 is concealed when viewed from the outside, since the second vane is located at the upper side of the first vane 210. Only when the indoor unit is operated, the second vane 220 is exposed to the user. When the indoor unit is not operated, therefore, the second vane 220 is located in the discharge channel 104, and the first vane 210 covers most of the discharge port 102.

[0320] Although the first vane 210 covers most of the discharge port 102 in this embodiment, the first vane 210 may be formed so as to cover the entirety of the discharge port 102 depending on design.

[0321] When the indoor blowing fan is operated in the state in which the second vane 220 is received, the vane motor 230 is operated, and the first vane 210 and the second vane 220 may provide one of the six discharge steps P1, P2, P3, P4, P5, and P6.

[0322] The state in which the indoor unit is stopped and thus the vane module 200 is not operated is defined as a stop step P0.

<Stop step P0>

[0323] In stop step P0, the vane module 200 is not operated. When the indoor unit is not operated, the vane module 200 is maintained in stop step P0.

[0324] In stop step P0, in the vane module 200, the vane motor 230 maximally rotates the driving link 240 in a first direction (in the clockwise direction in the figures of this embodiment).

[0325] At this time, the second driving link body 247 constituting the driving link 240 is supported by one end 271 of the stopper 270, whereby further rotation of the driving link in the first direction is limited.

[0326] In order to prevent excessive rotation of the driving link 240, the second driving link body 247 and the other end 270b of the stopper 270 interfere with each other in stop step P0. The second driving link body 247 is supported by the stopper 270, whereby further rotation of the driving link is limited.

[0327] The driving link 240 is rotated about the core link shaft 243 in the first direction, and the first vane link 250 is rotated about the 1-2 vane link shaft 252 in the first direction.

[0328] The first vane 210 is rotated while being restrained by the driving link 240 and the first vane link 250, and is located in the discharge port 102. The lower surface of the first vane 210 forms a continuous surface with the suction panel 320 and the side cover 314.

[0329] In stop step P0, the second vane 220 is located at the upper side of the first vane 210. When viewed from above, the second vane 220 is located between the first joints 214, and is located at the upper side of the first vane body 212.

[0330] In stop step P0, the driving link 240, the first vane link 250, and the second vane link 260 are located at the upper side of the first vane 210. The driving link 240, the first vane link 250, and the second vane link 260 are hidden by the first vane 210 and thus are not visible from the outside. That is, in stop step P0, the first vane 210 covers the discharge port 102, and prevents parts constituting the vane module 200 from being exposed outside.

[0331] In stop step P0, the driving link 240 is maximally rotated in the clockwise direction, and the second vane line 260 is maximally moved upwards.

[0332] When the indoor unit is not operated, the second vane 220 is concealed when viewed from the outside, since the second vane is located at the upper side of the first vane 210. Only when the indoor unit is operated, the second vane 220 is exposed to the user.

[0333] The positional relationship between the shafts forming the centers of rotation of the respective links in stop step P0 will be described.

[0334] First, the first joint portion 216 and the second joint portion 217 of the first vane 210 are disposed approximately horizontally. The second joint rib 224 of the second vane 220 is located at the upper side of the first joint rib 214.

[0335] When viewed from the side, the second joint rib 224 is located at the upper side of the second joint portion 217 and the first joint portion 216, and is located between the first joint portion 216 and the second joint portion 217.

[0336] Since the 2-1 vane link shaft 261 is coupled to the second joint rib 224, the 2-1 vane link shaft 261 is also located at the upper side of the second joint portion 217 and the first joint portion 216.

[0337] The first joint portion 216 and the second joint portion 217 are located at the upper side of the first vane body 212, and are located at the lower side of the second vane body 222.

[0338] In the state in which the indoor unit is stopped, the second vane 220 is located at the upper side of the first vane 210, and the 2-1 vane link shaft 261 is located at the upper side of the first driving link shaft 241 and the 1-1 vane link shaft 252.

[0339] In addition, the 2-1 vane link shaft 261 is located higher than the second vane shaft 221, and the 2-2 vane link journal 262 is located higher than the 2-1 vane link shaft 261.

[0340] The 2-2 vane link journal 262 is located at the upper side of the 2-1 vane link shaft 261, and is located at the upper side of the core link shaft 243.

[0341] Next, relative positions and directions of the respective links in stop step P0 will be described.

[0342] The first vane link 250 and the second vane link 260 are disposed in the same direction. The upper end of each of the first vane link 250 and the second vane link 260 is located at the front side in the discharge direction of air, and the rear end thereof is located at the rear side in the discharge direction of air.

[0343] Specifically, the 1-2 vane link shaft 252 of the first vane link 250 is located at the front side, and the 1-1 vane link shaft 251 of the first vane link 250 is located at the rear side. The 1-2 vane link shaft 252 of the first vane link 250 is located higher than the 1-1 vane link shaft 251. The first vane link 250 is disposed so as to be inclined rearwards and downwards from the 1-2 vane link shaft 252.

[0344] In the same manner, the 2-2 vane link journal 262 of the second vane link 260 is located at the front side, and the 2-1 vane link shaft 261 of the second vane link 260 is located at the rear side. The 2-2 vane link journal 262 of the second vane link 260 is located higher than the 2-1 vane link shaft 261. The second vane link 260 is disposed so as to be inclined rearwards and downwards from the 2-2 vane link journal 262.

[0345] The first driving link body 246 of the driving link 240 is disposed in the same direction as the first vane link 250 and the second vane link 260, and the second driving link body 247 intersects the disposition direction of the first vane link 250 and the second vane link 260.

<Discharge step P1>

[0346] In stop step P0, the driving link 240 is rotated in a second direction (in the counterclockwise direction in the figures of this embodiment), which is opposite the first direction, to provide discharge step P1.

[0347] In discharge step P1, the vane module 200 may provide horizontal wind.

[0348] In the state of the horizontal wind, air discharged from the discharge port 102 may be guided by the first vane 210 and the second vane 220 and may flow in the direction parallel with the ceiling or the floor. In the case in which the discharged air flows as the horizontal wind, it is possible to maximize the flow distance of the air.

[0349] Discharge step P1 may provide horizontal wind, and the flow in which discharged air flows along the ceiling of the room, flows downwards toward the floor after colliding with the wall of the room, and returns to the indoor unit after colliding with the floor may be formed.

[0350] That is, discharge step P1 does not directly provide air to a person in the room but provides indirect wind to the person in the room.

[0351] In discharge step P1, the upper surfaces of the first vane 210 and the second vane 220 may form a continuous surface. In discharge step P1, the first vane 210 and the second vane 220 are connected to each other like a single vane, and guide the discharged air.

[0352] When the vane module 200 provides discharge step P1, which is one of the plurality of discharge steps, the first vane 210 is located at the lower side of the discharge port 102, and the front end 222a of the second vane 220 is located higher than the rear end 212a of the first vane 210. The upper surface of the second vane 220 is located higher than the upper surface of the first vane 210.

[0353] In this embodiment, the first vane 210 is located at the front side in the flow direction of the discharged air, and the second vane 220 is located at the rear side in the flow direction of the discharged air. The front end 222a of the second vane 220 may be adjacent to or may contact the rear end 212b of the first vane 210. In discharge step P1, the distance S1 between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 may be minimized.

[0354] The rear end 222b of the second vane is located higher than the discharge port 102, the front end 222a of the second vane is located lower than the discharge port 102, and the rear end 212b of the first vane is located lower than the front end 222a of the second vane.

[0355] In discharge step P1, the front end 222a of the second vane 220 is located higher than the rear end 212b of the first vane 210.

[0356] In the case in which the front end 222a and the rear end 212b are adjacent to or contact each other, leakage of the discharged air between the first vane 210 and the second vane 220 may be minimized.

[0357] In this embodiment, the front end 222a and the rear end 212b are adjacent to each other, but do not contact each other.

[0358] When the vane module 200 forms the horizontal wind in discharge step P1, intensity of the horizontal wind may be increased, since the first vane 210 and the second vane 220 are connected to each other and operated like a single vane. That is, since the discharged air is guided along the upper surface of the second vane 220 and the upper surface of the first vane 210 in the horizontal direction, directivity of the discharged air may be further improved than the case in which the horizontal wind is formed using a single vane.

[0359] When forming the horizontal wind, the second vane 220 is disposed so as to be further inclined in the upward-downward direction than the first vane 210.

[0360] In the state of the horizontal wind, it is advantageous that the first vane 210 be located lower than the discharge port 102 and the second vane 220 be disposed so as to overlap the discharge port 102, when viewed from the side.

[0361] In discharge step P1, the second vane 220 is rotated in place about the second vane shaft 221; however, the first vane 210 is turned (swung) in the discharge direction of air, since the first vane is assembled to the driving link 240 and the first vane link 250.

[0362] When P0 is switched to P1, the second vane 220 is rotated about the second vane shaft 221, the first vane 210 is moved downwards while advancing in the discharge direction of air, and the front end 212a of the first vane is turned in the first direction (the clockwise direction in the figures).

[0363] Through rotation of the driving link 240 and the first vane link 250, the first vane 210 may be moved to the lower side of the discharge port 102, and the first vane 210 may be disposed approximately horizontally. Since a vane of a conventional indoor unit is rotated in place, it is not possible to realize disposition of the first vane 210 in this embodiment.

[0364] When the vane motor 230 rotates the driving link 240 in the second direction (the counterclockwise direction) in stop step P0, the second vane link 260 coupled to the driving link 240 is rotated in response to the driving link 240.

[0365] Specifically, when stop step P0 is switched to discharge step P1, the driving link 240 is rotated in the counter-clockwise direction, the first vane line 210 is rotated in the counterclockwise direction in response to rotation of the driving link 240, and the second vane link 220 is moved downwards while being rotated relative thereto.

[0366] Since the second vane 220 is assembled to the second vane shaft 221 and the second vane link 260 so as to be rotatable relative thereto, the second vane is rotated about the second vane shaft 221 in the clockwise direction due to downward movement of the second vane link 220.

[0367] When stop step P0 is switched to discharge step P1 in order to form the horizontal wind, the first vane 210 and the second vane 220 are rotated in opposite directions.

[0368] In discharge step P1, the vane motor 230 is rotated 78 degrees (P1 rotational angle), and the first vane 210 has an inclination of about 16 degrees (first vane P1 inclination) and the second vane 220 has an inclination of about 56.3 degrees (second vane P1 inclination) by rotation of the vane motor 230.

[0369] The positional relationship between the shafts forming the centers of rotation of the respective links in discharge step P1 will be described.

[0370] First, the second joint portion 217 and the first joint portion 216 of the first vane 210 are disposed so as to be inclined forwards in the discharge direction of air, unlike P0. When viewed from the side, the third joint portion 226 of the second vane 220 is disposed at the rearmost side, the first joint portion 216 is disposed at the frontmost side, and the second joint portion 217 is disposed between the first joint portion 216 and the third joint portion 226.

[0371] The 2-1 vane link shaft 261 is located lower than the second vane shaft 221, the first driving link shaft 241 is located lower than the 2-1 vane link shaft 261, and the 1-1 vane link shaft 251 is located lower than the first driving link shaft 241.

[0372] In P1, the third joint portion 226, the second joint portion 217, and the first joint portion 216 are disposed in a line, and are disposed so as to face forwards and downwards in the discharge direction of air. When providing discharge step P1, the second vane shaft 221, the 2-1 vane link shaft 261, the first driving link shaft 241, and the 1-1 vane link shaft 251 are disposed in a line.

[0373] In some embodiments, the third joint portion 226, the second joint portion 217, and the first joint portion 216 may not be disposed in a line.

[0374] In addition, the second vane shaft 221 may also be disposed in a line with the third joint portion 226, the second joint portion 217, and the first joint portion 216. In this case, the second vane shaft 221 is located at the rear side of the third joint portion 226.

[0375] In P1, the first vane 210 and the second vane 220 provide horizontal wind. The horizontal wind does not mean that the discharge direction of air is exactly horizontal. The horizontal wind means an angle by which discharged air can flow farthest in the horizontal direction through connection between the first vane 210 and the second vane 220 in the state in which the first vane 210 and the second vane 220 are connected to each other like a single vane.

[0376] In discharge step P1, the distance S1 between the front end 221 of the second vane 220 and the rear end 212b of the first vane 210 may be minimized.

[0377] In the state of the horizontal wind, air guided by the second vane 220 is guided to the first vane 210. In the case in which the discharged air flows as the horizontal wind in P1, it is possible to maximize the flow distance of the air.

[0378] Since the discharge channel 104 is formed in the upward-downward direction, the inclination of the second vane 220 adjacent to the suction port 101 is steeper than the inclination of the first vane 210.

[0379] In discharge step P1, the 1-1 vane link shaft 251 of the first vane link 250 is located at the lower side of the 1-2 vane link shaft 252.

[0380] In discharge step P1, the 2-1 vane link shaft 261 of the second vane link 260 is located at the lower side of the 2-2 vane link journal 262.

[0381] In discharge step P1, the first driving link shaft 241 of the driving link 240 is located at the lower side of the second driving link shaft 242 and the core link shaft 243.

[0382] In discharge step P1, in the upward-downward direction, the third joint portion 226 is located at the uppermost side, the first joint portion 216 is located at the lowermost side, and the second joint portion 217 is located therebetween.

[0383] In discharge step P1, the first joint portion 216 and the second joint portion 217 are located between the core link shaft 243 and the 1-2 vane link shaft 252. When providing discharge step P1, the first driving link shaft 241 and the 1-1 vane link shaft 251 are located between the core link shaft 243 and the 1-2 vane link shaft 252.

[0384] In discharge step P1, the first driving link shaft 241 and the 1-1 vane link shaft 251 are located at the lower side of the suction panel 320. In discharge step P1, the first driving link shaft 241 and the 1-1 vane link shaft 251 are located at the lower side of the discharge port 102. The 2-1 vane link shaft 261 is located over the border of the discharge port 102.

[0385] Due to the above disposition, the first vane 210 is located at the lower side of the discharge port 102 in discharge step P1. In discharge step P1, the front end 222a of the second vane 220 is located at the lower side of the discharge port 102, and the rear end 222b thereof is located at the upper side of the discharge port 102.

[0386] Next, relative positions and directions of the respective links in discharge step P1 will be described.

[0387] The longitudinal direction of the first driving link body 246 is defined as D-D'. The longitudinal direction of the first vane link 250 is defined as L1-L1'. The longitudinal direction of the second vane link 260 is defined as L2-L2'.

[0388] In discharge step P1, the first vane link 250, the second vane link 260, and the first driving link body 246 are disposed in the same direction. In this embodiment, the first vane link 250, the second vane link 260, and the first driving link body 246 are all disposed in the upward-downward direction in discharge step P1.

[0389] Specifically, L1-L1' of the first vane link 250 is disposed almost vertically, and L2-L2' of the second vane link 260 is disposed almost vertically. D-D' of the first driving link body 246 is disposed so as to face downwards in the discharge direction of air.

[0390] In discharge step P1, the first vane 210 is located at the lower side of the discharge port 102, and the front end 222a of the second vane 220 is located at the lower side of the discharge port 102. That is, in the state of the horizontal wind, only a portion of the second vane 220 is located outside the discharge port 102, and the entirety of the first vane 210 is located outside the discharge port 102.

[0391] In discharge step P1, the front end 212a of the first vane 210 is located further forwards than the front edge 102a of the discharge port 102 on the basis of the discharge port 102.

<Discharge step P2>

[0392] In the state of the horizontal wind of discharge step P1, the driving link 240 may be rotated in the second direction (in the counterclockwise direction in the figures of this embodiment), which is opposite the first direction, to provide discharge step P2.

[0393] When the vane module provides one of discharge steps P2 to P5, the rear end 212b of the first vane is located higher than the front end 222a of the second vane and is located level with or lower than the 2-1 vane link shaft 261.

[0394] In addition, when the vane module provides one of discharge steps P2 to P5, the angle formed by the core link shaft 243, the first driving link shaft 241, and the 1-1 vane link shaft 251 in the clockwise direction with respect to an imaginary straight line D-D' joining the core link shaft 243 and the first driving link shaft 241 to each other is an acute angle.

[0395] In discharge step P2, the vane module 200 may provide inclined wind. The inclined wind is defined as a discharge step between horizontal wind and vertical wind. In this embodiment, the inclined wind means discharge steps P2, P3, P4, and P5.

[0396] In the state of the inclined wind, air is discharged further downwards than in the state of the horizontal wind of discharge step P1. In discharge step P2, both the first vane 210 and the second vane 220 are adjusted so as to face further downwards than in discharge step P1.

[0397] Discharge step P2 may provide wind approximate to horizontal wind, and the flow in which discharged air flows along the ceiling of the room, flows downwards toward the floor after colliding with the wall of the room, and returns to the indoor unit after colliding with the floor may be formed.

[0398] Discharge step P2 provides indirect wind to the person in the room.

[0399] In discharge step P2, the distance S2 between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 is greater than the distance S1 in discharge step P1.

[0400] That is, when discharge step P1 is switched to P2, the distance between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 further increases. In discharge step P2, the first vane 210 and the second vane 220 are disposed further vertically than in P1.

[0401] When discharge step P1 is switched to discharge step P2, the front end 222a of the second vane 220 is moved downwards, and the rear end 212b of the first vane 210 is moved upwards.

[0402] In discharge step P2, the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 are located at similar heights.

[0403] When discharge step P1 is switched to discharge step P2, the second vane 220 is rotated in place about the second vane shaft 221; however, the first vane 210 is turned (swung), since the first vane is assembled to the driving link 240 and the first vane link 250.

[0404] In particular, when P1 is switched to P2, the first vane 210 further advances in the discharge direction of air, and the front end 212a of the first vane is further turned in the first direction (the clockwise direction in the figures).

[0405] Since the second vane 220 is assembled to the second vane shaft 221 and the second vane link 260 so as to be rotatable relative thereto, the second vane is further rotated about the second vane shaft 221 in the clockwise direction due to rotation of the second vane link 220.

[0406] The front end 222a of the second vane 220 is further rotated in the second direction (the clockwise direction in the figures).

[0407] When discharge step P1 is switched to discharge step P2, the first vane 210 and the second vane 220 are rotated in opposite directions.

[0408] In discharge step P2, the vane motor 230 is rotated 828 degrees (P2 rotational angle), and the first vane 210 has an inclination of about 18.6 degrees (first vane P2 inclination) and the second vane 220 has an inclination of about 59.1 degrees (second vane P2 inclination) by rotation of the vane motor 230.

[0409] The positional relationship between the shafts forming the centers of rotation of the respective links in discharge step P2 will be described.

[0410] In discharge step P2, the second joint portion 217 and the first joint portion 216 of the first vane 210 are disposed so as to be inclined forwards in the discharge direction of air, similarly to P1.

[0411] When viewed from the side, the third joint portion 226 of the second vane 220 is disposed at the rearmost side, the first joint portion 216 is disposed at the frontmost side, and the second joint portion 217 is disposed between the first joint portion 216 and the third joint portion 226.

[0412] In P2, the third joint portion 226, the second joint portion 217, and the first joint portion 216 are disposed so as to face forwards and downwards in the discharge direction of air, when viewed from the side of vane module 200.

[0413] In discharge step P2, the third joint portion 226 is moved further downwards, and the first joint portion 216 and the second joint portion 217 are moved further forwards. That is, the distance between the second vane 220 and the first vane 210 increases.

[0414] In discharge step P2, the disposition of the first vane link 250, the second vane link 260, and the driving link 240 is similar to that in discharge step P1.

[0415] In discharge step P2, the 1-1 vane link shaft 251 of the first vane link 250 is located at the lower side of the 1-2 vane link shaft 252. In discharge step P2, the 2-1 vane link shaft 261 of the second vane link 260 is located at the lower side of the 2-2 vane link journal 262. In discharge step P2, the first driving link shaft 241 of the driving link 240 is located at the lower side of the second driving link shaft 242 and the core link shaft 243.

[0416] In discharge step P2, the second vane shaft 221 is located at the uppermost side, the third joint portion 226 is located at the lower side of the second vane shaft 221, the second joint portion 217 is located is located at the lower side of the third joint portion 226, and the first joint portion 216 is located at the lower side of the second joint portion 217.

[0417] In discharge step P2, the second joint portion 217 is further rotated about the core link shaft 243 toward the 1-2 vane link shaft 252.

[0418] In discharge step P2, the entirety of the first vane 210 is located at the lower side of the discharge port 102 on the basis of the suction panel 320 or the discharge panel 102. In discharge step P2, the front end 222a of the second vane 220 is located at the lower side of the discharge port 102, and the rear end 222b thereof is located at the upper side of the discharge port 102.

[0419] In discharge step P2, therefore, the first driving link shaft 241 and the 1-1 vane link shaft 251 are located at the lower side of the suction panel 320. In discharge step P2, the first driving link shaft 241 and the 1-1 vane link shaft 251 are located at the lower side of the discharge port 102. The 2-1 vane link shaft 261 is located over the border of the discharge port 102.

[0420] Next, relative positions and directions of the respective links in discharge step P2 will be described.

[0421] In discharge step P2, the first vane link 250 and the second vane link 260 are disposed in approximately the same direction, and the first driving link body 246 is disposed so as to be inclined forwards and downwards. Particularly, in discharge step P2, the first vane link 250 and the second vane link 260 are disposed approximately vertically.

[0422] Specifically, when discharge step P1 is switched to discharge step P2, L1-L1' of the first vane link 250 is further rotated in the discharge direction of air. When discharge step P1 is switched to discharge step P2, L2-L2' of the second vane link 260 is further rotated in the direction opposite the discharge direction of air. When discharge step P1 is switched to discharge step P2, D-D' of the first driving link body 246 is further rotated in the discharge direction of air.

[0423] In discharge step P2, the entirety of the first vane 210 is located at the lower side of the discharge port 102, and only the front end 222a of the second vane 220 is located at the lower side of the discharge port 102.

