(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 975 520 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
01.10.2008 Bulletin 2008/40

(21) Application number: **06843072.7**

(22) Date of filing: **22.12.2006**

(51) Int Cl.:
F24F 1/00 *(2006.01)* ***F24F 13/14*** *(2006.01)*

(86) International application number:
PCT/JP2006/325615

(87) International publication number:
WO 2007/077764 (12.07.2007 Gazette 2007/28)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(30) Priority: **04.01.2006 JP 2006000150**

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(54) INDOOR UNIT FOR AIR CONDITIONER

(57) An object of the present invention is to provide a highly reliable indoor unit of an air conditioner in which the sealing of a shutter is improved. An indoor unit (1) of an air conditioner includes an indoor heat exchanger (3), a body (2), a centrifugal fan (4), and a shutter (5). A plurality of discharge passages (P2, P3) for discharging air that has passed through the indoor heat exchanger (3) are formed in the body (2). The centrifugal fan (4) generates a flow of air that passes through the indoor heat exchanger (3) and is blown out of the discharge passages (P2, P3). The shutter (5) is provided to at least one discharge passage (P3) of the plurality of discharge passages (P2, P3). The shutter (5) is kept in a closed state by the pressure of the air flow.

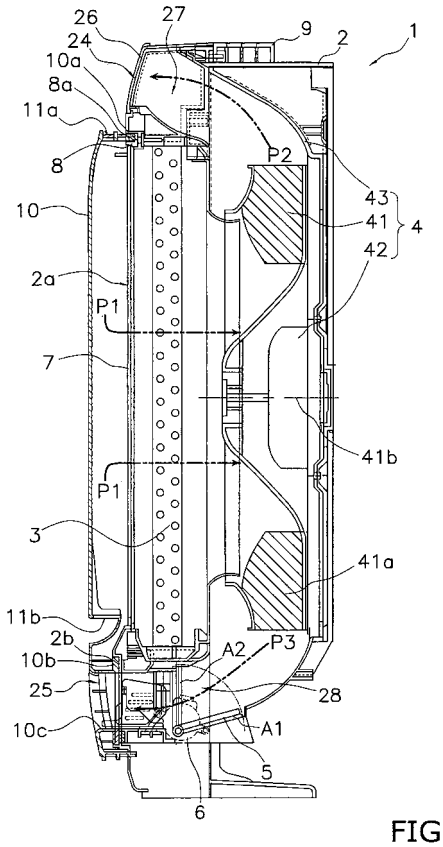

FIG. 3

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an indoor unit of an air conditioner having a plurality of discharge passages.

BACKGROUND ART

[0002] A conventional example of an indoor unit of an air conditioner having a plurality of discharge passages is the indoor unit disclosed in Patent Document 1. This indoor unit comprises an air conditioner body having air discharge ports at two upper and lower locations, cross-flow fans disposed at two upper and lower locations, and a shutter for opening and closing the bottom discharge port.

[0003] The shutter is held in the closed position by a spring made of a shape-memory alloy. Since the shutter is held in the closed position by the elastic force of the spring during cooling, the cooled air is blown out only through the top discharge port. On the other hand, during heating, the spring warmed by the heat of the heated air extends, thereby opening the shutter. The heated air can thereby be blown out through the top and bottom discharge ports during heating.

<Patent Document 1>
Japanese Laid-open Patent Publication No. 61-79983

DISCLOSURE OF THE INVENTION

PROBLEMS THE INVENTION IS INTENDED TO SOLVE

[0004] However, the indoor unit disclosed in Patent Document 1 has a problem that it is difficult to completely close the shutter so that air does not leak out and it is unreliable, because the shutter is closed by the elastic force of the spring so as to resist the pressure of the cooled air being discharged during cooling.

[0005] The use of a motor or another such electric drive device in place of a spring has also been considered, but the problem with this case is that rotational drive force must constantly be exerted on the shutter in order to keep the shutter closed.

[0006] An object of the present invention is to provide a highly reliable indoor unit of an air conditioner in which the sealing of the shutter is improved.

MEANS FOR SOLVING THESE PROBLEMS

[0007] An indoor unit of an air conditioner according to a first aspect of the present invention comprises an indoor heat exchanger, a body, a centrifugal fan, and a shutter. A plurality of discharge passages for discharging air that has passed through the indoor heat exchanger are formed in the body. The centrifugal fan generates a flow of air that passes through the indoor heat exchanger and is blown out of the discharge passages. The shutter is provided to at least one discharge passage of the plurality of discharge passages. The shutter is kept in a closed state by the pressure of the air flow.

[0008] When the shutter has closed, the shutter is kept closed utilizing the pressure of the air flow generated by the centrifugal fan. Therefore, since the shutter is kept closed by the air pressure generated by the centrifugal fan, sealing is improved as is reliability.

[0009] An indoor unit of an air conditioner according to a second aspect of the present invention is the indoor unit of an air conditioner according to the first aspect, wherein the shutter moves from the open state to the closed state by rotating away from the centrifugal fan in the discharge passage.

[0010] Since the shutter opens away from the centrifugal fan, the shutter can be reliably oriented towards a position of maintaining the closed state by the air pressure generated by the centrifugal fan when the shutter moves from the open state to the closed state. Moreover, the shutter can be kept closed using a simple configuration.

[0011] An indoor unit of an air conditioner according to a third aspect of the present invention is the indoor unit of an air conditioner according to the first aspect, wherein the shutter is positioned at a first position. The first position is a position where the shutter is open, and pressure is not applied to the shutter in the direction in which the shutter closes.

