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

(11) **EP 2 014 997 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
14.01.2009 Bulletin 2009/03

(21) Application number: **07741746.7**

(22) Date of filing: **17.04.2007**

(51) Int Cl.:
F24F 13/20 *(2006.01)* ***F24F 13/15*** *(2006.01)*

(86) International application number:
PCT/JP2007/058310

(87) International publication number:
WO 2007/123101 (01.11.2007 Gazette 2007/44)

(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 MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(30) Priority: **17.04.2006 JP 2006113441**

(71) Applicant: **DAIKIN INDUSTRIES, LTD.**
Osaka-shi, Osaka 530-8323 (JP)

(72) Inventor: **YABU, Tomohiro**
Sakai-shi
Osaka 591-8511 (JP)

(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) AIR CONDITIONER

(57) An object of the present invention is to provide an air conditioning apparatus in which ventilation can be ensured while the design is improved. The air conditioning apparatus is disposed above a space to be air conditioned, and comprises a casing (3) and a dividing cosmetic panel (4). The casing (3) has a suction port (34) and a discharge port (35). The dividing cosmetic panel (4) has a plurality of dividing panels (41), and an opening/closing moveable mechanism (43) for varying the positions of the dividing panels (41) relative to the suction port (34). The opening/closing moveable mechanism (43) switches between a state in which the dividing panels (41) are disposed in proximity to each other, thereby blocking air flow through the suction port (34), and a state in which the dividing panels (41) are separated from each other to allow ventilation through the suction port (34).

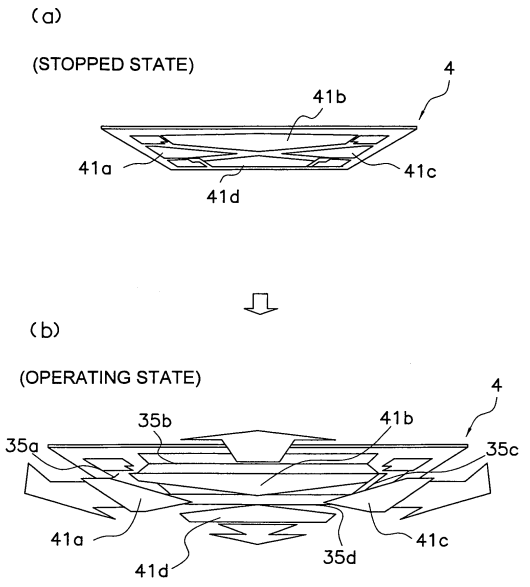


FIG. 4

EP 2 014 997 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioning apparatus, and particularly to an air conditioning apparatus installed and used in the vicinity of a ceiling.

BACKGROUND ART

[0002] An example of a known prior art device is an indoor device of an air conditioning apparatus for drawing in indoor air and supplying conditioned air into a room, wherein a flat panel is installed so that a discharge port and suction port run parallel to a ceiling surface, as is the case with a ceiling-embedded apparatus or the like.

[0003] With such indoor devices, efforts are being made to reduce the thickness of the device to accommodate limited installation space in the vicinity of the ceiling, and internal air-blowing resistance tends to increase.

[0004] With the air conditioning apparatus disclosed in Patent Document 1 shown below, for example, a proposal is made for the use of a structure in which the flow velocity distribution is made uniform in the interior of the indoor device, and that the air conditioning apparatus be made thinner while the air-blowing resistance is minimized.

<Patent Document 1>

[0005] Japanese Laid-open Patent Application No. 06-042768

DISCLOSURE OF THE INVENTION

PROBLEMS THE INVENTION IS INTENDED TO SOLVE

[0006] However, with the aforementioned air conditioning apparatus disclosed in Patent Document 1, the focus is on reducing the thickness of the apparatus and reducing air-blowing resistance, and the design of the discharge port is not taken into account. Therefore, the discharge port of the air conditioning apparatus is always visible to a user in the room, and the design is undesirable.

[0007] With the foregoing aspects in view, it is an object of the present invention to provide an air conditioning apparatus in which the design can be improved and ventilation can be ensured.

MEANS FOR SOLVING THESE PROBLEMS

[0008] The air conditioning apparatus according to a first aspect is an air conditioning apparatus disposed above a space to be air conditioned, the apparatus comprising a casing and a panel component. The casing has a first ventilation port, and second ventilation port through which air passing through the first ventilation port passes. The panel component has a panel including at least two panels, which are a first panel and a second panel, and a moveable mechanism for varying the relative position of the first ventilation port and the panel. The moveable mechanism switches between a first state and a second state. The first state is a state in which air flow through the first ventilation port is blocked by having one end of the first panel and one end of the second panel being positioned in proximity to each other. The second state is a state in which the one end of the first panel and the one end of the second panel move away from each other to different positions from the first state and air flow through at least part of the first ventilation port is allowed. The first ventilation port and second ventilation ports herein may function as suction ports or as discharge ports in the air conditioning apparatus.

[0009] The suction port in a conventional air conditioning apparatus is always exposed to the exterior in order to ensure ventilation, and is noticeable from the air conditioned space.

[0010] According to the air conditioning apparatus of the first aspect, the first ventilation port provided to the casing is covered and closed off by the panel in the first state. Therefore, in the first state in which the first ventilation port is covered, the panel is primarily visible when viewed from the air conditioned space, and the first ventilation port and other uneven shapes are therefore inconspicuous. Therefore, the outward appearance is appealing and the design can be improved. In the second state as well, the apparatus switches from the first state to the second state as a result of the moving of not just one, but two or more panels, including the first panel and the second panel; therefore, less movement per panel is required in order to ensure ventilation. Therefore, the panels are made to not be noticeable due to the panels undergoing large movements, and the design can be improved. The moveable mechanism varies the relative position of the panels, thereby switching from the first state, in which air flow through the first ventilation port is blocked, to the second state, in which air flow is at least partially allowed, whereby ventilation can be ensured.

[0011] The design of the air conditioning apparatus can thereby be improved, and ventilation can be ensured.

[0012] The air conditioning apparatus according to the a second aspect is the air conditioning apparatus according the first aspect, wherein in the first state, a surface of the first panel and a surface of the second panel are disposed in proximity to a surface of the first ventilation port. In the second state, the surface of the first panel and the surface of the second panel are disposed at position farther from the surface of the first ventilation port than in the first state.

[0013] In the second state, not only are the first panel and second panel merely farther from each other than in the first state, but the first panel and second panel are also farther from the casing. Therefore, there can be fewer portion in which airflow resistance is increased by the

panel component and the casing being in proximity to each other.

[0014] Airflow resistance in the suction port is thereby further reduced, whereby efficient suction can be performed.

[0015] The air conditioning apparatus according to a third aspect is an air conditioning apparatus disposed above a space to be air conditioned, the apparatus comprising a casing and a panel component. The casing has a first ventilation port, and second ventilation port through which the air passing through the first ventilation port passes. The panel component has at least two panels, which are a first panel that turns around a first rotating shaft on an end and a second panel that turns around a second rotating shaft on an end, and a moveable mechanism for varying the relative position of the first ventilation port and the panel.

[0016] The moveable mechanism switches between a first state and a second state. The first state is a state in which a surface of the first panel and a surface of the second panel are oriented in substantially the same direction as the primary ventilation direction in the first ventilation port, and air flow through the first ventilation port is blocked due to the surface of the first panel and the surface of the second panel being positioned on substantially the same plane. The second state is a state in which both the first panel, whose axis is the first rotating shaft; and the second panel, whose axis is the second rotating shaft, turn, whereby air is allowed to flow through at least part of the first ventilation port due to the orientation of the surface of the first panel and the orientation of the surface of the second panel being positioned so as to overlap each other when viewed from a direction substantially perpendicular to the primary ventilation direction in the first ventilation port.

[0017] The suction port in a conventional air conditioning apparatus is always exposed to the exterior in order to ensure ventilation and is noticeable from the air conditioned space.

[0018] In the air conditioning apparatus of the third aspect, the first ventilation port provided to the casing is covered and closed off by the panel in the first state. Therefore, in the first state in which the first ventilation port is covered, the panel is primarily visible when viewed from the air conditioned space, and the first ventilation port and other uneven shapes are therefore inconspicuous. Therefore, the outward appearance is appealing and the design can be improved. In the second state as well, less movement per panel is required in order to ensure ventilation because the apparatus switches from the first state to the second state by having not just one, but two or more panels, including the first panel and the second panel, rotate around the respective rotating shafts. Therefore, the panels are made to not be noticeable due to the panels undergoing large movements, and the design can be improved. The moveable mechanism switches from the first state in which air flow through the first ventilation port is blocked to the second state in which air flow is at least partially allowed by varying the relative position of the panels. The directions of the first panel and the second panel are varied so as to be substantially perpendicular to the ventilation surface of the first ventilation port, and the ventilation of the first ventilation port can be ensured because the number of portions of the panel that create resistance against the ventilation of the first ventilation port remains low.

[0019] The design of the air conditioning apparatus can thereby be improved, and ventilation can be ensured.

[0020] Since the panel component is configured from not one but a plurality of panels, dividing the panels into a plurality makes it possible to make the distance between the panels in the first state and the second state less than in a case of one panel, and the design can be improved in this respect as well.

[0021] The air conditioning apparatus according to a fourth aspect is the air conditioning apparatus according to the third aspect, wherein the panel component further has a panel frame in which a panel slide space is provided and in which air flow through the first ventilation port is blocked with the first panel and the second panel in the first state. The casing further has a casing support part for supporting the panel frame. The first panel further has a first sliding end which is an end on an opposite side of the first rotating shaft and which slides relative to the panel slide space. The first rotating shaft is rotatably supported relative to the casing support part. The second panel further has a second sliding end which is an end on an opposite side of the second rotating shaft and which slides relative to the panel slide space. The second rotating shaft is rotatably supported relative to the casing support part.

[0022] According to the present aspect, the first rotating shaft of the first panel and the second rotating shaft of the second panel turn in the casing support part provided to the casing. The sliding ends at the other ends of the panels slide relative to the panel slide space of the panel frame.

[0023] Switching between the first state and the second state is thereby readily performed merely by causing one end of each panel to slide while the rotating shaft is used to cause the other end to rotate.

[0024] The air conditioning apparatus according to a fifth aspect is the air conditioning apparatus according to the third aspect, wherein the panel component further has a panel support part for supporting the casing, and a panel frame for blocking air flow through the first ventilation port with the first panel and second panel. The casing further has a casing slide space. The first panel further has a first sliding end which is an end on an opposite side of the first rotating shaft and which slides relative to the casing slide space. The first rotating shaft is rotatably supported relative to the panel support part. The second panel further has a second sliding end which is an end on an opposite side of the second rotating shaft and which slides relative to the casing slide space. The second rotating shaft is rotatably supported relative to

the panel support part.

[0025] According to the present aspect, the first rotating shaft of the first panel and the second rotating shaft of the second panel turn in the casing support part provided to the casing. The sliding ends at the other ends of the panels slide relative to the casing slide space of the casing.

[0026] Switching between the first state and the second state is thereby readily performed merely by causing one end of each panel to slide while the rotating shaft is used to cause the other end to rotate.

[0027] The air conditioning apparatus according to a sixth aspect is an air conditioning apparatus disposed above a space to be air conditioned, comprising a casing and a panel component. The casing has a first ventilation port, and second ventilation ports through which the air passing through the first ventilation port passes. The panel component has a first panel, a second panel disposed so that one end thereof constitutes a first common rotating shaft shared by one end of the first panel, and a moveable mechanism for varying the relative position of the first ventilation port and the panel. The moveable mechanism switches between a first state and a second state. The first state is a state in which a surface of the first panel and a surface of the second panel are oriented in substantially the same direction as the primary ventilation direction in the first ventilation port, and air flow through the first ventilation port is blocked due to the surface of the first panel and the surface of the second panel being positioned on substantially the same plane. The second state is a state in which the first panel and second panel both turn around the first common rotating shaft, and air flow through at least part of the first ventilation port is allowed due to the orientation of the surface of the first panel and the orientation of the surface of the second panel being positioned so as to overlap each other when viewed from a direction substantially perpendicular to the primary ventilation direction in the first ventilation port.

[0028] The suction port in a conventional air conditioning apparatus is always exposed to the exterior in order to ensure ventilation, and is noticeable from the air conditioned space.

[0029] According to the air conditioning apparatus of the sixth aspect, the first ventilation port provided to the casing is covered and closed off by the panel in the first state. Therefore, in the first state in which the first ventilation port is covered, the panel is primarily visible when viewed from the air conditioned space, and the first ventilation port and other uneven shapes are therefore inconspicuous. Therefore, the outward appearance is appealing and the design can be improved. In the second state as well, less movement per panel is required in order to ensure ventilation because the apparatus is switched from the first state to the second state by the rotation not only of the first panel around the common rotating shaft but also of the second panel around the common rotating shaft. The panels are accordingly prevented from being made conspicuous, which occurs when they make large movements, and the design can be improved. The moveable mechanism switches from the first state in which air flow through the first ventilation port is blocked to the second state in which air flow is at least partially allowed by varying the relative position of the panels. The directions of the first panel and the second panel are varied so as to be substantially perpendicular to the ventilation surface of the first ventilation port, and the ventilation of the first ventilation port can be ensured because the number of portions of the panel that create resistance against the ventilation of the first ventilation port remains low.

[0030] The design of the air conditioning apparatus can thereby be improved, and ventilation can be ensured.