[0424] When discharge step P1 is switched to discharge step P2, the front end 212a of the first vane 210 is moved further forwards than the front edge 102a of the discharge port 102 on the basis of the discharge port 102.

<Discharge step P3>

[0425] In discharge step P2, the driving link 240 may be rotated in the second direction (in the counterclockwise direction in the figures of this embodiment), which is opposite the first direction, to provide discharge step P3.

[0426] In discharge step P3, the vane module 200 may provide inclined wind that is discharged further downwards than in discharge step P2. Discharge steps P3 to P5 provide inclined wind in which air is directly provided to the person in the room.

[0427] At the time of cooling, discharged air is heavier than indoor air and thus moves downwards. At the time of heating, discharged air is lighter than indoor air and thus moves upwards. Consequently, discharge step P3 is mainly used at the time of cooling, and discharge step P4, a description of which will follow, is mainly used at the time of heating.

[0428] In the state of the inclined wind of discharge step P3, air is discharged further downwards than in the state of the inclined wind of discharge step P2. In discharge step P3, both the first vane 210 and the second vane 220 are adjusted so as to face further downwards than in discharge step P2.

[0429] In discharge step P3, the distance S3 between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 is greater than the distance S2 in discharge step P2.

[0430] That is, when discharge step P2 is switched to P3, the distance between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 further increases. In discharge step P3, the first vane 210 and the second vane 220 are disposed further vertically than in P2.

[0431] When discharge step P2 is switched to discharge step P3, the front end 222a of the second vane 220 is moved further downwards, and the rear end 212b of the first vane 210 is moved further upwards.

[0432] In discharge step P3, the front end 222a of the second vane 220 is located lower than the rear end 212b of the first vane 210.

[0433] When discharge step P2 is switched to discharge step P3, the second vane 220 is rotated in place about the second vane shaft 221; however, the first vane 210 is turned (swung), since the first vane is assembled to the driving link 240 and the first vane link 250.

[0434] When discharge step P2 is switched to discharge step P3, the first vane 210 is located almost in place, and is rotated in the first direction (the clockwise direction). When discharge step P2 is switched to discharge step P3, the second vane 220 is further rotated in the first direction (the clockwise direction).

[0435] When discharge step P2 is switched to discharge step P3, the first vane 210 is located in place in the first direction (the clockwise direction), rather than advancing in the discharge direction.

[0436] When discharge step P2 is switched to discharge step P3, the front end 222a of the second vane 220 is further rotated in the first direction (the clockwise direction) due to downward movement of the second vane link 220.

[0437] When discharge step P2 is switched to discharge step P3, the first vane 210 and the second vane 220 are rotated in opposite directions.

[0438] In discharge step P3, the vane motor 230 is rotated 95 degrees (P3 rotational angle), and the first vane 210 has an inclination of about 29.6 degrees (first vane P3 inclination) and the second vane 220 has an inclination of about 67.3 degrees (second vane P3 inclination) by rotation of the vane motor 230.

[0439] The positional relationship between the shafts forming the centers of rotation of the respective links in discharge step P3 will be described.

[0440] In discharge step P3, the second joint portion 217 and the first joint portion 216 of the first vane 210 are disposed so as to be inclined forwards in the discharge direction of air, similarly to P2.

[0441] When viewed from the side, the third joint portion 226 of the second vane 220 is disposed at the rearmost side, the first joint portion 216 is disposed at the frontmost side, and the second joint portion 217 is disposed between the first joint portion 216 and the third joint portion 226.

[0442] In discharge step P3, the third joint portion 226 is moved further downwards. In discharge step P3, the first joint portion 216 and the second joint portion 217 are moved upwards due to rotation of the first vane link 250 and the first driving link body 246 in the second direction.

[0443] Since the length of the first driving link body 246 is less than the length of the first vane link 250, the upper side of the second joint portion 217 is higher.

[0444] In discharge step P3, the disposition of the shafts at the driving link 240, the first vane link 250, and the second vane link 260 is similar to that in discharge step P2.

[0445] However, relative heights of the first driving link shaft 241, the 1-1 vane link shaft 251, and the 2-1 vane link shaft 261 rotated by operation of the driving link 240, the first vane link 250, and the second vane link 260 are varied.

[0446] In discharge step P3, the first driving link shaft 241 is moved upwards, and the 2-1 vane link shaft 261 is moved downwards, whereby these shafts are located at similar heights in the upward-downward direction.

[0447] When discharge step P2 is switched to discharge step P3, the second joint portion 217 is further rotated about the core link shaft 243 toward the 1-2 vane link shaft 252, and the second joint portion 217 is spaced further apart from the 2-1 vane link shaft 261.

[0448] In discharge step P3, the 2-2 vane link journal 262 is located lower than the core link shaft 243.

[0449] When discharge step P2 is switched to discharge step P3, the 2-1 vane link shaft 261 is moved further rearwards than the 2-2 vane link journal 262.

[0450] On the basis of the suction panel 320 or the discharge port 102, the position of the first vane 210 and the second vane 220 in discharge step P3 is similar to that in discharge step P2.

[0451] In discharge step P3, therefore, the first driving link shaft 241 and the 1-1 vane link shaft 251 are located at the lower side of the suction panel 320 and the discharge port 102. The 2-1 vane link shaft 261 is located over the border of the discharge port 102.

[0452] Next, relative positions and directions of the respective links in discharge step P3 will be described.

[0453] In discharge step P3, the first vane link 250 and the second vane link 260 are disposed in opposite directions.

[0454] In discharge step P3, the first driving link body 246 and the first vane link 250 are disposed so as to be inclined forwards and downwards. In discharge step P3, the second driving link body 247 is disposed so as to face rearwards, and the second vane link 260 is disposed so as to face rearwards and downwards.

[0455] Specifically, when discharge step P2 is switched to discharge step P3, L1-L1' of the first vane link 250 is further rotated in the discharge direction of air. When discharge step P2 is switched to discharge step P3, L2-L2' of the second vane link 260 is further rotated in the direction opposite the discharge direction of air. When discharge step P2 is switched to discharge step P3, D-D' of the first driving link body 246 is further rotated in the discharge direction of air.

[0456] When discharge step P2 is switched to discharge step P3, both the first vane 210 and the second vane 220 are turned or rotated further vertically downwards on the basis of the discharge port 102.

<Discharge step P4>

[0457] In discharge step P3, the driving link 240 may be rotated in the second direction (in the counterclockwise direction in the figures of this embodiment), which is opposite the first direction, to provide discharge step P4.

[0458] In discharge step P4, the vane module 200 may provide inclined wind that is discharged further downwards than in discharge step P3. In the state of the inclined wind of discharge step P4, air is discharged further downwards than in the state of the inclined wind of discharge step P3.

[0459] In discharge step P4, both the first vane 210 and the second vane 220 are adjusted so as to face further downwards than in discharge step P3.

[0460] In discharge step P4, the distance S4 between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 is greater than the distance S3 in discharge step P3.

[0461] When discharge step P3 is switched to P4, the distance between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 further increases. In discharge step P4, the first vane 210 and the second vane 220 are disposed further vertically than in P3.

[0462] When discharge step P3 is switched to discharge step P4, the front end 222a of the second vane 220 is moved further downwards, and the rear end 212b of the first vane 210 is moved further upwards.

[0463] In discharge step P4, the front end 222a of the second vane 220 is located lower than in discharge step P3, and the rear end 212b of the first vane 210 is located higher than in discharge step P3.

[0464] When discharge step P3 is switched to discharge step P4, the second vane 220 is rotated in place about the second vane shaft 221. When discharge step P3 is switched to discharge step P4, the first joint portion 216 of the first vane 210 stays almost in place, and the second joint portion 217 is rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0465] That is, when discharge step P3 is switched to discharge step P4, the first vane 210 is hardly moved, and is rotated in place. When discharge step P3 is switched to discharge step P4, the first vane 210 is rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0466] When discharge step P3 is switched to discharge step P4, the second vane 220 is further rotated in the first direction (the clockwise direction).

[0467] When discharge step P3 is switched to discharge step P4, the front end 222a of the second vane 220 is further rotated in the first direction (the clockwise direction) due to downward movement of the second vane link 220.

[0468] When discharge step P3 is switched to discharge step P4, the first vane 210 and the second vane 220 are rotated in the same direction.

[0469] When discharge step P3 is switched to discharge step P4, the 1-1 vane link shaft 251 may be located further forwards than the 1-2 vane link shaft 252.

[0470] In discharge step P4, the vane motor 230 is rotated 100 degrees (P4 rotational angle), and the first vane 210 has an inclination of about 35.8 degrees (first vane P4 inclination) and the second vane 220 has an inclination of about

70 degrees (second vane P4 inclination) by rotation of the vane motor 230.

[0471] The positional relationship between the shafts forming the centers of rotation of the respective links in discharge step P4 will be described.

[0472] In discharge step P4, the second joint portion 217 and the first joint portion 216 of the first vane 210 are disposed so as to be inclined forwards in the discharge direction of air, similarly to P3.

[0473] When viewed from the side, the third joint portion 226 of the second vane 220 is disposed at the rearmost side, the first joint portion 216 is disposed at the frontmost side, and the second joint portion 217 is disposed between the first joint portion 216 and the third joint portion 226.

[0474] In discharge step P4, the third joint portion 226 is moved further downwards. In discharge step P4, the first joint portion 216 of the first vane link 250 is slightly moved upwards in the second direction (the counterclockwise direction) or is located almost in place, and the second joint portion 217 is rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0475] When the first vane 210 is further rotated than in discharge step P4, the first vane 210 is moved in the direction opposite the advancing direction up to now. In discharge step P1 to discharge step P4, the first vane 210 is moved in the discharge direction of air, and is rotated about the second joint portion 217 in the first direction (the clockwise direction).

[0476] In discharge step P4, the disposition of the shafts at the driving link 240, the first vane link 250, and the second vane link 260 is similar to that in discharge step P3. In discharge step P4, however, the second joint portion 217 and the first joint portion 216 are disposed in a line in the longitudinal direction of the first driving link body 246.

[0477] Relative heights of the first driving link shaft 241, the 1-1 vane link shaft 251, and the 2-1 vane link shaft 261 rotated by operation of the driving link 240, the first vane link 250, and the second vane link 260 are varied.

[0478] In discharge step P4, the first driving link shaft 241 is moved upwards, and the 2-1 vane link shaft 261 is moved downwards, whereby the first driving link shaft 241 is located slightly higher than the 2-1 vane link shaft 261.

[0479] When discharge step P3 is switched to discharge step P4, the second joint portion 217 is further rotated about the core link shaft 243 toward the 1-2 vane link shaft 252, and the core link shaft 243, the first driving link shaft 241, and the 1-1 vane link shaft 251, each of which is formed in the shape of a straight line, may be disposed in a line.

[0480] In discharge step P4, the 2-2 vane link journal 262 is located lower than the core link shaft 243.

[0481] When discharge step P3 is switched to discharge step P4, the 2-1 vane link shaft 261 is moved further rearwards than the 2-2 vane link journal 262.

[0482] On the basis of the suction panel 320 or the discharge port 102, the position of the first vane 210 and the second vane 220 in discharge step P4 is similar to that in discharge step P3.

[0483] Next, relative positions and directions of the respective links in discharge step P4 will be described.

[0484] When discharge step P3 is switched to discharge step P4, the first vane link 250 and the second vane link 260 are disposed so as to face in opposite directions. When discharge step P3 is switched to discharge step P4, the first vane link 250 is hardly rotated, and only the second vane link 260 may be rotated rearwards.

[0485] In this embodiment, there is no separate construction capable of limiting motion of the first vane link 250. In this embodiment, motion of the first vane link 250 may be limited through the coupling relationship between the first vane link 250, the first vane 210, and the first driving link body 246.

[0486] In discharge step P4, the first driving link body 246 and the first vane link 250 are disposed so as to be inclined forwards and downwards. In discharge step P4, the second driving link body 247 is disposed so as to face rearwards, and the second vane link 260 is disposed so as to face rearwards and downwards.

[0487] In this embodiment, when discharge step P3 is switched to discharge step P4, L1-L1’ of the first vane link 250 may be further rotated in the discharge direction of air. When discharge step P3 is switched to discharge step P4, L2-L2’ of the second vane link 260 is further rotated in the direction opposite the discharge direction of air. When discharge step P3 is switched to discharge step P4, D-D’ of the first driving link body 246 is further rotated in the discharge direction of air. An imaginary straight line joining the first joint portion 216 and the second joint portion 217 to each other is defined as B-B’.

[0488] In discharge step P4, D-D’ and B-B’ are connected to each other as a straight line, and have an angle of 180 degrees therebetween.

[0489] D-D’ and B-B’ have an angle of less than 180 degrees therebetween in discharge step P1 to discharge step P3, an angle of less than 180 degrees therebetween in discharge step P4, and an angle of greater than 180 degrees therebetween in discharge step P5 and discharge step P5.

<Discharge step P5>

[0490] In discharge step P4, the driving link 240 may be rotated in the second direction (in the counterclockwise direction in the figures of this embodiment), which is opposite the first direction, to provide discharge step P5.

[0491] In discharge step P5, the vane module 200 may provide inclined wind that is discharged further downwards than in discharge step P4. In the state of the inclined wind of discharge step P5, air is discharged further downwards than in the state of the inclined wind of discharge step P4.

[0492] In discharge step P5, both the first vane 210 and the second vane 220 are adjusted so as to face further downwards than in discharge step P4.

[0493] In discharge step P5, the distance S5 between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 is greater than the distance S4 in discharge step P4.

[0494] When discharge step P4 is switched to P5, the distance between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 further increases. In discharge step P5, the first vane 210 and the second vane 220 are disposed further vertically than in P4.

[0495] When discharge step P4 is switched to discharge step P5, the front end 222a of the second vane 220 is moved further downwards, and the rear end 212b of the first vane 210 is moved further upwards.

[0496] In discharge step P5, the front end 222a of the second vane 220 is located lower than in discharge step P4, and the rear end 212b of the first vane 210 is located higher than in discharge step P4.

[0497] When discharge step P4 is switched to discharge step P5, the second vane 220 is rotated in place about the second vane shaft 221. When discharge step P4 is switched to discharge step P5, the first joint portion 216 of the first vane 210 stays almost in place, and the second joint portion 217 is further rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0498] That is, when discharge step P4 is switched to discharge step P5, the first vane 210 is hardly moved, and is rotated in place about the first joint 216.

[0499] When discharge step P4 is switched to discharge step P5, the first vane 210 is further rotated about the first joint portion 216 in the first direction (the clockwise direction). When discharge step P4 is switched to discharge step P5, the second vane 220 is further rotated in the first direction (the clockwise direction).

[0500] When discharge step P4 is switched to discharge step P5, the front end 222a of the second vane 220 is further rotated in the first direction (the clockwise direction) due to downward movement of the second vane link 220.

[0501] When discharge step P4 is switched to discharge step P5, the first vane 210 and the second vane 220 are rotated in the same direction.

[0502] When discharge step P4 is switched to discharge step P5, the 1-1 vane link shaft 251 may be located further forwards than the 1-2 vane link shaft 252.

[0503] In discharge step P5, the vane motor 230 is rotated 105 degrees (P5 rotational angle), and the first vane 210 has an inclination of about 44.1 degrees (first vane P5 inclination) and the second vane 220 has an inclination of about 72.3 degrees (second vane P5 inclination) by rotation of the vane motor 230.

[0504] The positional relationship between the shafts forming the centers of rotation of the respective links in discharge step P5 will be described.

[0505] In discharge step P5, the second joint portion 217 and the first joint portion 216 of the first vane 210 are disposed so as to be inclined forwards in the discharge direction of air, similarly to discharge step P4.

[0506] When viewed from the side, the third joint portion 226 of the second vane 220 is disposed at the rearmost side, the first joint portion 216 is disposed at the frontmost side, and the second joint portion 217 is disposed between the first joint portion 216 and the third joint portion 226.

[0507] In discharge step P5, the third joint portion 226 is moved further downwards, and the second joint portion 217 of the first vane link 250 is rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0508] In discharge step P5, the second joint portion 217 is located so as to protrude toward the 1-2 vane link shaft 252 on the basis of an imaginary straight line joining the core link shaft 243 and the first joint portion 216 to each other.

[0509] In discharge step P5, the disposition of the shafts at the driving link 240, the first vane link 250, and the second vane link 260 is similar to that in discharge step P4.

[0510] Relative heights of the first driving link shaft 241, the 1-1 vane link shaft 251, and the 2-1 vane link shaft 261 rotated by operation of the driving link 240, the first vane link 250, and the second vane link 260 are varied.

[0511] When discharge step P4 is switched to discharge step P5, the first driving link shaft 241 is moved upwards, and the 2-1 vane link shaft 261 is moved downwards. In discharge step P5, therefore, the first driving link shaft 241 is located slightly higher than the 2-1 vane link shaft 261.

[0512] When discharge step P4 is switched to discharge step P5, the second joint portion 217 is rotated about the core link shaft 243, and the second joint portion 217 is further rotated toward the 1-2 vane link shaft 252.

[0513] In discharge step P5, the core link shaft 243, the first driving link shaft 241, and the 1-1 vane link shaft 251 are disposed in a line. In discharge step P5, the core link shaft 243, the first driving link shaft 241, and the 1-1 vane link shaft 251 form an obtuse angle of 180 degrees or more (on the basis of D-D').

[0514] In discharge step P5, the 2-2 vane link journal 262 is located lower than the core link shaft 243. When discharge step P1 is switched to discharge step P6, the angle formed by the core link shaft 243, the 2-2 vane link journal 262, and the third joint portion 226 gradually increases.

[0515] When discharge step P1 is switched to discharge step P6, however, the angle formed by the core link shaft 243, the 2-2 vane link journal 262, and the third joint portion 226 is less than 180 degrees.

[0516] When discharge step P4 is switched to discharge step P5, the 2-1 vane link shaft 261 is moved further rearwards than the 2-2 vane link journal 262, and is located between the third joint portion 226 and the core link shaft 243.

[0517] On the basis of the suction panel 320 or the discharge port 102, the position of the first vane 210 and the second vane 220 in discharge step P5 is similar to that in discharge step P4.

[0518] Next, relative positions and directions of the respective links in discharge step P5 will be described.

[0519] When discharge step P4 is switched to discharge step P5, the first vane link 250 and the second vane link 260 are disposed so as to face in opposite directions. When discharge step P4 is switched to discharge step P5, the first vane link 250 is hardly rotated, and only the second vane link 260 may be further rotated rearwards.

[0520] In discharge step P5, the disposition of the first driving link body 246, the first vane link 250, the second vane link 260 is similar to that in discharge step P4.

[0521] In this embodiment, when discharge step P4 is switched to discharge step P5, L1-L1' of the first vane link 250 may be rotated in the direction opposite the discharge direction of air. When discharge step P4 is switched to discharge step P5, L2-L2' of the second vane link 260 is further rotated in the direction opposite the discharge direction of air. When discharge step P4 is switched to discharge step P5, D-D' of the first driving link body 246 is rotated in the discharge direction of air.

[0522] In discharge step P5, D-D' and B-B' have an obtuse angle therebetween.

[0523] When discharge step P1 is switched to discharge step P4, the front end 212a of the first vane is moved in the discharge direction of air (forwards). When discharge step P4 is switched to discharge step P6, however, the front end 212a of the first vane is moved in the direction opposite the discharge direction of air (rearwards).

[0524] When discharge step P4 is switched to discharge step P6, therefore, the first vane 210 may be disposed further vertically.

<Discharge step P6>

[0525] In this embodiment, the state of the module vane 200 in discharge step P6 is defined as vertical wind.

[0526] The vertical wind does not mean that the first vane 210 and the second vane 220 constituting the module vane 200 are disposed vertically. This means that air discharged from the discharge port 102 is discharged downwards from the discharge port 102.

[0527] In discharge step P5, the driving link 240 may be rotated in the second direction (in the counterclockwise direction in the figures of this embodiment), which is opposite the first direction, to provide discharge step P6. In discharge step P6, the flow of the discharged air in the horizontal direction is minimized, and the flow of the discharged air in the vertical direction is maximized. In the state of the vertical wind of discharge step P6 air is discharged further downwards than in the state of the inclined wind of discharge step P5.

[0528] In discharge step P6, both the first vane 210 and the second vane 220 are adjusted so as to face further downwards than in discharge step P5.

[0529] When providing discharge step P6, the rear end 222b of the second vane is located higher than the discharge port, the front end 222a of the second vane is located lower than the discharge port, and the rear end 212b of the first vane is located higher than the front end 222a of the second vane and is located higher than the discharge port. In addition, the front end 212a of the first vane is located lower than the front end 222a of the second vane.

[0530] When providing discharge step P6, the rear end 212b of the first vane is disposed so as to face the discharge port 102.

[0531] In discharge step P6, the distance S6 between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 is greater than the distance S5 in discharge step P5.

[0532] When discharge step P5 is switched to P6, the distance between the front end 222a of the second vane 220 and the rear end 212b of the first vane 210 further increases. In discharge step P6, the first vane 210 and the second vane 220 are disposed further vertically than in P5.

[0533] When discharge step P5 is switched to discharge step P6, the front end 222a of the second vane 220 is moved further downwards, and the rear end 212b of the first vane 210 is moved further upwards.

[0534] In discharge step P6, the front end 222a of the second vane 220 is located lower than in discharge step P5, and the rear end 212b of the first vane 210 is located higher than in discharge step P5.