[0012] Since the shutter, while open, is at a position where pressure is not applied to the shutter in the direction in which the shutter closes, it is possible to prevent the inconvenience of the shutter closing naturally due to the air pressure from the centrifugal fan. Moreover, ventilation loss in the open state can be prevented.

[0013] An indoor unit of an air conditioner according to a fourth aspect of the present invention is the indoor unit of an air conditioner according to the third aspect, wherein the first position is inside a concavity. The concavity is formed in an inner wall of the discharge passage.

[0014] Since the first position is inside a concavity formed in an inner wall of the discharge passage, a position where the shutter is retracted from the air path can be ensured with a simple configuration.

[0015] An indoor unit of an air conditioner according to a fifth aspect of the present invention is the indoor unit of an air conditioner according to the first aspect, wherein the centrifugal fan is a turbofan.

[0016] Since the centrifugal fan is a turbofan, a strong air flow can be obtained in a small space.

[0017] An indoor unit of an air conditioner according to a sixth aspect of the present invention is the indoor unit of an air conditioner according to the first aspect, further comprising a rotational drive unit. The rotational drive unit is configured to rotatably drive the shutter. The

rotational drive unit stops rotational driving in the closed state.

[0018] Since the shutter is kept in the closed state utilizing the pressure of the air flow, the drive force of the rotational drive unit in the closed state can be reduced.

[0019] An indoor unit of an air conditioner according to a seventh aspect of the present invention is the indoor unit of an air conditioner according to the sixth aspect, wherein when the centrifugal fan has stopped while the shutter is in a closed state, the rotational drive unit begins driving again.

[0020] When the centrifugal fan has stopped while the shutter is closed, the rotational drive unit starts up again, whereby the shutter can be reliably kept closed.

[0021] An indoor unit of an air conditioner according to an eighth aspect of the present invention is the indoor unit of an air conditioner according to the sixth or seventh aspect, wherein the rotational drive unit is a stepper motor.

[0022] Since the rotational drive unit is a stepper motor, the shutter can be rotatably driven at a precise rotational angle. Moreover, when the shutter is in the closed state, the stepper motor can stop driving at a precise timing so as to not apply torque to the shutter.

[0023] An indoor unit of an air conditioner according to a ninth aspect of the present invention is the indoor unit of an air conditioner according to the first aspect, further comprising a stopper. The stopper is formed inside the discharge passage. The stopper is in contact with the shutter in the closed state. The shutter, while closed, is positioned at a second position. The second position is a position where the shutter is vertically aligned or is lying against the stopper.

[0024] Since the shutter, when closed, is positioned at a second position where the shutter is aligned vertically or is lying against the stopper, the shutter can be kept closed regardless of the strength of the air from the centrifugal fan or whether air is being blown.

[0025] An indoor unit of an air conditioner according to a tenth aspect of the present invention is the indoor unit of an air conditioner according to the first aspect, the indoor unit being a floor installation type wherein air can be blown upwards and downwards, and only the downward air discharge is closed by the shutter during cooling.

[0026] The indoor unit is the floor installation type, air can be discharged upwards and downwards, and only the downward air discharge can be closed by the shutter during cooling. Thus, it is possible to discharge air upwards and downwards during heating, and to discharge air upwards only during cooling.

EFFECT OF THE INVENTION

[0027] According to the first aspect of the present invention, the shutter is kept closed using the pressure of the air flow generated by the centrifugal fan, and sealing is therefore improved as is reliability.

[0028] According to the second aspect of the present invention, the shutter can be reliably oriented towards a position of maintaining the closed state by the air pressure generated by the centrifugal fan when the shutter moves from the open state to the closed state. Moreover, the shutter can be kept closed with a simple configuration.

[0029] According to the third aspect of the present invention, it is possible to prevent the inconvenience of the shutter closing naturally due to the air pressure from the centrifugal fan. Moreover, ventilation loss in the open state can be prevented.

[0030] According to the fourth aspect of the present invention, a position where the shutter is retracted from the air path can be ensured with a simple configuration.

[0031] According to the fifth aspect of the present invention, a strong air flow can be obtained in a small space.

[0032] According to the sixth aspect of the present invention, the drive force of the rotational drive unit in the closed state can be reduced.

[0033] According to the seventh aspect of the present invention, the shutter can be reliably kept closed even when the centrifugal fan has stopped.

[0034] According to the eighth aspect of the present invention, the shutter can be rotatably driven at a precise rotational angle. Moreover, the shutter can stop being driven at a precise timing so that torque is not applied to the shutter while the shutter is closed.

[0035] According to the ninth aspect of the present invention, the shutter can be kept closed regardless of the strength of the air from the centrifugal fan or whether air is being blown.

[0036] According to the tenth aspect of the present invention, since air can be discharged upwards and downwards, and only the downward air discharge can be closed by the shutter during cooling, it is possible to discharge air upwards and downwards during heating, and to discharge air upwards only during cooling.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037]

FIG. 1 is a front view of the indoor unit of an air conditioner according to an embodiment of the present invention.

FIG. 2 is a side view of the indoor unit in FIG. 1.

FIG. 3 is a longitudinal cross-sectional view of the indoor unit in FIG. 1.

FIG. 4 is an enlarged view of the vicinity of the shutter in FIG. 3.

FIG. 5 is an enlarged perspective view of the shutter and concavity in FIG. 4.