[0031] The air conditioning apparatus according to a seventh aspect is the air conditioning apparatus according to the sixth aspect, wherein the panel component further has a third panel, and a fourth panel disposed so that one end thereof constitutes a second common rotating shaft shared by the end of the third panel. The moveable mechanism is such that, in the first state, the surface of the first panel, the surface of the second panel, the surface of the third panel, and the surface of the fourth panel are oriented in substantially the same direction as the primarily ventilation direction in the first ventilation port, and air flow through the first ventilation port is blocked due to the surface of the first panel, the surface of the second panel, the surface of the third panel, and the surface of the fourth panel being positioned on substantially the same plane. The moveable mechanism is also such that, in the second state, the first panel and second panel assume a substantially overlapping state as a result of both rotating around the first common rotating shaft, and the third panel and fourth panel assume a substantially overlapping state as a result of both rotating around the second common rotating shaft.

[0032] According to the present aspect, the first panel and second panel join together and overlap, as do the third panel and fourth panel, and these joined panels are in a substantially perpendicular positional relationship with respect to the first ventilation port. Therefore, disposing the first panel, the second panel, the third panel, and the fourth panel so as to extend downward all together in this manner makes it possible to suppress airflow resistance against air taken in through the periphery in the second state, in comparison with a case in which the first panel, the second panel, the third panel, and the fourth panel are disposed extending downward individually.

[0033] Bringing the panels together in this manner allows distance between one end of panel and the other end of the panel to be shortened with larger numbers of panels covering the first ventilation port.

[0034] The air conditioning apparatus according to an eighth aspect is the air conditioning apparatus according to the sixth aspect, wherein the panel component further has a panel frame in which a panel slide space is provided and in which air flow through the first ventilation port is

blocked with the first panel and the second panel in the first state. The casing further has a casing support part for supporting the panel frame. The first panel further has a first sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the panel slide space. The second panel further has a second sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the panel slide space. The common rotating shaft is rotatably supported relative to the panel support part.

[0035] According to the present aspect, the common rotating shaft shared by the first panel and the second panel turns in the casing support part provided to the casing. The sliding ends at the other ends of the panels slide relative to the panel slide space of the panel frame.

[0036] Switching between the first state and the second state is thereby readily performed merely by causing one end of each panel to slide while the rotating shaft is used to cause the other end to rotate.

[0037] The air conditioning apparatus according to a ninth aspect is the air conditioning apparatus according to the sixth aspect, wherein the panel component further has a panel support part for supporting the casing, and a panel frame for blocking air flow through the first ventilation port with the first panel and second panel. The casing has a casing slide space. The first panel further has a first sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the casing slide space. The second panel further has a second sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the casing slide space. The common rotating shaft is rotatably supported relative to the panel support part.

[0038] According to the present aspect, the common rotating shaft shared by the first panel and the second panel turns in the panel support part provided to the panel component. The sliding ends at the other ends of the panels slide relative to the casing slide space of the casing.

[0039] Switching between the first state and the second state is thereby readily performed merely by causing one end of each panel to slide while the rotating shaft is used to cause the other end to rotate.

[0040] The air conditioning apparatus according to a tenth aspect is an air conditioning apparatus disposed above a space to be air conditioned, comprising a casing and a panel component. The casing has first ventilation port, blocking part provided to the first ventilation port and partially blocking ventilation, and second ventilation port through which air passing through the first ventilation port passes. The panel component has panel whose shapes correspond to the first ventilation port, blocking corresponding opening whose shapes correspond to the blocking part, and a moveable mechanism for varying the relative position of the first ventilation port and the panel. The moveable mechanism switches between a first state and a second state. The first state is a state in which peripheral edge of the panel is disposed so as to correspond with peripheral edge of the first ventilation port, peripheral edge of the blocking corresponding opening is disposed so as to correspond with peripheral edge of the blocking part, and air flow through the first ventilation port is blocked. The second state is a state in which a positional relationship between the peripheral edge of the panel and the peripheral edge of the first ventilation port as well as a positional relationship between the peripheral edge of the blocking corresponding opening and the peripheral edge of the blocking part is different than in the first state, whereby air flow is allowed through at least part of the first ventilation port.

[0041] When the moveable mechanism switches to the first state, the panel fits with the blocking part of the casing, and air flow through the first ventilation port is blocked. When the moveable mechanism switches to the second state, the panels separate from the casing, and air flow passes through the blocking corresponding opening, bypasses the blocking part, and passes through the first ventilation port, whereby ventilation is ensured.

[0042] Thus, in the first state, the casing and the panel component fit together, whereby an appealing appearance can be created and the design can be improved. Ventilation in the second state is not ensured through the horizontal gap formed by the distance between the separated panel component and casing, but through flow channel created by the misalignment between the positions of the first ventilation port and the position of the blocking corresponding opening when the moveable mechanism switches from the first state to the second state. It is thereby sufficient to cause misalignment in the positional relationship between the position of the first ventilation port and the position of the blocking corresponding opening, and ventilation can be ensured without separating the panel component from the casing more than is necessary. The extent by which the panel component is lowered in the second state can thereby be kept small, and ventilation can be easily ensured.

[0043] The design of the air conditioning apparatus can thereby be improved, and ventilation can be ensured.

[0044] Since the panel component is only lowered by a small amount, it is possible to prevent a person in the room from feeling that the ceiling has lowered or otherwise feeling confined as a result of the panel component descending from the ceiling, and the design can be improved from this respect as well.

[0045] The air conditioning apparatus according to an eleventh aspect is the air conditioning apparatus according to any of the first through tenth aspects, wherein the first ventilation port functions as a suction port leading into the casing, and the second ventilation ports function as discharge ports leading out of the casing.

[0046] Air flow from the suction port to the discharge ports in the casing interior can herein be ensured, and the suction port can be concealed until the panel component moves, which improves the design. Even in cases in which, e.g., a grill with a filter or another such component is provided to the first ventilation port as the suction

port, the panel can conceal these components.

[0047] The air conditioning apparatus according to a twelfth aspect is the air conditioning apparatus according to any of the first through eleventh aspects, wherein the moveable mechanism moves the panel and the casing away from each other in the second state and widens the second ventilation port.

[0048] In the second state, the panel is separated from the casing by the moveable mechanism, whereby the distance between the panel and the casing widens, and the second ventilation port is widened. Therefore, airflow resistance in the peripheries of the second ventilation port can be reduced.

[0049] Air flow in the second ventilation ports can thereby be more easily ensured.

[0050] The air conditioning apparatus according to a thirteenth aspect is the air conditioning apparatus according to the twelfth aspect, wherein the moveable mechanism disposes the panel in the second state at a position where the second ventilation port is covered in a plan view.

[0051] The panel component in the second state is moved by the moveable mechanism and is thereby disposed at a position where the second ventilation port is covered in a plan view. Therefore, the panel can conceal the second ventilation port in the second state.

[0052] The second ventilation ports are thereby concealed, whereby the design in the second state can be improved.

[0053] The air conditioning apparatus according to a fourteenth aspect is the air conditioning apparatus according to the twelfth or thirteenth aspect, further comprising an angle adjustment mechanism for varying the angle of inclination of the panel to the casing, the panel being in proximity to the second ventilation port in the second state.

[0054] The panel itself can be inclined by the angle adjustment mechanism in relation to the vicinity of the second ventilation port of the casing. Therefore, the orientation of air flow passing through the second ventilation port can be adjusted.

[0055] It is thereby possible to adjust the direction of air flow passing through the second ventilation port.

[0056] In cases in which the discharge direction is adjusted to a direction parallel to the ceiling surface to achieve a round flow, the discharged air current does not directly reach the user, and a drafty sensation can be reduced.

[0057] In cases in which a configuration is used in which air flow in the proximity of the first ventilation port can be affected by adjusting the inclination of the panel in the proximity of the second ventilation port, it is possible, depending on the manner of inclination of the panel, to further reduce resistance to suction in the air conditioning apparatus, and to proactively facilitate suction.

[0058] The air conditioning apparatus according to a fifteenth aspect is the air conditioning apparatus according to any of the twelfth through fourteenth aspects, further comprising a flap for adjusting the orientation of air flow passing through the second ventilation ports, the flap being positioned between the casing and the panel in the second state.

[0059] In the second state in which the panel has moved so as to open up the first ventilation port, the flap can adjust the orientation of air flow passing through the second opening.

[0060] It is thereby possible to more acutely adjust the ventilation direction not only because the direction of air flow from the second ventilation ports is adjusted by the position where the panel is located, but also because the inclined state of the flap can be varied.

[0061] Situations in which the discharged air is blown directly into the ceiling surface can be avoided and the ceiling surface can be prevented from being soiled by acutely adjusting the air-blowing direction using the flap, even in cases in round flow is achieved using the panel.

[0062] The air conditioning apparatus according to a sixteenth aspect is the air conditioning apparatus according to any of the first through fifteenth aspects, wherein the panel has a surface formed in a substantially flat shape, and covers the first ventilation port in a substantially planar shape in the first state.

[0063] According to the present aspect, the surface of the panel has a substantially flat shape, and the first ventilation port is covered and sealed off in a substantially planar shape in the first state. Therefore, the design can be improved because the portion visible to a user in the air conditioned space is flat and can be made to have an appealing appearance.

EFFECT OF THE INVENTION

[0064] In the air conditioning apparatus according to the first aspect, the design of the air conditioning apparatus can be improved, and ventilation can be ensured.

[0065] In the air conditioning apparatus according to the second aspect, airflow resistance in the suction port is further reduced, whereby efficient suction can be performed.

[0066] In the air conditioning apparatus according to the third aspect, the design of the air conditioning apparatus can be improved, and ventilation can be ensured.

[0067] In the air conditioning apparatus according to the fourth and fifth aspects, switching between the first state and the second state is readily accomplished merely by causing one end of each panel to slide while causing the other end to rotate using a rotating shaft.

[0068] In the air conditioning apparatus according to the sixth aspect, the design of the air conditioning apparatus can be improved, and ventilation can be ensured.

[0069] In the air conditioning apparatus according to the seventh aspect, it is possible to suppress airflow resistance against air taken in through the periphery in the second state.

[0070] In the air conditioning apparatus according to the eighth and ninth aspects, switching between the first

state and the second state is readily accomplished merely by causing one end of each panel to slide while causing the other end to rotate using a rotating shaft.

[0071] In the air conditioning apparatus according to the tenth aspect, the design of the air conditioning apparatus can be improved, and ventilation can be ensured.

[0072] In the air conditioning apparatus according to the eleventh aspect, air flow from the suction port to the discharge ports can be ensured, and the suction port can be concealed until the panel component moves, which improves the design.

[0073] In the air conditioning apparatus according to the twelfth aspect, air flow in the second ventilation ports can be more readily ensured.

[0074] In the air conditioning apparatus according to the thirteenth aspect, the second ventilation ports are concealed, whereby the design in the second state can be improved.

[0075] In the air conditioning apparatus according to the fourteenth aspect, the direction of air flow passing through the second ventilation ports can be adjusted.

[0076] In the air conditioning apparatus according to the fifteenth aspect, it is possible to more acutely adjust the ventilation direction because the direction of air flow from the second ventilation ports is not only adjusted by the position where the panel is located, but also because the inclined state of the flap can be varied.

[0077] In the air conditioning apparatus according to the sixteenth aspect, the design can be improved because the portion visible to a user in the air conditioned space is flat and can be made to have an appealing appearance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0078]

FIG 1 is an external perspective view of a ceiling-installed air conditioning apparatus according to first embodiment of the present invention.

FIG. 2 is a cross-sectional side view of the casing interior in the air conditioning apparatus.

FIG. 3 is a schematic cross-sectional plan view of the air conditioning apparatus in which the top plate has been removed.

FIG 4(a) is a perspective view of the dividing cosmetic panel in the stopped state, and (b) is a perspective view of the dividing cosmetic panel in the operating state.

FIG. 5 is a plan view of the bottom surface of the casing of the air conditioning apparatus.

FIG. 6 is a plan view of the dividing cosmetic panel in a stopped state.

FIG 7 is a plan view of the dividing cosmetic panel in the operating state.

FIG. 8(a) is a schematic cross-sectional side view of the casing interior in the stopped state, and (b) is a schematic cross-sectional side view of the casing interior in the operating state.

FIG. 9(a) is a perspective view of the dividing cosmetic panel in the stopped state of the air conditioning apparatus according to Modification (A), and (b) is a perspective view of the dividing cosmetic panel in the operating state of the air conditioning apparatus according to Modification (A).

FIG. 10(a) is a schematic cross-sectional side view of the air conditioning apparatus according to Modification (B) in the stopped state, and (b) is a schematic cross-sectional side view of the air conditioning apparatus according to Modification (B) in the operating state.

FIG. 11 is a schematic cross-sectional side view of the air conditioning apparatus according to Modification (C).

FIG 12(a) is a schematic cross-sectional side view of the air conditioning apparatus according to Modification (C) in the stopped state, and (b) is a schematic cross-sectional side view of the air conditioning apparatus according to Modification (C) in the operating state.

FIG. 13 is a schematic cross-sectional side view of the air conditioning apparatus according to Modification (D).

FIGS. 14(a) to (d) are schematic cross-sectional side views of the air conditioning apparatus according to Modification (D).

FIG 15(a) is a schematic cross-sectional side view of the air conditioning apparatus according to second embodiment in the stopped state, and (b) is a schematic cross-sectional side view of the air conditioning apparatus according to second embodiment in the operating state.

FIG. 16 is an explanatory diagram of the separate stages of a fixed folding mechanism on the casing side.

FIG. 17 is an explanatory diagram of the separate stages of a fixed folding mechanism on the panel side in Modification (A) of the air conditioning apparatus according to second embodiment.

FIG. 18(a) is an example of Modification (B) of the air conditioning apparatus of second embodiment, which does not have a panel frame, and (b) is another example of Modification (B) of the air conditioning apparatus of second embodiment, which does not have a panel frame.