[0535] When discharge step P5 is switched to discharge step P6, the second vane 220 is rotated in place about the second vane shaft 221. When discharge step P5 is switched to discharge step P6, the first joint portion 216 of the first vane 210 stays almost in place, and the second joint portion 217 is further rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0536] That is, when discharge step P5 is switched to discharge step P6, the first vane 210 may be moved rearwards. When discharge step P5 is switched to discharge step P6, the front end 212a of the first vane 210 is moved rearwards, since the first vane 210 is further rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0537] When discharge step P5 is switched to discharge step P6, the second vane 220 is further rotated in the first direction (the clockwise direction). When discharge step P5 is switched to discharge step P6, the front end 222a of the second vane 220 is further rotated in the first direction (the clockwise direction) due to downward movement of the second vane link 220.

[0538] When discharge step P5 is switched to discharge step P6, the first vane 210 and the second vane 220 are rotated in the same direction.

[0539] In discharge step P6, the vane motor 230 is rotated 110 degrees (P6 rotational angle), and the first vane 210 has an inclination of about 56.7 degrees (first vane P6 inclination) and the second vane 220 has an inclination of about 74 degrees (second vane P6 inclination) by rotation of the vane motor 230.

[0540] The positional relationship between the shafts forming the centers of rotation of the respective links in discharge step P6 will be described.

[0541] In discharge step P6, the second joint portion 217 and the first joint portion 216 of the first vane 210 are disposed so as to be inclined forwards in the discharge direction of air, similarly to discharge step P5.

[0542] When viewed from the side, the third joint portion 226 of the second vane 220 is disposed at the rearmost side, the first joint portion 216 is disposed at the frontmost side, and the second joint portion 217 is disposed between the first joint portion 216 and the third joint portion 226.

[0543] In discharge step P6, the third joint portion 226 is moved further downwards, and the second joint portion 217 of the first vane link 250 is rotated about the first joint portion 216 in the first direction (the clockwise direction).

[0544] In discharge step P6, the second joint portion 217 is located so as to further protrude toward the 1-2 vane link shaft 252 on the basis of an imaginary straight line joining the core link shaft 243 and the first joint portion 216 to each other.

[0545] In discharge step P6, the disposition of the shafts at the driving link 240, the first vane link 250, and the second vane link 260 is similar to that in discharge step P5.

[0546] Relative heights of the first driving link shaft 241, the 1-1 vane link shaft 251, and the 2-1 vane link shaft 261 rotated by operation of the driving link 240, the first vane link 250, and the second vane link 260 are varied.

[0547] When providing discharge step P6, the rear end 212b of the first vane is located at the lower side of the core link shaft 243, and is located further forwards than the core link shaft 243. When providing discharge step P6, the front end 212a of the first vane is located further rearwards than the front edge 102a of the discharge port.

[0548] When discharge step P5 is switched to discharge step P6, the first driving link shaft 241 is moved upwards, and the 2-1 vane link shaft 261 is moved downwards. In discharge step P6, therefore, the first driving link shaft 241 is located higher than the 2-1 vane link shaft 261.

[0549] When providing discharge step P6, the 2-2 vane link journal 262 is located lower than the core link shaft 243, the first driving link shaft 241 is located lower than the 2-2 vane link journal 262, the 2-1 vane link shaft 261 is located lower than the first driving link shaft 241, and the 1-1 vane link shaft 251 is located lower than the 2-1 vane link shaft 261.

[0550] When discharge step P5 is switched to discharge step P6, the second joint portion 217 is rotated about the core link shaft 243, and the second joint portion 217 is further rotated toward the 1-2 vane link shaft 252.

[0551] When viewed from the side, in discharge step P6, at least a portion of the second joint portion 217 may overlap the first vane link body 255. Since the second joint portion 217 is moved to the position at which the second joint portion overlaps the first vane link body 255, it is possible to further vertically dispose the first vane 210.

[0552] In discharge step P6, however, the second joint portion 217 is not moved forwards over L1-L1'. The second joint portion 217 is not moved further forwards than the first vane link body 255. In the case in which the second joint portion 217 is excessively moved forwards, the second joint portion may not return to the original position thereof even when the vane motor is rotated in the first direction (the clockwise direction).

[0553] In order to prevent excessive rotation of the driving link 240, the first driving link body 246 and one end 270a of the stopper 270 interfere with each other in discharge step P6. The first driving link body 246 is supported by the stopper 270, whereby further rotation of the driving link is limited.

[0554] In discharge step P6, the core link shaft 243, the first driving link shaft 241, and the 1-1 vane link shaft 251 form an obtuse angle of 180 degrees or more (the clockwise direction on the basis of D-D').

[0555] When discharge step P5 is switched to discharge step P6, the 1-1 vane link shaft 251 may be located further forwards than the 1-2 vane link shaft 252.

[0556] In discharge step P6, the 2-2 vane link journal 262 is located at the lower side of the core link shaft 243, the second joint portion 217 is located at the lower side of the 2-2 vane link journal 262, the third joint portion 226 is located at the lower side of the second joint portion 217, and the first joint portion 216 is located at the lower side of the third joint portion 226.

[0557] When discharge step P5 is switched to discharge step P6, the 2-1 vane link shaft 261 is moved further rearwards than the 2-2 vane link journal 262, and is located between the third joint portion 226 and the core link shaft 243.

[0558] Next, relative positions and directions of the respective links in discharge step P6 will be described.

[0559] When discharge step P5 is switched to discharge step P6, the first vane link 250 and the second vane link 260 are disposed so as to face in opposite directions. When discharge step P5 is switched to discharge step P6, the first vane link 250 is hardly rotated, and only the second vane link 260 may be further rotated rearwards.

[0560] In discharge step P6, the disposition of the first driving link body 246, the first vane link 250, the second vane link 260 is similar to that in discharge step P5.

[0561] When providing discharge step P6, the 2-1 vane link shaft 261 is located further forwards than the second vane shaft 221, the 2-2 vane link journal 262 is located further forwards than the 2-1 vane link shaft 261, the core link shaft 243 is located further forwards than the 2-2 vane link journal 262, the first driving link shaft 241 is located further forwards than the core link shaft 243, and the 1-1 vane link shaft 251 is located further forwards than the first driving link shaft 241

[0562] In this embodiment, when discharge step P5 is switched to discharge step P6, L1-L1' of the first vane link 250 may be further rotated in the direction opposite the discharge direction of air. When discharge step P5 is switched to discharge step P6, L2-L2' of the second vane link 260 is further rotated in the direction opposite the discharge direction of air. When discharge step P5 is switched to discharge step P6, D-D' of the first driving link body 246 is further rotated in the direction opposite the discharge direction of air.

[0563] In discharge step P6, the angle between D-D' and B-B', which is an obtuse angle, is greater than the angle between D-D' and B-B', which is an obtuse angle, in discharge step P5.

[0564] When discharge step P1 is switched to discharge step P4, the front end 212a of the first vane is moved in the discharge direction of air (forwards).

[0565] When discharge step P1 is switched to discharge step P4, the first vane link 250 is rotated in the second direction (the counterclockwise direction). When discharge step P4 is switched to discharge step P6, however, the first vane link 250 is rotated in the first direction (the clockwise direction).

[0566] When discharge step P1 is switched to discharge step P4, therefore, the front end 212s of the first vane is rotated in the second direction and is moved upwards. When discharge step P4 is switched to discharge step P6, however, the front end 212s of the first vane is rotated in the first direction and is moved downwards. That is, motion of the first vane 210 is changed on the basis of discharge step P4.

[0567] When discharge step P4 is switched to discharge step P6, the first vane 210 may be disposed further vertically. In discharge step P6, the rear end 212b of the first vane 210 is located further forwards than the core link shaft 243.

[0568] When the vane module 200 forms the vertical wind in the discharge step P6, the first vane 210 and the second vane 220 are maximally spaced apart from each other.

[0569] In discharge step P6, at least one of the second joint portion 217 or the first drive link shaft 241 overlaps the first vane link 250, when viewed from the side of the vane module 200.

[0570] In discharge step P6, at least one of the second joint portion 217 or the first drive link shaft 241 is located on or behind L1-L1 of the first vane link 250, when viewed from the side of the vane module 200.

[0571] In discharge step P6, the rear end 212b of the first vane 210 is located inside the discharge port 102 and is located higher than the outer surface of the side cover 314, when viewed from the side of the vane module 200. Since the rear end 212b of the first vane 210 is located inside the discharge port 102, it is possible to guide air discharged from the discharge port 102 in the vertical direction.

<Dynamic cooling mode>

[0572] A dynamic cooling mode of the ceiling type indoor unit according to this embodiment will be described with reference to FIGS. 1 to 4, 15, and 23.

[0573] The ceiling type indoor unit according to this embodiment includes a first vane module 201 disposed at the edge of the suction port 101 based on the suction port 101, a third vane module 203 disposed at the edge of the suction port 101, the third vane module being disposed opposite the first vane module 201 based on the suction port 101, a third vane module 202 disposed at the edge of the suction port 101, the third vane module being disposed to form an angle of 90 degrees together with each of the first vane module 201 and the third vane module 203 based on the suction port 101, and a fourth vane module 204 disposed at the edge of the suction port 101, the fourth vane module being disposed opposite the second vane module 202 based on the suction port 101.

[0574] When viewed in a bottom view, the indoor unit includes a first vane module 201 disposed at the edge of the suction port 101, the first vane module being disposed in the 12 o'clock direction based on the suction port 101, a second vane module 202 disposed at the edge of the suction port 101, the second vane module being disposed in the 3 o'clock direction based on the suction port 101, a third vane module 203 disposed at the edge of the suction port 101, the third vane module being disposed in the 6 o'clock direction based on the suction port 101, and a fourth vane module 204 disposed at the edge of the suction port 101, the fourth vane module being disposed in the 9 o'clock direction based on the suction port 101.

[0575] For convenience of description, the discharge port at which the first vane module 201 is disposed is defined as a first discharge port 102-1, the discharge port at which the second vane module 202 is disposed is defined as a second discharge port 102-2, the discharge port at which the third vane module 203 is disposed is defined as a third discharge port 102-3, and the discharge port at which the fourth vane module 204 is disposed is defined as a fourth discharge port 102-4.

[0576] When viewed in a bottom view, the first vane module 201 is disposed in the 12 o'clock direction and discharges air in the 12 o'clock direction, the second vane module 202 is disposed in the 3 o'clock direction and discharges air in the 3 o'clock direction, the third vane module 203 is disposed in the 6 o'clock direction and discharges air in the 6 o'clock direction, and the fourth vane module 204 is disposed in the 9 o'clock direction and discharges air in the 9 o'clock direction.

[0577] When viewed in a bottom view, the air discharge directions of the first vane module 201 and the third vane module 203 are opposite each other. The air discharge directions of the second vane module 202 and the fourth vane module 204 are opposite each other.

[0578] When viewed in a bottom view, the air discharge direction of the first vane module 201 is perpendicular to the air discharge directions of the second vane module 202 and the fourth vane module 204. The air discharge direction of the third vane module 203 is perpendicular to the air discharge directions of the second vane module 202 and the fourth vane module 204.

[0579] The air discharge direction of the first vane module 201 is defined as a first discharge direction 291, the air discharge direction of the second vane module 202 is defined as a second discharge direction 292, the air discharge direction of the third vane module 203 is defined as a third discharge direction 293, and the air discharge direction of the fourth vane module 204 is defined as a fourth discharge direction 294.

[0580] The dynamic cooling mode is configured to cool the room within a shorter time. Conventionally, when the indoor unit is operated in a power mode, a target temperature is set to the minimum temperature (generally, 18 degrees), and the indoor blowing fan is maximally operated to supply discharged air into the room at the maximum wind speed.

[0581] In the dynamic cooling mode according to this embodiment, the target temperature is set to the minimum temperature (generally, 18 degrees) and the indoor blowing fan is maximally operated, as in the conventional art; however, each vane module is controlled in order to generate air flow in the room, whereby it is possible to more rapidly reduce indoor temperature.

[0582] The dynamic cooling mode may be suitable for a place at which it is necessary to rapidly decrease temperature. Although low-temperature discharged air may cause user discomfort, such as a chill, the dynamic cooling mode may be suitable for a drugstore, a convenience store, or a confectionery, at which people stay for a short time.

[0583] Since a place at which people stay for a short time is a place which customers frequently enter and leave and into which external air is introduced many times, the dynamic cooling mode is suitable for such a place. Since the dynamic cooling mode is capable of providing low-temperature discharged air to customers exposed to external high temperature, it is possible to improve customer comfort. In addition, the dynamic cooling mode has an advantage in that it is possible to rapidly cool an indoor space within a short time.

[0584] A method of controlling the ceiling type indoor unit according to the present disclosure performs control such that two pairs of vane modules discharge air in different directions in pairs at the time of cooling.

[0585] In particular, a pair of a first vane module 201 and a third vane module 203 and another pair of a second vane module 202 and a fourth vane module 204 discharge air in different directions.

[0586] When viewed in a bottom view, the first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 are disposed at intervals of 90 degrees based on the suction port 101.

[0587] When viewed in a bottom view, based on the suction port 101, the discharge direction of the first vane module 201 and the discharge direction of the second vane module 202 have an angle of 90 degrees therebetween, the discharge direction of the second vane module 202 and the discharge direction of the third vane module 203 have an angle of 90 degrees therebetween, the discharge direction of the third vane module 203 and the discharge direction of the fourth vane module 204 have an angle of 90 degrees therebetween, and the discharge direction of the fourth vane module 204 and the discharge direction of the first vane module 201 have an angle of 90 degrees therebetween.

[0588] When viewed in a bottom view, the first vane module 201 and the third vane module 203 are located opposite each other based on the suction port 101. When viewed in a bottom view, the second vane module 202 and the third vane module 204 are located opposite each other based on the suction port 101.

[0589] In this embodiment, the first vane module 201 and the third vane module 203 disposed so as to face each other based on the suction port 101 are defined as a first discharge pair, and the second vane module 202 and the fourth vane module 204 are defined as a second discharge pair.

[0590] In the dynamic cooling mode according to this embodiment, a target indoor temperature may be set to 18 degrees, and the indoor blowing fan may be set to high, among low, medium, and high. In the dynamic cooling mode, the target indoor temperature or speed of the indoor blowing fan may be variously changed.

[0591] The method of controlling the ceiling type indoor unit according to this embodiment includes a step (S10) of turning on a dynamic cooling mode, a reset auto swing step (S20) of simultaneously operating the first discharge pair constituted by the first vane module 201 and the third vane module 203 and the second discharge pair constituted by the second vane module 202 and the fourth vane module 204 after step S10, a step (S30) of determining whether the reset auto swing step (S20) exceeds a reset auto time (10 minutes in this embodiment), a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step in the case in which step S30 is satisfied, a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time (5 minutes in this embodiment), a first auto swing step (S60) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S50 is satisfied, a step (S70) of determining whether the first auto swing step (S60) exceeds a first auto time (5 minutes in this embodiment), a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2 in the case in which step S70 is satisfied, a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time (5 minutes in this embodiment), a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S90 is satisfied, a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time (5 minutes in this embodiment), a step (S120) of determining whether the dynamic cooling mode is turned off in the case in which step S110 is satisfied, and a step of finishing the dynamic cooling mode in the case in which step S120 is satisfied.

[0592] The first discharge pair and the second discharge pair are operated in the sequence of same operation -> different operations -> same operation -> different operations -> same operation.

[0593] In this embodiment, the first discharge pair is operated in the sequence of reset auto swing (S20) -> discharge step P2 (S40) -> first auto swing (S60) -> power cooling discharge step P4.5 (S80) -> second auto swing (S100).

[0594] In this embodiment, the second discharge pair is operated in the sequence of reset auto swing (S20) -> power cooling discharge step P4.5 (S40) -> first auto swing (S60) -> discharge step P2 (S80) -> second auto swing (S100).

[0595] The first vane module, the second vane module, the third vane module, and the fourth vane module may be set to be operated in one of discharge steps P1 to P6.

[0596] Based on the horizon, the inclination of the first vane satisfies "0 degrees < inclination of the first vane in discharge step P1 < inclination of the first vane in discharge step P2 < inclination of the first vane in discharge step P3 < inclination of the first vane in discharge step P4 < inclination of the first vane in discharge step P5 < inclination of the first vane in discharge step P6 < 90 degrees."

[0597] Based on the horizon, the inclination of the second vane satisfies "0 degrees < inclination of the second vane in discharge step P1 < inclination of the second vane in discharge step P2 < inclination of the second vane in discharge step P3 < inclination of the second vane in discharge step P4 < inclination of the second vane in discharge step P5 < inclination of the second vane in discharge step P6 < 90 degrees."

[0598] In each discharge step, the inclination of the second vane is set to always be greater than the inclination of the first vane.

[0599] A user may select the dynamic cooling mode using a wireless remote controller (not shown) or a wired remote controller (not shown) (S10). In this embodiment, the dynamic cooling mode is selected by the user. Unlike this embodiment, however, the dynamic cooling mode may be automatically executed under a specific condition. For example, when the indoor unit is switched from an off state to an on state, the dynamic cooling mode may be automatically executed.

[0600] In this embodiment, when the user selects a power mode using the wireless remote controller, the dynamic cooling mode may be set. When the user selects power cooling using the wired remote controller, the dynamic cooling mode may be set.

[0601] In the reset auto swing step (S20), all of the first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 are operated in the same manner. In the reset auto swing step (S20), a controller reciprocates the first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 within a specific section.

[0602] In this embodiment, in the reset auto swing step (S20), all of the vane modules 200 are sequentially changed from discharge step P2 to discharge step P5 and are than changed in reverse order, which is repeated.

[0603] In the reset auto swing step (S20), therefore, each of the first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 operates the vane motor 230 such that the discharge step is performed in the sequence of discharge step P2 -> discharge step P3 -> discharge step P4 -> discharge step P5 and is then performed in reverse order, i.e. in the sequence of discharge step P5 -> discharge step P4 -> discharge step P3 -> discharge step P2. This cycle is defined as an auto swing cycle.

[0604] Discharge step P1 and discharge step P6 are omitted from the auto swing cycle.

[0605] The reset auto swing step (S20) is performed for a reset auto time. In this embodiment, the reset auto time is set to 10 minutes. Unlike this embodiment, the reset auto time may be variously changed. Preferably, the reset auto time is set to be longer than the first dynamic time. Preferably, a sufficient amount of cool air is supplied to the user before the first dynamic cooling step in order to satisfy needs of the user.

[0606] In the reset auto swing step (S20), cooled air is discharged to the surroundings of the indoor unit through the first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204. At this time, the discharged air cooled in the reset auto swing step (S20) is not aimed at a specific position or a specific distance.

[0607] The reset auto swing step (S20) discharges cooled air to the surroundings of the indoor unit while performing reciprocation over discharge steps ranging from discharge step P2 to discharge step P5, and the cooled air is randomly mixed with indoor air.

[0608] That is, the auto swing step has the effects of randomly mixing cooled discharged air with indoor air and more rapidly equalizing temperature of all indoor air.

[0609] Steps S20 and S30 are control steps for equalizing air around the indoor unit. Before the dynamic cooling mode is executed, steps S20 and S30 may be performed in order to mix air around the indoor unit and thus to reduce deviation in temperature around the indoor unit.

[0610] When step S30 is satisfied, step S40 is performed. When step S30 is not satisfied, the procedure returns to step S20.

[0611] Step S40 is a first dynamic cooling step. In the first dynamic cooling step (S40), the cooled discharged air has a directed point, unlike the reset auto swing step (S20).

[0612] In the reset auto swing step (S20), the first discharge pair and the second discharge pair are identical to each other in terms of discharged air supply target and supply purpose. In the first dynamic cooling step (S40), however, the first discharge pair and the second discharge pair are different from each other in terms of supply target and supply purpose.

[0613] In the first dynamic cooling step (S40), therefore, the first discharge pair and the second discharge pair are operated in different manners.

[0614] In this embodiment, in the first dynamic cooling step (S40), the first discharge pair is set to be operated in discharge step P2, and the second discharge pair is set to be operated in the power cooling discharge step.

[0615] In the first dynamic cooling step (S40), the first discharge pair is changed to be operated in discharge step P2, and then the state thereof is maintained. In the first dynamic cooling step (S40), the second discharge pair is changed to be operated in the power cooling discharge step, and then the state thereof is maintained.

[0616] Discharge step P2 may send discharged air the farthest except for horizontal wind (discharge step PI). Discharge step P2 may provide indirect wind to the user.

[0617] In contrast, the second discharge pair provides direct wind in which cooled air is directly provided to the user. The power cooling discharge step may be one of discharge steps P3 to P6, in which the second discharge pair is disposed further vertically than in discharge step P2.

[0618] Preferably, the power cooling discharge step is between discharge steps P4 to P6. In order to rapidly cool indoor air, discharged air is preferably provided as inclined wind, rather than horizontal wind or vertical wind. In particular, the first discharge pair provides indirect wind approximate to horizontal wind, and therefore the first discharge pair provides discharged air over a long distance, and the second discharge pair provides discharged air over a short distance.

[0619] In the power cooling discharge step, the inclination of the first vane may be set to 35 degrees to 57 degrees.

[0620] In this embodiment, a separate discharge step is disposed between discharge steps ranging from discharge steps P4 to P6 instead of the power cooling discharge step being selected as one of discharge steps P1 to P6. Therefore, discharge step P4.5 is disposed between discharge steps P4 and P5, and is defined as a power cooling discharge step.

[0621] Unlike this embodiment, discharge step P4 or P5 may be selected as the power cooling discharge step. The reason that discharge step P4 or P5 is selected is that this discharge step is a discharge step greatly different in air discharge direction from discharge step P2, among discharge steps that do not provide horizontal wind and vertical wind.

[0622] In power cooling discharge step 4.5, the vane motor 230 is rotated 102 degrees (P4.5 rotational angle). The first vane 210 and the second vane 220 have an inclination between discharge steps P4 and P5 by rotation of the vane motor 230. Consequently, the first vane 210 has an inclination of 35 degrees to 44 degrees, and the second vane 210 has an inclination of about 70 degrees to 72 degrees.

