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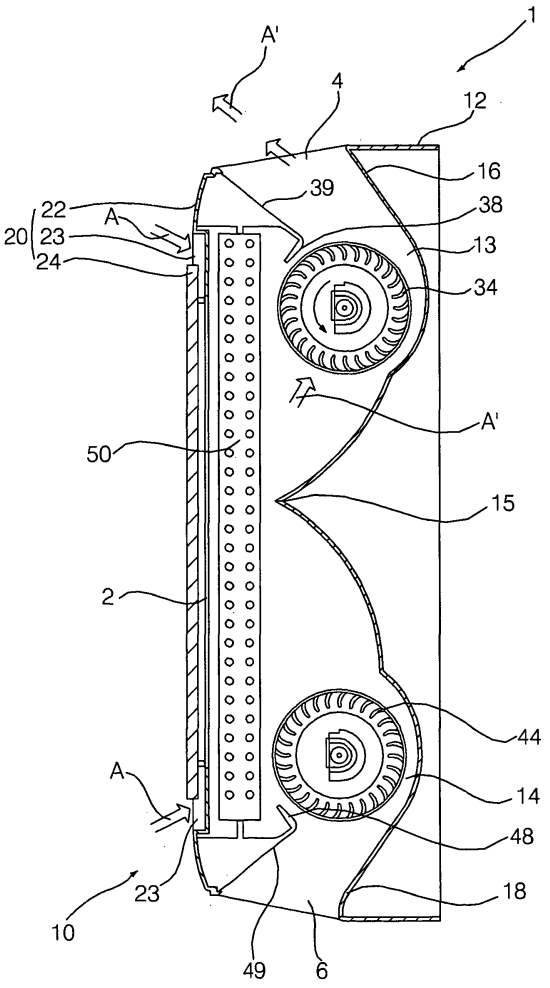
(54) Air conditioner and control method of the same

(57) Disclosed are an air conditioner and a control method of the same. An air intake opening is formed on the front surface of a main body (10), air discharge openings (4,6) are formed on the upper and lower portions thereof, respectively, a plurality of blower fans (30,40) are vertically installed inside the main body (10), and a control unit (68) controls the plurality of blower fans according to a cooling/heating operation, thus a discharge direction of cool air/warm air can be vertically adjusted according to the cooling/heating operation, thereby making the room air-conditioned more efficiently during the cooling/heating operation.

Fig. 6



EP 1 734 313 A1

Description

[0001] The present invention relates to an air conditioner and a control method of the same, and more particularly, to an air conditioner, which discharges cool air to the upper portion during a cooling operation and warm air to the lower portion during a heating operation, and a control method of the same.

[0002] Generally, an air conditioner is an appliance for cooling or heating an indoor space using a refrigeration cycle of a refrigerant in order to create a more pleasant indoor environment for a user, which includes a compressor, a four-way valve, an outdoor heat exchanger (condenser or evaporator), an expansion mechanism, and an indoor heat exchanger (evaporator or condenser), and which is largely classified into a split type and an integral type. The split type and the integral type are functionally the same, but the split type is an apparatus with separate indoor and outdoor units connected by a refrigerant pipe by installing a cooling/heat sink device and an indoor fan and an indoor fan motor on the indoor unit, and installing a heat sink/cooling device, a compressor, and an outdoor fan and an outdoor fan motor on the outdoor unit. On the other hand, the integral type is an apparatus that is directly installed on a wall or a window by perforating the wall or hanging the apparatus on the window by integrating the cooling and heat sink functions.

[0003] FIG. 1 is an exploded perspective view of an example of an air conditioner according to the prior art. FIG. 2 is a cross sectional view of an example of an air conditioner according to the prior art.

[0004] As shown in FIGS. 1 and 2, the prior art air conditioner includes a chassis 102, a front grille 110 coupled to the front face of the chassis 102, having an air intake opening 104 and an intake grille 106, and having an air discharge opening 108 on the front lower side or on the bottom face, an intake grille 112 rotatably connected to the front face of the front grille 110, a motor 114 mounted on the chassis 102, a blower fan 116 connected to the motor 114, and a heat exchanger 118 disposed between the blower fan 116 and the air intake opening 104 and intake grille 106.

[0005] The front air intake opening 104 is formed on the front face of the front grille 110, and the top intake grille 106 is integrally formed on the top face thereof.

[0006] A pre-filter 105 filtering out foreign materials from the air taken into the front air intake opening 104 is disposed on the front grille 110.

[0007] The intake grille 112 is for protecting the front air intake opening 104 and the pre-filter 105, the upper portion thereof being connected to the top portion of the front grille 110 so as to be rotatable.

[0008] At an inside lower portion of the front grille 110, there is formed a condensed water collecting section 119 collecting condensed water dropped from the indoor heat exchanger 118, and there are mounted a discharge grille 124 including a louver 120 for changing a left/right direction of the air discharged to the air discharge opening 108 and a vain 122 for changing an up/down direction of the air.

[0009] In the prior art air conditioner thus constructed, when the blower fan 116 is rotated by the driving of the motor 114, as the indoor air at the front of the intake grille 112 passes through the intake grilled 112 and the front air intake opening 104, foreign materials are filtered by the filter 105, and sucked into the space between the front grilled 110 and the chassis 102.

[0010] Then, the indoor air on the upper side of the front grille 110 passes through the top intake grille 106 to be sucked into the space between the front grille 110 and the chassis 102.

[0011] The indoor air thus sucked is cooled or heated by the refrigerant passing through the indoor heat exchanger 118 while passing through the indoor heat exchanger 118, passes through the blower fan 116, and thereafter is discharged to the indoor space through the air discharge opening 108, being guided by the louver 120 and the vein 122.

[0012] However, since the indoor air is sucked through the front face and top face of the air conditioner, cooled/heated in the heat exchanger 118, and thereafter discharged into the indoor space through the lower face thereof, the prior art air conditioner has a problem in that if the installation height is low, the time taken to uniformly diffuse cool air throughout the room during a cooling operation is lengthened, and if the installation height is high, warm air is discharged onto the face of a user during a heating operation, thereby increasing discomfort. Moreover, there is another problem that the time to taken to cool or heat an indoor space is delayed because there are only one motor 114 and blower fan 116 installed.

[0013] Meanwhile, Korean Laid-Open Patent Publication No. 10-2004-0015872 (laid-open on February 21, 2004) discloses an air conditioner which has a plurality of motors 114 and blower fans 116 installed therein, and which eliminates the discomfort caused by direct discharge of warm air and uniformly diffuses cool air by sucking indoor air toward the front face and discharging it through both side faces and the bottom face. However, the air conditioner disclosed in the laid-open patent publication has a problem that it takes a considerable amount of time for cool air to reach far corners of a room because the cool air is discharged only to the lower side or lateral sides of the air conditioner.

[0014] The present invention has been made in an effort to solve the aforementioned problems of the prior art, and provides an air conditioner, which can air-condition a room more efficiently during a cooling/heating operation by adjusting a discharge direction of cool air according to cooling and heating operations.

[0015] The present invention provides a control method of an air conditioner, which can uniformly cool a room far enough by cooling the room with cool air discharged and dropped to the upper portion of the air conditioner during a cooling operation, and which prevents a user from feeling discomfort by heating a room with warm air

discharged and rising up to the lower portion of the air conditioner during a heating operation.

[0016] The present invention provides a control method of an air conditioner, which can cool/heat a room at an initial stage by discharging cool air/warm air through the upper and lower portions at initial stages of cooling/heating operations, and thereafter perform efficient cooling/heating according to the conditions of cooling/heating.

[0017] To achieve the above-mentioned purposes, there is provided an air conditioner in accordance with one aspect of the present invention, including: a main body having an air intake opening on the front face, an upper air discharge opening on the upper portion, and a lower air discharge opening on the lower portion; a plurality of blower fans installed on the main body so as to be spaced apart longitudinally from each other; a heat exchanger installed inside the main body, for heat-exchanging the air sucked into the air intake opening; and a control unit controlling the plurality of blower fans according to cooling and heating operations.

[0018] The main body includes: a chassis having the upper air discharge opening formed on the upper portion and the lower air discharge opening formed on the lower portion; and a front panel disposed at the front of the chassis and having the front air intake opening formed thereon.

[0019] The chassis has a central air guide section partitioning the inside of the air conditioner into an upper air blow passage and a lower air blow passage.

[0020] The chassis has an upper air guide section guiding discharged air to the upper air discharge opening so that the air discharged to the upper air discharge opening can have an upward discharge angle of 25 to 45° with respect to a horizontal plane.

[0021] The chassis has a lower air guide section guiding discharged air to the lower air discharge opening so that the air discharged to the lower air discharge opening can have a downward discharge angle of 45 to 65° with respect to a horizontal plane.

[0022] The plurality of blower fans includes an upper blower fan for blowing the air heat-exchanged in the heat exchanger to the upper air discharge opening, and a lower blower fan for blowing the air heat-exchanged in the heat exchanger to the lower air discharge opening.

[0023] The blower fans include transverse fans longitudinally disposed from side to side of the chassis, and motors installed at one of the left and right sides of the chassis so as to rotate the transverse fans, respectively.