FIG. 19(a) is a schematic cross-sectional side view of the air conditioning apparatus according to third embodiment in the stopped state, and (b) is a schematic cross-sectional side view of the air conditioning apparatus according to third embodiment in the operating state.

FIG. 20 is a partial enlarged view of the sliding opening/closing moveable mechanisms of the air conditioning apparatus according to third embodiment.

FIG. 21 (a) shows Modification (A) of the air conditioning apparatus according to third embodiment, (b)

shows Modification (B) of the air conditioning apparatus according to third embodiment, (c) shows Modification (C) of the air conditioning apparatus according to third embodiment, and (d) shows Modification (D) of the air conditioning apparatus according to third embodiment.

FIG. 22(a) is a schematic cross-sectional side view of the air conditioning apparatus in another embodiment (A) in the stopped state, and (b) is a schematic cross-sectional side view of the air conditioning apparatus in another embodiment (A) in the operating state.

FIG. 23 is an air conditioning apparatus according to another embodiment (B).

FIG 24 is a partial enlarged view of an air conditioning apparatus according to another embodiment (B).

DESCRIPTION OF THE REFERENCE SYMBOLS

[0079]

1	Air conditioning apparatus
3	Casing
4	Dividing cosmetic panel (panel component)
33	Bottom plate (panel frame)
34	Suction port (first ventilation port)
35	Discharge port (second ventilation port)
38	Casing support part
39	Blocking member (blocking part)
41	Dividing panel (first through fourth dividing panels)
43	Opening/closing moveable mechanism (opening/closing moveable mechanisms)
44	Angle adjustment mechanism
45	Flap (first through fourth flaps)
48	Panel support part
49	Blocking corresponding opening (blocking corresponding opening parts)
243	Folding opening/closing moveable mechanism (folding mechanism)
343	Sliding opening/closing moveable mechanism (direction-varying mechanism)
504	Fitted cosmetic panel
S	Slide space

BEST MODE FOR CARRYING OUT THE INVENTION

<Summary Of The Invention>

[0080] The present invention provides an air conditioning apparatus in which a suction port is exposed due to the movement of a panel. In the air conditioning apparatus of the present invention, a structure is used in which a suction port is covered by a substantially flat panel in a stopped state in which the apparatus is not being operated. Specifically, in terms of the primary outward appearance in the state in which the suction port is covered, the substantially flat panel is visible, and an opening and irregular portion are not easily visible, which provides an appealing appearance. The present invention is thereby characterized in that the design can be improved in an air conditioning apparatus. The present invention is also characterized in that the panel including the entire peripheral edge can be moved by an opening/closing mechanism to expose the suction port and sufficiently ensure ventilation.

[0081] Embodiments of the ceiling-installed air conditioning apparatus according to the present invention are described hereinbelow with reference to the drawings.

<First embodiment>

(Basic structure of ceiling-installed air conditioning apparatus)

[0082] FIG. 1 shows an external perspective view (with the ceiling omitted) of a ceiling-installed air conditioning apparatus 1 according to first embodiment of the present invention.

[0083] The air conditioning apparatus 1 is a ceiling-embedded air conditioning apparatus, and is primarily composed of a casing 3 for housing various structural devices in the interior, and a dividing cosmetic panel 4.

[0084] The casing 3 is inserted and placed in an opening formed in a ceiling U of an air conditioned room, as shown in FIG. 2, which shows a schematic cross-sectional side view of the air conditioning apparatus 1, for example. Disposed inside the casing 3 are, primarily, an air-blowing fan 5 for drawing air in the air-conditioned room into the casing 3 and blowing the air peripherally outward, and a heat exchanger 6 disposed so as to enclose the external periphery of the air-blowing fan 5. The letter O in FIG. 2 indicates the rotational axis or rotational center of the air-blowing fan 5. The casing 3 is disposed so as to fit in the opening in the ceiling U in this case.

[0085] The casing 3 has the shape of a box in a plan view, in which a substantially octagonal bottom surface having long sides and short sides formed alternately is open, and the casing 3 has a substantially octagonal top plate 31 having long sides and short sides formed alternately and continuously, side plates 32 extending downward from the peripheral edges of the top plate 31, and a bottom plate 33 extending from the peripheral edges of the side plates 32 of the casing to form a flat surface, as shown in FIGS. 2 and 3.

[0086] Formed in the bottom plate 33 are a suction port 34 in the substantial center thereof for drawing in air in the air-conditioned room, and a plurality (four in the present embodiment) of discharge ports 35a to 35d formed so as to enclose the suction port 34, for blowing air from the casing 3 into the air-conditioned room, as shown in FIG. 2. In the present embodiment, the suction port 34 is a substantially rectangular or substantially circular opening. The discharge ports 35a to 35d are substantially rectangular openings extending in long, thin shapes along the peripheral edges of the bottom plate

33. The casing 3 is also provided with a substantially rectangular suction grill 36 which covers the suction port 34 and which is disposed so as to be enclosed by the discharge ports 35a to 35d. Furthermore, a filter 37 for collecting dust in the air drawn in through the suction port 34 is provided on the top side of the suction grill 36 of the suction port 34.

[0087] The dividing cosmetic panel 4 is composed of a plurality (four in the present embodiment) of dividing panels 41 (a first dividing panel 41a, a second dividing panel 41b, a third dividing panel 41c, and a fourth dividing panel 41d) as shown in FIGS. 1, 4, and other drawings. These four panels constitute a substantially rectangular plate shape (flat panel) in a plan view when they are assembled in substantially the same plane, and the panels are provided so as to block off the suction grill 36 of the suction port 34. When the air conditioning apparatus 1 is in a stopped state, the dividing panels converge in the center and cover the suction port 34, as shown in FIG. 6. When the air conditioning apparatus 1 is in an operating state, the dividing panels 41 a to 41 d move so as to expand in a radial manner from the center as shown in FIG. 7, thus opening the suction port 34. An opening/closing moveable mechanism 43 of the dividing cosmetic panel 4 has support members 42a to 42d for supporting the dividing panels 41 a to 41d relative to the casing 3, as shown in FIG. 8. The operation of the opening/closing moveable mechanism 43 causes the support members 42 to move the positions of the dividing panels 41 to open and close the suction port 34.

[0088] Each of the dividing panels 41a to 41d is formed in the shape of a pentagon obtained by cutting away the areas near two of the vertices of a triangle, and the dividing panels are disposed so that each of the remaining vertices comes together in a position corresponding to the center of the suction grill 36. The dividing panels 41a to 41d open and close the suction port 34 by moving radially so as to separate from each other.

[0089] The support members 42 are composed of four members, which are a first support member 42a, a second support member 42b, a third support member 42c, and a fourth support member 42d, each corresponding to one of the dividing panels 41a to 41 d, as shown in FIG. 8. In the stopped state, the support members 42 are positioned inside the casing 3, as shown in FIG. 8(a). In the operating state, having been moved with the dividing panels 41 by the opening/closing moveable mechanism 43, the support members 42 extend downward so as to protrude out of the interior of the casing 3, and extend to predetermined positions to support the dividing panels 41, as shown in FIG. 8(b).

[0090] The opening/closing moveable mechanism 43 is a mechanism for moving the dividing panels 41 relative to the casing 3 as shown in FIG. 8, and is composed of four opening/closing moveable mechanisms 43, which are a first opening/closing moveable mechanism 43a, a second opening/closing moveable mechanism 43b, a third opening/closing moveable mechanism 43c, and a fourth opening/closing moveable mechanism 43d, each corresponding to one of the dividing panels 41a to 41d. The opening/closing moveable mechanism 43 is a mechanism for moving the dividing panels 41a to 41d via the support members 42a to 42d away from each other in a radial manner from the center, whereby the dividing panels 41a to 41d are separated from the suction port 34 and lowered (in the height direction). Thus, by separating the dividing panels 41 from each other and also from the suction port 34 of the casing 3, the airflow resistance in the vicinity of the suction port 34 of the casing 3 is reduced, creating a state in which suction is possible.

[0091] An angle adjustment mechanism 44 is a mechanism for adjusting the angles of inclination of the dividing panels 41a to 41d in relation to the discharge ports 35a to 35d, as shown in FIG. 8. The angle adjustment mechanism 44 is composed of four angle adjustment mechanisms 44, which are a first angle adjustment mechanism 44a, a second angle adjustment mechanism 44b, a third angle adjustment mechanism 44c, and a fourth angle adjustment mechanism 44d, each corresponding to one of the dividing panels 41a to 41d. The angle adjustment mechanisms 44 are provided as one end of each support member 42 for supporting the dividing panels 41a to 41d. The angle adjustment mechanisms 44 can incline the dividing panels 41 in relation to the discharge ports 35 of the casing 3 and adjust the discharge angles by rotating the dividing panels 41 around the lower ends of the support members 42 as fulcra, when the angle adjustment mechanisms 44 are in their positions associated with the operating state of the air conditioning apparatus 1, as shown in FIG. 8. After the opening/closing moveable mechanisms 43 move the support members 42 and also move the dividing panels 4 1 a to 4 1 d, the angle adjustment mechanisms 44 rotate the dividing panels 41 such that the axial directions of the rotation are the longitudinal directions of the connecting portions between the support members 42 and the dividing panels 41.

[0092] A flap 45 has the casing 3 and four flaps, which are a first flap 45a, a second flap 45b, a third flap 45c, and a fourth flap 45d, each corresponding to one of the dividing panels 41a to 41d, as shown in FIG. 8. The flaps 45a to 45d are provided so as to be associated with the dividing panels 41a to 41d, and the flaps 45a to d move as the dividing panels 41 are moved by the opening/closing moveable mechanisms 43 when the air conditioning apparatus 1 transitions from the stopped state to the operating state. Specifically, the flaps 45a to 45d are positioned so as to be accommodated inside the casing 3 when the air conditioning apparatus 1 is in the stopped state, and the flaps 45a to 45d move together with the movement of the dividing panels 41 to be positioned between the dividing panels 41 and the discharge ports 35a to 35d of the casing 3 when the air conditioning apparatus 1 transitions to the operating state. The direction of air flow discharged from the discharge ports 35a to 35d is acutely adjusted by varying the angles in relation to the casing 3, wherein the axial directions are directions sub-

stantially the same as the longitudinal directions of the angle adjustment mechanisms 44 described above.

[0093] The air-blowing fan 5 draws air in the air-conditioned room into the casing 3 through the suction port 34 of the casing 3, and blows the air peripherally outward, as shown in FIGS. 2 and 3. In the present embodiment, a turbofan is used as the air-blowing fan 5, which has a fan motor 51 provided in the substantial center of the top plate 31 of the casing 3, and an impeller 52 linked to and rotatably driven by the fan motor 51. The impeller 52 has a discoid end plate 53 linked to the fan motor 51, a plurality of blades 54 provided in the external periphery of the bottom surface of the end plate 53, and a discoid end ring 55 provided on the undersides of the blades 54 and having an opening in the center. Through the rotation of the blades 54, the air-blowing fan 5 can draw air into the interior of the impeller 52 through the opening in the end ring 55, and can blow the air drawn into the impeller 52 to the external periphery of the impeller 52.

[0094] In the present embodiment, the heat exchanger 6 is a cross-fin tube type heat exchanger panel bent so as to enclose the external periphery of the air-blowing fan 5, as shown in FIGS. 2 and 3, and is connected via a refrigerant tube to an outdoor unit (not shown) installed outside the building or in another such location. The heat exchanger 6 can function as an evaporator for a refrigerant flowing through the interior during a cooling operation, and as a condenser for the refrigerant flowing through the interior during a heating operation. The heat exchanger 6 can thereby perform heat exchange with the air drawn into the casing 3 through the suction port 34 by the air-blowing fan 5 to cool the air during the cooling operation and to heat the air during the heating operation.

[0095] Disposed on the underside of the heat exchanger 6 is a drain pan 7 for receiving drain water produced by condensation of the moisture in the air in the heat exchanger 6, as shown in FIGS. 2 and 3.

[0096] The drain pan 7 is mounted below the casing 3 as shown in FIG. 3. The drain pan 7 has a suction hole 71 formed so as to communicate with the suction port 34 of the casing 3, four discharge holes 72a to 72d formed so as to communicate with the discharge ports 35a to 35d of the casing 3, and a drain water receiving groove 73 formed on the underside of the heat exchanger 6 to receive drain water.

[0097] Disposed in the suction hole 71 is a bell mouth 8 for guiding air drawn in through the suction port 34 to the impeller 52 of the air-blowing fan 5.

[0098] Formed in the casing 3 are a suction flow channel 2a running from the suction port 34, to the air-blowing fan 5 through the suction grill 36, the filter 37, and the bell mouth 8; and discharge flow channels 2b running from the air-blowing fan 5 to the discharge ports 35a to 35d through the heat exchanger 6 and the discharge holes 72a to 72d.

(Action of the air conditioning operation of the air conditioning apparatus)

[0099] Next, the action of the air conditioning operation of the air conditioning apparatus 1 will be described using FIGS. 1 and 2.

[0100] The states of the air conditioning apparatus 1 are classified as two states, which are the stopped state and the operating state as described above.

[0101] In the operating state, the dividing panels 41 a to 41 d, which had been disposed at positions covering the suction port 34 in the stopped state, are moved by the opening/closing moveable mechanisms 43, and the suction port 34 and discharge ports 35a to 35d are opened. When the dividing panels 41a to 41d are disposed at their respective operating state positions, the fan motor 51 is driven and the impeller 52 of the air-blowing fan 5 rotates. Refrigerant is supplied into the heat exchanger 6 from the outdoor unit (not shown) as the fan motor 51 is driven. The heat exchanger 6 herein operates as an evaporator during the cooling operation and as a condenser during the heating operation. The air in the air-conditioned room is drawn in through the suction port 34 into the casing 3 via the suction flow channel 2a along with the rotation of the impeller 52. The air drawn in is blown peripherally outward by the impeller 52 to the heat exchanger 6, cooled or heated in the heat exchanger 6, and then blown out into the air-conditioned room through the discharge ports 35a to 35d via the discharge flow channels 2b. Cooling or heating in the air-conditioned room is performed in this manner.