[0623] In the first dynamic cooling step (S40), the vane motor 230 of the first discharge pair is rotated 78 degrees (P2 rotational angle), and the vane motor of the second discharge pair is rotated 102 degrees (P4.5 rotational angle).

[0624] In step S40, the first discharge pair provides inclined wind approximate to horizontal wind, whereby discharged air is provided over a long distance. The second discharge pair, which is disposed so as to be perpendicular to the discharge direction of the first discharge pair, provides inclined wind, whereby discharged air is provided over a short distance.

[0625] For example, in the first dynamic cooling step (S40), when the first discharge pair supplies air to a place far from the indoor unit in discharge step P2, cooled air is discharged at a gentle angle, and the discharged air slowly moves downwards due to the difference in density from indoor air. In the case in which the air discharged from the first discharge pair slowly moves downwards and reaches a place far from the indoor unit, indoor air is pushed by the cooled discharged air and thus moves outwards.

[0626] In the first dynamic cooling step (S40), when the first discharge pair supplies discharged air as indirect wind in discharge step P2, the second discharge pair moves cooled air from the side close to the indoor unit to the side far from the indoor unit in power cooling discharge step 4.5. At this time, the air discharged from the second discharge pair is directed to the floor, compared to the first discharge pair. Consequently, the discharged air reaches the portion of the floor that is close to the indoor unit, and then moves to the portion of the floor that is far from the indoor unit along the floor. In the case in which the air discharged from the second discharge pair slowly moves downwards and reaches a place far from the indoor unit, indoor air is pushed by the cooled discharged air and thus moves outwards.

[0627] In the case in which the first discharge pair provides the discharged air over a long distance and the second discharge pair, which is disposed so as to be perpendicular thereto, provides the discharged air over a short distance, as described above, it is possible to accelerate circulation of the indoor air. That is, in the case in which the distance difference and the height difference are formed when the discharged air is discharged in different directions, it is possible to more rapidly mix the cooled air and the indoor air with each other.

[0628] In the case in which the cooled discharged air is supplied in the first dynamic cooling step (S40), therefore, deviation in temperature around the indoor unit may occur. In particular, temperature deviation depending on the vertical height as well as temperature deviation depending on the horizontal distance based on the indoor unit may greatly occur. In addition, temperature deviation between the first discharge pair direction and the second discharge pair direction may also greatly occur.

[0629] This is a natural phenomenon that occurs since the first discharge pair and the second discharge pair are different in purpose from each other in the first dynamic cooling step (S40). In order to solve this, the first auto swing step (S60) is performed.

[0630] In step S50, operation time of step S40 is determined. In the case in which step S50 is satisfied, step S60 is performed. In the case in which step S50 is not satisfied, the procedure returns to step S40.

[0631] Step S60 is a first auto swing step. The first auto swing step is identical to the reset auto swing step except for the operation time. The first auto swing step (S60) is performed based on an auto swing cycle.

[0632] In the first auto swing step (S60), each of the first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 operates the vane motor 230 such that the discharge step is sequentially changed in the sequence of discharge step P2 -> discharge step P3 -> discharge step P4 -> discharge step P5 and is then sequentially changed in reverse order, i.e. in the sequence of discharge step P5 -> discharge step P6 -> discharge step P3 -> discharge step P2.

[0633] Discharge step P1 and discharge step P6 are also omitted from the auto swing cycle of the first auto swing step (S60). The operation time of the first auto swing step (S60) is set to a first auto time (5 minutes in this embodiment). In this embodiment, the operation time of the first auto swing step (S60) is equal to the first dynamic time.

[0634] The first auto swing step (S60) discharges cooled air to the surroundings of the indoor unit while performing reciprocation over discharge steps ranging from discharge step P2 to discharge step P5, and the cooled air is randomly mixed with indoor air. The first auto swing step (S60) has the effects of randomly mixing cooled discharged air with indoor air and more rapidly equalizing temperature of all indoor air.

[0635] The first auto swing step (S60) solves temperature deviation occurring in the first dynamic cooling step (S40).

[0636] When step S70 is satisfied, step S80 is performed. When step S70 is not satisfied, the procedure returns to step S60.

[0637] Step S80 is a second dynamic cooling step.

[0638] In the second dynamic cooling step (S80), the first discharge pair and the second discharge pair are operated in the opposite manner to the first dynamic cooling step (S40). In the second dynamic cooling step (S80), therefore, the first discharge pair is set to be operated in the power cooling discharge step, and the second discharge pair is set to be operated in discharge step P2.

[0639] In the second dynamic cooling step (S80), the first discharge pair is changed to be operated in the power cooling discharge step, and then the state thereof is maintained. In the second dynamic cooling step (S80), the second discharge pair is changed to be operated in discharge step P2, and then the state thereof is maintained.

[0640] In the opposite manner to the first dynamic cooling step (S40), the second dynamic cooling step (S80) provides direct wind through the first discharge pair, and provides indirect wind through the second discharge pair.

[0641] In this embodiment, the power cooling discharge step of the second dynamic cooling step (S80) is discharge step P4.5.

[0642] In the second dynamic cooling step (S80), the vane motor 230 of the first discharge pair is rotated 102 degrees (P4.5 rotational angle), and the vane motor of the second discharge pair is rotated 78 degrees (P2 rotational angle).

[0643] It is possible to more effectively mix air in the indoor space by alternately performing the first dynamic cooling step (S40) and the second dynamic cooling step (S80). In addition, it is possible to minimize a dead zone that indoor air does not reach by alternately performing the first dynamic cooling step (S40) and the second dynamic cooling step (S80).

[0644] In particular, since the first dynamic cooling step (S40) and the second dynamic cooling step (S80) alternately provide indirect wind and direct wind, it is possible to minimize a dead zone that indoor air does not reach.

[0645] For example, in the first dynamic cooling step (S40), the first discharge pair discharges air to a place far from the indoor unit in discharge step P2. Subsequently, in the second dynamic cooling step (S80), the first discharge pair discharges air to a place close to the indoor unit in power cooling discharge step P4.5. When the air is discharged, as described above, it is possible to minimize a dead zone in the discharge direction of the first vane module 201 and the third vane module 203.

[0646] In addition, when the first discharge pair is operated, the second discharge pair is operated reversely. The second discharge pair discharges air to a place close to the indoor unit in the first dynamic cooling step (S40), and discharges air to a place far from the indoor unit in the second dynamic cooling step (S80). When the air is discharged, as described above, it is possible to minimize a dead zone in the discharge direction of the second vane module 202 and the fourth vane module 204.

[0647] For example, in the second dynamic cooling step (S80), the first discharge pair moves cooled air from the side close to the indoor unit to the side far from the indoor unit in discharge step P4.5. At this time, the air discharged from the first discharge pair is directed to the floor. Consequently, the discharged air reaches the portion of the floor that is close to the indoor unit, and moves to the portion of the floor that is far from the indoor unit along the floor. In the case in which the air discharged from the first discharge pair slowly moves upwards and reaches a place far from the indoor unit, indoor air is pushed by the cooled discharged air and thus moves outwards.

[0648] In the case in which the second discharge pair supplies air to a place far from the indoor unit in the discharge step P2, cooled air is discharged at a gentle angle, and the discharged air slowly moves downwards due to the difference in density from indoor air. In the case in which the air discharged from the second discharge pair slowly moves upwards and reaches a place far from the indoor unit, indoor air is pushed by the cooled discharged air and thus moves outwards.

[0649] Since cooled air is alternately supplied to a place close to the indoor unit and a place far from the indoor unit in the horizontal direction in the first dynamic cooling step (S40) and the second dynamic cooling step (S80), as described above, it is possible to effectively mix indoor air.

[0650] In addition, since cooled air is alternately supplied to the higher side and the lower side in the vertical direction in the first dynamic cooling step (S40) and the second dynamic cooling step (S80), it is possible to effectively mix indoor air.

[0651] In step S90, whether the second dynamic time (5 minutes in this embodiment) has elapsed is determined. In the case in which step S90 is satisfied, step S100 is performed. In the case in which step S90 is not satisfied, the procedure returns to step S80.

[0652] The second auto swing step (S100) is identical to the first auto swing step (S60), and therefore a detailed description thereof will be omitted. Step S110 is also identical to step S70, and therefore a detailed description thereof will be omitted. In this embodiment, the first auto time of step S70 is equal to the second auto time of step S110.

[0653] The first dynamic time and the second dynamic time may be set to be equal to each other, whereby it is possible to uniformly form the temperature of air around the indoor unit. In the case in which the first dynamic time and the second dynamic time are set to be different from each other, the temperature of air discharged from the first discharge pair or the second discharge pair may be lower. In addition, the first auto time and the second auto time may be set to be equal to each other, and temperature around the indoor unit may be more uniformly formed.

[0654] In step S120, whether the dynamic cooling mode is turned off is determined. Since step S10 is performed based on a manipulation signal input by the user in this embodiment, whether the user has input a dynamic cooling mode off signal is determined in step S120.

[0655] In this embodiment, even when the user inputs the dynamic cooling mode off signal before step S120, this is determined in step S120 after step S110. Unlike this embodiment, step S120 may be disposed between steps ranging from step S10 to step S110, and step S120 may be performed after each step is finished. In this case, when the user inputs the dynamic cooling mode off signal, the dynamic cooling mode may be finished immediately after the step that is being performed is finished.

[0656] In the case in which step S120 is not satisfied (in the case in which the user does not input the dynamic cooling mode off signal), the procedure returns to step S40.

[0657] A method of controlling a ceiling type indoor unit according to a second embodiment of the present disclosure will be described with reference to FIG. 24.

[0658] The method of controlling the ceiling type indoor unit according to this embodiment includes a step (S10) of turning on a dynamic cooling mode, a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step after step S10, a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time (5 minutes in this embodiment), a first auto swing step (S60) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S50 is satisfied, a step (S70) of determining whether the first auto swing step (S60) exceeds a first auto time (5 minutes in this embodiment), a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2, in the opposite manner to step S40, in the case in which step S70 is satisfied, a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time (5 minutes in this embodiment), a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S90 is satisfied, a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time (5 minutes in this embodiment), a step (S120) of determining whether the dynamic cooling mode is turned off in the case in which step S110 is satisfied, and a step of finishing the dynamic cooling mode in the case in which step S120 is satisfied.

[0659] In this embodiment, steps S20 and S30 are omitted, unlike the first embodiment.

[0660] The first discharge pair and the second discharge pair are operated in the sequence of different operations -> same operation -> different operations -> same operation.

[0661] In this embodiment, the first discharge pair is operated in the sequence of discharge step P2 (S40) -> first auto swing (S60) -> power cooling discharge step P4.5 (S80) -> second auto swing (S100).

[0662] In this embodiment, the second discharge pair is operated in the sequence of power cooling discharge step P4.5 (S40) -> first auto swing (S60) -> discharge step P2 (S80) -> second auto swing (S100).

[0663] Steps S20 and S30 are control steps for equalizing air around the indoor unit. Before the dynamic cooling mode is executed in the first embodiment, steps S20 and S30 may be performed in order to mix air around the indoor unit and thus to reduce deviation in temperature around the indoor unit.

[0664] In this embodiment, steps S20 and S30 are omitted, whereby the minimum one cycle time of the dynamic cooling mode is reduced. In the first embodiment, one cycle time of the dynamic cooling mode is 30 minutes. In this embodiment, steps S20 and S30 may be omitted, whereby the first one cycle time of the dynamic cooling mode may be reduced to 20 minutes.

[0665] The other constructions of this embodiment are identical to those of the first embodiment, and therefore a detailed description thereof will be omitted.

[0666] A method of controlling a ceiling type indoor unit according to a third embodiment of the present disclosure will be described with reference to FIG. 25.

[0667] The method of controlling the ceiling type indoor unit according to this embodiment includes a step (S10) of turning on a dynamic cooling mode, a first dynamic cooling step (S42) of operating the first discharge pair in discharge step P1 and operating the second discharge pair in a power cooling discharge step after step S10, a step (S50) of determining whether the first dynamic cooling step (S42) exceeds a first dynamic time (5 minutes in this embodiment), a first auto swing step (S60) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S50 is satisfied, a step (S70) of determining whether the first auto swing step (S60) exceeds a first auto time (5 minutes in this embodiment), a second dynamic cooling step (S82) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P1, in the opposite manner to step S40, in the case in which step S70 is satisfied, a step (S90) of determining whether the second dynamic cooling step (S82) exceeds a second dynamic time (5 minutes in this embodiment), a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S90 is satisfied, a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time (5 minutes in this embodiment), a step (S120) of determining whether the dynamic cooling mode is turned off in the case in which step S110 is satisfied, and a step of finishing the dynamic cooling mode in the case in which step S120 is satisfied.

[0668] In the dynamic cooling steps (S40 and S80) of each of the first embodiment and the second embodiment, one discharge pair is set to be operated in P2, and the other discharge pair is set to be operate in the power cooling discharge step.

[0669] In contrast, in the dynamic cooling steps (S42 and S82) of the third embodiment, one discharge pair is set to be operated in P1, and the other discharge pair is set to be operate in the power cooling discharge step.

[0670] In the case in which one discharge pair is set to be operated in P1 in the dynamic cooling steps (S42 and S82), it is possible to supply cooled discharged air over a longer distance. That is, the third embodiment is more useful when the dynamic cooling mode is executed in a large space than the first embodiment and the second embodiment.

[0671] The other constructions of this embodiment are identical to those of the second embodiment, and therefore a detailed description thereof will be omitted.

[0672] A method of controlling a ceiling type indoor unit according to a fourth embodiment of the present disclosure will be described with reference to FIG. 26.

[0673] The method of controlling the ceiling type indoor unit according to this embodiment includes a step (S10) of turning on a dynamic cooling mode, a first dynamic cooling step (S44) of operating the first discharge pair in discharge step P1 and operating the second discharge pair in power cooling discharge step P6 after step S10, a step (S50) of determining whether the first dynamic cooling step (S44) exceeds a first dynamic time (5 minutes in this embodiment), a first auto swing step (S60) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S50 is satisfied, a step (S70) of determining whether the first auto swing step (S60) exceeds a first auto time (5 minutes in this embodiment), a second dynamic cooling step (S84) of operating the first discharge pair in power cooling discharge step P6 and operating the second discharge pair in discharge step P1, in the opposite manner to step S40, in the case in which step S70 is satisfied, a step (S90) of determining whether the second dynamic cooling step (S84) exceeds a second dynamic time (5 minutes in this embodiment), a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair in the case in which step S90 is satisfied, a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time (5 minutes in this embodiment), a step (S120) of determining whether the dynamic cooling mode is turned off in the case in which step S110 is satisfied, and a step of finishing the dynamic cooling mode in the case in which step S120 is satisfied.

[0674] In the fourth embodiment, in the dynamic cooling steps (S44 and S84), one discharge pair is set to be operated in P1, and the other discharge pair is set to be operate in power cooling discharge step P6, unlike the second embodiment. That is, in the fourth embodiment, one discharge pair is set to provide horizontal wind, and the other discharge pair is set to provide vertical wind.

[0675] The first auto swing step (S60) and the second auto swing step (S100) provide inclined wind.

[0676] The other constructions of this embodiment are identical to those of the second embodiment, and therefore a detailed description thereof will be omitted.

[0677] A method of controlling a ceiling type indoor unit according to a fifth embodiment of the present disclosure will be described with reference to FIG. 27.

[0678] The method of controlling the ceiling type indoor unit according to this embodiment includes a step (S10) of turning on a dynamic cooling mode, a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step after step S10, a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time (5 minutes in this embodiment), a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2 in the case in which step S50 is satisfied, a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time (5 minutes in this embodiment), a step (S120) of determining whether the dynamic cooling mode is turned off in the case in which step S90 is satisfied, and a step of finishing the dynamic cooling mode in the case in which step S120 is satisfied.

[0679] The first discharge pair and the second discharge pair are operated in the sequence of different operations -> different operations.

[0680] In this embodiment, therefore, the first discharge pair is operated in the sequence of discharge step P2 (S40) -> power cooling discharge step P4.5 (S80). In this embodiment, the second discharge pair is operated in the sequence of power cooling discharge step P4.5 (S40) -> discharge step P2 (S80).

[0681] In this embodiment, steps S20, S30, S60, S70, S100, and S110 are omitted, unlike the first embodiment.

[0682] In this embodiment, steps S20, S30, S60, S70, S100, and S110 are omitted, whereby the minimum one cycle time of the dynamic cooling mode is reduced. In the first embodiment, one cycle time of the dynamic cooling mode is 25 minutes. In this embodiment, steps S20, S30, S60, and S70 may be omitted, whereby the first one cycle time of the dynamic cooling mode may be reduced to 10 minutes.

[0683] In this embodiment, the dynamic cooling steps (S40 and S80) may be alternately performed when the dynamic cooling mode is executed.

[0684] The other constructions of this embodiment are identical to those of the first embodiment, and therefore a detailed description thereof will be omitted.

[0685] While the embodiments of the present disclosure have been described with reference to the accompanying drawings, the present disclosure is not limited to the embodiments and may be embodied in various different forms, and those skilled in the art will appreciate that the present disclosure may be embodied in specific forms other than those set forth herein without departing from the technical idea and essential characteristics of the present disclosure. The disclosed embodiments are therefore to be construed in all aspects as illustrative and not restrictive.

[Description of Reference Numerals]

[0686]

100: Case	101: Suction port
102: Discharge port	103: Suction channel
104: Discharge channel	110: Case housing
120: Front panel	130: Indoor heat exchanger
140: Indoor blowing fan	200: Vane module
210: First vane	212a: Front end of first vane
212b: Rear end of first vane	
216: First joint portion	217: Second joint portion
220: Second vane	222a: Front end of second vane
222b: Rear end of second vane	
226: Third joint portion	230: Vane motor
240: Driving link	241: First driving link shaft
242: Second driving link shaft	243: Core link shaft
245: Driving link body	246: First driving link body
247: Second driving link body	248: Core body

(continued)

250: First vane link	260: Second vane link
251: 1-1 vane link shaft	252: 1-2 vane link shaft
261: 2-1 vane link shaft	262: 2-2 vane link shaft
300: Front panel	310: Front body
320: Suction grill	330: Pre-filter
400: Module body	410: First module body
420: Second module body	500: Elevator

Claims

1. A method of controlling a ceiling type indoor unit of an air conditioner, the ceiling type indoor unit comprising:

a case installed at a ceiling of a room so as to be suspended therefrom, the case having a suction port formed at a lower surface thereof, a first discharge port, a second discharge port, a third discharge port, and a fourth discharge port being formed at an edge of the suction port; and

a first vane module disposed at the first discharge port, the first vane module being disposed in a 12 o'clock direction based on the suction port, the first vane module constituting one of a first discharge pair, the first vane module being configured to discharge air in a first discharge direction; a second vane module disposed at the second discharge port, the second vane module being disposed in a 3 o'clock direction based on the suction port, the second vane module constituting one of a second discharge pair, the second vane module being configured to discharge air in a second discharge direction; a third vane module disposed at the third discharge port, the third vane module being disposed in a 6 o' clock direction based on the suction port, the third vane module constituting the other of the first discharge pair, the third vane module being configured to discharge air in a third discharge direction; and a fourth vane module disposed at the fourth discharge port, the fourth vane module being disposed in a 9 o'clock direction based on the suction port, the fourth vane module constituting the other of the second discharge pair, the fourth vane module being configured to discharge air in a fourth discharge direction, wherein

each vane module comprises: a module body installed at the case, at least a portion of the module body being exposed to the discharge port; a vane motor assembled to the module body, the vane motor being configured to provide driving force; a driving link assembled to the module body so as to be rotatable relative thereto, the driving link being coupled to the vane motor, the driving link being configured to be rotated by the driving force of the vane motor, the driving link comprising a first driving link body and a second driving link body having a predetermined angle therebetween; a first vane link located further forwards than the driving link, the first vane link being assembled to the module body so as to be rotatable relative thereto; a second vane link assembled to the second driving link body so as to be rotatable relative thereto; a first vane disposed at each discharge port, the first vane being disposed forwards in a discharge direction of air discharged from the discharge port, the first vane being assembled to each of the first driving link body and the first vane link so as to be rotatable relative thereto; and a second vane disposed at each discharge port, the second vane being assembled to the module body so as to be rotatable relative thereto by the second vane shaft, the second vane being assembled to the second vane link so as to be rotatable relative thereto,

the first vane module, the second vane module, the third vane module, and the fourth vane module are set to be operated in one of discharge steps P1 to P6,

based on a horizon, an inclination of the first vane satisfies "0 degrees < inclination of the first vane in discharge step P1 < inclination of the first vane in discharge step P2 < inclination of the first vane in discharge step P3 < inclination of the first vane in discharge step P4 < inclination of the first vane in discharge step P5 < inclination of the first vane in discharge step P6 < 90 degrees,"

based on the horizon, an inclination of the second vane satisfies "0 degrees < inclination of the second vane in discharge step P1 < inclination of the second vane in discharge step P2 < inclination of the second vane in discharge step P3 < inclination of the second vane in discharge step P4 < inclination of the second vane in discharge step P5 < inclination of the second vane in discharge step P6 < 90 degrees,"

in each discharge step, the inclination of the second vane is set to always be greater than the inclination of the first vane, and

the method comprises:

a step (S10) of turning on a dynamic cooling mode;
a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step in a case in which step S10 is satisfied;
a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time;
a first auto swing step (S60) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section in a case in which step S50 is satisfied;
a step (S70) of determining whether the first auto swing step (S60) exceeds a first auto time;
a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2 in a case in which step S70 is satisfied;
a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time;
a step (S120) of determining whether the dynamic cooling mode is turned off after step S90; and
a step of finishing the dynamic cooling mode in a case in which step S120 is satisfied.