DESCRIPTION OF THE REFERENCE SYMBOLS

[0038]

1 Air conditioner
2 Body

3 Indoor heat exchanger
4 Fan
5 Shutter
6 Stepper motor
7 Filter
8 Front grill
10 Front panel
24 Top discharge port
25 Bottom discharge port
27 Top space
28 Bottom space
29 Inner wall
30 Concavity

BEST MODE FOR CARRYING OUT THE INVENTION

[0039] The following is a description, made with reference to the drawings, of an indoor unit of an air conditioner according to an embodiment of the present invention.

[0040] An indoor unit 1 of an air conditioner shown in FIGS. 1 through 5 is a floor installation type indoor unit, and comprises a body 2, an indoor heat exchanger 3, a fan 4, a shutter 5, a stepper motor 6, a filter 7, a front grill 8, and a front panel 10. The front panel 10 disposed on the front surface of the body 2 has a flat (plane) shape.

[0041] The indoor heat exchanger 3, the fan 4, the shutter 5, the stepper motor 6, the filter 7, and the front grill 8 are housed within the body 2.

[0042] The indoor unit 1 is used while being installed on the floor of a room. Not only can the indoor unit 1 be installed so that the body 2 is in contact with the surface of the wall of the room, but the indoor unit 1 can also be installed in a state in which all or part of the rear portion A of the body 2 (see FIG. 2) is embedded in the wall of the room. The indoor unit 1 further comprises a detachable cover 9 for covering both sides and part of the top of the rear portion A of the body 2. Therefore, the cover 9 can be detached in accordance with the length by which the rear portion A of the body 2 is embedded in a wall.

<Configuration of Body 2>

[0043] The body 2 comprises a hollow casing made of a synthetic resin, as shown in FIG 3. In the interior of the body 2, the filter 7, the indoor heat exchanger 3, and the fan 4 are placed in this order backward from a front opening 2a formed in the front surface.

[0044] The front grill 8 is mounted in the peripheral edge of the front opening 2a of the body 2. The filter 7 is fitted into the front grill 8.

[0045] The front panel 10 is disposed in front of the front opening 2a of the body 2 and is suspended from the front opening 2a. The front panel 10 is placed separately forward from the body 2, therefore forming a top suction port 11 a, a first side suction port 11c, and a second side suction port 11d (see FIG. 1) on three sides, namely, the top, left, and right, of the front panel 10. A slit-shaped bottom suction port 11b is formed at a position at the bottom of the front panel 10 and slightly higher than a bottom discharge port 25. The suction ports 11a, 11b, 11c, and 11d are thereby disposed respectively at the top, bottom, left, and right sides of the front panel 10.

[0046] Fitting protrusions 10a, 10b are formed respectively in the top and bottom of the front panel 10. The fitting protrusions 10a, 10b are fitted respectively in a fitting concavity 8a of the front grill 8 and a fitting hole 2b in the vicinity of the front bottom end of the body 2, whereby the front panel 10 is fixed in a state of being suspended from the front opening 2a of the body 2.

[0047] A suction passage P1, a top discharge passage P2, and a bottom discharge passage P3 are formed in the body 2.

[0048] The suction passage P1 is a passage that passes through any of the four suction ports of the front panel 10, namely, the top suction port 11a, the bottom suction port 11b, the first side suction port 11c, and the second side suction port 11d; then enters the body 2 through the front opening 2a, and passes through the filter 7, the indoor heat exchanger 3, and the fan 4 in this order.

[0049] The top discharge passage P2 is a passage that runs from the fan 4 through a top space 27 to a top discharge port 24. The top discharge port 24 is formed above the front opening 2a of the body 2. A movable plate 26 capable of opening and closing is placed over the top discharge port 24.

[0050] The bottom discharge passage P3 is a passage that runs from the fan 4 through a bottom space 28 to the bottom discharge port 25. The bottom discharge port 25 is formed below the front opening 2a of the body 2. The shutter 5, which is capable of opening and closing, is placed over the bottom space 28. Furthermore, a stopper 37 that is in contact with the shutter 5 when closed is formed inside the bottom space 28. A plurality of slits 10c that extend horizontally is formed in a portion of the front panel 10 in front of the bottom discharge port 25.

[0051] A plurality of vertical air deflectors 31 for adjusting the horizontal direction of the air blown out of the bottom discharge port 25, a linking bar 32 for linking each of the vertical air deflectors 31, and a manual operation lever 33 linked to the linking bar 32 are also arranged in the bottom space 28, as shown in FIG. 4.

<Configuration of Fan 4>

[0052] The fan 4 is a turbofan, which is a type of centrifugal fan that blows air out in the centrifugal direction, and comprises a fan rotor 41, a motor 42, and a fan casing 43, as shown in FIG. 3. The fan rotor 41 has a plurality of blades 41a (the diagonal line portions in FIG. 3) disposed so as to extend away from a center 41b in a helical formation.

[0053] The fan casing 43 is a casing that houses the fan rotor 41 and the motor 42. The top of the fan casing 43 is communicated with the top space 27 of the body 2. The bottom of the fan casing 43 is communicated with

the bottom space 28 of the body 2.

[0054] The air flow blown out in the centrifugal direction generated by the fan 4 diverges up and down from the fan casing 43 and passes respectively through the top discharge passage P2 and the bottom discharge passage P3, and is then discharged to the outside of the body 2 respectively from the top discharge port 24 and the bottom discharge port 25.