(Opening/closing action of the opening/closing mechanism for the dividing cosmetic panel)

-Stopped State-

[0102] In the stopped state of the air conditioning apparatus 1, the dividing panels 41a to 41d are disposed at positions covering and blocking off the suction port 34 of the casing 3, as shown in FIGS. 1, 4, and 8(a). In the stopped state, the dividing panels 41a to 41d of the dividing cosmetic panel 4 are positioned at substantially the same height in a plan view, and the entire structures of the four substantially flat dividing panels 41a to 41d are adjusted so as to be positioned at substantially the same height. Therefore, when the air conditioning apparatus is viewed from within the room, the dividing cosmetic panel 4 is primarily visible. Therefore, since the suction port 34 is in an inconspicuous flat state in the stopped state, the design is improved in terms of a user in the room seeing the air conditioning apparatus 1 as having an appealing appearance. The entire surface of the ceiling in the room can thereby be made to have an appealing appearance.

-Operating State-

[0103] In the operating state of the air conditioning apparatus 1, the casing 3 and the first dividing panel 41a, second dividing panel 41b, third dividing panel 41c, and fourth dividing panel 41d of the dividing cosmetic panel 4 are disposed separated from each other, as shown in FIGS. 4, 7, and 8(b). Suction through the suction port 34 into the casing 3 is thereby made possible, and discharge through the discharge ports 35a to 35d is also made possible.

[0104] In the operating state, as well as in the stopped state, the dividing panels 41 a to 4 1 d are kept in a positional relationship of overlapping the discharge ports 35a to 35d in a plan view. The design is thereby improved in terms of the discharge ports 35a to 35d not being visible in a plan view, not only in the stopped state, but also in the operating state.

[0105] In the operating state, the dividing panels 41a to 41d are inclined by the angle adjustment mechanisms 44 in relation to the discharge ports 35a to 35d of the casing 3, and a round flow is achieved in which the discharge direction is adjusted to a direction parallel to the ceiling surface. In cases in which a round flow is achieved in this manner, the air current blown out through the discharge ports 35a to 35d can be prevented from directly reaching a user in the room, and a drafty sensation can be reduced.

[0106] As the dividing panels 41 a to 41d are inclined in relation to the casing 3 and a round flow is achieved via the discharge ports 35a to 35d as shown in FIG. 8(b), the dividing panels 41a to 41d become capable of guiding air so that air is readily drawn into the suction port 34.

-Transition from Stopped State to Operating State-

[0107] The transition from the stopped state to the operating state of the air conditioning apparatus 1 is a transition from the stopped state shown in FIG. 8(a) to the operating state shown in FIG. 8(b), wherein the opening/closing moveable mechanisms 43 move the support members 42a to 42d and the dividing panels 41a to 41d relative to the casing 3. At the same time, the opening/closing moveable mechanisms 43 move the dividing panels 41a to 41d away from each other.

[0108] When the dividing panels 4 1 a to 41 d move, or while the dividing panels 4 1 a to 41 d move, the angle adjustment mechanisms 44 are functioning, whereby the dividing panels 41a to 41 d are inclined in relation to the casing 3 so that in the stopped state, the outward side of the direction in which the dividing panels move is down, and the inward side is up.

[0109] When the dividing panels 41 a to 41 d move into an inclined state, the angles of the flaps 45a to 45d are adjusted in order to control the direction of discharge from the discharge ports 35a to 35d. The flaps 45 located inside the casing 3 in the stopped state become exposed between the dividing panels 41 a to 41d and the casing 3 when the transition is made to the operating state as the dividing panels 41a to 41d are moved by the opening/closing moveable mechanisms 43. The flaps 45 adjust the direction of the air flow from a area between the dividing panels 41 and the casing 3.

(Characteristics of air conditioning apparatus of first embodiment)

(1)

[0110] In conventional practice, the suction port of the air conditioning apparatus installed indoors or in another location is always exposed in order to ensure that air is taken in through the suction port, and is visible to a user in the room.

[0111] With the ceiling-installed air conditioning apparatus 1 of first embodiment, in the stopped state, the dividing panels 41 not only overlap the discharge ports 35a to 35d in a plan view but also cover and block off the suction port 34. Therefore, when viewed from within the room, the dividing cosmetic panel is visible, and the suction port 34 is inconspicuous. The surface of the dividing cosmetic panel 4 has a flat shape, and is disposed in the shape of a substantially flat surface in cases in which the suction port 34 is covered and sealed off in the stopped state. Therefore, the portion visible to a user in the air conditioned space has a smooth shape. Consequently, the outward appearance is appealing, and the design is improved.

[0112] The opening/closing moveable mechanisms 43 move the positions of the peripheral edges of the dividing panels 41a to 41d, thereby switching from a stopped state in which the suction port 34 is blocked off to an operating state in which the suction port 34 is open, and ventilation is ensured. Furthermore, the dividing cosmetic panel 4 is designed so that in the operating state, the distances between the dividing panels 41 and the distances to the discharge ports 35a to 35d are widened by the opening/closing moveable mechanisms 43 in comparison with the stopped state. Therefore, airflow resistance in the peripheries of the suction port 34 and the discharge ports 35a to 35d is reduced, and air suction through the suction port 34 is more effective as is air discharge through the discharge ports 35a to 35d.

[0113] According to the configuration described above, the design when the stopped air conditioning apparatus 1 is viewed from within the room can be improved, and ventilation can be sufficiently ensured in the operating state.

[0114] The dividing cosmetic panel 4 opens the suction port 34 due to the moving of the four divided panels, which are the first through fourth dividing panels 41 a to 41d. Therefore, in cases in which an attempt is made to open the suction port 34 to the same degree with one panel or with four divided panels, the four divided panels need only be moved by a smaller amount than would be the case with one panel. The design is thereby prevented

from losing attractiveness due to the dividing panels 41a to 41 d needing to move in greater amounts, which would compromise the outward appearance, and ventilation can be effectively ensured.

[0115] The opening/closing moveable mechanisms 43 entirely move the dividing panels 41a to 41d including the peripheral edges of the panels, and none of the ends of the dividing panels 41a to 41 d are fixed in relation to the casing 3. Therefore, in the operating state, airflow resistance in the vicinity of the suction port 34 can be efficiently reduced and a satisfactory suctioning state can be achieved.

(2)

[0116] In the ceiling-installed air conditioning apparatus 1 of first embodiment, in the operating state, the dividing cosmetic panel 4 is moved by the opening/closing moveable mechanism 43, whereby the discharge ports 35a to 35d remain covered in a plan view. Therefore, the dividing cosmetic panel 4 obscures the discharge ports 35a to 35d in the operating state. The discharge ports 35a to 35d can thereby be concealed and the design in the operating state can be improved.

(3)

[0117] In the operating state, in which the dividing cosmetic panel 4 of the ceiling-installed air conditioning apparatus 1 of first embodiment has moved to a position opening up the suction port 34 as shown in FIG. 8, the angle of the dividing cosmetic panel 4 in relation to the discharge ports 35a to 35d of the casing 3 is adjusted by the angle adjustment mechanism 44, whereby the flow of air blown out into the room through the discharge ports 35a to 35d can be adjusted. Furthermore, the dividing panels 41a to 41d of the dividing cosmetic panel 4 are provided with respective flaps 45a to 45d, and the orientation of the flow of air through the discharge ports 35a to 35d can also be adjusted by the flaps 45.

[0118] Thereby, not only is the direction of air flowing through the discharge ports 35a to d adjusted by the position of the dividing cosmetic panel 4, but the direction of ventilation can be more acutely adjusted by varying the inclined state of the flaps 45a to 45d. Situations in which the discharged air is blown directly into the ceiling surface can be avoided and the ceiling surface can be prevented from being soiled by acutely adjusting the air-blowing direction by means of the flaps 45a to 45d as shown in FIG 8, even in cases in which the discharged air is made to flow along the ceiling surface by the angle adjustment mechanism 44 to achieve round flow.

(Modification of the air conditioning apparatus of first embodiment)

[0119] An embodiment of the present invention was described above, but the present invention is not limited to this embodiment, and various modifications are possible as long as they do not deviate from the scope of the invention.

(A)

[0120] In the air conditioning apparatus 1 of first embodiment, the dividing cosmetic panel 4 was described as an example of a case in which the panel is composed of four panels, which are the first through fourth dividing panels 41a to 41 d.

[0121] However, the present invention is not limited to this example, and the dividing cosmetic panel 4 may also be composed of two dividing panels, including a first dividing panel 141a and a second dividing panel 141b, as shown in FIG. 9, for example. In this case as well, the suction port 34 is covered and blocked off in the stopped state as shown in FIG. 9(a), and the suction port 34 is opened up in the operating state as shown in FIG. 9(b) to blow air out in the two directions of discharge ports 135a, 135b, thereby ensuring ventilation. The design can thereby be improved and ventilation can be ensured similar to first embodiment.

(B)

[0122] In the air conditioning apparatus 1 of first embodiment, the dividing cosmetic panel 4 has an angle adjustment mechanism 44, and the direction of the flow of air blown out through the discharge ports 35a to 35d can be adjusted.

[0123] However, the present invention is not limited to this example, and another possibility is a configuration in which the dividing cosmetic panel 4 particularly does not have the angle adjustment mechanism 44 referred to in first embodiment, and the angles of the dividing panels 41 in relation to the casing 3 are maintained. In this case, the flat shape in the ceiling can be maintained from the stopped state throughout the operating state, and the design can therefore be improved in this respect.

(C)

[0124] In the air conditioning apparatus 1 of first embodiment, and an example of a configuration was described in which flaps 45 were included which were located inside the casing 3 in the stopped state and which were exposed between the dividing panels 41 and the casing 3 in the operating state.

[0125] However, the present invention is not limited to this example, and another possibility is a configuration in which the flaps 45 referred to in first embodiment are not provided, as shown in FIG. 11. For example, the directions of the flow of discharged air from the discharge ports 35a to 35d may be adjusted by the angle adjustment mechanism 44 alone, as shown in FIG. 11.

[0126] Another additional possibility is to dispose flaps 145a to 145d at positions mostly in contact with the di-

viding panels 41 in the stopped state, and to expose the flaps 145a to 145d between the dividing panels 41 and the casing 3 in the operating state, as shown in FIG. 12. In this case, unlike in first embodiment, the air passing through the discharge ports 35a to 35d also passes between the casing 3 and the flaps 145a to 145d, and the discharge directions can be adjusted by adjusting the degrees of inclination of the flaps 145a to 145d.

(D)

[0127] An example was described of a case in which in the air conditioning apparatus 1 of first embodiment, heat exchange was performed between the drawn in air and the refrigerant merely via the heat exchanger 6 provided in the interior of the casing 3, and the conditioned air was supplied into the room.

[0128] However, the present invention is not limited to this example, and another possibility is a configuration in which there are a plurality of discharge ports 35a to 35d, and temperatures of the refrigerant differ according to the air blown through each of the discharge ports 35a to 35d with which the refrigerant exchanges heat.

[0129] For example, the temperature of the refrigerant flowing through a heat exchanger 6a positioned in proximity to a discharge port 35a may be set low so that the air blown out through the discharge port 35a becomes colder, and the temperature of the refrigerant flowing through a heat exchanger 6c positioned in proximity to another discharge port 35c may be set high so that the air blown out through the other discharge port 35c is warmer than the air blown out through the discharge port 35a, as shown in FIG 13. In this case, when there are a plurality of discharge ports 35a to 35d, the discharge temperature can be adjusted to suit the preference of a user standing in the direction in which air is blown out via the discharge ports 35a to 35d, and air can be supplied at different desired temperatures preferred by a plurality of users.

[0130] Another possibility is a configuration in which the temperature of the flowing refrigerant is adjusted so as to differ in the different positions of the refrigerant tubes of the heat exchanger 6, and a drain water guide 66 is also provided for guiding drain water produced in the periphery of any refrigerant tube to another refrigerant tube having a different refrigerant temperature, as shown in FIGS. 14(a) to (d). The placement of the heat exchanger 6 in this case is not particularly limited, and the drain water guide 66 can have a structure that can guide the produced drain water from the portion where the drain water is produced to the portions having the refrigerant tubes, which can use the drain water for heat recovery.

[0131] For example, in another possibility as shown in FIG. 14(a), a heat exchanger 6e disposed directly above the suction port 34 is also included, heat exchangers 6a to d provided corresponding to the discharge ports 35a to 35d are included, drain water produced from the heat exchanger 6c disposed at an incline inside the casing 3 is recovered by the drain water guide 66 and led to the heat exchanger 6a disposed at an incline inside the casing 3, and heat is recovered in the heat exchanger 6a.

[0132] Other possibility is a configuration in which the above-described heat exchanger 6e is not included as shown in FIG. 14(b), a configuration in which the heat exchangers 6 are not inclined inside the casing 3 as shown in FIG. 14(c), or a configuration in which the heat exchangers 6a, 6c are disposed at a distance from each other within the casing 3 and are connected via the drain water guide 66 as shown in FIG. 14(d). Thus, in cases in which the temperature of the refrigerant flowing through the refrigerant tubes is changed in order to vary the temperature of the air discharged via the discharge ports 35a to 35d of the casing 3, a heat recovery operation can be performed by the drain water guide 66 using the produced drain water, and the heat efficiency of the air conditioning apparatus 1 can be improved.