2. The method according to claim 1, wherein
in discharge step P2, the first vane has an inclination of 16 to 29 degrees and the second vane has an inclination of 57 to 67 degrees, and
in the power cooling discharge step, the first vane has an inclination of 35 to 44 degrees and the second vane has an inclination of about 70 to 72 degrees.

3. The method according to claim 1, wherein, when providing discharge step P1, a rear end of the second vane is located higher than the discharge port, a front end of the second vane is located lower than the discharge port, a rear end of the first vane is located lower than the front end of the second vane, and a front end of the first vane is located lower than the rear end of the first vane .

4. The method according to claim 1, wherein, in discharge step P1, an upper surface of the second vane is located higher than an upper surface of the first vane.

5. The method according to claim 3, wherein, when providing discharge step P1, the rear end of the first vane is located higher than the front end of the second vane.

6. The method according to claim 1, wherein, when providing discharge step P6, a rear end of the second vane is located higher than the discharge port, a front end of the second vane is located lower than the discharge port, a rear end of the first vane is located higher than the front end of the second vane and is located higher than the discharge port, and a front end of the first vane is located lower than the front end of the second vane.

7. The method according to claim 1, wherein
the driving link comprises: a core body; the core link shaft disposed at the core body, the core link shaft being rotatably coupled to the module body, the core link shaft protruding toward the vane motor, the core link shaft being coupled to the vane motor; a first driving link body extending from the core body; a first driving link shaft disposed at the first driving link body, the first driving link shaft protruding toward a first vane body, the first driving link shaft being rotatably coupled to the first vane; a second driving link body extending from the core body, a predetermined angle (E) being defined between the second driving link body and the first driving link body; and a second driving link shaft disposed at the second driving link body, the second driving link shaft protruding in an identical direction to the first driving link shaft, the second driving link shaft being rotatably coupled to the second vane link,
the first vane link comprises: a first vane link body; a 1-1 vane link shaft disposed at one side of the first vane link body, the 1-1 vane link shaft being assembled to the first vane, the 1-1 vane link shaft being configured to be rotated relative to the first vane; and a 1-2 vane link shaft disposed at the other side of the first vane link body, the 1-2 vane link shaft being assembled to the module body, the 1-2 vane link shaft being configured to be rotated relative to the module body,
the second vane link comprises: a second vane link body; a 2-1 vane link shaft disposed at one side of the second vane link body, the 2-1 vane link shaft being assembled to the second vane, the 2-1 vane link shaft being configured to be rotated relative to the second vane; and a 2-2 vane link journal disposed at the other side of the second vane link body, the 2-2 vane link journal being assembled to the driving link, the 2-2 vane link journal being configured to be rotated relative to the driving link, and
when providing the power cooling discharge step, an angle defined between an imaginary straight line (D-D') joining the core link shaft and the first driving link shaft to each other and an imaginary straight line (B-B') joining the first driving link shaft and the 1-1 vane link shaft to each other is an obtuse angle of greater than 180 degrees.

8. The method according to claim 7, wherein, when providing one of discharge steps P2 to P5, a rear end of the first vane is located higher than a front end of the second vane and is located level with or lower than the 2-1 vane link shaft.

9. The method according to claim 7, wherein, when providing one of discharge steps P1 to P3, an angle formed by the core link shaft, the first driving link shaft, and the 1-1 vane link shaft in a clockwise direction with respect to the imaginary straight line (D-D') joining the core link shaft and the first driving link shaft to each other is an acute angle.

10. The method according to claim 1, wherein
in discharge step P1, the vane motor is rotated by a P1 rotational angle, and the first vane has a first vane P1 inclination and the second vane has a second vane P1 inclination by rotation of the vane motor,
in discharge step P2, the vane motor is rotated by a P2 rotational angle greater than the P1 rotational angle, and the first vane has a first vane P2 inclination and the second vane has a second vane P2 inclination by rotation of the vane motor,
in discharge step P3, the vane motor is rotated by a P3 rotational angle greater than the P2 rotational angle, and the first vane has a first vane P3 inclination and the second vane has a second vane P3 inclination by rotation of the vane motor,
in discharge step P4, the vane motor is rotated by a P4 rotational angle greater than the P3 rotational angle, and the first vane has a first vane P4 inclination and the second vane has a second vane P4 inclination by rotation of the vane motor,
in discharge step P5, the vane motor is rotated by a P5 rotational angle greater than the P4 rotational angle, and the first vane has a first vane P5 inclination and the second vane has a second vane P5 inclination by rotation of the vane motor,
in discharge step P6, the vane motor is rotated by a P6 rotational angle greater than the P5 rotational angle, and the first vane has a first vane P6 inclination and the second vane has a second vane P6 inclination by rotation of the vane motor, and
the first vane P1 inclination is set to 16 degrees or more and the first vane P6 inclination is set to 57 degrees or less.

11. The method according to claim 10, wherein the P1 rotational angle is set to 78 degrees or more, and the P6 rotational angle is set to 110 degrees or less.

12. The method according to claim 10, wherein
in discharge step P2, the first vane has an inclination of 16 to 29 degrees and the second vane has an inclination of 57 to 67 degrees, and
in the power heating discharge step ,the first vane has an inclination of 35 to 44 degrees and the second vane has an inclination of about 70 to 72 degrees.

13. The method according to claim 1, further comprising:

a reset auto swing step (S20) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section after step S10; and
a step (S30) of determining whether the reset auto swing step (S20) exceeds a reset auto time, wherein
the first dynamic cooling step (S40) is performed in a case in which step S30 is satisfied.

14. The method according to claim 13, wherein the reset auto time is set to be longer than the first auto time.

15. The method according to claim 1, further comprising:

a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section in a case in which step S90 is satisfied; and
a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time, wherein step S120 is performed in a case in which step S110 is satisfied.

16. The method according to claim 15, wherein the first auto time and the second auto time are set to be equal to each other.

17. The method according to claim 1, wherein

returning to the first dynamic cooling step (S40) is performed in a case in which step S50 is not satisfied, and returning to the second dynamic cooling step (S80) is performed in a case in which step S90 is not satisfied.

18. The method according to claim 1, wherein the first dynamic time and the second dynamic time are set to be equal to each other.

19. The method according to claim 1, further comprising:

a reset auto swing step (S20) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section after step S10;
a step (S30) of determining whether the reset auto swing step (S20) exceeds a reset auto time,
the first dynamic cooling step (S40) being performed in a case in which step S30 is satisfied;
a second auto swing step (S100) of simultaneously operating the first discharge pair and the second discharge pair and reciprocating the first discharge pair and the second discharge pair within a predetermined section in a case in which step S90 is satisfied; and
a step (S110) of determining whether the second auto swing step (S100) exceeds a second auto time, wherein step S120 is performed in a case in which step S110 is satisfied.

20. The method according to claim 19, wherein
the reset auto time is set to be longer than the first auto time,
the first auto time and the second auto time are set to be equal to each other, and
the first dynamic time and the second dynamic time are set to be equal to each other.

21. A method of controlling a ceiling type indoor unit of an air conditioner, the ceiling type indoor unit comprising:

a case installed at a ceiling of a room so as to be suspended therefrom, the case having a suction port formed at a lower surface thereof, a first discharge port, a second discharge port, a third discharge port, and a fourth discharge port being formed at an edge of the suction port; and
a first vane module disposed at the first discharge port, the first vane module being disposed in a 12 o'clock direction based on the suction port, the first vane module constituting one of a first discharge pair, the first vane module being configured to discharge air in a first discharge direction; a second vane module disposed at the second discharge port, the second vane module being disposed in a 3 o'clock direction based on the suction port, the second vane module constituting one of a second discharge pair, the second vane module being configured to discharge air in a second discharge direction; a third vane module disposed at the third discharge port, the third vane module being disposed in a 6 o' clock direction based on the suction port, the third vane module constituting the other of the first discharge pair, the third vane module being configured to discharge air in a third discharge direction; and a fourth vane module disposed at the fourth discharge port, the fourth vane module being disposed in a 9 o'clock direction based on the suction port, the fourth vane module constituting the other of the second discharge pair, the fourth vane module being configured to discharge air in a fourth discharge direction, wherein
each vane module comprises: a module body installed at the case, at least a portion of the module body being exposed to the discharge port; a vane motor assembled to the module body, the vane motor being configured to provide driving force; a driving link assembled to the module body so as to be rotatable relative thereto, the driving link being coupled to the vane motor, the driving link being configured to be rotated by the driving force of the vane motor, the driving link comprising a first driving link body and a second driving link body having a predetermined angle therebetween; a first vane link located further forwards than the driving link, the first vane link being assembled to the module body so as to be rotatable relative thereto; a second vane link assembled to the second driving link body so as to be rotatable relative thereto; a first vane disposed at each discharge port, the first vane being disposed forwards in a discharge direction of air discharged from the discharge port, the first vane being assembled to each of the first driving link body and the first vane link so as to be rotatable relative thereto; and a second vane disposed at each discharge port, the second vane being assembled to the module body so as to be rotatable relative thereto by the second vane shaft, the second vane being assembled to the second vane link so as to be rotatable relative thereto,
the first vane module, the second vane module, the third vane module, and the fourth vane module are set to be operated in one of discharge steps P1 to P6,
based on a horizon, an inclination of the first vane satisfies "0 degrees < inclination of the first vane in discharge step P1 < inclination of the first vane in discharge step P2 < inclination of the first vane in discharge step P3 <

inclination of the first vane in discharge step P4 < inclination of the first vane in discharge step P5 < inclination of the first vane in discharge step P6 < 90 degrees,"

based on the horizon, an inclination of the second vane satisfies "0 degrees < inclination of the second vane in discharge step P1 < inclination of the second vane in discharge step P2 < inclination of the second vane in discharge step P3 < inclination of the second vane in discharge step P4 < inclination of the second vane in discharge step P5 < inclination of the second vane in discharge step P6 < 90 degrees,"

in each discharge step, the inclination of the second vane is set to always be greater than the inclination of the first vane, and

the method comprises:

a step (S10) of turning on a dynamic cooling mode;

a first dynamic cooling step (S40) of operating the first discharge pair in discharge step P2 and operating the second discharge pair in a power cooling discharge step after step S10;

a step (S50) of determining whether the first dynamic cooling step (S40) exceeds a first dynamic time;

a second dynamic cooling step (S80) of operating the first discharge pair in the power cooling discharge step and operating the second discharge pair in discharge step P2 in a case in which step S50 is satisfied;

a step (S90) of determining whether the second dynamic cooling step (S80) exceeds a second dynamic time;

a step (S120) of determining whether the dynamic cooling mode is turned off in a case in which step S90 is satisfied; and

a step of finishing the dynamic cooling mode in a case in which step S120 is satisfied, wherein

the first vane has an inclination of 35 to 57 degrees in the power cooling discharge step.

Fig. 1

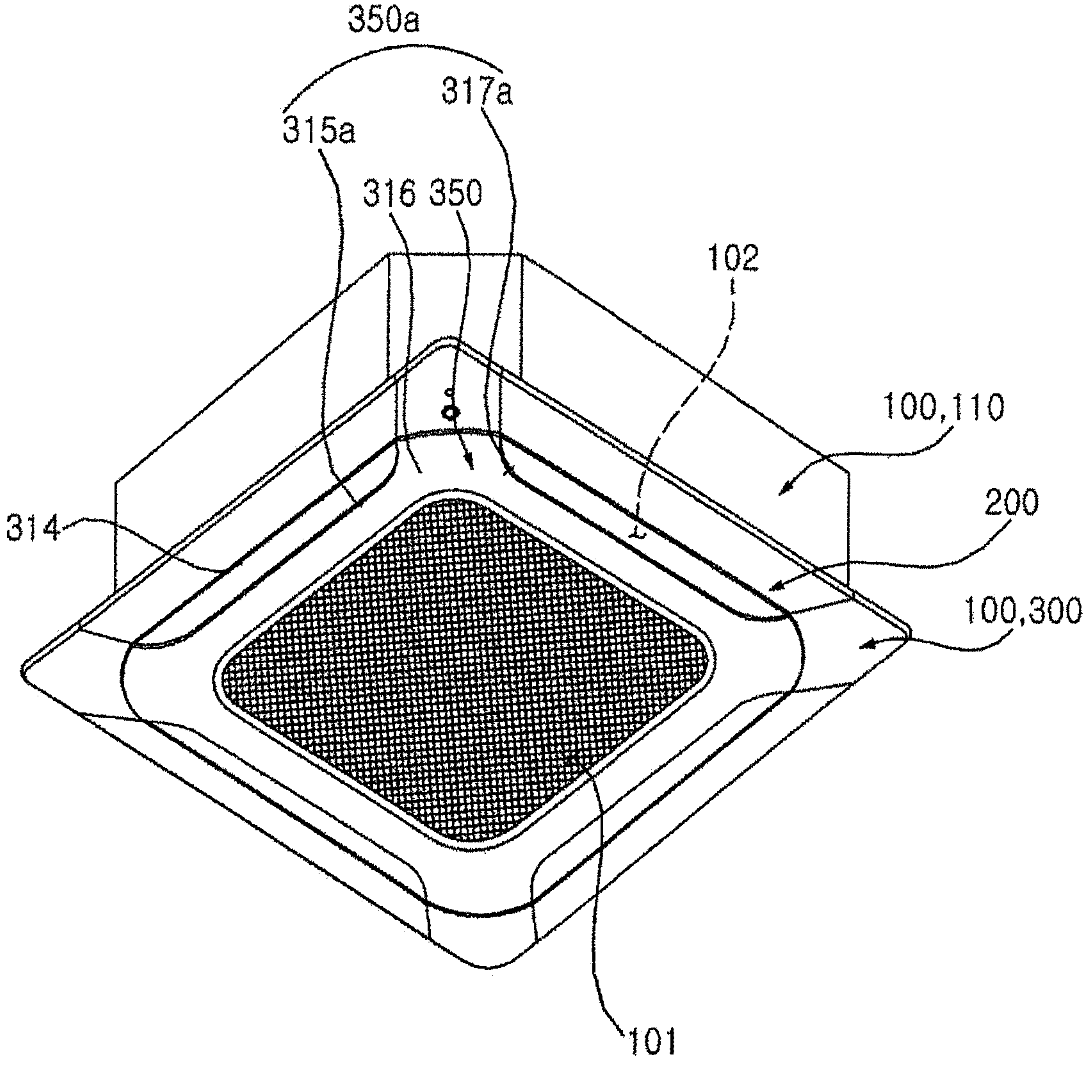


Fig. 2

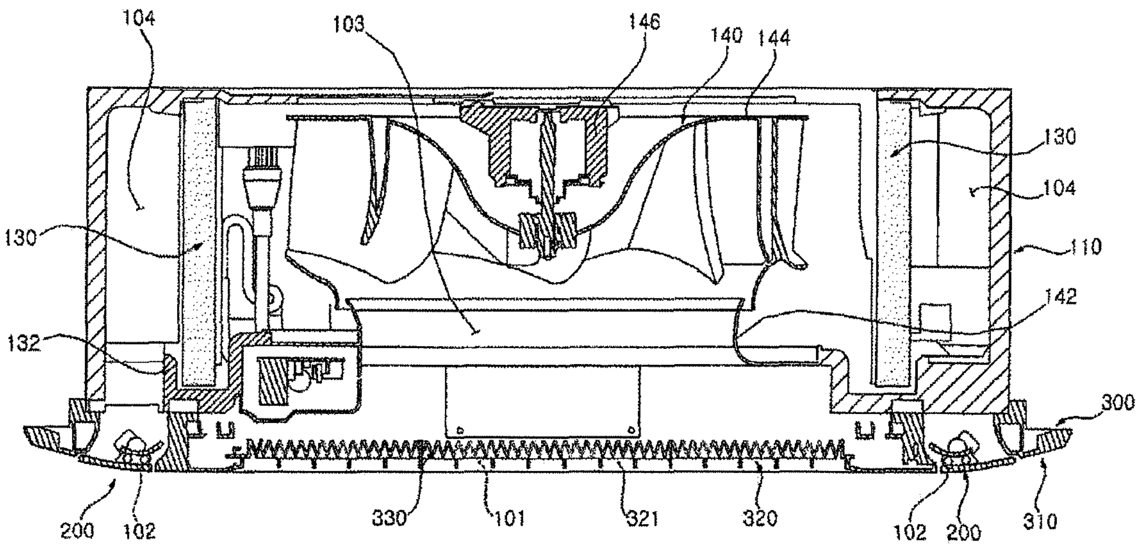

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Fig. 3

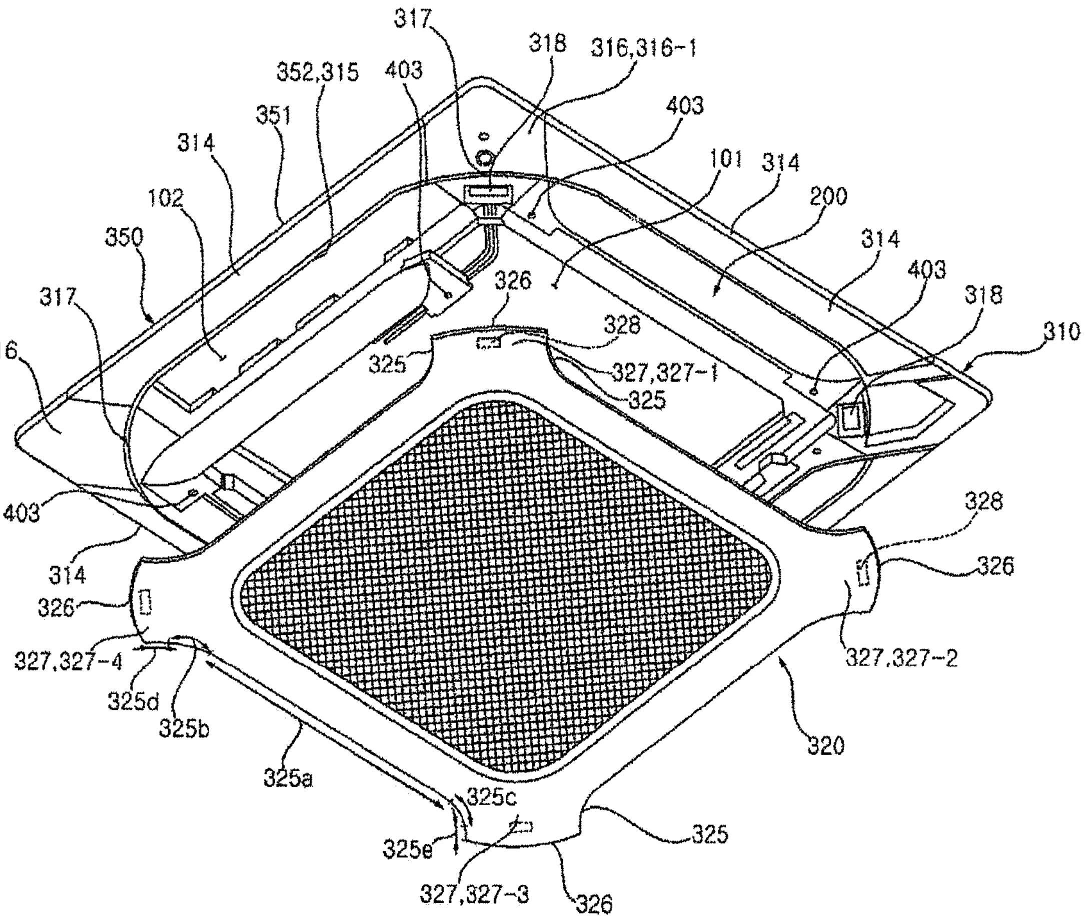
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Fig. 4

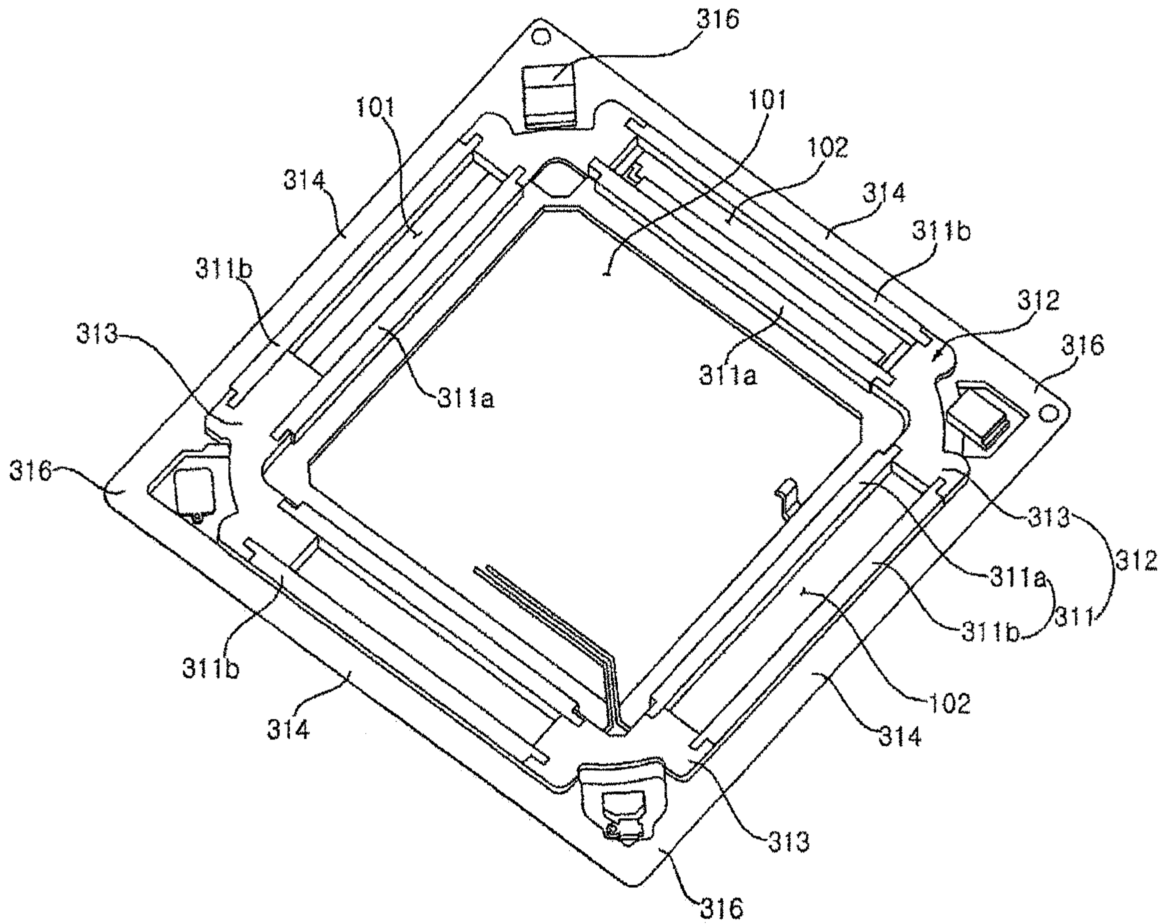
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Fig. 5