[0024] The above-described air conditioner is a wall-type air conditioner.

[0025] There is provided a control method of an air conditioner in accordance with one aspect of the present invention, in which only an upper blower fan disposed on the inside upper portion of the air conditioner is driven during a cooling operation of the air conditioner so as to discharge cool air through an upper air discharge opening, and only a lower blower fan disposed on the inside lower portion of the air conditioner is driven during a heating operation of the air conditioner so as to discharge warm air through a lower air discharge opening.

[0026] There is provided a control method of an air conditioner in accordance with another aspect of the present invention, including: simultaneously driving an upper blower fan disposed on the inside upper portion of the air conditioner and a lower blower fan disposed on the inside lower portion of the air conditioner during a cooling or heating operation of the air conditioner; and after the simultaneous driving, if the air conditioner is in a cooling operation, stopping the lower blower fan and driving only the upper blower fan, and if the air conditioner is in a heating operation, stopping the upper bower fan and driving only the lower bower fan.

[0027] In the control method of an air conditioner, if the simultaneous driving is performed for a predetermined time, the separate driving is performed.

[0028] In the control method of an air conditioner, after performing the simultaneous driving, if an indoor temperature increases or decreases by a predetermined temperature, the separate driving is performed.

[0029] The thus-constructed air conditioner in accordance with the present invention is advantageous in that an air intake opening is formed on the front surface of a main body, air discharge openings are formed on the upper and lower portions thereof, respectively, a plurality of blower fans are vertically installed inside the main body, and a control unit controls the plurality of blower fans according to a cooling/heating operation, thus a discharge direction of cool air/warm air can be vertically adjusted according to the cooling/heating operation, thereby making the room air-conditioned more efficiently during the cooling/heating operation.

[0030] Additionally, the control method of an air conditioner of the present invention is advantageous in that the room is cooled by the cool air discharged and dropped to the upper portion of the air conditioner during a cooling operation such that the room is uniformly cooled far enough, and the room is heated by the warm air discharged and rising up to the lower portion of the air conditioner during a heating operation such that the user does not feel discomfort.

[0031] Additionally, the control method of an air conditioner of the present invention is advantageous in that the upper blower fan and the lower blower fan are driven simultaneously at an initial stage of a cooling/heating operation to thus quickly cool/heat the room at an initial stage, and thereafter, during a cooling operation, only the upper motor is driven to thus uniformly air-condition the room and increase the comfort, and during a heating operation, only the lower blower fan is driven to thus prevent the discomfort caused when warm air is directly discharged onto the user.

[0032] The invention will be described in detail with reference to the following drawings in which like numerals refer to like elements:

[0033] FIG.1 is an exploded perspective view of an ex-

ample of an air conditioner according to the prior art;

[0034] FIG. 2 is a cross sectional view of an example of an air conditioner according to the prior art;

[0035] FIG. 3 is a perspective view of an air conditioner in a cooling operation in accordance with one embodiment of the present invention;

[0036] FIG. 4 is a perspective view of an air conditioner in a heating operation in accordance with one embodiment of the present invention;

[0037] FIG. 5 is an exploded perspective view of an air conditioner in accordance with one embodiment of the present invention;

[0038] FIG. 6 is a cross sectional view of an air conditioner in a cooling operation in accordance with one embodiment of the present invention;

[0039] FIG. 7 is a cross sectional view of an air conditioner in a heating operation in accordance with one embodiment of the present invention;

[0040] FIG. 8 is a control block diagram of an air conditioner in accordance with one embodiment of the present invention;

[0041] FIG. 9 is a sequential diagram showing a control method of an air conditioner in accordance with one embodiment of the present invention;

[0042] FIG. 10 is a sequential diagram showing a control method of an air conditioner in accordance with another embodiment of the present invention;

[0043] FIG. 11 is a cross sectional view of an air conditioner at an initial stage of a cooling operation according to the control method of an air conditioner in accordance with another embodiment of the present invention; and

[0044] FIG. 12 is a cross sectional view of an air conditioner at an initial stage of a heating operation according to the control method of an air conditioner in accordance with another embodiment of the present invention.

[0045] Exemplary embodiments of an air conditioner and a control method of the same in accordance with the present invention will be described in a more detailed manner with reference to the drawings.

[0046] FIG. 3 is a perspective view of an air conditioner in a cooling operation in accordance with one embodiment of the present invention. FIG. 4 is a perspective view of an air conditioner in a heating operation in accordance with one embodiment of the present invention

[0047] In a cooling operation of the air conditioner in accordance with this embodiment, as shown in FIG. 3, indoor air (A) is sucked through the front surface, heat-exchanged inside, and then discharged through the upper portion, and in a heating operation thereof, as shown in FIG. 4, indoor air (B) is sucked through the front face, heat exchanged, and then discharged through the lower portion.

[0048] A front air intake opening 2 for sucking indoor air (A)(B) is formed on the front surface of the air conditioner 1, an upper air discharge opening 4 for discharging heat-exchanged air (A') is formed on the upper portion thereof, and a lower air discharge opening 6 for discharging heat-exchanged air (B') is formed on the lower portion thereof.

[0049] FIG. 5 is an exploded perspective view of an air conditioner in accordance with one embodiment of the present invention. FIG. 6 is a cross sectional view of an air conditioner in a cooling operation in accordance with one embodiment of the present invention. FIG. 7 is a cross sectional view of an air conditioner in a heating operation in accordance with one embodiment of the present invention.

[0050] As shown in FIGS. 5 to 7, the air conditioner includes: a main body 10 having an air intake opening 2 on the front face, an upper air discharge opening 4 on the upper portion, and a lower air discharge opening 6 on the lower portion; a plurality of blower fans 30 and 40 installed on the main body 10 so as to be spaced apart longitudinally from each other; and a heat exchanger 90 installed inside the main body 10, for heat-exchanging the air sucked into the air intake opening 10.

[0051] The main body 10 forms the outer appearance of the air conditioner, and the description thereof will be made with respect to a case where the upper air discharge opening 4 is formed at least one of front upper portion, upper surface, and rear upper portion thereof, and the lower air discharge opening 6 is formed at least one of the front lower portion, lower surface, and rear lower portion thereof, and a case where the upper air discharge opening 4 is formed on the upper surface thereof and the lower air discharge opening 6 is formed on the lower surface thereof.

[0052] The main body 10 includes: a chassis 12 having an upper air discharge opening 4 on the upper portion, particularly, the upper surface and a lower air discharge opening 6 on the lower portion, particularly, the lower surface; and a front panel 20 disposed at the front of the chassis 12 and having the front air intake opening 2 formed thereon.

[0053] If the air conditioner is a wall-type air conditioner, the chassis 12 is hung and mounted on a mounting plate (not shown) mounted on the wall surface of a room.

[0054] The chassis 12 is opened at the front surface, and has air passages (P1)(P2) and housing sections 13 and 14 for housing the blower fans 30 and 40 formed therein.

[0055] The chassis 12 has a central air guide section 15 partitioning the inside of the main body 10 into an upper air blow passage (P1) and a lower air blow passage (P2).

[0056] The chassis 12 has an upper air guide section 16 guiding discharged air to the upper air discharge opening 4 so that the air discharged to the upper air discharge opening 4 can have an upward discharge angle (α°) of 25 to 45° with respect to a horizontal plane.

[0057] The upper air guide section 16 forms a fan housing of one of the plurality of blower fans 30 and 40. The upward discharge angle (α °) is the optimum discharge angle set such that the air heat-exchanged in the heat exchanger 90, particularly, cool air can be discharged to a far side of the room as far as possible.

[0058] The chassis 12 has a lower air guide section 18 guiding discharged air to the lower air discharge opening 6 so that the air discharged to the lower air discharge opening 6 can have a downward discharge angle (β °) of 45 to 65° with respect to a horizontal plane.

[0059] The lower air guide section 18 forms a fan housing of the other of the plurality of blower fans 30 and 40. The downward discharge angle (β°) is the optimum discharge angle set such that the air heat-exchanged in the heat exchanger 90, particularly, warm air can be discharged as far toward the floor of the room as possible.

[0060] The front panel 20 forms the outer appearance of the front side of the air conditioner, and allows the indoor air (A)(B) to be sucked into the air conditioner. The front air intake opening 2 may be formed in a grille shape on the front surface of the front panel 20, or may be separated on the upper and lower portions of the front surface of the front panel 20, or may be formed large in a round or rectangular shape on the front central side of the front panel 20.

[0061] The description of the front panel 20 is made with respect to a case where the front panel 20 includes a front case 22 having the air blowing passages (P1)(P2) between the chassis 12 and the front panel 20 and the front air intake opening 2 at the middle of the front surface, and an intake panel 24 located spaced apart at the front of the front air intake opening 2 of the front case 22 and defining an air intake path 23 between the front case 22 and the front panel 20.

[0062] The plurality of blower fans 30 and 40 includes an upper blower fan 30 installed on the lower side of the upper air discharge opening 4, for blowing the air heat-exchanged in the heat exchanger 50 to the upper air discharge opening 4, and a lower blower fan 40 installed on the upper side of the lower air discharge opening 6, for blowing the air heat-exchanged in the heat exchanger 50 to the lower air discharge opening 6.