<Second Embodiment>

[0133] A ceiling-installed air conditioning apparatus 200 according to embodiment 2 of the present invention is described hereinbelow with reference to FIGS. 15 through 17.

[0134] Aspects of the ceiling-installed air conditioning apparatus 200 of embodiment 2 that are shared by the air conditioning apparatus 1 of first embodiment are not described herein.

[0135] The dividing cosmetic panel 4 of the air conditioning apparatus 200 differs most from that of the air conditioning apparatus 1 of first embodiment in being provided with first through fourth dividing panels 241a to 241d disposed below the suction grill 36, and in that the dividing panels 241a to 241d have respective folding opening/closing moveable mechanisms 243a to 243d.

[0136] The folding opening/closing moveable mechanisms 243a to 243d are disposed so that in the substantially same plane, the folding axial directions of the folding opening/closing moveable mechanisms 243 are parallel to each other, as shown in FIG. 15(b) and FIGS. 16(a) to (e) (partial enlarged cross-sectional views of the portions indicated by "P" in FIG 15(a)).

[0137] The folding opening/closing moveable mechanisms 243a to 243d are provided so as to extend longitudinally in proximity to the centers of the dividing panels 241a to 241 d. The folding opening/closing moveable mechanisms 243a to 243d fold the dividing panels 241a to 241 d in a manner in which the longitudinal direction is the axial direction.

[0138] The folding opening/closing moveable mechanisms 243a to 243d function as fixed ends which can rotate relative to the casing 3 but whose positions are fixed. Both ends of each dividing panel 241 a to 241 d function as free ends which can freely slide relative to a panel frame 33 provided with a slide space S, as shown in FIG. 16.

[0139] In the stopped state, the dividing panels 241a

to d are not folded but are housed within the slide space S provided in the panel frame 33, and are disposed in mutual succession along the substantially same plane, thereby covering a suction port 234 as shown in FIGS. 15(a) and 16(a).

[0140] In the operating state, the dividing panels 241a to 241d are folded by the folding opening/closing moveable mechanisms 243a to 243d as shown in FIG. 15(b) and FIGS. 16(b) to (e) (the manner of folding is shown in separate stages in FIGS. 16(b), (c), (d), and (e)). The dividing panels 241a to 241d sustain the state in which the folding opening/closing moveable mechanisms 243a to 243d functioning as fixed ends are supported relative to the casing 3. Both ends of each dividing panel 241a to 241d functioning as free ends slide so as to approach each other within the slide space S, whereby the dividing panels 24 1 a to 241d are folded. At this time, the panel frame 33 and both ends of each dividing panel 241a to 241d are lowered relative to the casing 3. The suction port 234 is opened up in this manner.

[0141] The air drawn in through the suction port 234 is blown out via discharge ports 235a to 235d formed between the casing 3 and the lowered panel frame 33.

(Characteristics of the air conditioning apparatus of embodiment 2)

[0142] In the ceiling-installed air conditioning apparatus 200 of embodiment 2, the dividing cosmetic panel 4 has the folding opening/closing moveable mechanisms 243a to 243d. The folding opening/closing moveable mechanisms 243a to 243d fold the dividing panels 241a to 241d during the transition from the stopped state to the operating state so as to position the panels perpendicular to the suction port 34. The portions disposed so as to interfere with the air flow attempting to pass through the suction port 34 are thereby fewer than with the stopped state.

[0143] The folded portions extending downward from the suction port 34 can also be reduced in length in comparison with a case in which the dividing panels 241a to 241d are vertically established without being folded. The airflow resistance in the periphery of the suction port 34 is thereby reduced, making it easier for air to be drawn in through the periphery.

[0144] The folding opening/closing moveable mechanisms 243a to 243d are provided to each of a divided plurality of dividing panels 241a to 241d, and the dividing panels 241a to 241 d are folded individually. Therefore, the number of airflow resistances can be reduced in comparison with a case in which one dividing panel is folded into two parts.

[0145] Furthermore, the folded portions extending downward from the suction port 34 can be further reduced in length by folding not one but each of the plurality of dividing panels 241 a to 241 d, and the airflow resistance in the periphery of the suction port 34 is further reduced, making it even easier for air to be drawn in through the periphery.

[0146] The transition from the stopped state to the operating state thereby requires less action from the dividing panels 241a to 241d, which protrude downward from the suction port 34 to a lesser degree, and the design is improved.

(Modifications of the air conditioning apparatus of embodiment 2)

[0147] An embodiment of the present invention was described above, but the present invention is not limited to this embodiment, and various modifications are possible as long as they do not deviate from the scope of the invention.

(A)

[0148] A case was described as an example in which in the air conditioning apparatus 200 of second embodiment, the folding opening/closing moveable mechanisms 243a to 243d function as fixed ends relative to the casing 3, and both ends of each dividing panel 241a to 241d function as free ends which slide relative to the slide space S of the panel frame 33.

[0149] However, the present invention is not limited to this example, and the same effects are obtained with a configuration such as the one shown in FIG. 17, for example. Specifically, the configuration may be designed so that the folding opening/closing moveable mechanisms 243a to 243d function as fixed ends relative to the panel frame 33, and both ends of each dividing panel 24 1 a to 241 d function as free ends which slide relative to a slide space S provided in the casing 3, as shown in FIGS. 17(a) to (e).

(B)

[0150] A case was described as an example in which in the air conditioning apparatus 200 of second embodiment, the panel frame 33 in the operating state lowers while sliding relative to the dividing panels 241a to 241d.

[0151] However, the present invention is not limited to this example, and another possibility is a configuration in which a panel frame 33 is not provided, as shown in FIG 18, for example.

[0152] The configuration may be designed so that the ends of the dividing panels 241 a to 241d each having respective folding opening/closing moveable mechanisms 243a to 243d slide relative to a slide space S provided in the casing 3, and the folding opening/closing moveable mechanisms 243a to 243d are lowered, thereby opening up the suction port 34 as shown in FIG. 18(a).

[0153] Another possibility is a configuration in which the dividing panels 241a to 241d each have respective folding opening/closing moveable mechanisms 243a to 243d, and the folding opening/closing moveable mechanisms 243a to 243d remain supported relative to sup-

port members 247a to 247d provided in the casing 3, in which the dividing panels 241a to 241d are folded, thereby opening up the suction port 34 as shown in FIG. 18(b).

<Third Embodiment>

[0154] A ceiling-installed air conditioning apparatus 300 according to a third embodiment of the present invention is described hereinbelow with reference to FIGS. 19 and 20.

[0155] Aspects of the ceiling-installed air conditioning apparatus 300 of third embodiment that are shared by the air conditioning apparatus 1 of first embodiment are not described herein.

[0156] The dividing cosmetic panel 4 of the air conditioning apparatus 300 differs most from the air conditioning apparatuses 1, 200 of the first and second embodiments in being provided with first through fourth dividing panels 341a to 341f disposed below the suction grill 36, and also in that the dividing panels 341a to 341f have respective sliding opening/closing moveable mechanisms 343a to 343f.

[0157] The sliding opening/closing moveable mechanisms 343a to 343f are mechanisms associated with the end portions of the dividing panels 341 a to 341f, the mechanisms having mechanisms which function as fixed ends for rotatably supporting one set of end portions of the dividing panels 341a to 341f relative to the casing 3, and mechanisms which function as free ends for sliding the other set of end portions of the dividing panels 341a to 341f relative to a slide space S provided in the panel frame 33, as shown in FIGS. 19(a) and (b), and FIG 20.

[0158] The sliding opening/closing moveable mechanisms 343a to 343f are disposed so as to share the same primary sliding direction (a horizontal sliding direction). The dividing panels 341 a to 341 c are disposed so that their ends on the left sides of the drawings slide, and the dividing panels 341d to 341f are disposed so that their ends on the right sides of the drawings slide, as shown in FIGS. 19 and 20.

[0159] In the stopped state, the dividing panels 341a to 341f do not slide but are accommodated within a slide space S provided in the panel frame 33, and are disposed in mutual succession along the substantially same plane, thereby covering a suction port 334 as shown in FIG 19 (a).

[0160] In the operating state, one set of ends of the dividing panels 341a to 341f slide relative to the slide space S provided to the panel frame 33 due to the functioning of the sliding opening/closing moveable mechanisms 343a to 343f, so that the dividing panels 341a to 341 f come to have a perpendicular positional relationship with respect to the suction port 334, as shown in FIGS. 19(b) and 20. At this time, the panel frame 33 and both sets of ends of the dividing panels 341a to 341f are lowered relative to the casing 3. The suction port 334 is opened up in this manner.

[0161] The air drawn in through the suction port 334 is blown out via discharge ports 335a to 335d formed between the casing 3 and the lowered panel frame 33.

(Characteristics of the air conditioning apparatus of third embodiment)

[0162] In the ceiling-installed air conditioning apparatus 300 of third embodiment, in the operating state, the positions of the dividing panels 341a to 341f are changed by the functioning of the sliding opening/closing moveable mechanisms 343a to 343f so as to face in a direction substantially perpendicular to the suction port 334. Therefore, in comparison with the stopped state, there are fewer portions of the dividing panels 341a to 341f disposed so as to interfere with air flows attempting to pass through the suction port 334.

[0163] The sliding opening/closing moveable mechanisms 343a to 343f also function at the respective ends of the divided plurality of dividing panels 341 a to 341 f and individually slide the respective dividing panels 341a to 341 f. Therefore, since the plurality of dividing panels 341a to 341f are slid to open up the suction port 334, airflow resistance can be reduced in comparison with a case in which one dividing panel is slid to open up the suction port 334.

[0164] Furthermore, the slid portions extending downward from the suction port 334 can be further reduced in length by individually sliding not one but each of the plurality of dividing panels 341a to f, and the airflow resistance in the periphery of the suction port 334 is further reduced, making it even easier for air to be drawn in through the periphery.

[0165] The transition from the stopped state to the operating state thereby requires less action from the dividing panels 341a to 341f, which protrude downward from the suction port 334 to a lesser degree, and the design is improved.

[0166] The dividing panels 341a, 341b, and 341c are disposed parallel to each other, and apart from these panels, the dividing panels 341d, 341e, and 341f are disposed parallel to each other. The panels are opened and closed by the sliding opening/closing moveable mechanisms 343a to 343f while remaining parallel to each other, whereby a state of reduced airflow resistance in the suction port 334 can be achieved even while the opening or closing action is taking place.

(Modifications of the air conditioning apparatus of third embodiment)

[0167] An embodiment of the present invention was described above, but the present invention is not limited to this embodiment, and various modifications are possible as long as they do not deviate from the scope of the invention.

(A)

[0168] A case was described as an example in which in the air conditioning apparatus 300 of third embodiment, the panel frame 33 lowers while sliding in relation to the dividing panels 34 1 a to 341f during the operating state.

[0169] However, the present invention is not limited to this example, and another possibility is a configuration in which a panel frame 33 is not provided as shown in FIG. 21(a), for example.

(B)

[0170] The dividing panels 341a to 341f having the sliding opening/closing moveable mechanisms 343a to 343f which are provided in the slide space S provided in the panel frame 33, as shown in FIG. 21(b) need not have portions which function as fixed ends.

(C)

[0171] The sliding opening/closing moveable mechanisms 343a to 343f of the dividing panels 341a to 341f may also be configured so that one end of each functions as a fixed end in the panel frame 33, and the other end functions as a free end in the slide space S provided in the casing 3, as shown in FIG. 21(c).

(D)

[0172] The sliding opening/closing moveable mechanisms 343a to 343f of the dividing panels 341a to 341 f may be configured so that one set of ends function as fixed ends in the casing 3 while the other set of ends function as free ends in a slide space S provided in the panel frame 33, and the dividing panels 341 a to 341f need not be disposed so as to be parallel to each other, as shown in FIG. 21(d).

<Other Embodiments>

[0173] An embodiment of the present invention was described above, but the present invention is not limited to this embodiment, and various modifications are possible as long as they do not deviate from the scope of the invention.

(A)

[0174] The present invention is not limited to the ceiling-installed air conditioning apparatuses 1, 200, 300 in the first through third embodiments described above, and may also be a ceiling-installed air conditioning apparatus 400 such as the one shown in FIG 22, for example. Aspects of the ceiling-installed air conditioning apparatus 400 that are shared by the air conditioning apparatus 1 of first embodiment are not described herein.

[0175] The dividing cosmetic panel 4 of the air conditioning apparatus 400 has first through fourth dividing panels 441 a to 441d as shown in FIG. 22. The dividing panels 441 a to 441d have respective rotating opening/closing moveable mechanisms 444a to 444d, whose rotating states are adjusted so as to differ between the stopped state and the operating state of the air conditioning apparatus 400.

[0176] The air conditioning apparatus 400 is designed so that in the stopped state, the first through fourth dividing panels 441a to 441d are disposed in a substantially planar manner in a plan view so as to run along the bottom surface of the casing 3 in the peripheral edge of the casing 3, which is disposed on the ceiling surface, as shown in FIG. 22(a).

[0177] The air conditioning apparatus 400 is also designed so that in the operating state, the first through fourth dividing panels 441a to 441d are rotated by the respective rotating opening/closing moveable mechanisms 444a to 444d, exposing respective suction ports 434a to 434d in the inner side of the bottom surface of the casing 3. At the same time, respective discharge ports 435a to 435d are exposed in the outer side of the bottom surface of the casing 3.