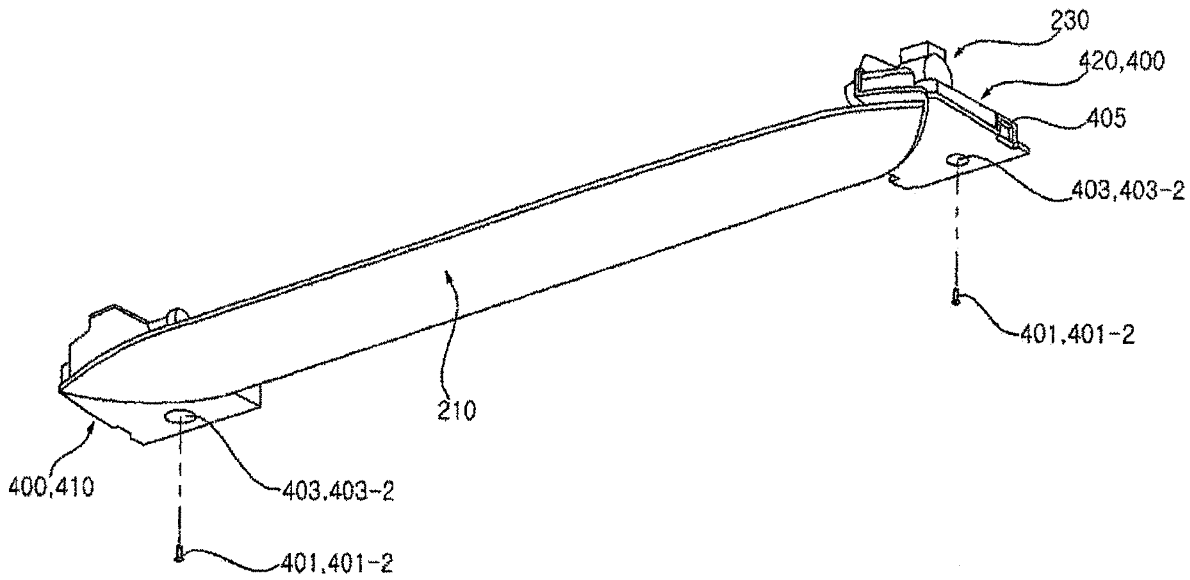

Fig. 6

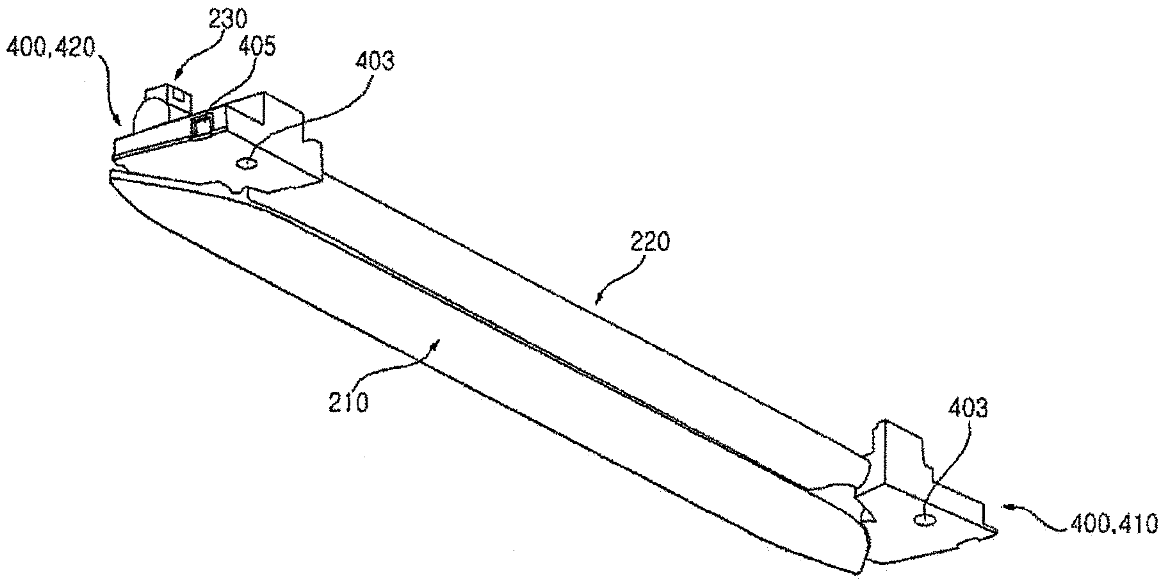

Fig. 7

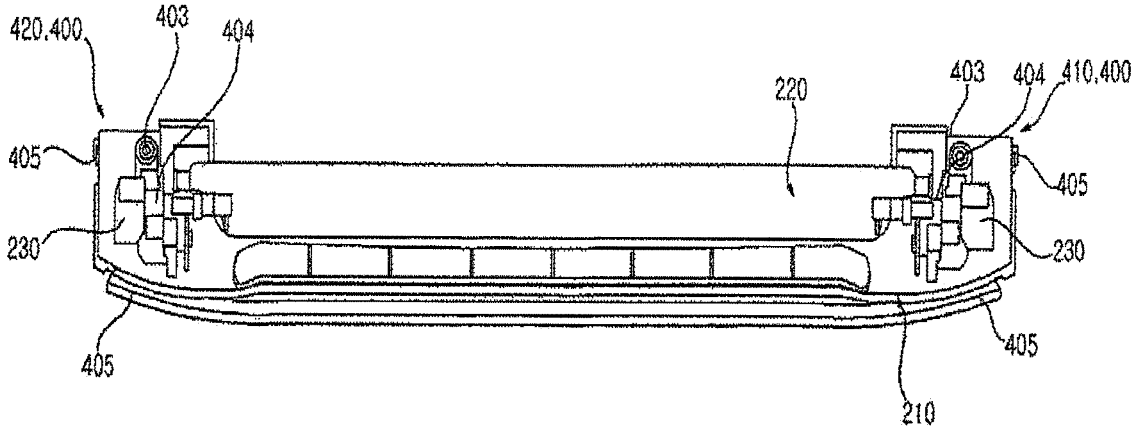
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Fig. 8

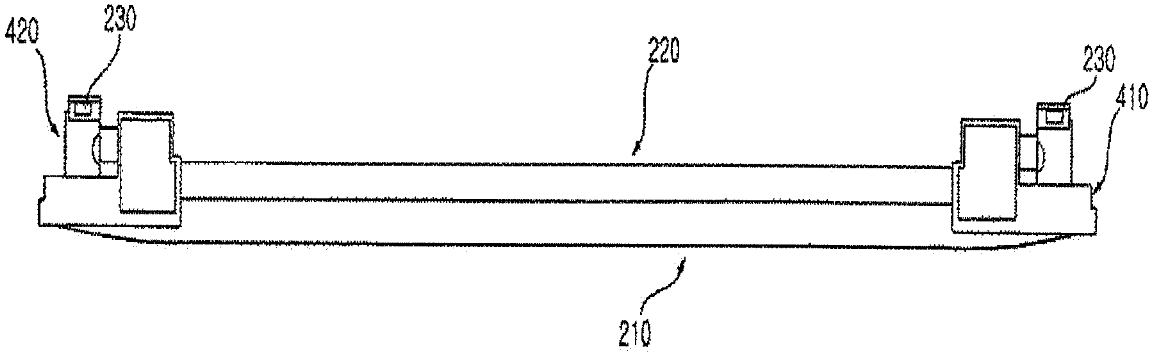
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Fig. 9

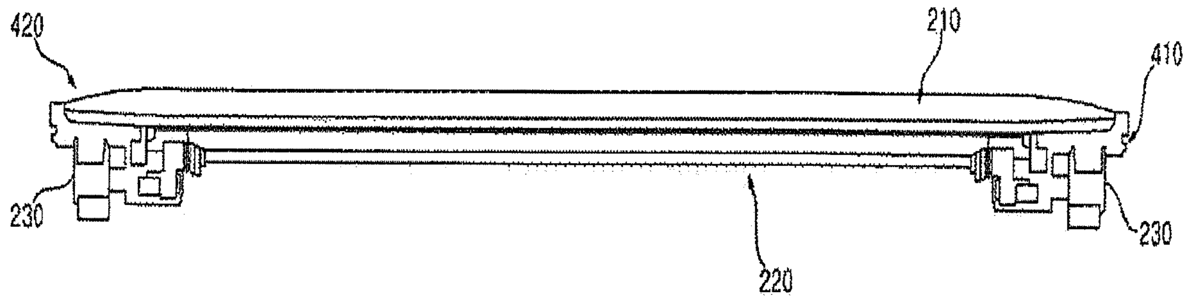
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Fig. 10

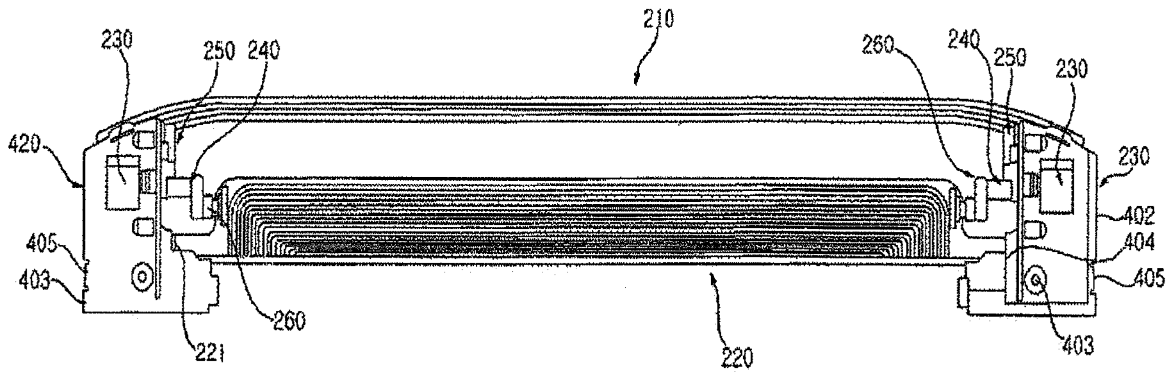
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Fig. 11

200

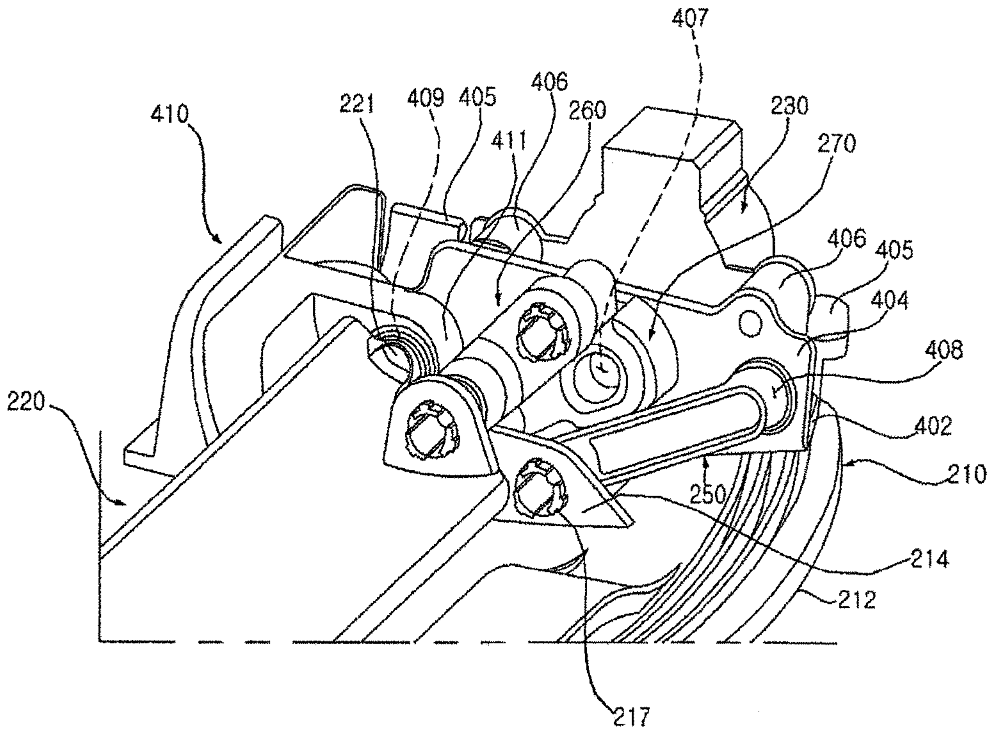
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Fig. 12

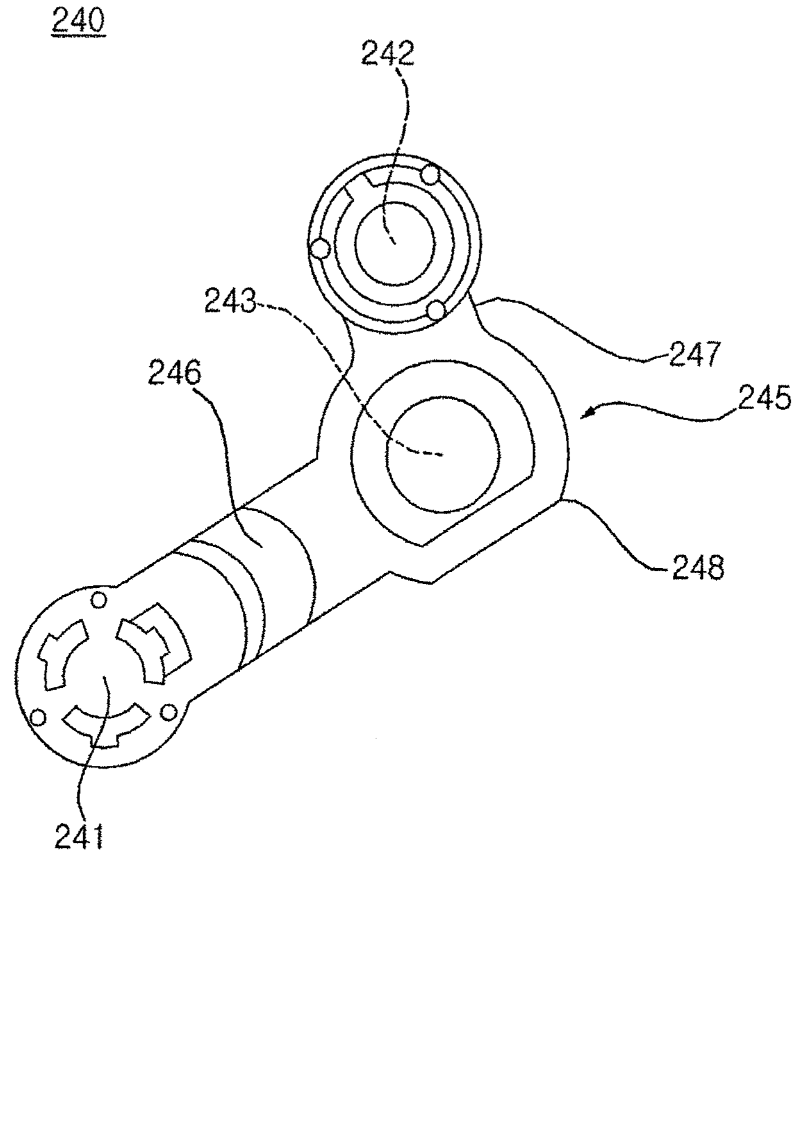


Fig. 13

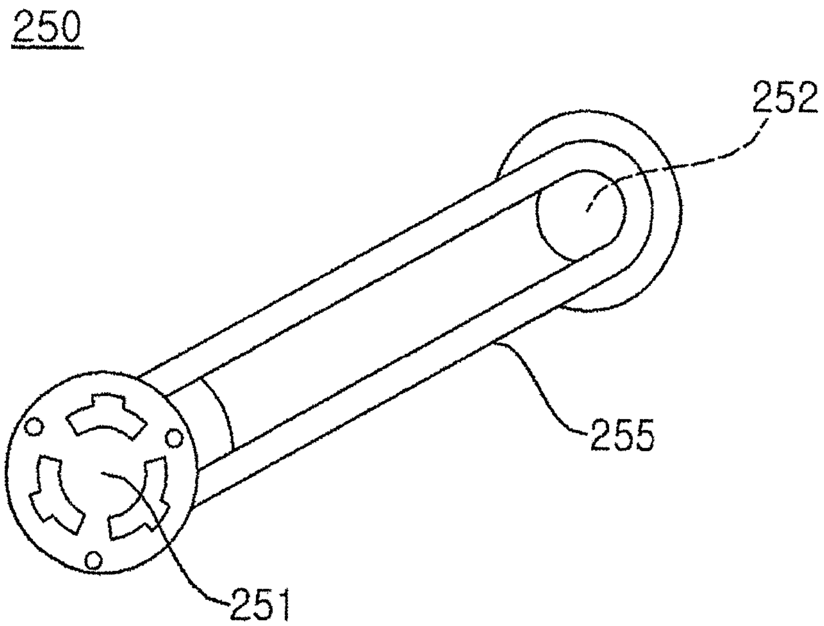


Fig. 14

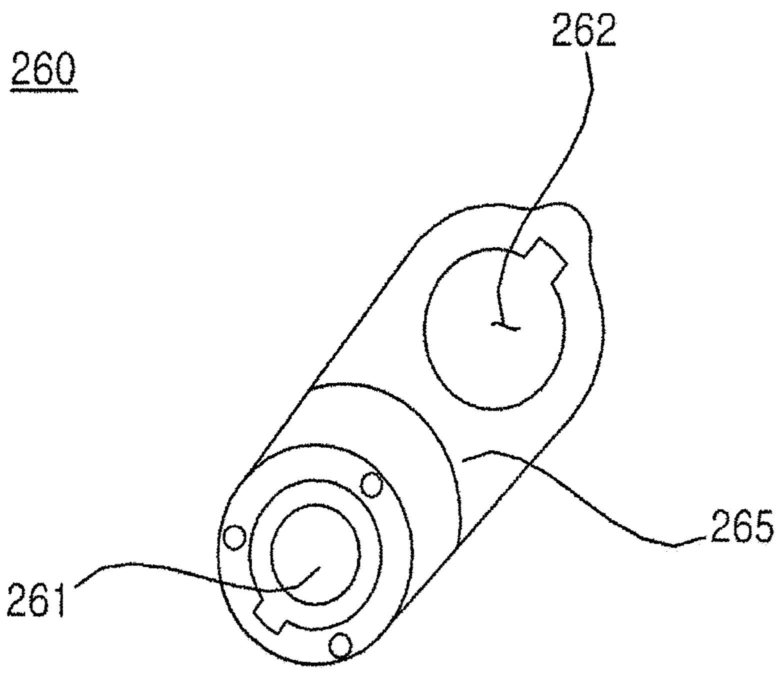


Fig. 15

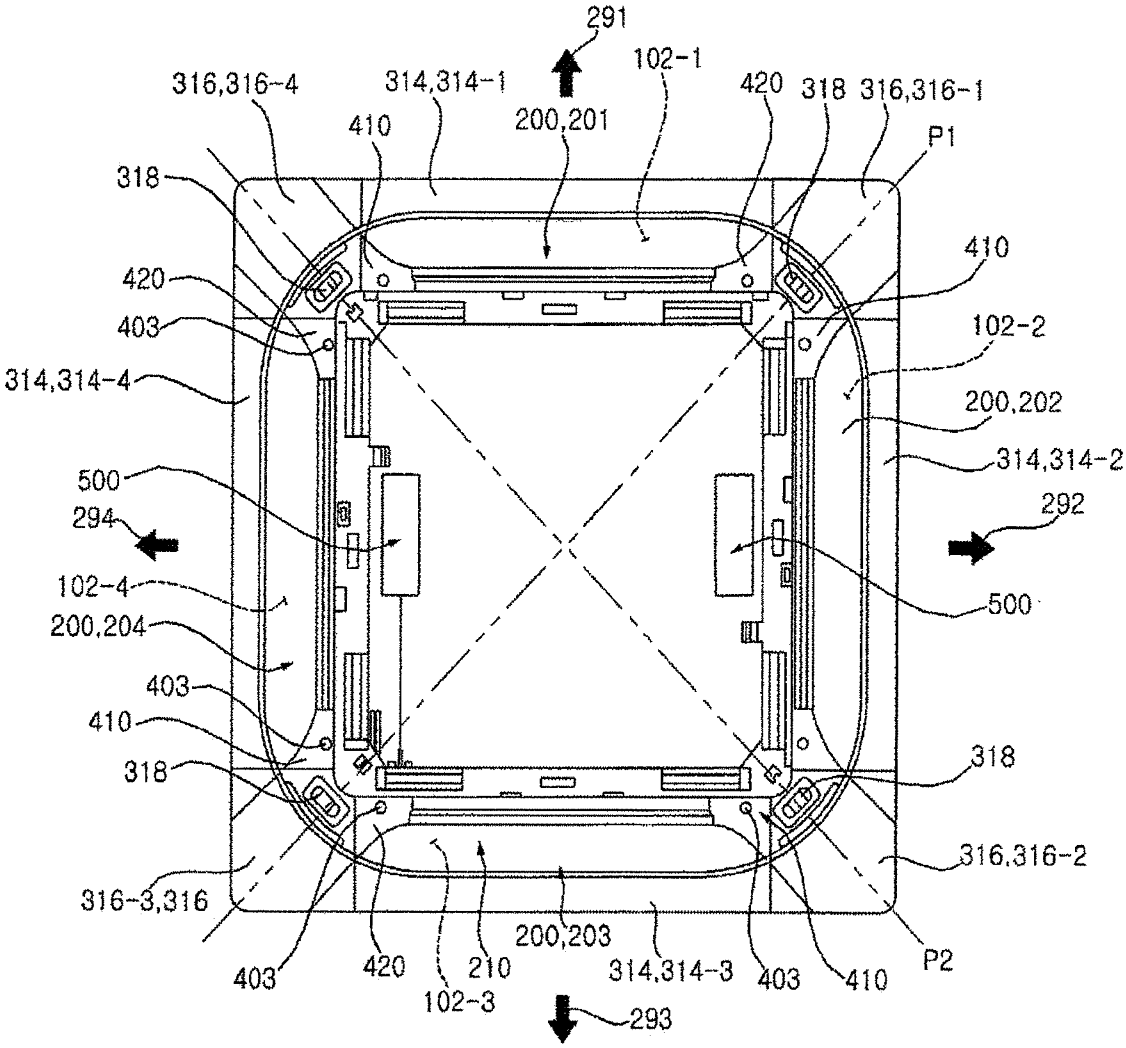

291
102-1
316,316-4
314,314-1
420
318
316,316-1
410
200,201
P1
318
410
420
403
102-2
314,314-4
200,202
314,314-2
500
292
294
500
102-4
200,204
403
410
318
318
316,316-2
316-3,316
200,203
403
420
210
314,314-3
403
410
P2
102-3
293