[0063] The blower fans 30 and 40 include transverse fans 34 and 44 longitudinally disposed from side to side of the chassis 12, and motors 36 and 46 installed at one of the left and right sides of the chassis 12 so as to rotate the transverse fans 34 and 44, respectively.

[0064] That is to say, the upper blower fan 30 includes an upper transverse fan 34 longitudinally disposed from side to side of the upper housing section 13 of the chassis 10, and an upper motor 36 disposed at one of the left and right sides of the upper transverse fan 34 so as to rotate the upper transverse fan 34, and installed on the main chassis 12.

[0065] The upper transverse fan 34 is a cross flow fan formed such that a blade forces the air below it upward.

[0066] The upper transverse fan 34 has a left rotary shaft 34a projected on the left side end and a right rotary shaft 34b projected on the right side end.

[0067] The upper blower fan 34 is rotatably supported on an upper bearing 34c, with one of the left and right rotary shafts 34a and 34b being connected to a rotary shaft 36a of the upper motor 36, and the other one being inserted into the upper bearing 34c installed on an upper bearing housing 52 to be described later.

[0068] The upper motor 36 is mounted on an upper motor mounting section 12a formed on the upper portion of the chassis 12.

[0069] The upper blower fan 30 further includes an upper stabilizer 38 dividing the upper air blowing passage (P1) inside the main body 10 into an intake passage and a discharge passage, and an upper discharger 39 defining the discharge passage.

[0070] The lower blower fan 40 includes a lower transverse fan 44 longitudinally disposed from side to side of the lower housing section 14 of the chassis 10 so as to be parallel with the upper transverse fan 44, and a lower motor 46 disposed at one of the left and right sides of the lower transverse fan 44 so as to rotate the lower transverse fan 44, and installed on the main chassis 12.

[0071] The lower transverse fan 44 is a cross flow fan formed such that a blade forces the air above it downward.

[0072] The lower transverse fan 44 is disposed below the upper transverse fan 34 so as to be parallel with the upper transverse fan 34.

[0073] The lower transverse fan 44 has a left rotary shaft 44a projected on the left side end and a right rotary shaft 44b projected on the right side end.

[0074] The lower blower fan 44 is rotatably supported on a lower bearing 44c, with one of the left and right rotary shafts 44a and 44b being connected to a rotary shaft 46a of the lower motor 46, and the other one being inserted into the lower bearing 44c installed on a lower bearing housing 53 to be described later.

[0075] The lower motor 46 is mounted on a lower motor mounting section 12b formed on the chassis 12.

[0076] The lower blower fan 40 further includes a lower stabilizer 48 dividing the lower air blowing passage (P2) inside the main body 10 into an intake passage and a discharge passage, and a lower discharger 49 defining the discharge passage.

[0077] The heat exchanger 50 is formed in a rectangle and disposed vertically on the rear side of the front panel 20, or is formed in a' <' or ' > ' shape and disposed between the front panel 20 and the chassis 12.

[0078] Reference numeral 52 denotes an upper bearing housing coupled to the front side of the chassis 12, for supporting the upper bearing 34c and preventing heat-exchanged air from leaking out of the sides.

[0079] Reference numeral 53 denotes a lower bearing housing coupled to the front side of the chassis 12, for supporting the lower bearing 44c and preventing heat-exchanged air from leaking out of the sides.

[0080] FIG. 8 is a control block diagram of an air conditioner in accordance with one embodiment of the present invention.

[0081] The air conditioner in accordance with this embodiment further includes an input section 64 inputting a desired temperature or a cooling/heating operation and a control unit 68 controlling the upper motor 36 and the

lower motor 46 according to the cooling/heating operation inputted into the input section 64.

[0082] The operation of the present invention thus constructed will be described as follows.

[0083] FIG. 9 is a sequential diagram showing a control method of an air conditioner in accordance with one embodiment of the present invention.

[0084] First, when a cooling operation or heating operation is inputted through the input section 64, the control unit 68 checks the inputted operation.

[0085] If a cooling operation is inputted, the control unit 68 drives the upper motor 36 (S1)(S2).

[0086] At the time of driving the upper motor 36, the upper transverse fan 34 is rotated in one of clockwise or anti-clockwise directions (in an anti-clockwise direction as shown in FIG.6).

[0087] At this time, indoor air (A) is collected at the front of the main body 10 by the vacuum formed by the rotation of the upper transverse fan 34, and sucked into the main body 10 through the front air intake opening 2.

[0088] The sucked indoor air (A) is cooled as it is deprived of the heat by the refrigerant passing through the heat exchanger 50, and sucked toward the upper transverse fan 34.

[0089] The heat-exchanged air (A') sucked to the upper transverse fan 34 is blown in an upward direction while being guided by the upper stabilizer 38 and the lower portion of the upper air guide section 16, and is discharged to the front upper side of the air conditioner at an upward discharge angle ($\alpha°$) of 25 to 45° with respect to a horizontal plane while being guided by the upper discharger 39 and the upper portion of the upper air guide section 16.

[0090] The cool air (A') discharged to the front upper side of the air conditioner falls like a shower while spreading widely toward the upper part of the room, and thus the room is uniformly cooled far enough away from the air conditioner throughout the entire part.

[0091] On the other hand, if a heating operation is inputted, the control unit 68 drives the lower motor 46 (S3).

[0092] At the time of driving the lower motor 46, the lower transverse fan 44 is rotated in the opposite direction of the direction in which the upper transverse fan 34 is rotated (in a clockwise direction as shown in FIG.7).

[0093] At this time, indoor air (B) is collected at the front of the main body 10 by the vacuum formed by the rotation of the lower transverse fan 44, and sucked into the main body 10 through the front air intake opening 2.

[0094] The sucked indoor air (B) is heated as it absorbs the heat of the refrigerant passing through the heat exchanger 50, and sucked toward the lower transverse fan 44.

[0095] The heat-exchanged air (B') sucked to the lower transverse fan 44 is blown in a downward direction while being guided by the lower stabilizer 48 and the lower portion of the lower air guide section 18, and is discharged to the front lower side of the air conditioner at a downward discharge angle ($\beta°$) of 45 to 65° with respect to a horizontal plane while being guided by the lower discharger 49 and the lower portion of the lower air guide section 18.

[0096] The warm air (B') discharged to the front lower side of the air conditioner spreads widely toward the lower part of the room and then rises up, and thus the room is uniformly cooled far enough away from the air conditioner throughout the entire part.

[0097] FIG. 10 is a sequential diagram showing a control method of an air conditioner in accordance with another embodiment of the present invention. FIG. 11 is a cross sectional view of an air conditioner at an initial stage of a cooling operation according to the control method of an air conditioner in accordance with another embodiment of the present invention. FIG. 12 is a cross sectional view of an air conditioner at an initial stage of a heating operation according to the control method of an air conditioner in accordance with another embodiment of the present invention.

[0098] In the control method of an air conditioner in accordance with this embodiment, as shown in FIG. 10, when a cooling operation is inputted or a heating operation is inputted, the upper motor 36 and the lower motor 46 are driven simultaneously, and thereafter one 46 of the two is stopped.

[0099] First, when a cooling operation is inputted through the input section 64, the control unit 68 drives the upper motor 36 and the lower motor 46 simultaneously (S11)(S12).

[0100] At the time of driving the upper motor 36, the upper transverse fan 34 is rotated in one of clockwise or anti-clockwise directions (in an anti-clockwise direction as shown in FIG.11). At the time of driving the lower motor 46, the lower transverse fan 44 is rotated in the opposite direction of the direction in which the upper transverse fan 34 is rotated (in a clockwise direction as shown in FIG.11).

[0101] Indoor air (A) is collected at the front of the main body 10 by the vacuum formed by the rotation of the lower transverse fan 34 and the vacuum formed by the rotation of the upper transverse fan 44, and sucked into the main body 10 through the front air intake opening 2.

[0102] At this time, since the upper transverse fan 34 and the lower transverse fan 44 are rotated simultaneously, the indoor air (A) is sucked into the main body 10 more quickly than the first embodiment in which only the upper transverse fan 34 is rotated or only the lower transverse fan 44 is rotated.

[0103] The indoor air (A) sucked into the main body 10 is cooled as it is deprived of the heat by the refrigerant passing through the heat exchanger 50, and the cooled air (A') is distributed by the central air guide section 15 such that some part is sucked into the upper air blowing passage (P1) and the other part is sucked into the lower air blowing passage (P2).

[0104] The cool air (A') sucked into the upper air blowing passage (P1) is blown by the upper transverse fan 34 and discharged to the front upper side of the air con-

ditioner, while the cool air (A') sucked into the lower air blowing passage (P2) is blown by the lower transverse fan 44 and discharged to the front lower side of the air conditioner.

[0105] The cool air (A') discharged to the front upper side of the air conditioner cools the room as it falls like a shower while spreading widely toward the upper part of the room, and the cool air (A') discharged to the front lower side of the air conditioner cools the lower part of the room as it spreads widely toward the lower part of the room, thereby cooling the room more quickly by the cool air discharged from both upper and lower portions of the air conditioner.