[0178] In the operating state, the air-blowing fan 5 is driven, whereby the indoor air that has been drawn into the casing 3 via the suction ports 434a to 434d passes through the suction grill 36, dust is removed by the filter 37, the temperature is adjusted by heat exchange with the refrigerant flowing through the heat exchanger 6, and the air is blown out into the room via the discharge ports 435a to 435d.

[0179] Thus, in the air conditioning apparatus 400 as well, the exposure of the suction ports 434a to 434d and the discharge ports 435a to 435d is ensured merely by rotating the dividing panels 441a to 441d by the rotating opening/closing moveable mechanisms 444a to 444d, and ventilation for air conditioning can therefore easily be ensured while creating an appealing appearance in the ceiling surface and improving the design, similar to the air conditioning apparatus 1, 200, 300 of the first through third embodiments described above.

(B)

[0180] The present invention may also be a ceiling-installed air conditioning apparatus 500 such as the one shown in FIGS. 23 and 24. Aspects of the ceiling-installed air conditioning apparatus 500 that are shared by the air conditioning apparatus 1 of first embodiment are not described herein.

[0181] In a fitted cosmetic panel 504 of the air conditioning apparatus 500, the casing 3 is provided with blocking members 39a to 39f for partially blocking ventilation through a suction port 534, as shown in FIG 23. The blocking members 39a to 39f are members extending in parallel to each other so as to partially block off ventilation through the suction port 534, as shown in FIG. 23 (the blocking members extend in the depth direction of the

paper surface in FIG 23). Since the blocking members 39a to 39f are provided to the suction port 534, during operation, indoor air bypasses the blocking members 39a to 39f and passes through suction ports 534a to 534e to be taken into the casing 3. The fitted cosmetic panel 504 is provided with blocking corresponding openings 49a to 49f which correspond to the blocking members 39a to 39f of the casing 3, and a plurality of fitting members 541a to 541e extending in parallel to each other so as to correspond to the ventilation portions of the suction ports 534a to 534e are provided between the blocking corresponding openings 49a to 49f, as shown in FIG. 23.

[0182] When the air conditioning apparatus 500 is in the stopped state, the fitting members 541a to 541e of the fitted cosmetic panel 504 are each fitted with the blocking members 39a to 39f of the casing 3, blocking off ventilation, and a substantially flat surface is configured by the lower end surfaces of the fitting members 541a to 541e and the lower end surfaces of the blocking members 39a to 39f, as shown in FIG. 24(a). The bottom surface of the air conditioning apparatus 500 thereby has an appealing appearance during the stopped state when the ceiling surface is viewed from within the room. When the air conditioning apparatus 500 is in the operating state, the fitting members 541a to 541e of the fitted cosmetic panel 504 are lowered relative to the casing 3 by the operation of the opening/closing moveable mechanism 543, as shown in FIG 24(b). In the operating state, the driving of the air-blowing fan 5 thereby causes indoor air to pass through the blocking corresponding openings 49a to 49f, to further pass through the suction ports 534a to 534e, and to be taken into the casing 3, as shown in FIG. 24(b). Air thus taken in passes through the suction grill 36, dust is removed by the filter 37, the temperature is adjusted by heat exchange with the refrigerant flowing through the heat exchanger 6, and the air is blown back out into the room via discharge ports 535a to 535d.

[0183] Thus, with the air conditioning apparatus 500 as well, the ceiling surface has an appealing appearance and the design is improved, similar to the air conditioning apparatuses 1, 200, 300 of the first through third embodiments described above. During the operating state, indoor air is not taken in via a horizontal gap formed by a distance separating the fitted cosmetic panel 4 from the casing 3, but rather via a flow channel formed from a misalignment in the positional relationship between the positions of the suction ports 534a to 534e and the positions of the blocking corresponding openings 49a to 49f when the apparatus transitions from the stopped state to the operating state. To ensure that indoor air is taken into the casing 3, it is thereby sufficient if a misalignment can be ensured in the positional relationship between the positions of the suction ports 534a to 534e and the positions of the blocking corresponding openings 49a to 49f, and the fitted cosmetic panel 504 does not need to be separated from the casing 3 any more than is necessary. The fitted cosmetic panel 504 thereby only needs to be lowered by a small extent in the operating state, and ventilation can be easily ensured. Since the fitted cosmetic panel 504 is lowered by a small extent, it is possible to prevent a person in the room from feeling that the ceiling has lowered or otherwise feeling confined as a result of the fitted cosmetic panel 504 descending from the ceiling, and the design can be improved from this respect as well.

INDUSTRIAL APPLICABILITY

[0184] According to the present invention, since ventilation can be ensured while the design is improved, it is particularly useful to apply the present invention to an air conditioning apparatus which is disposed in a position easily visible to a user and in which design is a factor.

Claims

1. An air conditioning apparatus (1) disposed above a space to be air conditioned, the air conditioning apparatus (1) comprising:

a casing (3) having a first ventilation port (34), and second ventilation port (35a to 35d) through which air passing through the first ventilation port (34) passes; and
a panel component (4) having a panel (41) including at least two panels, which are a first panel (41a, 41b, 41c, 41 d) and a second panel (41a, 41b, 41c, 41 d), and a moveable mechanism (43) for varying the relative position of the first ventilation port (34) and the panel (41); wherein the moveable mechanism (43) switches between a first state in which air flow through the first ventilation port (34) is blocked by having one end of the first panel and one end of the second panel positioned in proximity to each other, and a second state in which the one end of the first panel and the one end of the second panel move away from each other to positions different from the first state and air flow through at least part of the first ventilation port (34) is allowed.

2. The air conditioning apparatus (1) as recited in Claim 1, wherein
in the first state, a surface of the first panel and a surface of the second panel are disposed in proximity to a surface of the first ventilation port; and
in the second state, the surface of the first panel and the surface of the second panel are disposed at positions farther from the surface of the first ventilation port than in the first state.

3. An air conditioning apparatus (1) disposed above a space to be air conditioned, the air conditioning apparatus (1) comprising:

a casing (3) having a first ventilation port (34), and second ventilation port (35a to 35d) through which air passing through the first ventilation port (34) passes; and
a panel component (4) having at least two panels, which are a first panel (41a, 41b, 41 c, 41 d) that turns around a first rotating shaft on an end and a second panel (41 a, 41 b, 41 c, 41d) that turns around a second rotating shaft on an end, and a moveable mechanism (43) for varying the relative positions of the first ventilation port (34) and the panel (41); wherein
the moveable mechanism (43) switches between a first state in which a surface of the first panel and a surface of the second panel are oriented in substantially the same direction as the primary ventilation direction in the first ventilation port, and air flow through the first ventilation port (34) is blocked due to the surface of the first panel and the surface of the second panel being positioned in substantially the same plane; and
a second state in which the first panel whose axis is the first rotating shaft and the second panel whose axis is the second rotating shaft both turn, whereby air flow through at least part of the first ventilation port (34) is allowed due to the orientation of the surface of the first panel and the orientation of the surface of the second panel being positioned so as to overlap each other when viewed from a direction substantially perpendicular to the primary ventilation direction in the first ventilation port.

4. The air conditioning apparatus (1) as recited in Claim 3, wherein
the panel component (4) further has a panel frame (33) in which a panel slide space (S) is provided and in which air flow through the first ventilation port (34) is blocked with the first panel and the second panel in the first state;
the casing (3) further has a casing support part (38) for supporting the panel frame (33);
the first panel further has a first sliding end which is an end on an opposite side of the first rotating shaft and which slides relative to the panel slide space (S);
the first rotating shaft is rotatably supported relative to the casing support part (38);
the second panel further has a second sliding end which is an end on an opposite side of the second rotating shaft and which slides relative to the panel slide space (S); and
the second rotating shaft is rotatably supported relative to the casing support part (38).

5. The air conditioning apparatus (1) as recited in Claim 3, wherein
the panel component (4) further has a panel support part (48) for supporting the casing, and a panel frame (33) for blocking air flow through the first ventilation port (34) with the first panel and second panel;
the casing (3) further has a casing slide space (S);
the first panel further has a first sliding end which is an end on an opposite side of the first rotating shaft and which slides relative to the casing slide space (S);
the first rotating shaft is rotatably supported relative to the panel support part (48);
the second panel further has a second sliding end which is an end on an opposite side of the second rotating shaft and which slides relative to the casing slide space (S); and
the second rotating shaft is rotatably supported relative to the panel support part (48).

6. An air conditioning apparatus (1) disposed above a space to be air conditioned, comprising:

a casing (3) having a first ventilation port (34), and second ventilation port (35a to 35d) through which the air passing through the first ventilation port (34) passes; and
a panel component (4) having a first panel (41 a, 41b, 4 1 c, 41 d), a second panel (41 a, 41b, 41c, 41d) disposed so that one end thereof constitutes a first common rotating shaft shared by one end of the first panel, and a moveable mechanism (43) for varying the relative position of the first ventilation port (34) and the panel (41); wherein
the moveable mechanism (43) switches between a first state in which a surface of the first panel and a surface of the second panel are oriented in substantially the same direction as the primary ventilation direction in the first ventilation port, and air flow through the first ventilation port (34) is blocked due to the surface of the first panel and the surface of the second panel being positioned on substantially the same plane; and
a second state in which the first panel and second panel both turn around the first common rotating shaft, and air flow through at least part of the first ventilation port (34) is allowed due to the orientation of the surface of the first panel and the orientation of the surface of the second panel being positioned so as to overlap each other when viewed from a direction substantially perpendicular to the primary ventilation direction in the first ventilation port.

7. The air conditioning apparatus (1) as recited in Claim 6, wherein
the panel component (4) further has a third panel, and a fourth panel disposed so that one end thereof constitutes a second common rotating shaft shared by an end of the third panel; and
the moveable mechanism (43) is such that, in the

first state, the surface of the first panel, the surface of the second panel, the surface of the third panel, and the surface of the fourth panel are oriented in substantially the same direction as the primary ventilation direction in the first ventilation port, and air flow through the first ventilation port (34) is blocked due to the surface of the first panel, the surface of the second panel, the surface of the third panel, and the surface of the fourth panel being positioned in substantially the same plane; and, in the second state, the first panel and second panel assume a substantially overlapping state as a result of both rotating around the first common rotating shaft, while the third panel and fourth panel assume a substantially overlapping state as a result of both rotating around the second common rotating shaft.

8. The air conditioning apparatus (1) as recited in Claim 6, wherein
the panel component (4) further has a panel frame (33) in which a panel slide space (S) is provided and in which air flow through the first ventilation port (34) is blocked with the first panel and the second panel in the first state;
the casing (3) further has a casing support part (38) for supporting the panel frame (33);
the first panel further has a first sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the panel slide space (S);
the second panel further has a second sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the panel slide space (S); and
the common rotating shaft is rotatably supported relative to the panel support part (48).

9. The air conditioning apparatus (1) as recited in Claim 6, wherein
the panel component (4) further has a panel support part (48) for supporting the casing, and a panel frame (33) for blocking air flow through the first ventilation port (34) with the first panel and second panel;
the casing (3) has a casing slide space (S);
the first panel further has a first sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the casing slide space (S);
the second panel further has a second sliding end which is an end on an opposite side of the common rotating shaft and which slides relative to the casing slide space (S); and
the common rotating shaft is rotatably supported relative to the panel support part (48).

10. An air conditioning apparatus (1) disposed above a space to be air conditioned, the air conditioning apparatus (1) comprising:
a casing (3) having first ventilation port (534, 534a to 534e), blocking part (39, 39a to 39f) provided to the first ventilation port (534) and partially blocking ventilation, and second ventilation port (535a to 535d) through which air passing through the first ventilation port (534a to 534e) passes; and
a panel component (4) having panel (541, 541 a to 541e) whose shapes correspond to the first ventilation port (534a to 534e), blocking corresponding opening (49, 49a to 49f) whose shapes correspond to the blocking part, and a moveable mechanism (543) for varying the relative position of the first ventilation port (534a to 534e) and the panel (541a to 541e); wherein
the moveable mechanism (543) switches between a first state in which peripheral edge of the panel (541 a to 541e) are disposed so as to correspond with peripheral edge of the first ventilation port (534a to 534e), peripheral edge of the blocking corresponding opening (49a to 49f) are disposed so as to correspond with peripheral edge of the blocking part (39a to 39f), and air flow through the first ventilation port (534a to 534e) is blocked; and a second state in which a positional relationship between the peripheral edge of the panel (541a to 541e) and the peripheral edge of the first ventilation port (534a to 534e) as well as a positional relationship between the peripheral edge of the blocking corresponding opening (49a to 49f) and the peripheral edge of the blocking part (39a to 39f) are different than in the first state, whereby air flow is allowed through at least part of the first ventilation port (534a
to 534e).

11. The air conditioning apparatus (1) as recited in any of Claims 1 through 10, wherein
the first ventilation port (34) functions as a suction port leading into the casing (3); and
the second ventilation ports (35a to 35d) function as discharge ports leading out of the casing (3).

12. The air conditioning apparatus (1) as recited in any of Claims 1 through 11, wherein
the moveable mechanism (43) moves the panel (41) and the casing (3) away from each other in the second state, and widens the second ventilation port.

13. The air conditioning apparatus (1) as recited in Claim 12, wherein
the moveable mechanism (43) disposes the panel (41) in the second state at a position where the second ventilation port (35a to 35d) are covered in a plan view.

14. The air conditioning apparatus (1) as recited in Claim

12 or 13, further comprising:

an angle adjustment mechanism (44) for varying the angle of inclination of the panel (41) in relation to the casing (3), the panel (41) being in proximity to the second ventilation port (35a to 35d) in the second state.

15. The air conditioning apparatus (1) as recited in any of Claims 12 through 14, further comprising:

a flap (45) for adjusting the orientation of air flow passing through the second ventilation port (35a to 35d), the flap (45) being positioned between the casing (3) and the panel (41) in the second state.