<Configuration of Shutter 5>

[0055] The shutter 5 is provided in the bottom space 28 of the bottom discharge passage P3, as shown in FIGS. 3 through 5. The shutter 5 is a plate-shaped member having a rectangular shape that corresponds to the cross-sectional shape of the bottom space 28. The shutter 5 has a fitting cylindrical portion 5a that fits with an output shaft 6a of the stepper motor 6 so that the shutter 5 can rotate integrally with the output shaft 6a.

[0056] The portion where the fitting cylindrical portion 5a of the shutter 5, which is the rotating shaft of the shutter 5, is combined with the output shaft 6a of the stepper motor 6 is positioned on the bottom surface of an inner wall 29 that forms the bottom space 28 of the bottom discharge passage P3.

[0057] When the shutter 5 is closed, the shutter 5 is kept in a closed state by the pressure of the air flow generated by the fan 4. Sealing is thereby improved.

[0058] While closed, the shutter 5 is positioned at a second position A2 (see FIG. 4) in which the shutter 5 is vertically aligned or laying against the stopper 37. Therefore, the shutter 5 can be kept closed regardless of the strength of the air from the fan 4 or whether or not the air is blowing. The load applied to the stepper motor 6 can also be reduced while the shutter 5 is closed.

[0059] The shutter 5 can move from the open state to the closed state by rotating away from the fan 4 in the bottom discharge passage P3 as shown in FIGS. 4 and 5, i.e., in the R2 direction shown in FIG. 4. Therefore, when the shutter 5 moves from the open state to the closed state, the shutter 5 can be reliably oriented towards a position in which the closed state is maintained by the air pressure generated by the fan 4.

[0060] While open, the shutter 5 is positioned at a first position A1 (see FIG. 4) where pressure does not act on the shutter 5 in the direction in which the shutter 5 closes as shown in FIGS. 4 and 5; i.e., pressure does not act in the R2 direction shown in FIG. 4. The first position A1 is inside a concavity 30 formed in the inner wall 29 that forms the bottom space 28 of the bottom discharge passage P3.

<Configuration of Stepper Motor 6>

[0061] The stepper motor 6 is a motor for rotatably driving the shutter 5. The stepper motor 6 stops rotational driving so as not to apply torque to the shutter 5 when the shutter 5 is closed.

[0062] Specifically, the indoor unit 1 of the present embodiment is provided with a limit switch 36 (see FIG. 4) for controlling the rotational driving of the stepper motor 6. Therefore, when the shutter 5 is closed, the limit switch 36 can operate to stop the rotational driving of the stepper motor 6. At this time, since the shutter 5 is kept in the closed state by the pressure of the air flow, there is no trouble of air leaking out from the periphery of the shutter 5.

[0063] When the fan 4 stops while the shutter 5 is closed, the stepper motor 6 begins driving again. For example, while the limit switch 36 detects the shutter 5 to be in a closed state, a microcomputer or another such control circuit (not shown) installed in the indoor unit 1 detects that the driving of the fan 4 has stopped, whereupon the control circuit controls the stepper motor 6 so as to begin driving again.

<Description of Operation>

[0064] During heating, the rotational drive force of the stepper motor 6 causes the shutter 5 of the bottom discharge passage P3 to open to the first position A1. The movable plate 26 of the discharge passage P2 is also opened by a stepper motor (not shown). The air flow generated by the fan 4 is heated by the indoor heat exchanger 3. The heated air can be blown through the top discharge passage P2 and the bottom discharge passage P3 via the fan 4, and blown out through the top discharge port 24 and the bottom discharge port 25 respectively. Therefore, the heated air is blown upwards and downwards into the room from the indoor unit 1, whereby the interior of the room can be quickly warmed.

[0065] During cooling, the rotational drive force of the stepper motor 6 causes the shutter 5 to close to the second position A2, where the shutter 5 is vertically aligned or is lying against the stopper 37. The movable plate 26 of the top discharge passage P2 opens. When the shutter 5 has rotated to the second position A2, the rotational driving of the stepper motor 6 is stopped by the limit switch 36. When the shutter 5 has closed, the shutter 5 is kept closed using the pressure of the air flow generated by the fan 4. The air flow generated by the fan 4 is cooled by the indoor heat exchanger 3. The cooled air is blown through the top discharge passage P2 via the fan 4 and blown upward out through the top discharge port 24, whereby the interior of the room can be cooled.

<Characteristics>

[0066]

(1)

In the indoor unit 1 of the embodiment, when the shutter 5 has closed, the shutter 5 is kept closed by the pressure of the air flow generated by the fan 4, which comprises a centrifugal fan. Therefore, since the shutter 5 is kept closed by the air pressure gen-

erated by the fan 4, sealing is improved as is reliability.

(2)

While closed, the shutter 5 is abutted against the stopper 37 provided in the interior of the bottom space 28 of the body 2 by the air pressure generated by the fan 4. High performance of sealing can therefore be maintained, and sealing parts can be omitted.

(3)

In the indoor unit 1 of the embodiment, the shutter 5 can move from the open state to the closed state by rotating in the R2 direction away from the fan 4 in the bottom discharge passage P3, as shown in FIGS. 4 and 5. Therefore, when the shutter 5 moves from the open state to the closed state, the shutter 5 can be reliably oriented towards a position in which the closed state is maintained utilizing the air pressure generated by the fan 4. Moreover, the shutter 5 can be kept closed with a simple configuration.