[0106] Meanwhile, after discharging the cool air from the upper and lower portions and performing the consequent cooling operation, when a predetermined time (e.g., 10 minutes) is elapsed or the load of the room is eliminated to a certain degree (e.g., the indoor temperature reaches a desired temperature or the indoor temperature decreases by a predetermined temperature (e.g., 3°C)), the control unit 68 does not drive the upper motor 36 and the lower motor 46 simultaneously, but stops the lower motor 46 (S13)(S14).

[0107] In other words, the control unit 68 stops the lower motor 46 according to a signal outputted from a timer (not shown), or stops the lower motor 46 according to a signal outputted from an indoor temperature sensor (not shown).

[0108] When the lower motor 46 is stopped and only the upper motor 36 is driven, the indoor air (A) is discharged only to the front upper portion of the air conditioner, and thus the room is uniformly cooled far enough away from the air conditioner throughout the entire part.

[0109] On the other hand, when a heating operation is inputted through the input section 64, the control unit 68 drives the upper motor 36 and the lower motor 46 simultaneously as it does in the cooling operation (S15)(S16).

[0110] At the time of driving the upper motor 36, the upper transverse fan 34 is rotated in one of clockwise or anti-clockwise directions (in an anti-clockwise direction as shown in FIG.12). At the time of driving the lower motor 46, the lower transverse fan 44 is rotated in the opposite direction of the direction in which the upper transverse fan 34 is rotated (in a clockwise direction as shown in FIG.12).

[0111] Indoor air (B) is quickly sucked into the main body 10 as in the above-described cooling operation, and heated as it absorbs the heat of the refrigerant passing through the heat exchanger 50. Thereafter, the indoor air (B) is distributed by the central air guide section 15 such that some part is sucked into the upper air blowing passage (P1) and the other part is sucked into the lower air blowing passage (P2).

[0112] The warm air (B') sucked into the upper air blowing passage (P1) is blown by the upper transverse fan 34 and discharged to the front upper side of the air conditioner, while the warm air (B') sucked into the lower air blowing passage (P2) is blown by the lower transverse fan 44 and discharged to the front lower side of the air conditioner.

[0113] The warm air (B') discharged to the front upper side of the air conditioner is discharged to the upper part of the room and reaches a far distance of the room, and the warm air (B') discharged to the front lower side of the air conditioner cools the lower part of the room as it spreads widely toward the lower part of the room, thereby heating the room more quickly by the warm air discharged from both upper and lower portions of the air conditioner.

[0114] Meanwhile, after discharging the warm air from the upper and lower portions and performing the consequent heating operation, as in the above-described cooling operation, when a predetermined time (e.g., 10 minutes) is elapsed or the load of the room is eliminated to a certain degree (e.g., the indoor temperature reaches a desired temperature or the indoor temperature increases by a predetermined temperature (e.g., 3°C)), the control unit 68 does not drive the upper motor 36 and the lower motor 46 simultaneously, but stops the upper motor 36 (S17)(S18).

[0115] In other words, the control unit 68 stops the upper motor 36 according to a signal outputted from a timer (not shown), or stops the upper motor 36 according to a signal outputted from an indoor temperature sensor (not shown).

[0116] When the upper motor 36 is stopped and only the lower motor 46 is driven, the indoor air (B) is discharged only to the front lower portion of the air conditioner, and thus even far sides of the room from the air conditioner are uniformly heated throughout the entire part.

[0117] The effects of the air conditioner thus constructed and the control method of the same in accordance with the present invention will be described as follows.

[0118] The air conditioner in accordance with the present invention is advantageous in that an air intake opening is formed on the front surface of a main body, air discharge openings are formed on the upper and lower portions thereof, respectively, a plurality of blower fans are vertically installed inside the main body, and a control unit controls the plurality of blower fans according to a cooling/heating operation, thus a discharge direction of cool air/warm air can be vertically adjusted according to the cooling/heating operation, thereby making the room air-conditioned more efficiently during the cooling/heating operation.

[0119] Additionally, the air conditioner of the present invention is advantageous in that the air discharged to the upper air discharge opening has an upward discharge angle of 25 to 45° with respect to a horizontal plane, thus the air discharged to the upper part can reach a far distance of the room, thereby uniformly air-conditioning the room and increasing the comfort of the room.

[0120] Additionally, the air conditioner of the present invention is advantageous in that the air discharged to the lower air discharge opening has a downward discharge angle of 45 to 65° with respect to a horizontal

plane, thus preventing any discomfort that may caused when the air discharged to the upper part is directly discharged onto a user.

[0121] Additionally, the control method of an air conditioner of the present invention is advantageous in that the air discharged to the upper air discharge opening has an upward discharge angle of 25 to 45° with respect to a horizontal plane, thus the air discharged to the upper part can reach a far distance of the room, thereby uniformly air-conditioning the room and increasing the comfort.

[0122] Additionally, the control method of an air conditioner of the present invention is advantageous in that the room is cooled by the cool air discharged and dropped to the upper portion of the air conditioner during a cooling operation such that the room is uniformly cooled far enough, and the room is heated by the warm air discharged and rising up to the lower portion of the air conditioner during a heating operation such that the user does not feel discomfort.

[0123] Additionally, the control method of an air conditioner of the present invention is advantageous in that the upper blower fan and the lower blower fan are driven simultaneously at an initial stage of a cooling/heating operation to thus quickly cool/heat the room at an initial stage, and thereafter, during a cooling operation, only the upper motor is driven to thus uniformly air-condition the room and increase the comfort, and during a heating operation, only the lower blower fan is driven to thus prevent the discomfort caused when warm air is directly discharged onto the user.

Claims

1. An air conditioner, comprising:

a main body (10) having an air intake opening (2) on the front face, an upper air discharge opening (4) on the upper portion, and a lower air discharge opening (6) on the lower portion;
a plurality of blower fans (30 and 40) installed on the main body (10) so as to be spaced apart longitudinally from each other;
a heat exchanger (50) installed inside the main body (10), for heat-exchanging the air sucked into the air intake opening (2); and
a control unit (68) controlling the plurality of blower fans (30 and 40) according to cooling and heating operations.

2. The air conditioner of claim 1, wherein the main body (10) comprises:

a chassis (12) having the upper air discharge opening (4) formed on the upper portion and the lower air discharge opening (6) formed on the lower portion; and
a front panel (20) disposed at the front of the chassis (12) and having the front air intake opening (12) formed thereon.

3. The air conditioner of claim 2, wherein the chassis (12) has a central air guide section (15) partitioning the inside of the air conditioner (1) into an upper air blow passage (P1) and a lower air blow passage (P2).

4. The air conditioner of claim 2, wherein the chassis (12) has an upper air guide section (16) guiding discharged air to the upper air discharge opening (4) so that the air discharged to the upper air discharge opening (4) can have an upward discharge angle of 25 to 45° with respect to a horizontal plane.

5. The air conditioner of claim 2, wherein the chassis (12) has a lower air guide section (18) guiding discharged air to the lower air discharge opening (6) so that the air discharged to the lower air discharge opening (6) can have a downward discharge angle of 45 to 65° with respect to a horizontal plane.

6. The air conditioner of any of claims 1 to 5, wherein the plurality of blower fans (30 and 40) includes an upper blower fan (30) for blowing the air heat-exchanged in the heat exchanger (50) to the upper air discharge opening (4), and a lower blower fan (40) for blowing the air heat-exchanged in the heat exchanger (50) to the lower air discharge opening (6).

7. The air conditioner of any of claims 1 to 5, wherein the blower fans (30 and 40) include transverse fans (34 and 44) longitudinally disposed from side to side of the chassis (12), and motors (36 and 46) installed at one of the left and right sides of the chassis (12) so as to rotate the transverse fans, respectively.

8. The air conditioner of any of claims 1 to 7, wherein the air conditioner (1) is a wall-type air conditioner.

9. A control method of an air conditioner, in which only an upper blower fan (30) disposed on the inside upper portion of the air conditioner (1) is driven during a cooling operation of the air conditioner (1) so as to discharge cool air through an upper air discharge opening (4), and only a lower blower fan (40) disposed on the inside lower portion of the air conditioner (1) is driven during a heating operation of the air conditioner (1) so as to discharge warm air through a lower air discharge opening (6).

10. A control method of an air conditioner, comprising:

simultaneously driving an upper blower fan (30) disposed on the inside upper portion of the air conditioner (1) and a lower blower fan (40) dis-

posed on the inside lower portion of the air conditioner during a cooling or heating operation of the air conditioner (S11)(S12)(S15)(S16); and after the simultaneous driving, if the air conditioner (1) is in a cooling operation, stopping the lower blower fan (40) and driving only the upper blower fan (30), and if the air conditioner (1) is in a heating operation, stopping the upper bower fan (30) and driving only the lower bower fan (40) (S13)(S14)(S17)(S18).

11. The method of claim 10, wherein if the simultaneous driving is performed for a predetermined time (S11)(S12)(S14)(S15), the separate driving is performed (S13)(S14)(S17)(S18) .