16. The air conditioning apparatus (1) as recited in any of Claims 1 through 15, wherein
the panel (41) has a surface formed in a substantially flat shape, and covers the first ventilation port (34) in a substantially planar shape in the first state.

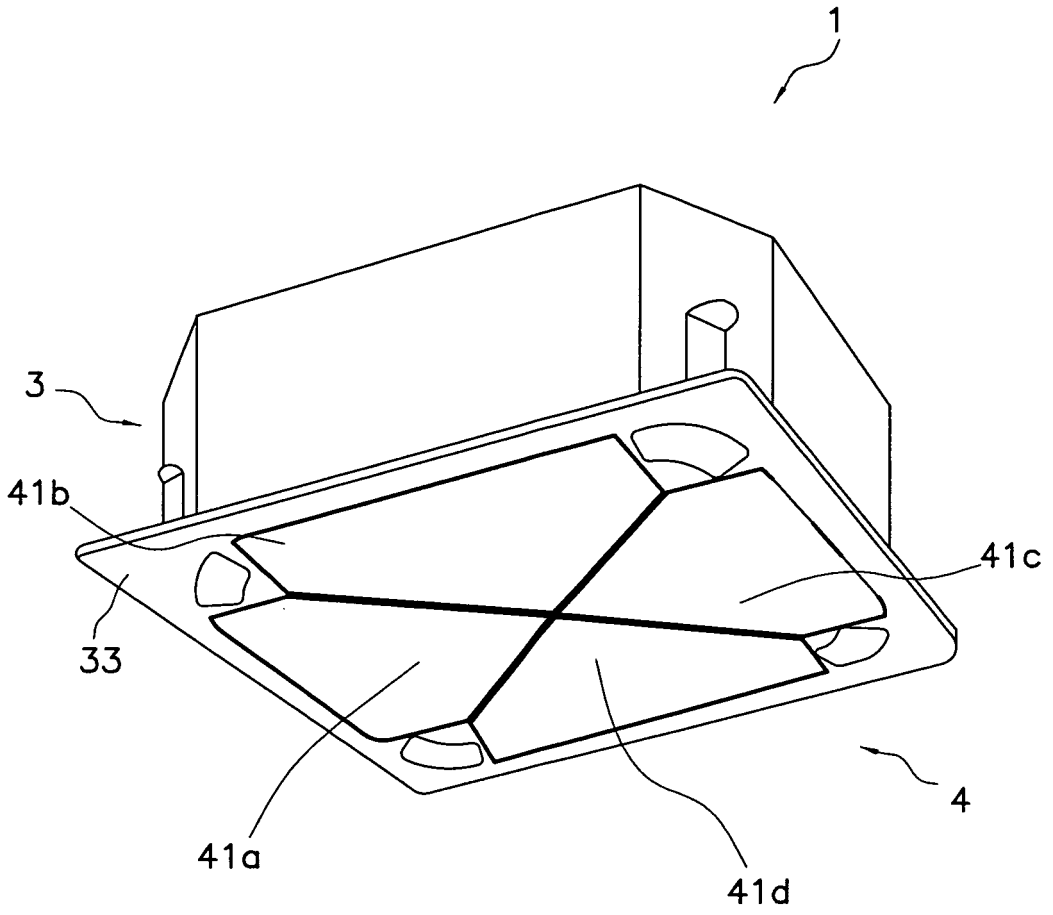


FIG. 1

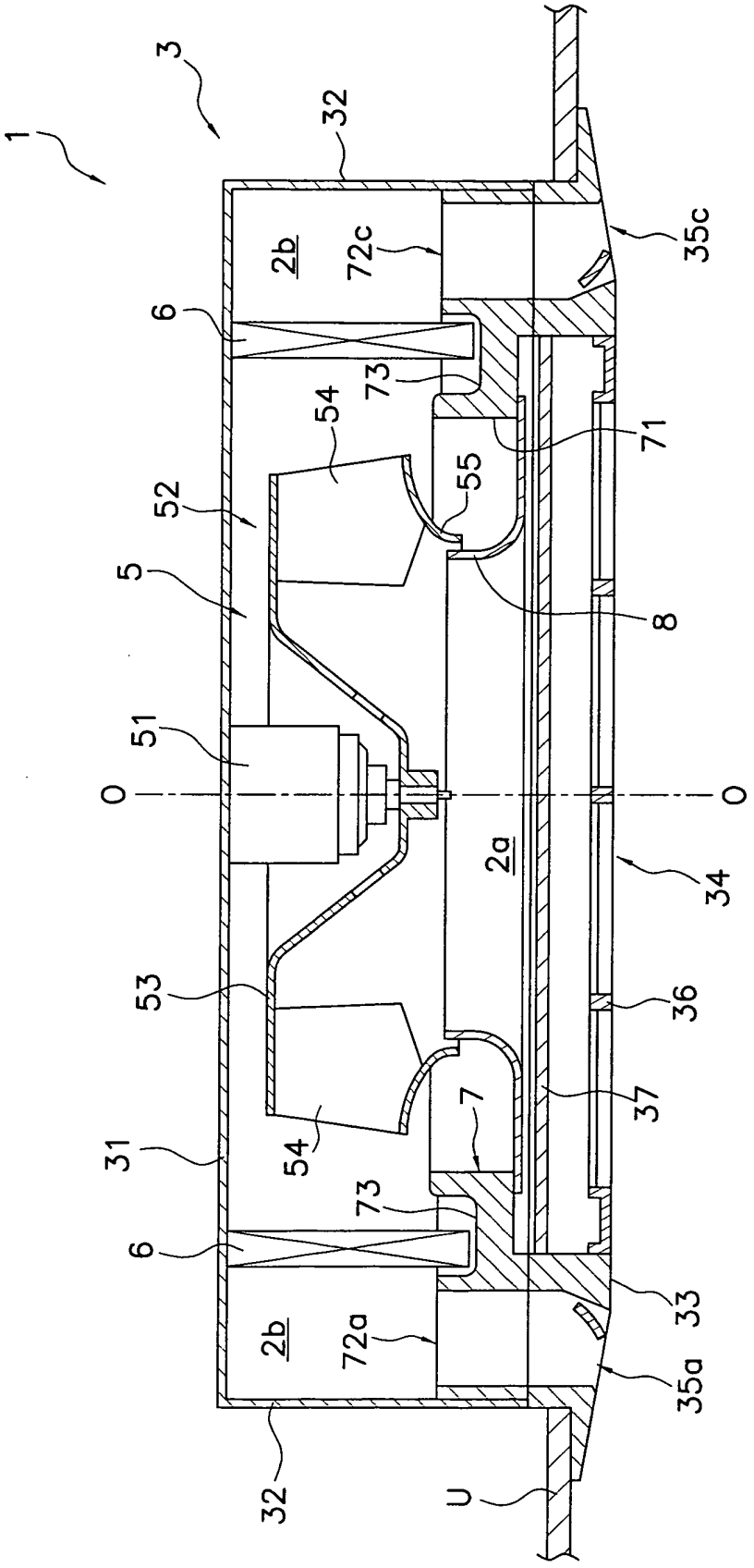

1
3
32
2b
72c
35c
6
73
54
71
52
55
5
8
51
O
O
2a
34
53
36
37
7
31
54
73
6
33
2b
72a
35a
32
U

FIG. 2

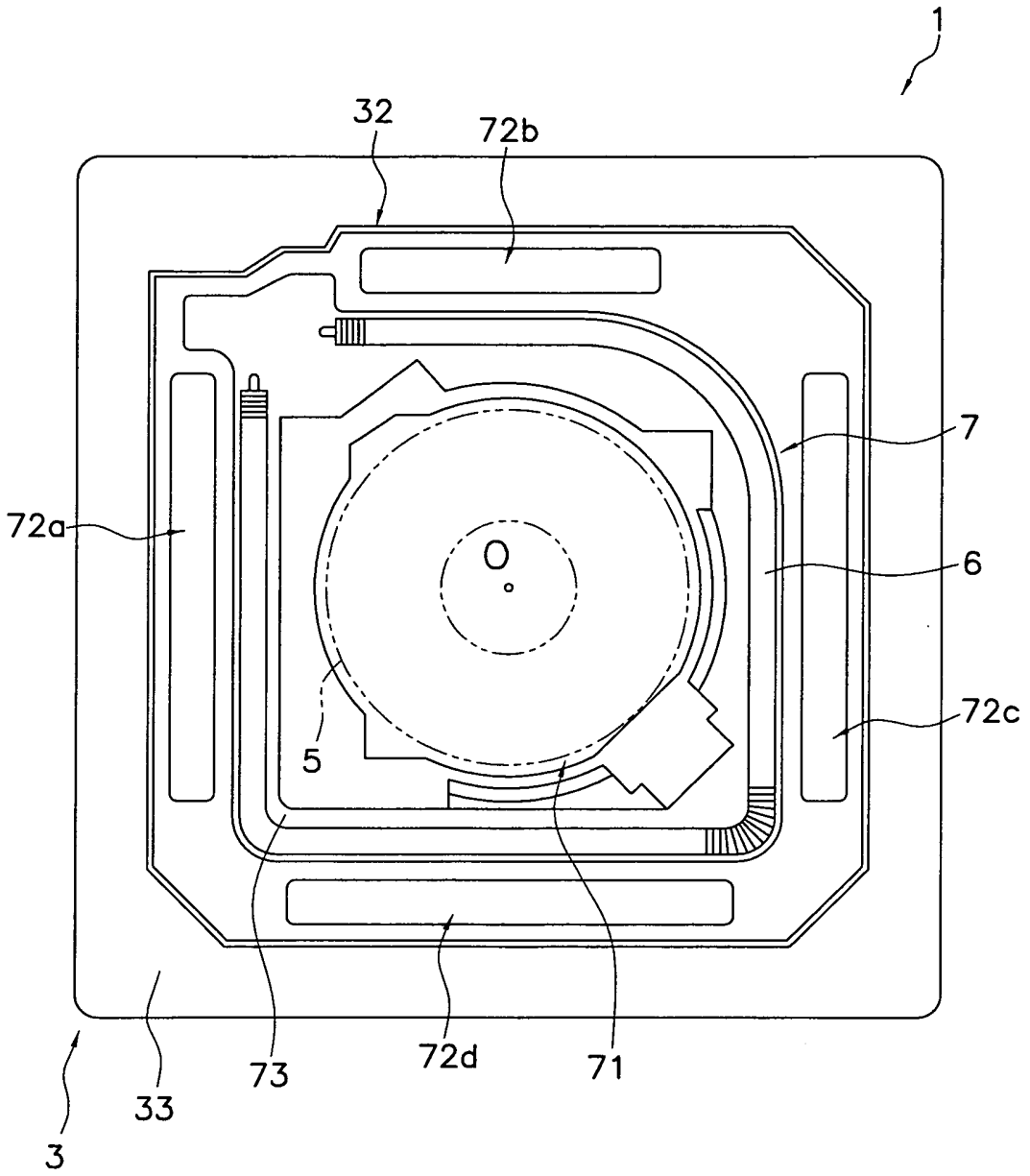
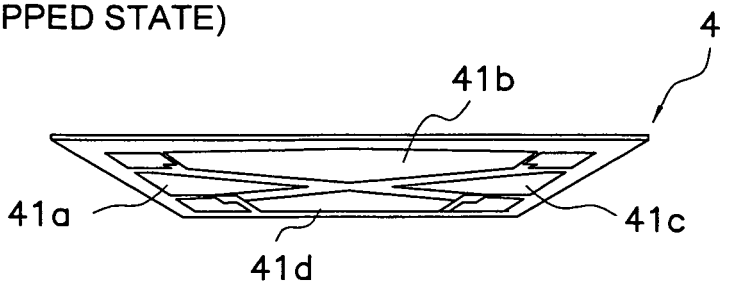


FIG. 3

(a)

(STOPPED STATE)



(b)

(OPERATING STATE)