Fig. 16

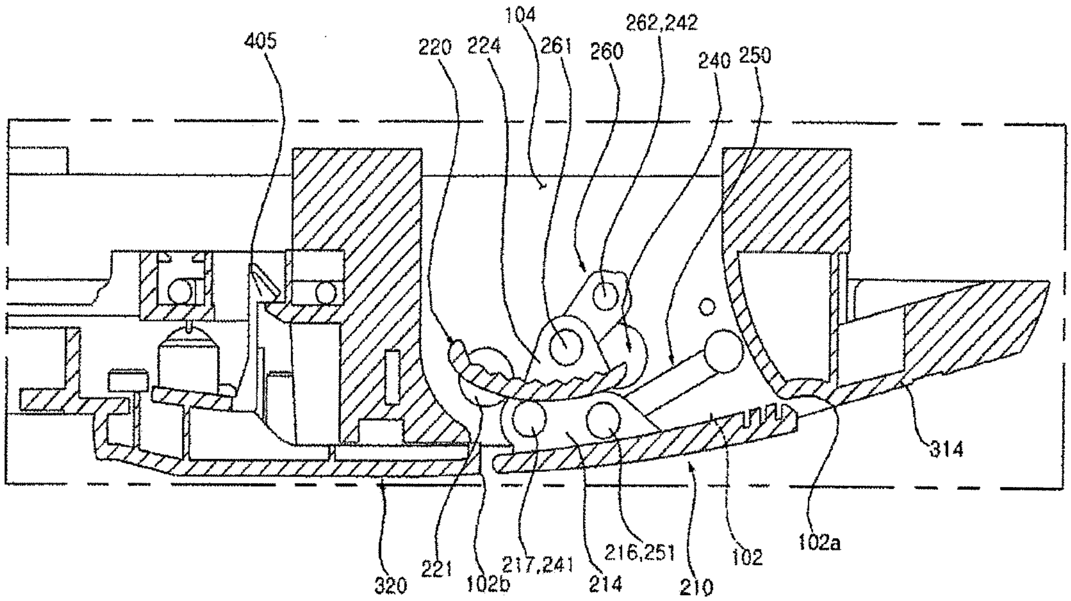

104
262,242
405
220
224
261
260
240
250
314
320
221
102b
217,241
214
216,251
210
102
102a

Fig. 17

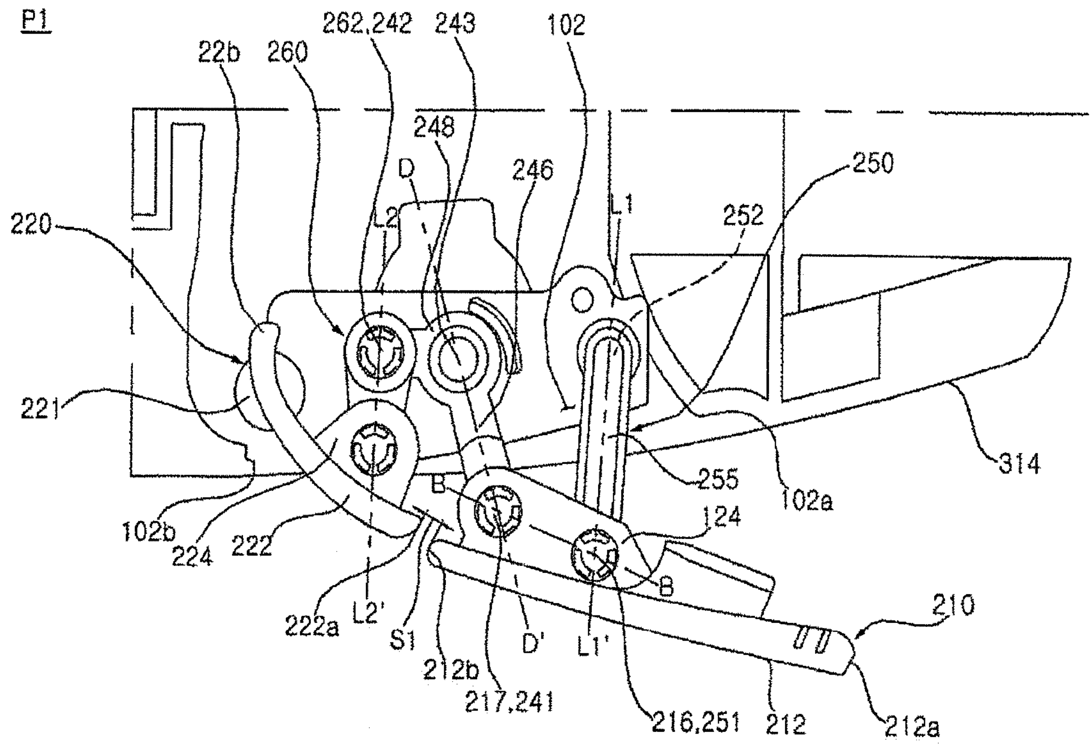

P1
22b
260
262,242
243
102
248
D
246
250
L2
L1
252
220
221
255
102a
314
102b
224
222
B
124
B
222a
L2'
S1
D'
L1'
210
212b
217,241
216,251
212
212a

Fig. 18

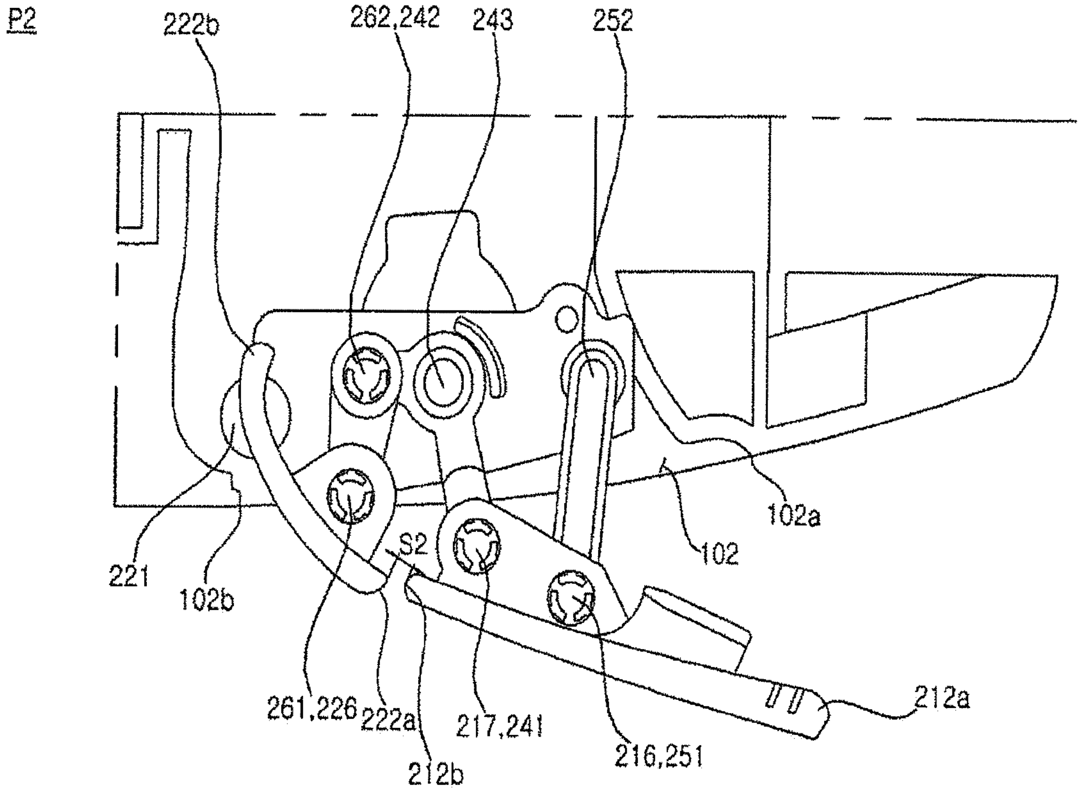

P2
222b
262,242
243
252
221
102b
102a
102
S2
261,226
222a
212b
217,241
216,251
212a

Fig. 19

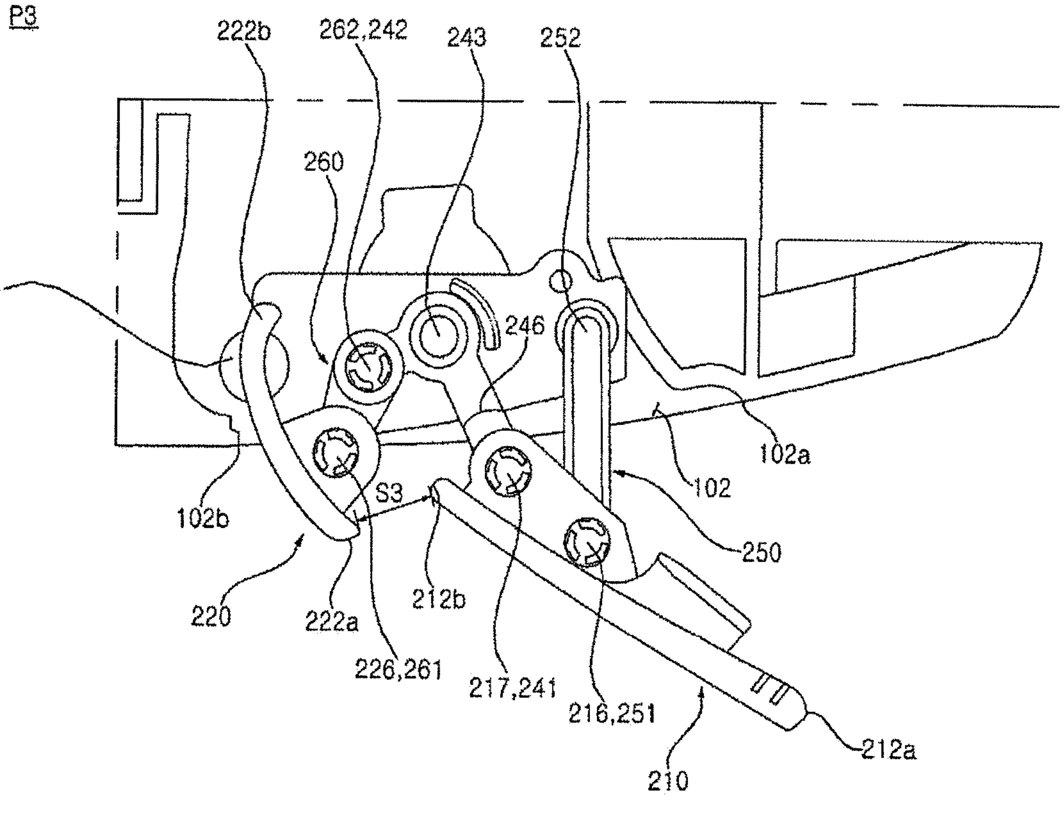

P3
222b
262,242
243
252
260
221
246
102a
102
102b
S3
250
220
222a
212b
226,261
217,241
216,251
212a
210

Fig. 20

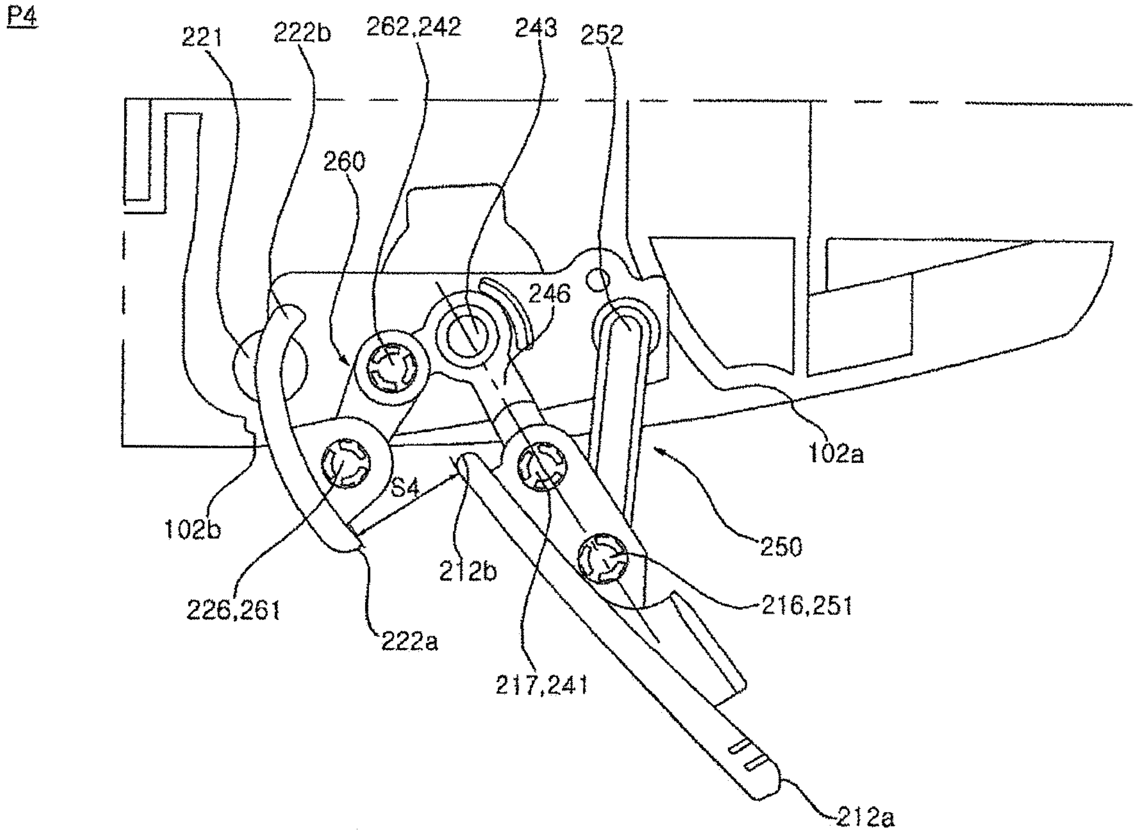

P4
221
222b
262,242
243
252
260
246
102a
250
102b
S4
212b
216,251
226,261
222a
217,241
212a

Fig. 21

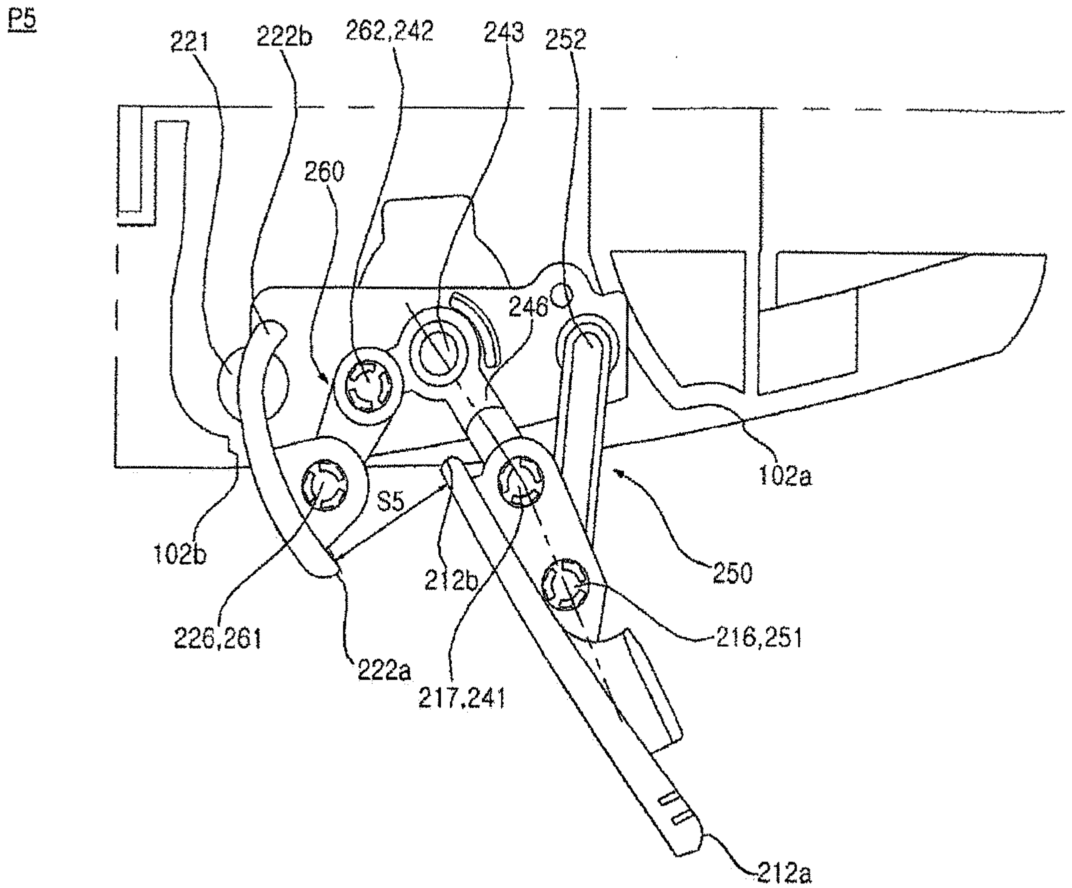

P5
221
222b
262,242
243
252
260
246
102a
102b
S5
250
212b
226,261
216,251
222a
217,241
212a

Fig. 22

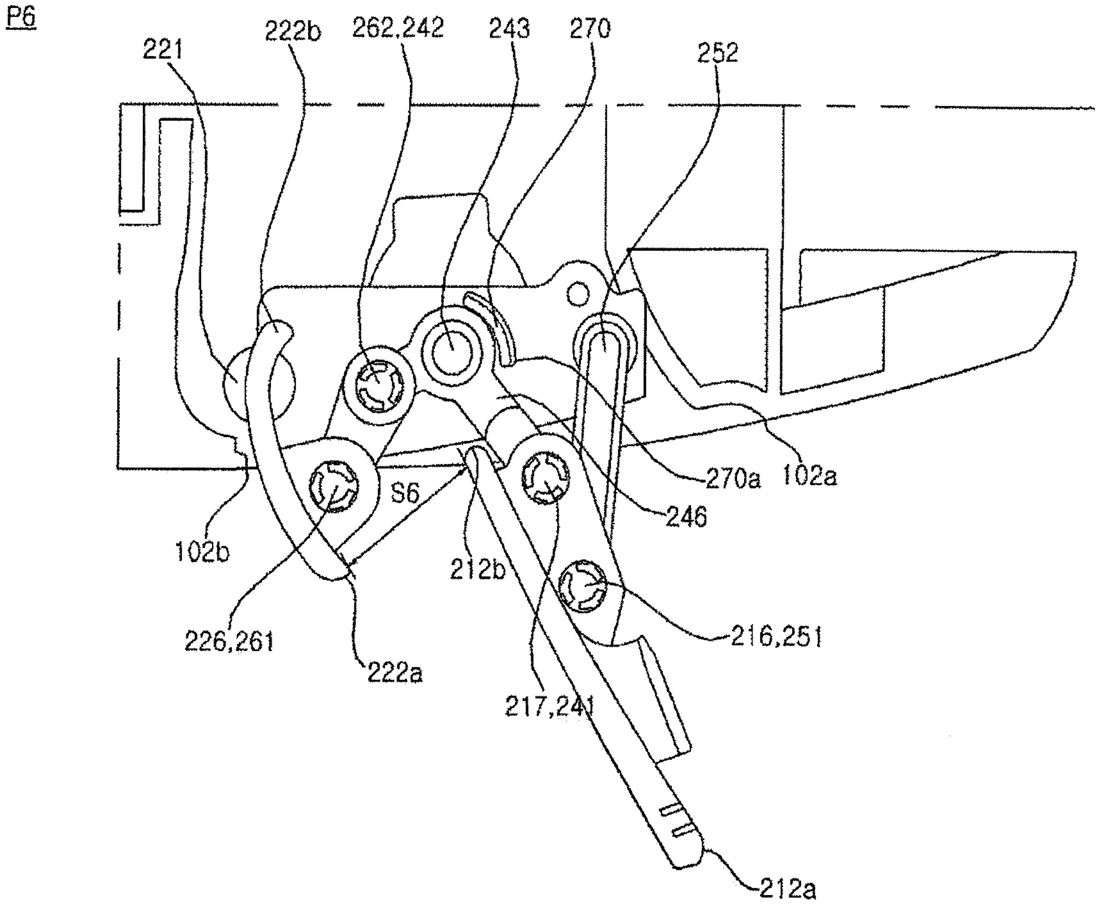

P6
221
222b
262,242
243
270
252
270a
102a
246
102b
S6
212b
216,251
226,261
222a
217,241
212a