12. The method of claim 10, wherein after performing the simultaneous driving, if an indoor temperature increases or decreases by a predetermined temperature(S11)(S12)(S14)(S15), the separate driving is performed (S13)(S14)(S17)(S18).

Fig. 1 (related art)

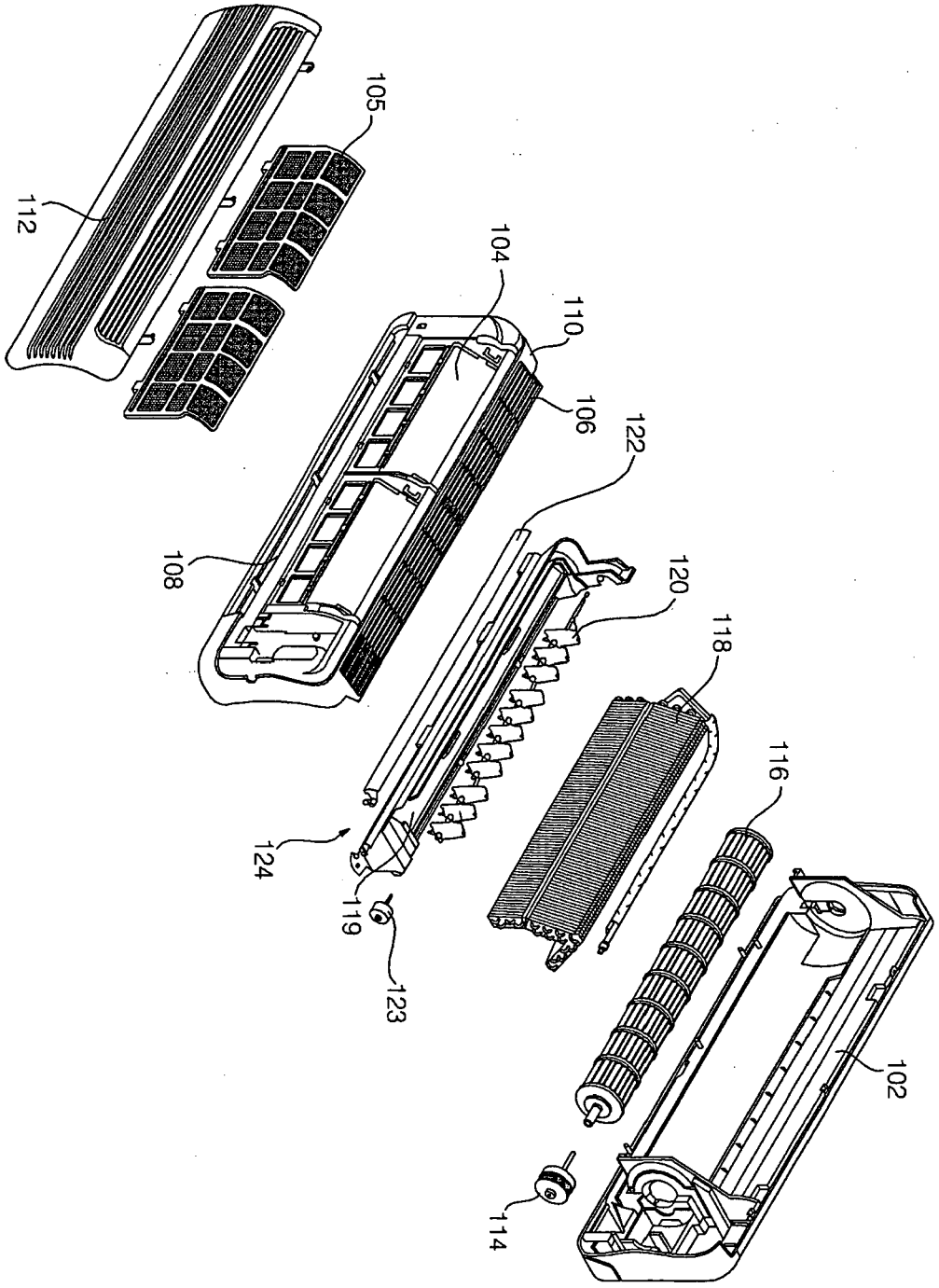


Fig. 2 (related art)