(4)

In the indoor unit 1 of the embodiment, the shutter 5, while open, is positioned at a first position A1 where pressure is not applied to the shutter 5 in the R2 direction in which the shutter 5 closes. It is thereby possible to prevent the inconvenience of the shutter closing naturally due to the air pressure from the fan 4. Moreover, loss of ventilation from the fan 4 in the open state can be prevented.

(5)

In the indoor unit 1 of the embodiment, the first position A1 is inside a concavity 30 formed in an inner wall 29 that forms the bottom space 28 of the bottom discharge passage P3. A position where the shutter 5 is retracted from the bottom discharge passage P3, which is the air path, can thereby be ensured with a simple configuration.

(6)

In the indoor unit 1 of the embodiment, a centrifugal fan is used as the fan 4. A centrifugal fan is more readily handled and can be manufactured and controlled more readily than in cases in which two top and bottom cross-flow fans are used in conventional indoor units. Two top and bottom cross-flow fans used in conventional indoor units require two motors, whereas the fan 4 of the present embodiment needs only one motor, and manufacturing costs and weight can be greatly reduced.

The fan 4, which comprises a centrifugal fan, has greater static pressure than cross-flow fans used in conventional indoor units, and a flat front panel 10 can therefore be used.

(7)

In the indoor unit 1 of the embodiment, since the fan 4 used comprises a turbofan, which is a type of centrifugal fan, a strong air flow can be obtained in a small space.

(8)

In the indoor unit 1 of the embodiment, the stepper motor 6 stops rotatably driving so as not to apply torque to the shutter 5 in the closed state. In the present embodiment, the drive force of the stepper motor 6 during the closed state can be reduced because the shutter 5 maintains the closed state using the pressure of the air flow in the closed state.

(9)

In the indoor unit 1 of the embodiment, when the fan 4 has stopped while the shutter 5 is closed, the stepper motor 6 begins driving again. The shutter 5 can thereby be reliably kept closed even when the fan 4 has stopped.

(10)

In the indoor unit 1 of the embodiment, since a stepper motor 6 is used as the rotational drive unit, the shutter 5 can be rotatably driven at a precise rotational angle. Further, when the shutter 5 is in the closed state, the stepper motor 6 can stop driving at a precise timing so as to not apply torque to the shutter 5.

(11)

The indoor unit 1 of the embodiment further comprises a stopper 37 that is formed inside the bottom discharge passage P3 and that is in contact with the shutter 5 in the closed state. The shutter 5, when closed, is positioned at a second position A2 where the shutter is aligned vertically or is lying against the stopper 37. Therefore, the shutter 5 can be kept closed regardless of the strength of the air from the fan 4 or whether air is being blown. The load applied to the stepper motor 6 in the closed state can also thereby be reduced.

(12)

Since the indoor unit 1 of the embodiment is a floor installation type, air can be discharged upwards and downwards, and merely downward air discharge can be closed during cooling, it is possible to discharge air upwards and downwards during heating, and to discharge air upwards only during cooling.

(13)

In the indoor unit 1 of the embodiment, the rotating shaft of the shutter 5 (specifically, the portion where the fitting cylindrical portion 5a of the shutter 5 is combined with the output shaft 6a of the stepper motor 6) is positioned on the bottom surface of the inner wall 29 that forms the bottom space 28 of the bottom discharge passage P3. The shutter 5 thereby lies on the bottom surface of the inner wall 29 in the open position, where the shutter is stable.

<Modifications>

[0067]

(A)

In the indoor unit 1 of the embodiment, the rotational driving of the stepper motor 6 is stopped by the limit switch 36 when the shutter 5 is closed, but the

present invention is not limited to this option alone, and the limit switch 36 may be omitted. In this case, the shutter 5 can be kept closed by the pressure of the air flow generated by the fan 4 merely by stopping the stepper motor 6 after the shutter 5 has been rotatably driven a predetermined rotational angle or for a predetermined time period.

(B)

In the operation description of the indoor unit 1 of the embodiment, the shutter 5 is closed after cooling begins, but the present invention is not limited to this option alone. Another option is to perform a control so that the shutter 5 is opened and the room is cooled by upwards and downwards air discharge for a predetermined time period, e.g., about one hour after cooling begins, and after the hour has passed, the shutter 5 is closed to allow cooling only through upwards air discharge. In this case, the entire room can be cooled quickly by upwards and downwards air discharge for about one hour.

(C)

In the embodiment, a floor installation type indoor unit was described as an example, but the present invention is not limited to this option alone, and the present invention can be applied to any indoor unit that has a plurality of discharge passages and a shutter for closing at least one of the discharge passages. For example, the present invention can be applied to an indoor unit that is mounted on the ceiling.

INDUSTRIAL APPLICABILITY

[0068] The present invention can be applied to an indoor unit having a plurality of discharge passages and a shutter for closing at least one of the discharge passages.

Claims

1. An indoor unit (1) of an air conditioner, comprising:

an indoor heat exchanger (3);
a body (2) in which are formed a plurality of discharge passages (P2, P3) for discharging air that has passed through the indoor heat exchanger (3);
a centrifugal fan (4) for generating a flow of air that passes through the indoor heat exchanger (3) and is blown out of the discharge passages (P2, P3); and
a shutter (5) that is provided to at least one discharge passage (P3) of the plurality of discharge passages (P2, P3), and that is kept in a closed state by the pressure of the air flow.