Fig. 23

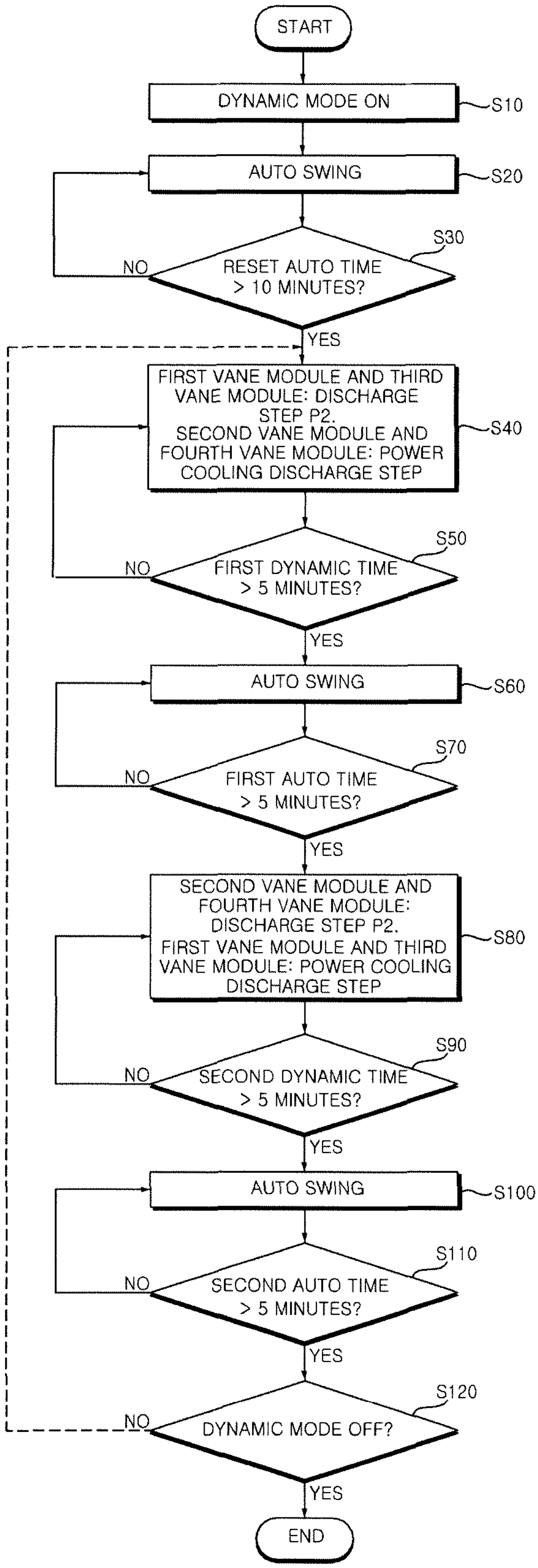

START
DYNAMIC MODE ON
S10
AUTO SWING
S20
RESET AUTO TIME
> 10 MINUTES?
S30
NO
YES
FIRST VANE MODULE AND THIRD VANE MODULE: DISCHARGE STEP P2.
SECOND VANE MODULE AND FOURTH VANE MODULE: POWER COOLING DISCHARGE STEP
S40
FIRST DYNAMIC TIME
> 5 MINUTES?
S50
NO
YES
AUTO SWING
S60
FIRST AUTO TIME
> 5 MINUTES?
S70
NO
YES
SECOND VANE MODULE AND FOURTH VANE MODULE: DISCHARGE STEP P2.
FIRST VANE MODULE AND THIRD VANE MODULE: POWER COOLING DISCHARGE STEP
S80
SECOND DYNAMIC TIME
> 5 MINUTES?
S90
NO
YES
AUTO SWING
S100
SECOND AUTO TIME
> 5 MINUTES?
S110
NO
YES
DYNAMIC MODE OFF?
S120
NO
YES
END

Fig. 24

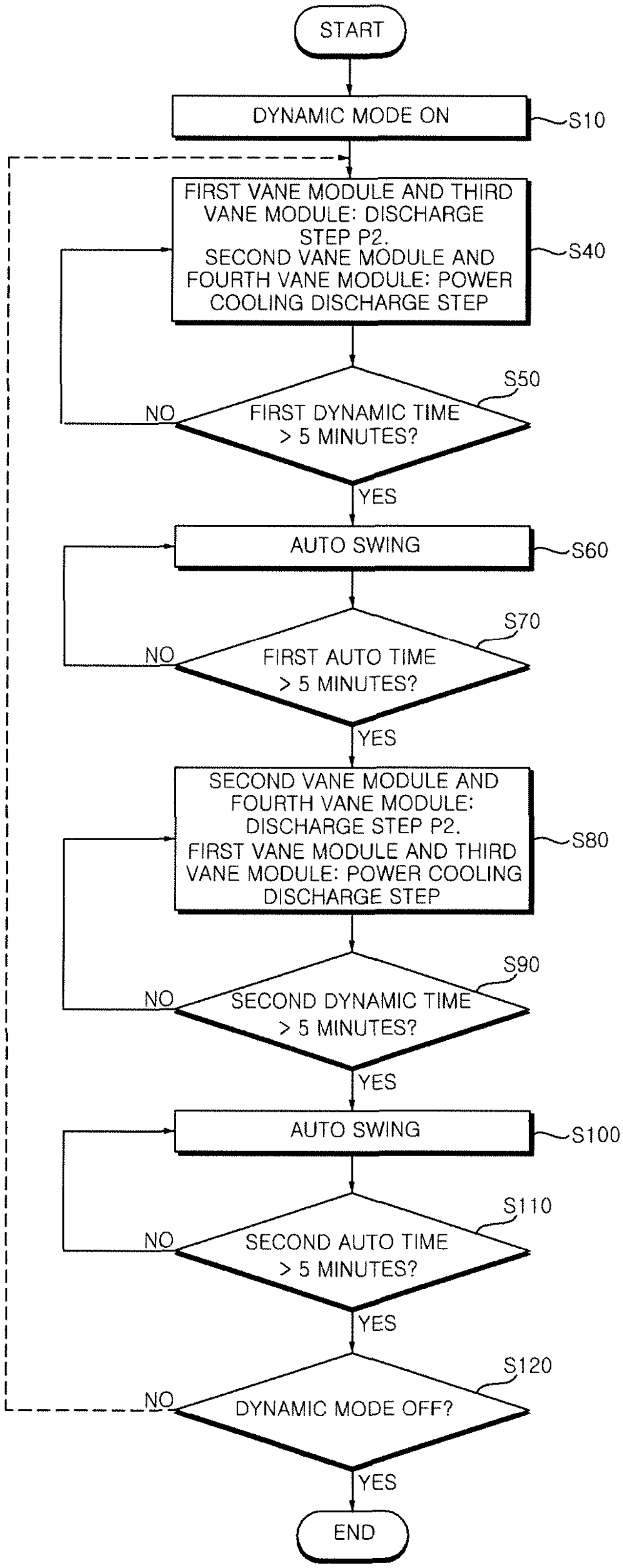

START
DYNAMIC MODE ON
S10
FIRST VANE MODULE AND THIRD VANE MODULE: DISCHARGE STEP P2.
SECOND VANE MODULE AND FOURTH VANE MODULE: POWER COOLING DISCHARGE STEP
S40
FIRST DYNAMIC TIME > 5 MINUTES?
S50
NO
YES
AUTO SWING
S60
FIRST AUTO TIME > 5 MINUTES?
S70
NO
YES
SECOND VANE MODULE AND FOURTH VANE MODULE: DISCHARGE STEP P2.
FIRST VANE MODULE AND THIRD VANE MODULE: POWER COOLING DISCHARGE STEP
S80
SECOND DYNAMIC TIME > 5 MINUTES?
S90
NO
YES
AUTO SWING
S100
SECOND AUTO TIME > 5 MINUTES?
S110
NO
YES
DYNAMIC MODE OFF?
S120
NO
YES
END

Fig. 25

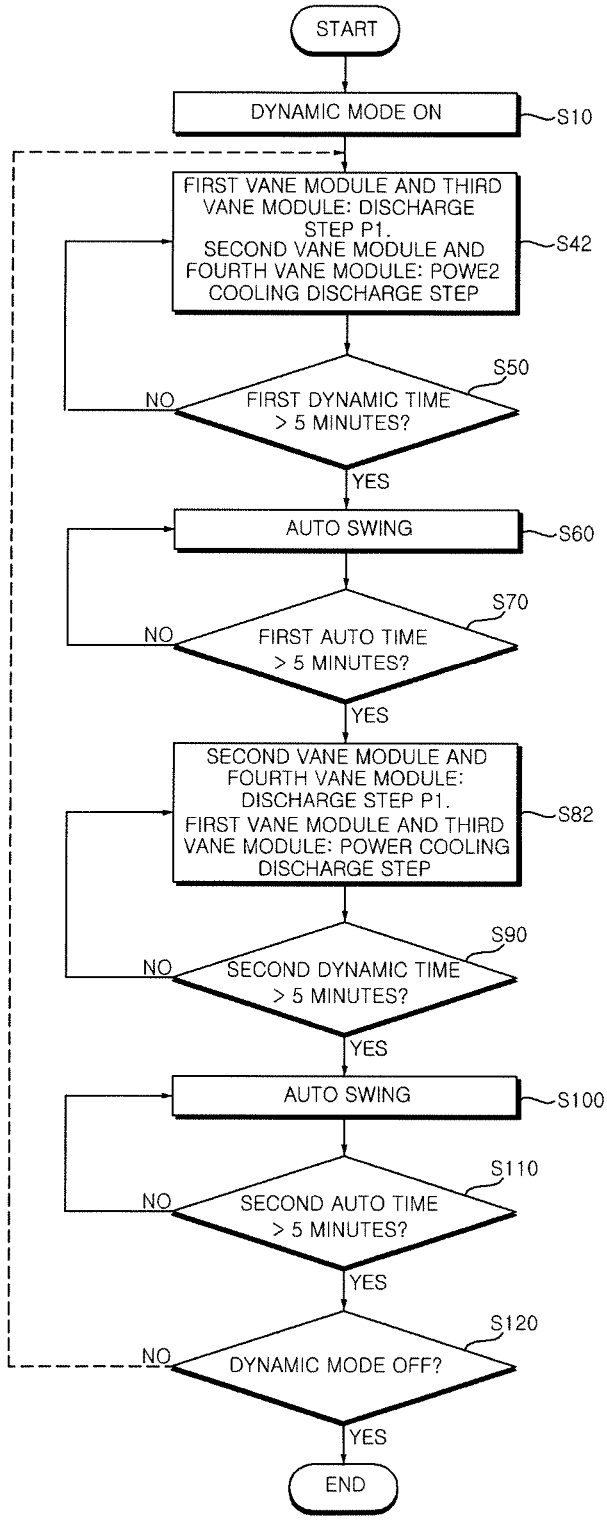

START
DYNAMIC MODE ON
S10
FIRST VANE MODULE AND THIRD VANE MODULE: DISCHARGE STEP P1.
SECOND VANE MODULE AND FOURTH VANE MODULE: POWE2 COOLING DISCHARGE STEP
S42
FIRST DYNAMIC TIME > 5 MINUTES?
S50
NO
YES
AUTO SWING
S60
FIRST AUTO TIME > 5 MINUTES?
S70
NO
YES
SECOND VANE MODULE AND FOURTH VANE MODULE: DISCHARGE STEP P1.
FIRST VANE MODULE AND THIRD VANE MODULE: POWER COOLING DISCHARGE STEP
S82
SECOND DYNAMIC TIME > 5 MINUTES?
S90
NO
YES
AUTO SWING
S100
SECOND AUTO TIME > 5 MINUTES?
S110
NO
YES
DYNAMIC MODE OFF?
S120
NO
YES
END

Fig. 26

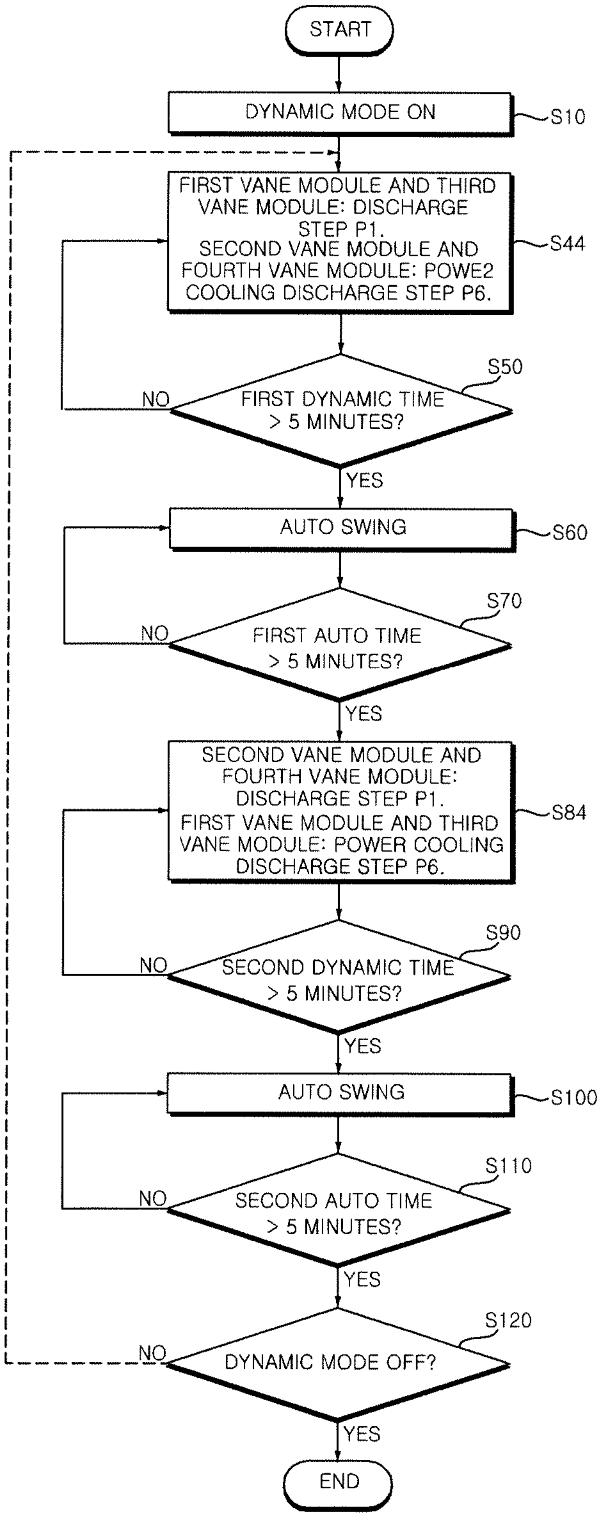
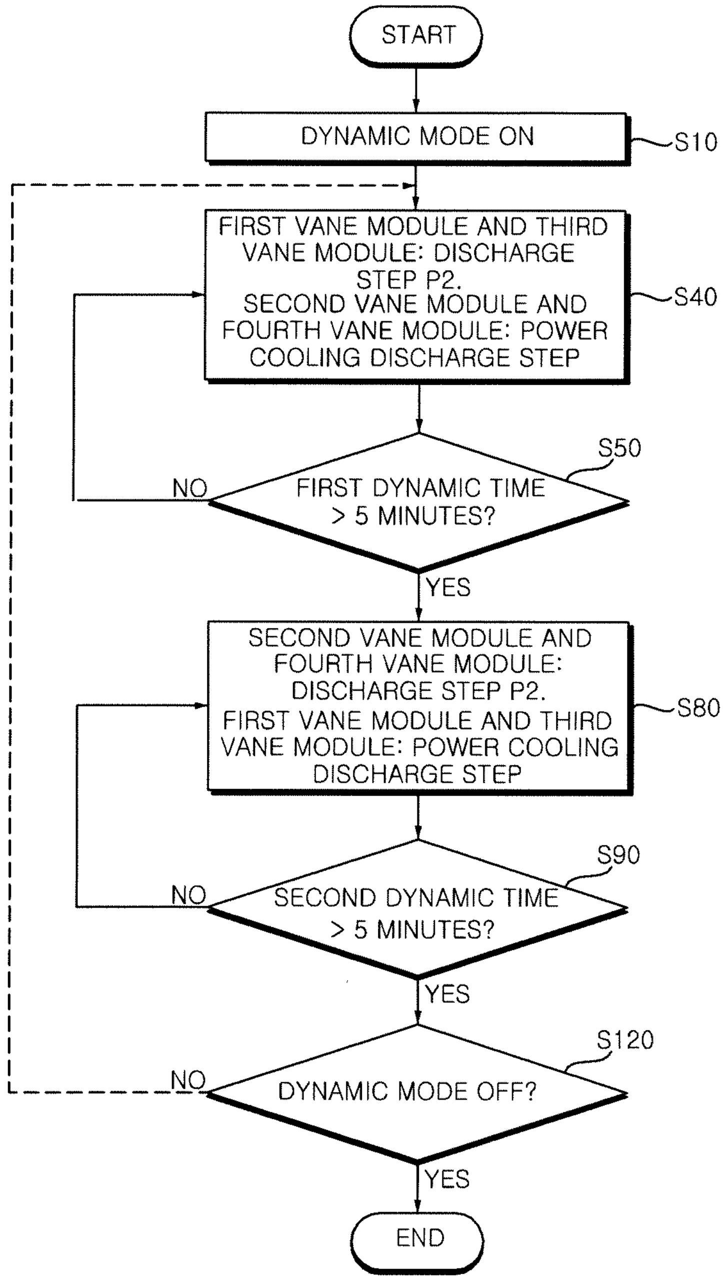

START
DYNAMIC MODE ON
S10
FIRST VANE MODULE AND THIRD VANE MODULE: DISCHARGE STEP P1.
SECOND VANE MODULE AND FOURTH VANE MODULE: POWE2 COOLING DISCHARGE STEP P6.
S44
FIRST DYNAMIC TIME > 5 MINUTES?
S50
NO
YES
AUTO SWING
S60
FIRST AUTO TIME > 5 MINUTES?
S70
NO
YES
SECOND VANE MODULE AND FOURTH VANE MODULE: DISCHARGE STEP P1.
FIRST VANE MODULE AND THIRD VANE MODULE: POWER COOLING DISCHARGE STEP P6.
S84
SECOND DYNAMIC TIME > 5 MINUTES?
S90
NO
YES
AUTO SWING
S100
SECOND AUTO TIME > 5 MINUTES?
S110
NO
YES
DYNAMIC MODE OFF?
S120
NO
YES
END

Fig. 27


START
DYNAMIC MODE ON
S10
FIRST VANE MODULE AND THIRD VANE MODULE: DISCHARGE STEP P2.
SECOND VANE MODULE AND FOURTH VANE MODULE: POWER COOLING DISCHARGE STEP
S40
S50
FIRST DYNAMIC TIME > 5 MINUTES?
NO
YES
SECOND VANE MODULE AND FOURTH VANE MODULE: DISCHARGE STEP P2.
FIRST VANE MODULE AND THIRD VANE MODULE: POWER COOLING DISCHARGE STEP
S80
S90
SECOND DYNAMIC TIME > 5 MINUTES?
NO
YES
S120
DYNAMIC MODE OFF?
NO
YES
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2018/011173

A. CLASSIFICATION OF SUBJECT MATTER

F24F 13/14(2006.01)i, F24F 1/00(2011.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24F 13/14; F24F 1/02; F24F 11/02; F24F 13/08; F24F 13/15; F24F 13/20; F24F 1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: portable air purifier, rotary shaft, fan blade, shielding plate, guide vane, guide surface

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2017-0000386 A (LG ELECTRONICS INC.) 02 January 2017 See paragraphs [0021]-[0083]; and figures 2-4, 6-7.	1-21
A	KR 10-2014-0101284 A (PANASONIC CORPORATION) 19 August 2014 See paragraphs [0029]-[0040]; and figures 3-8, 9a-9b.	1-21
A	JP 2010-060223 A (SHARP CORP.) 18 March 2010 See paragraphs [0019]-[0061]; and figures 1-10.	1-21
A	JP 2009-222302 A (PANASONIC CORP.) 01 October 2009 See paragraphs [0009]-[0121]; and figures 1-14.	1-21
A	KR 10-2011-0057458 A (KIM, Soon-Cheul) 01 June 2011 See paragraphs [0019]-[0058]; and figures 2-6.	1-21

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 JANUARY 2019 (14.01.2019)	**15 JANUARY 2019 (15.01.2019)**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office Government Complex Daejeon Building 4, 189, Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578	Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2018/011173

Patent document cited in search report	Publication date	Patent family member	Publication date
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		CN 104515203 B	25/09/2018
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		KR 10-1833303 B1	28/02/2018
		KR 10-2015-0041340 A	16/04/2015
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JP 2009-222302 A	01/10/2009	JP 5194910 B2	08/05/2013
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Patent documents cited in the description

- KR 100679838 B1 **[0015]**