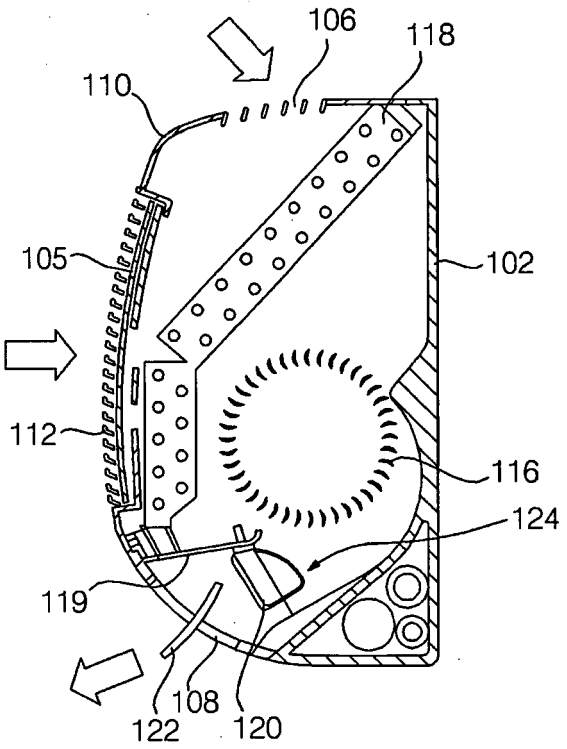


Fig. 3

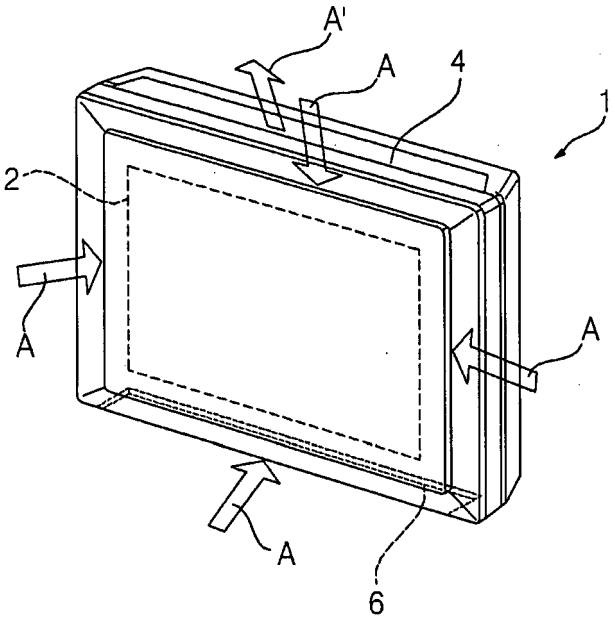


Fig. 4

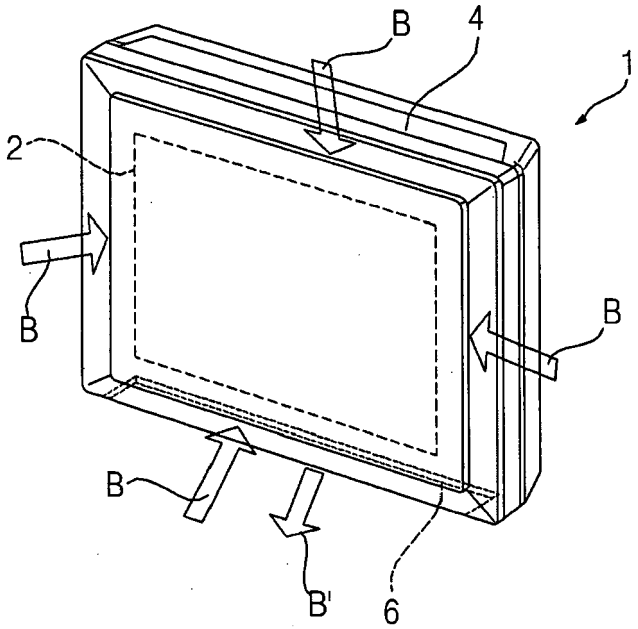


Fig. 5

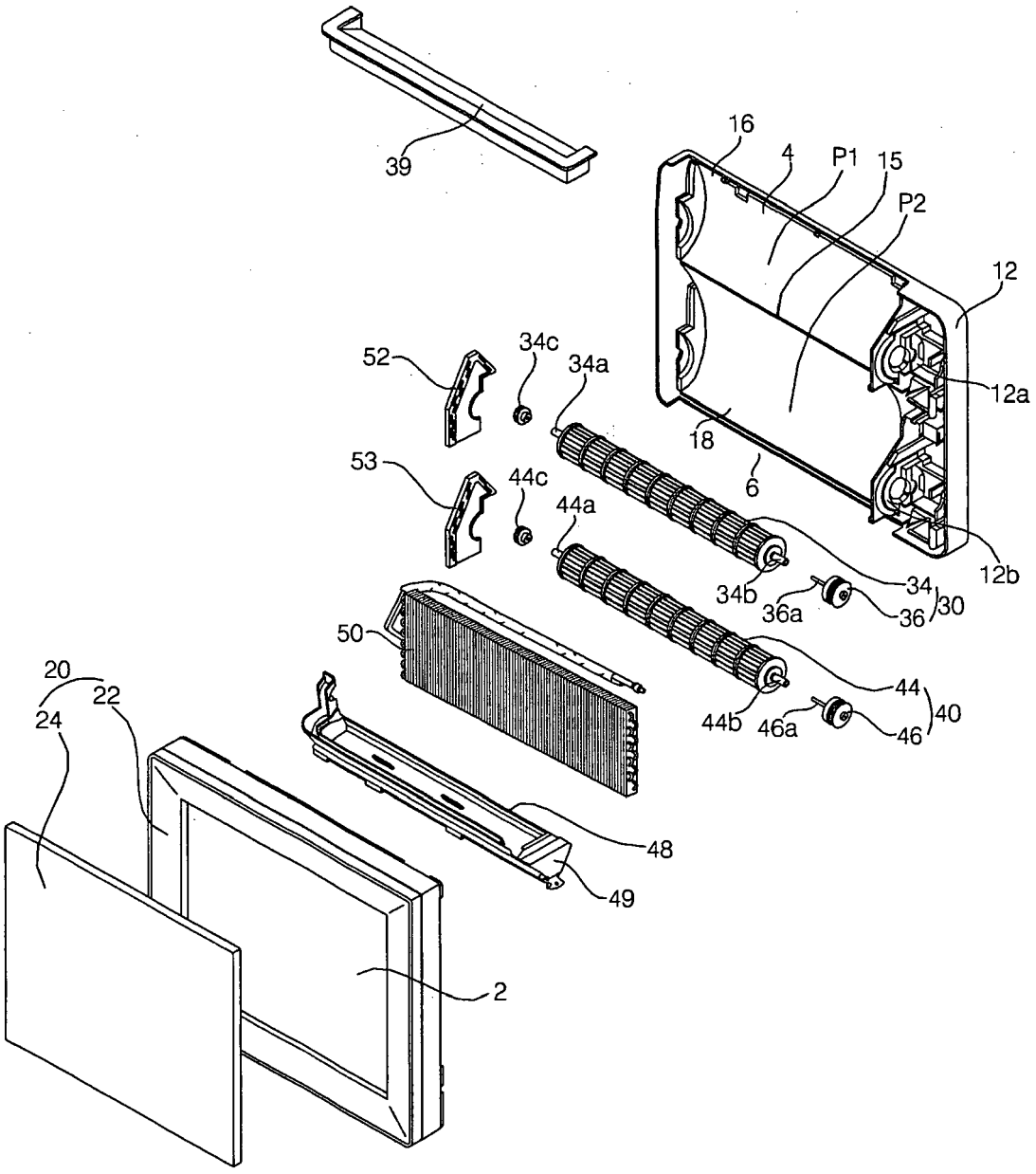

39
16
4
P1
15
P2
12
12a
12b
52
34c
34a
18
6
53
44c
44a
34b
34
36a
36
30
50
44
44b
46a
46
40
20
22
24
48
49
2