2. The indoor unit (1) as recited in claim 1, wherein
the shutter (5) moves from an open state to the closed state by rotating away from the centrifugal fan (4) in the discharge passage (P3).

3. The indoor unit (1) as recited in claim 1, wherein
the shutter (5), while in an open state, is positioned at a first position where pressure is not applied to the shutter (5) in a direction in which the shutter (5) closes.

4. The indoor unit (1) as recited in claim 3, wherein
the first position is inside a concavity (30) formed in an inner wall of the discharge passage (P3).

5. The indoor unit (1) as recited in claim 1, wherein the centrifugal fan (4) is a turbofan.

6. The indoor unit (1) as recited in claim 1, further comprising:

a rotational drive unit (6) for rotatably driving the shutter (5), wherein
the rotational drive unit (6) stops rotational driving in the closed state.

7. The indoor unit (1) as recited in claim 6, wherein
when the centrifugal fan has stopped while the shutter is in a closed state, the rotational drive unit begins driving again.

8. The indoor unit (1) as recited in claim 6 or 7, wherein
the rotational drive unit (6) is a stepper motor.

9. The indoor unit (1) as recited in claim 1, further comprising:

a stopper (37) that is formed inside the discharge passage (P3) and that is in contact with the shutter (5) in the closed state; wherein
the shutter (5), while closed, is positioned at a second position where the shutter (5) is vertically aligned or laying against the stopper (37).

10. The indoor unit (1) as recited in claim 1, the indoor unit being a floor installation type wherein air can be blown upwards and downwards, and merely downward air discharge can be closed by the shutter during cooling.

FIG. 1

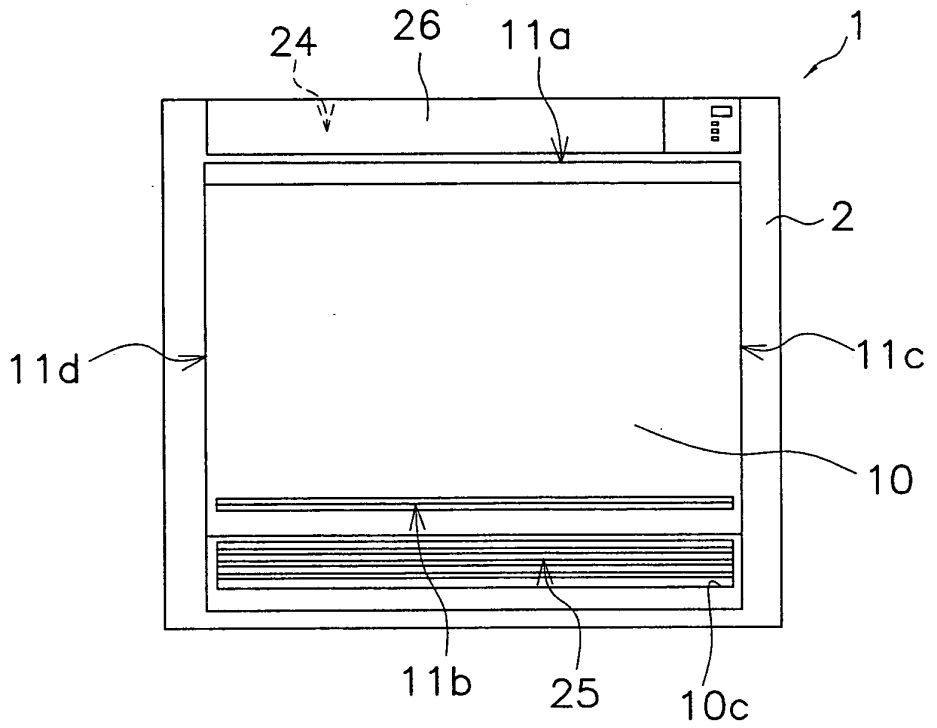
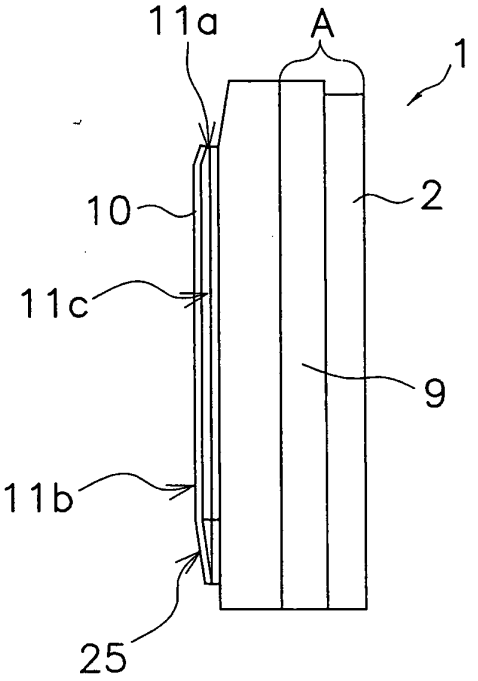
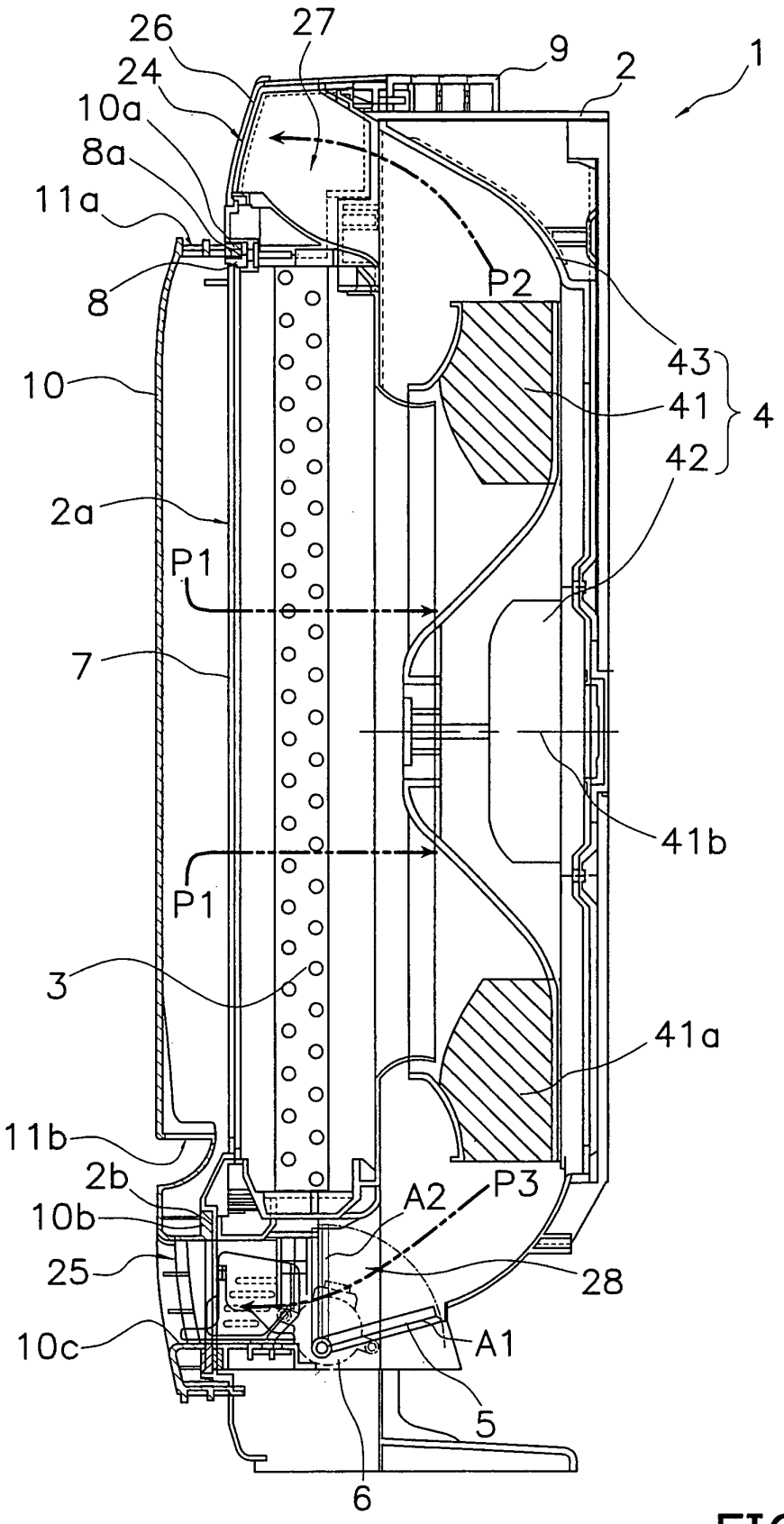