Fig. 6

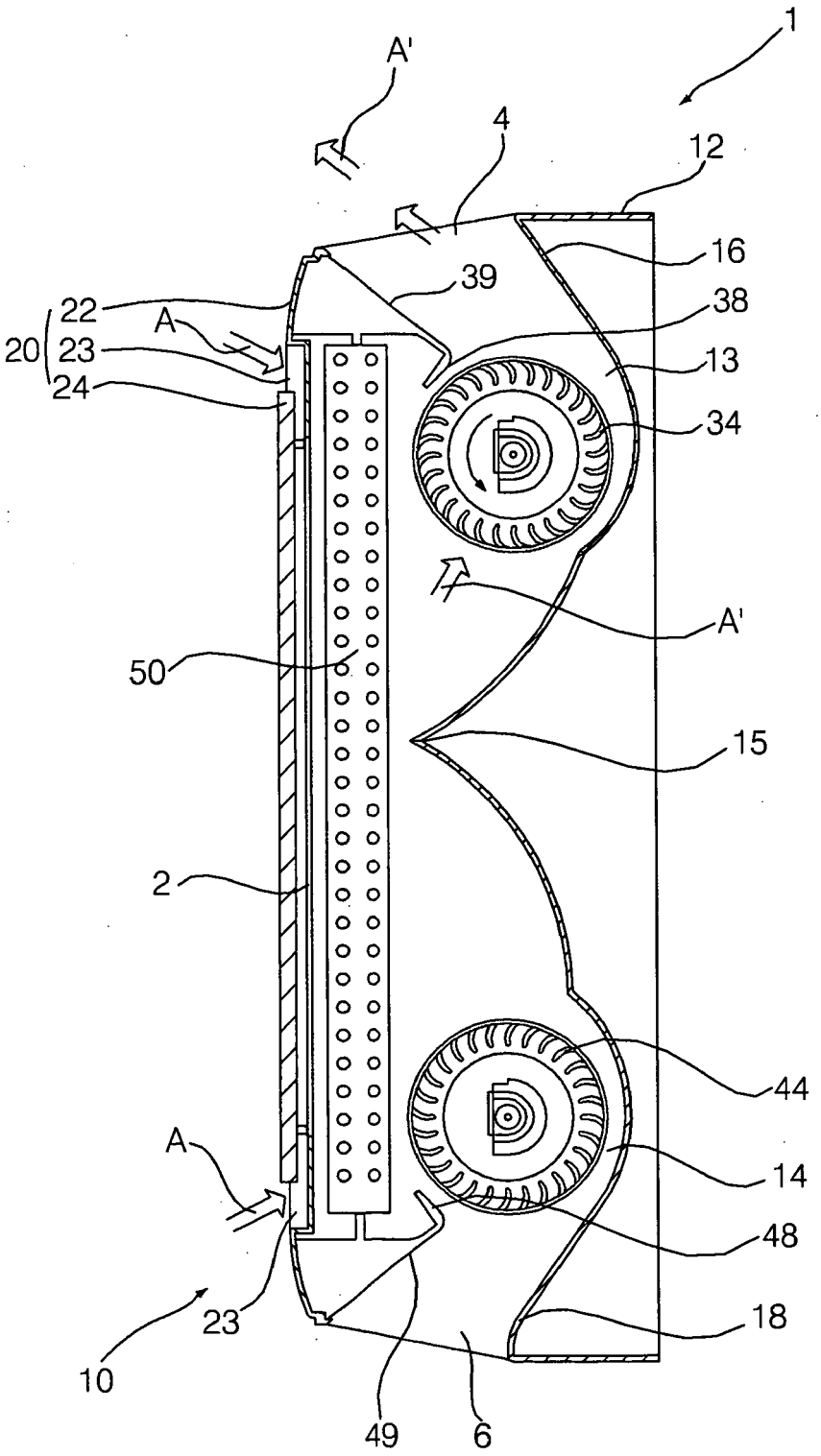


Fig. 7

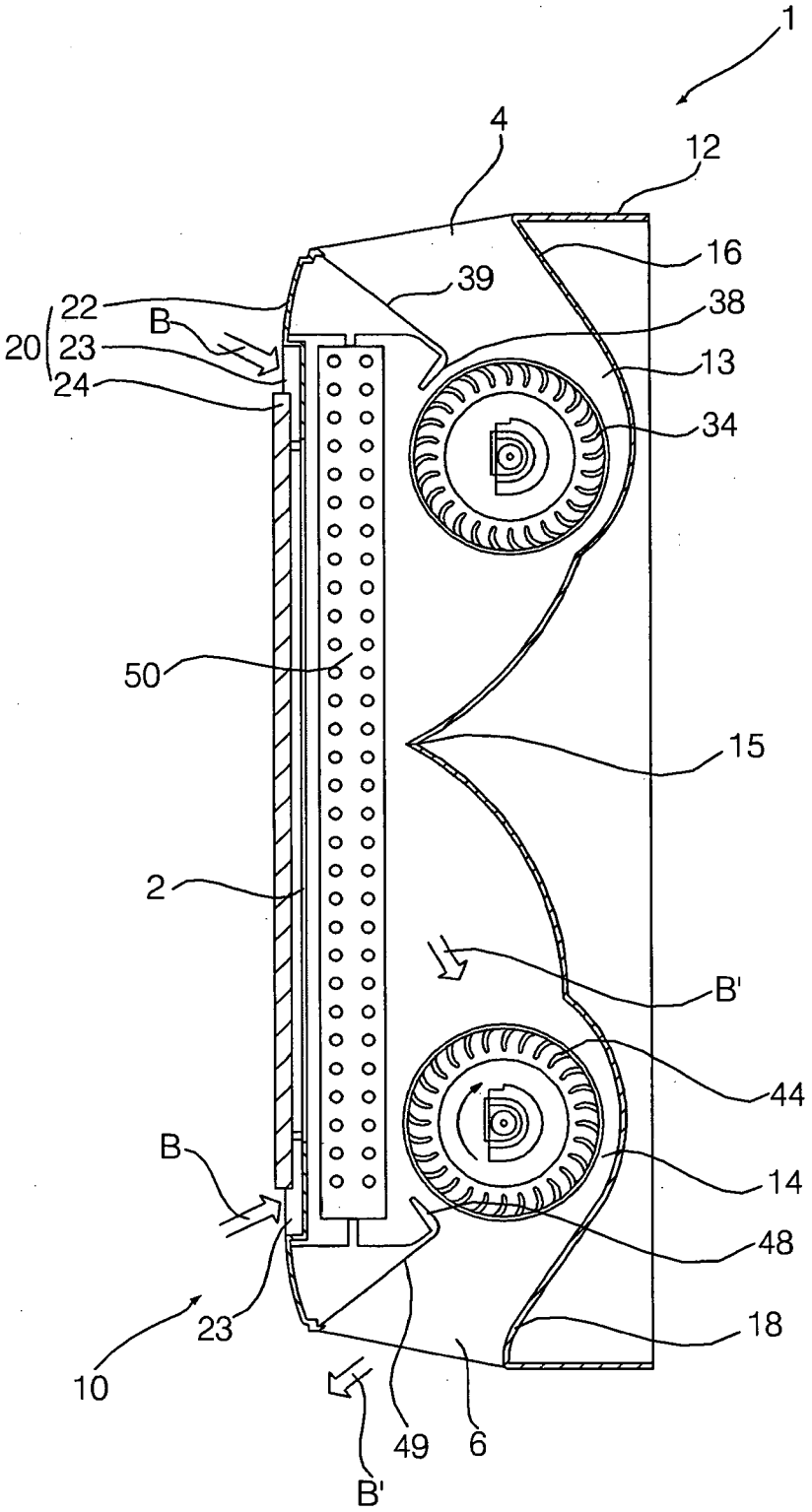


Fig. 8

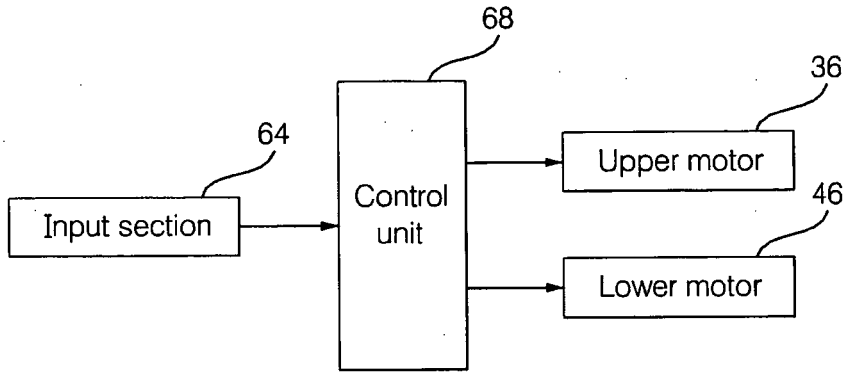

68
36
64
Upper motor
Control unit
Input section
46
Lower motor

Fig. 9

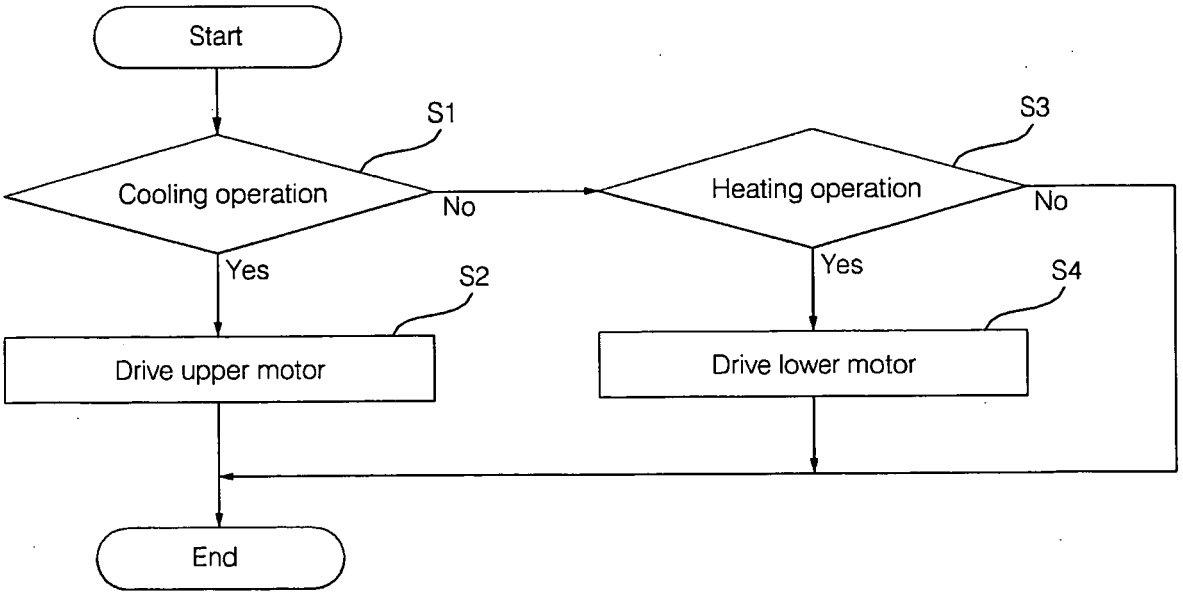

Start
S1
S3
Cooling operation
No
Heating operation
No
Yes
Yes
S2
S4
Drive upper motor
Drive lower motor
End

Fig. 10

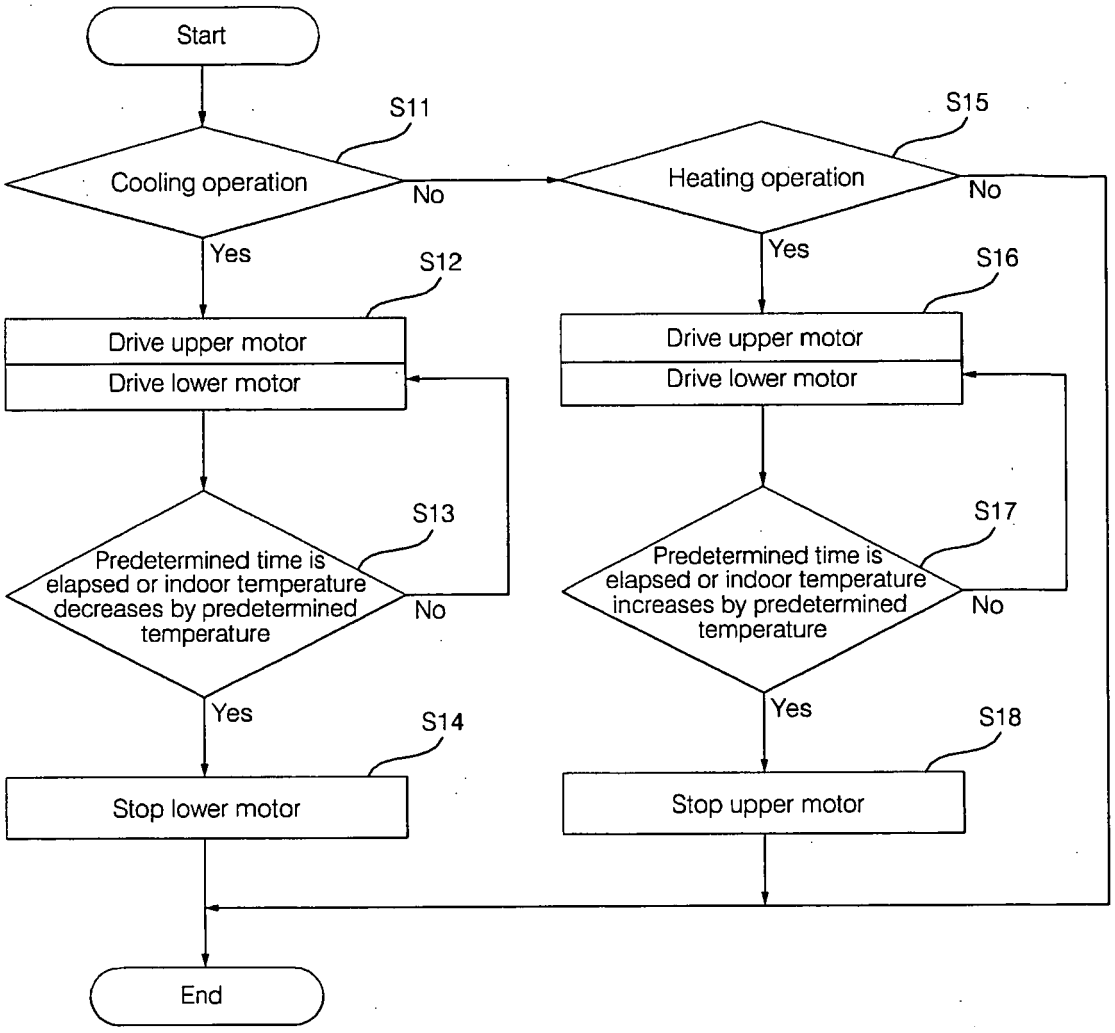

Start
S11
Cooling operation
No
Yes
S12
Drive upper motor
Drive lower motor
S13
Predetermined time is elapsed or indoor temperature decreases by predetermined temperature
No
Yes
S14
Stop lower motor
S15
Heating operation
No
Yes
S16
Drive upper motor
Drive lower motor
S17
Predetermined time is elapsed or indoor temperature increases by predetermined temperature
No
Yes
S18
Stop upper motor
End