FIG. 2

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10
2a
P1
7
41b
P1
3
41a
11b
2b
A2
P3
10b
25
28
10c
A1
5
6

FIG. 3

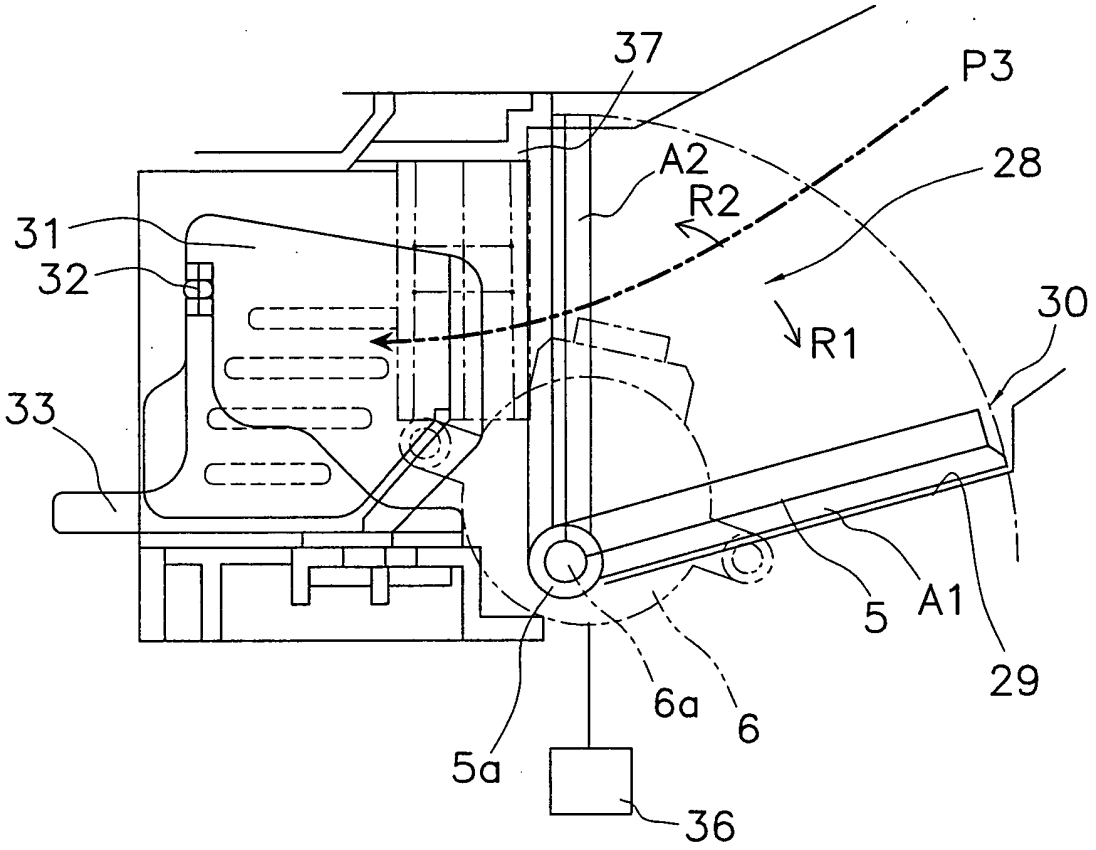

FIG. 4

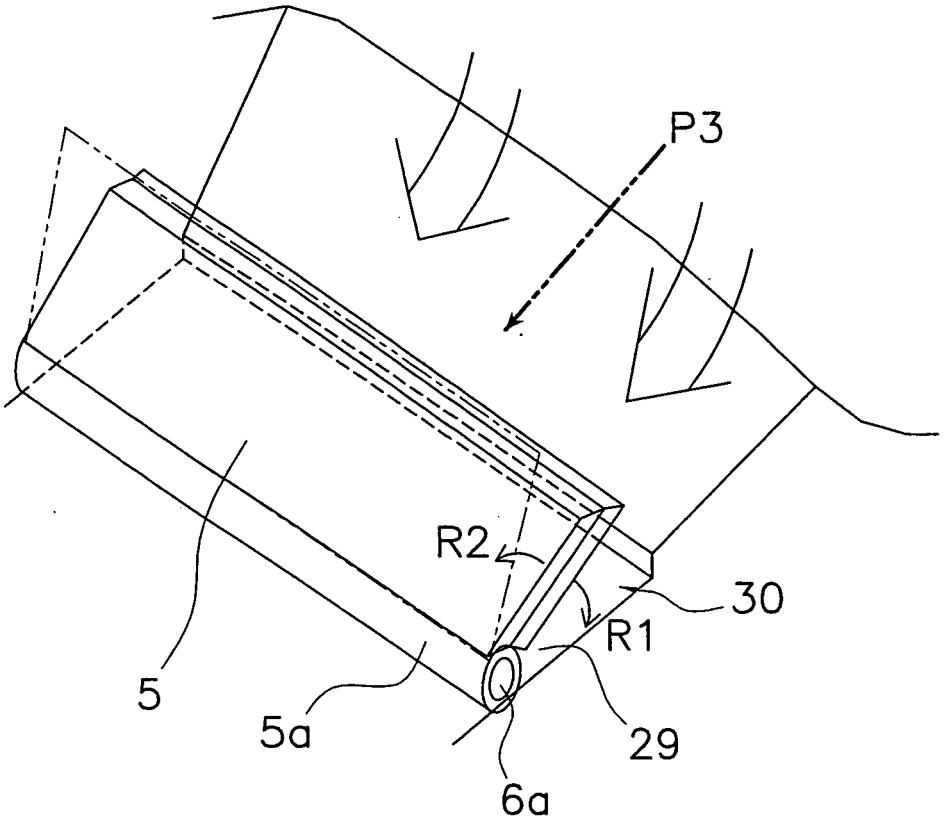

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/325615

A. CLASSIFICATION OF SUBJECT MATTER
F24F1/00(2006.01)i, *F24F13/14*(2006.01)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)
F24F1/00, F24F13/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Document 1: JP 10-89722 A (Calsonic Corp.), 10 April, 1998 (10.04.98), Prior art, Par. Nos. [0002] to [0005]; Par. Nos. [0010] to [0026]; Figs. 1, 4 (Family: none)	1,2,3,4,5,6, 8,9
Y	Document 2; Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 63616/1987 (Laid-open No. 172855/1988) (Mitsubishi Electric Corp.), 10 November, 1988 (10.11.88), Full text; Figs. 1 to 6 (Family: none)	1,2,3,4,5,6, 7,8,9,10

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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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
28 February, 2007 (28.02.07)	13 March, 2007 (13.03.07)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/325615

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Document 3; Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 127020/1986(Laid-open No. 32231/1988) (Sanden Corp.), 02 March, 1988 (02.03.88), Page 9, lines 8 to 16; Figs. 1 to 3 (Family: none)	1,2,3,4,5,6, 7,8,9,10
Y	Document 4; Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 50237/1987(Laid-open No. 159145/1988) (Diesel Kiki Co., Ltd.), 18 October, 1988 (18.10.88), Page 6, lines 3 to 11; Fig. 4 (Family: none)	1,2,3,4,5,6, 7,8,9,10
Y	Document 5; Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 45/1985(Laid-open No. 116945/1986) 23 July, 1986 (23.07.86), Page 5, lines 8 to 19; page 10, lines 4 to 10; page 11, lines 4 to 11; page 12, lines 3 to 5; Figs. 1, 3, 4 (Family: none)	1,2,3,4,5,6, 7,8,9,10

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 61079983 A **[0003]**