Fig. 11

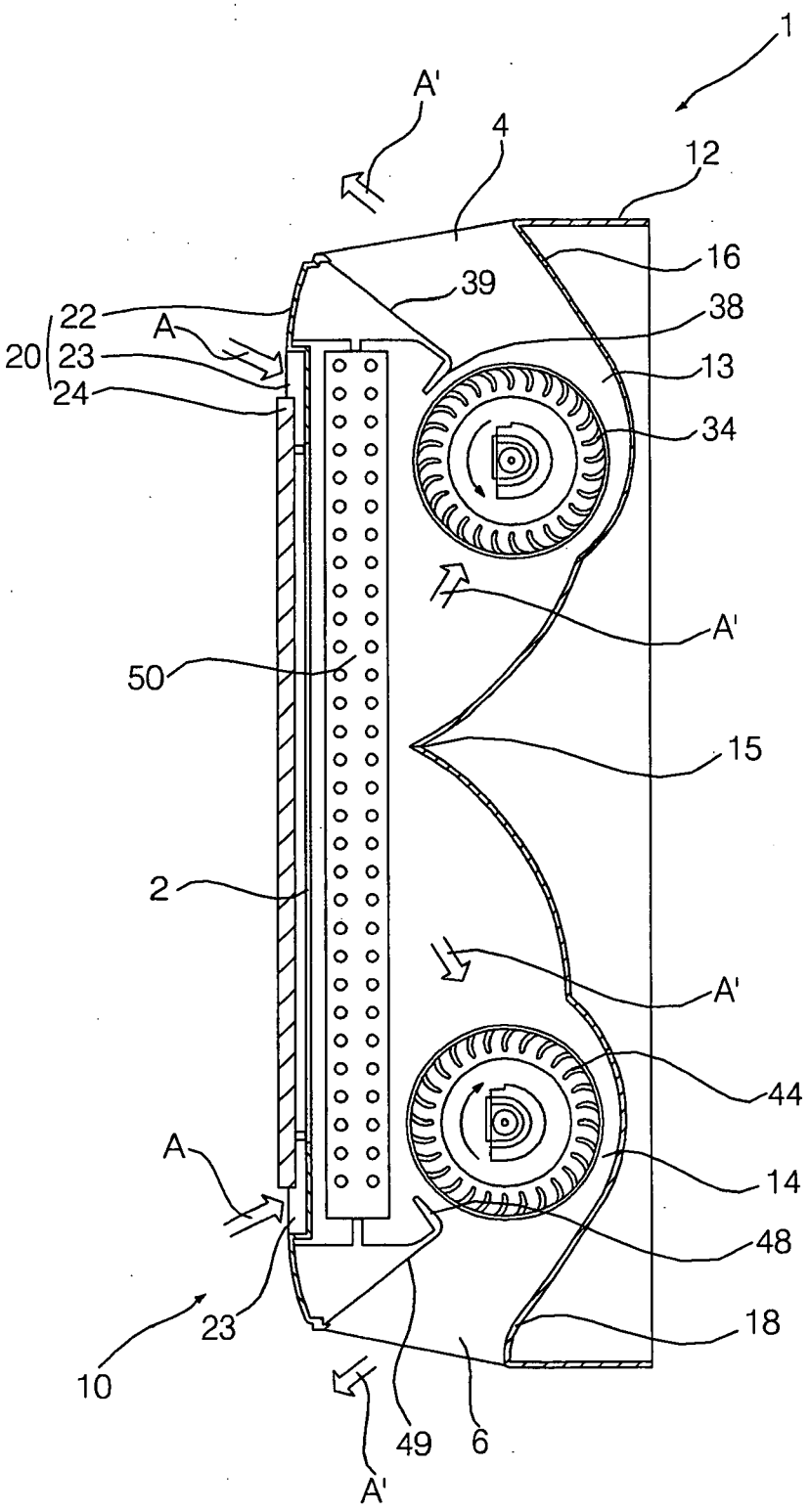
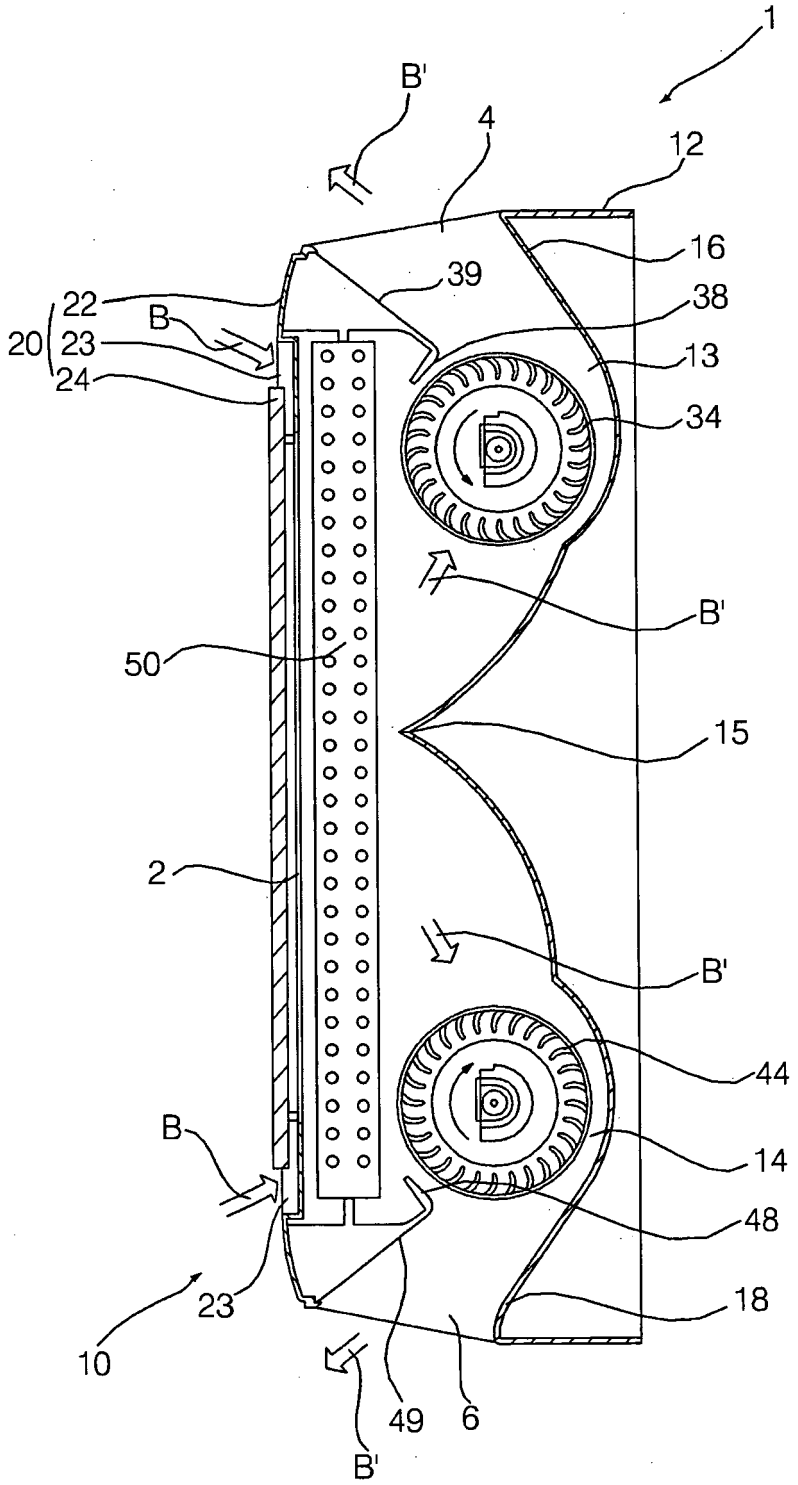


Fig. 12



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EUROPEAN SEARCH REPORT

Application Number
EP 06 01 2307

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	PATENT ABSTRACTS OF JAPAN vol. 011, no. 071 (M-567), 4 March 1987 (1987-03-04) -& JP 61 228242 A (MITSUBISHI ELECTRIC CORP), 11 October 1986 (1986-10-11) * abstract * -----	1-12	INV. F24F1/00
X	PATENT ABSTRACTS OF JAPAN vol. 013, no. 289 (M-845), 5 July 1989 (1989-07-05) -& JP 01 084036 A (MATSUSHITA SEIKO CO LTD), 29 March 1989 (1989-03-29) * abstract * -----	1-12	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 September 2006	GONZALEZ-GRANDA, C

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
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