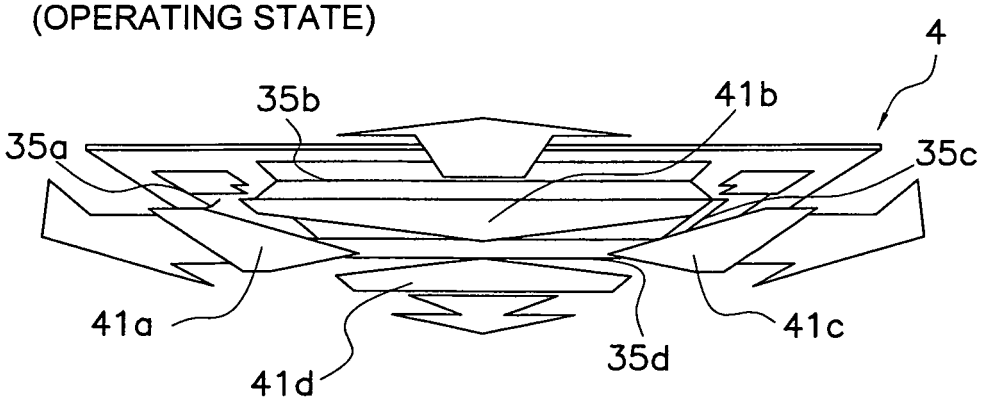


FIG. 4

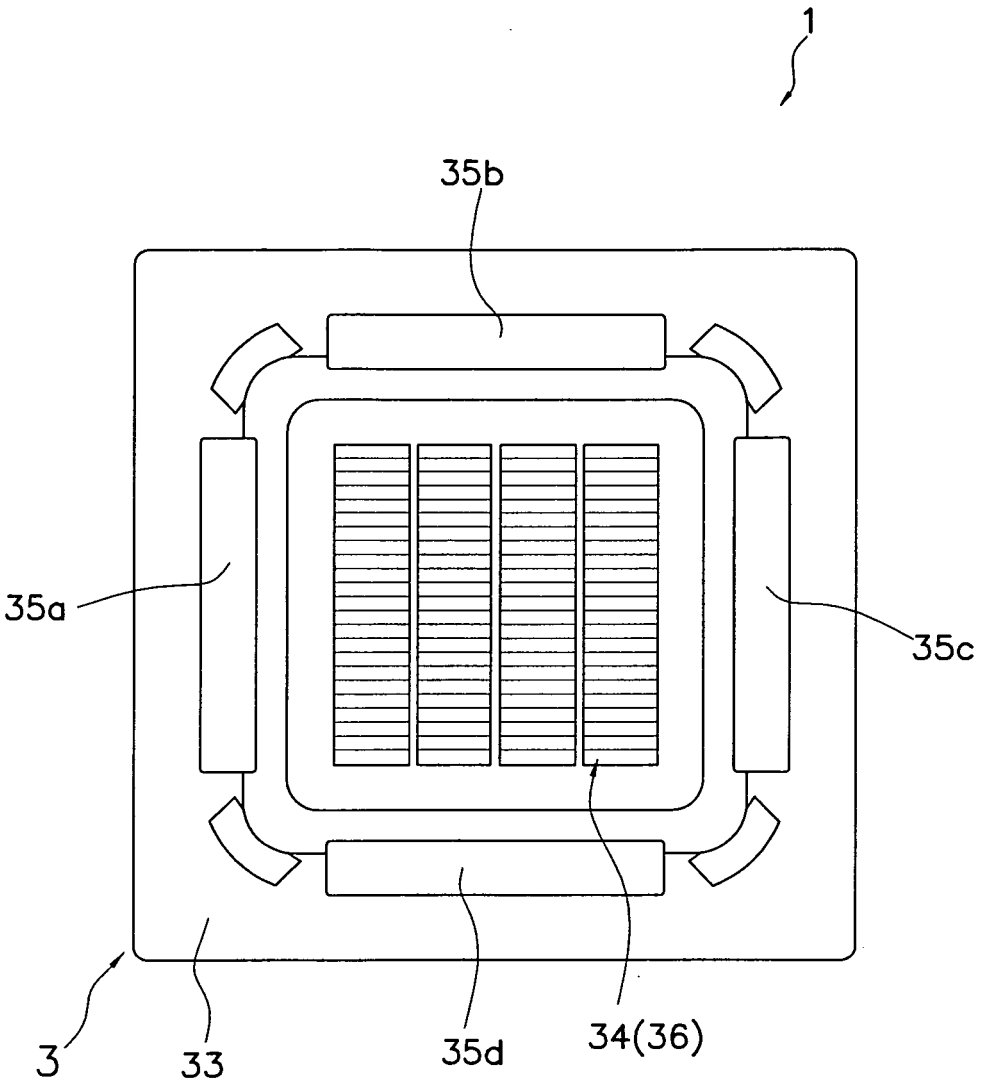


FIG. 5

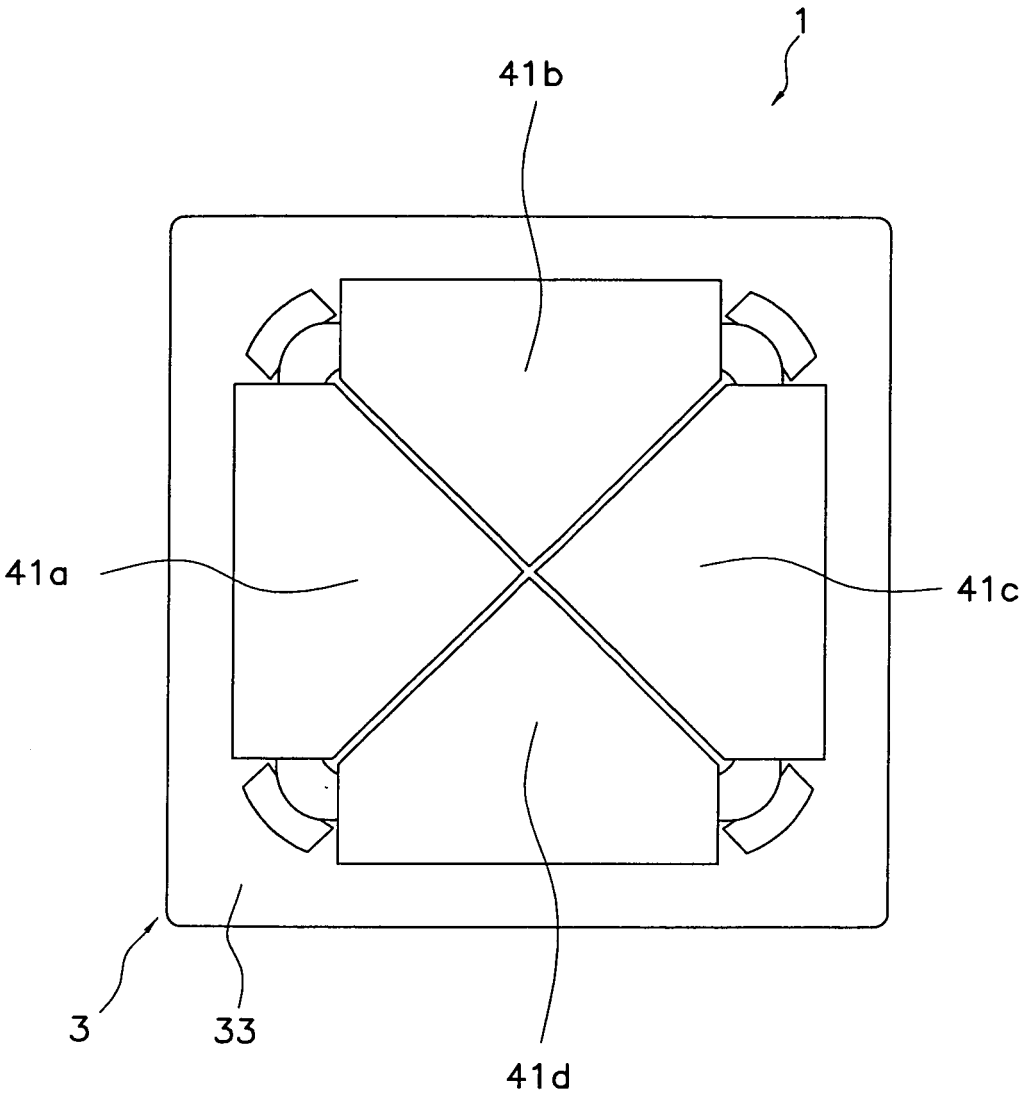


FIG. 6

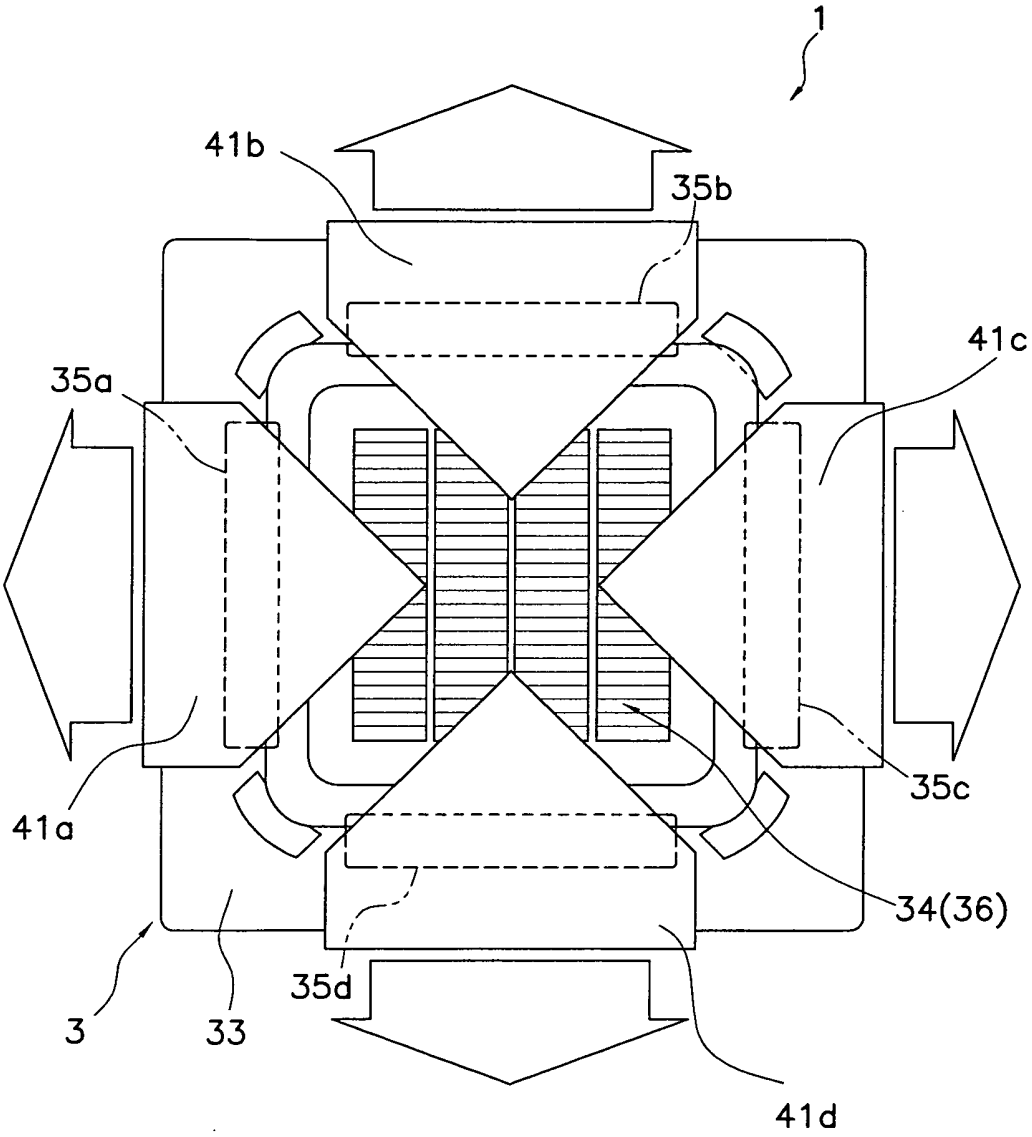
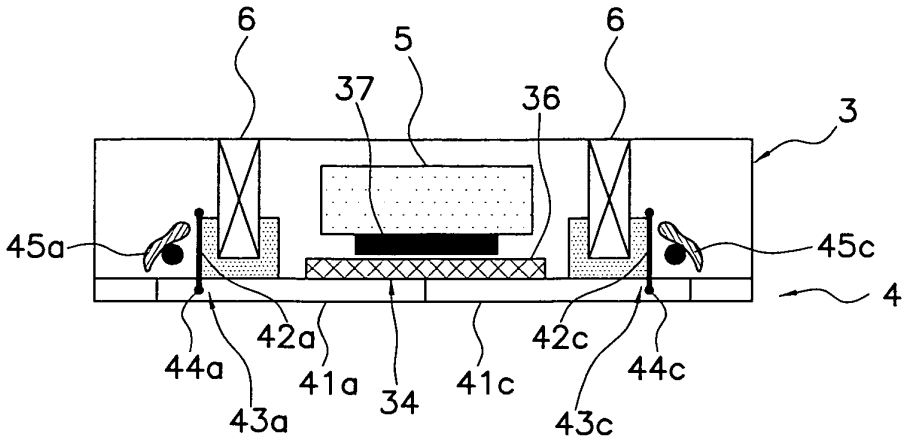


FIG. 7

(a)

(STOPPED STATE)



(b)

(OPERATING STATE)

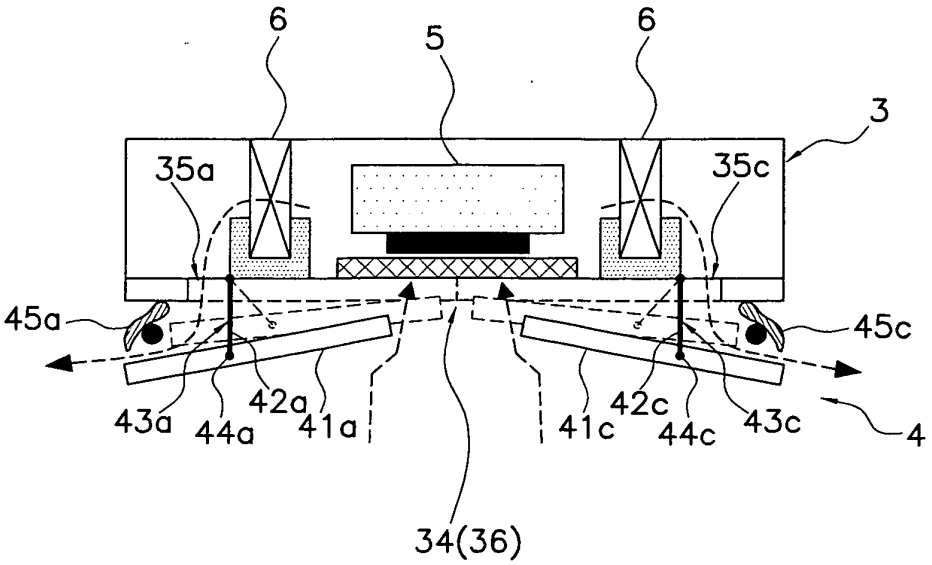


FIG. 8

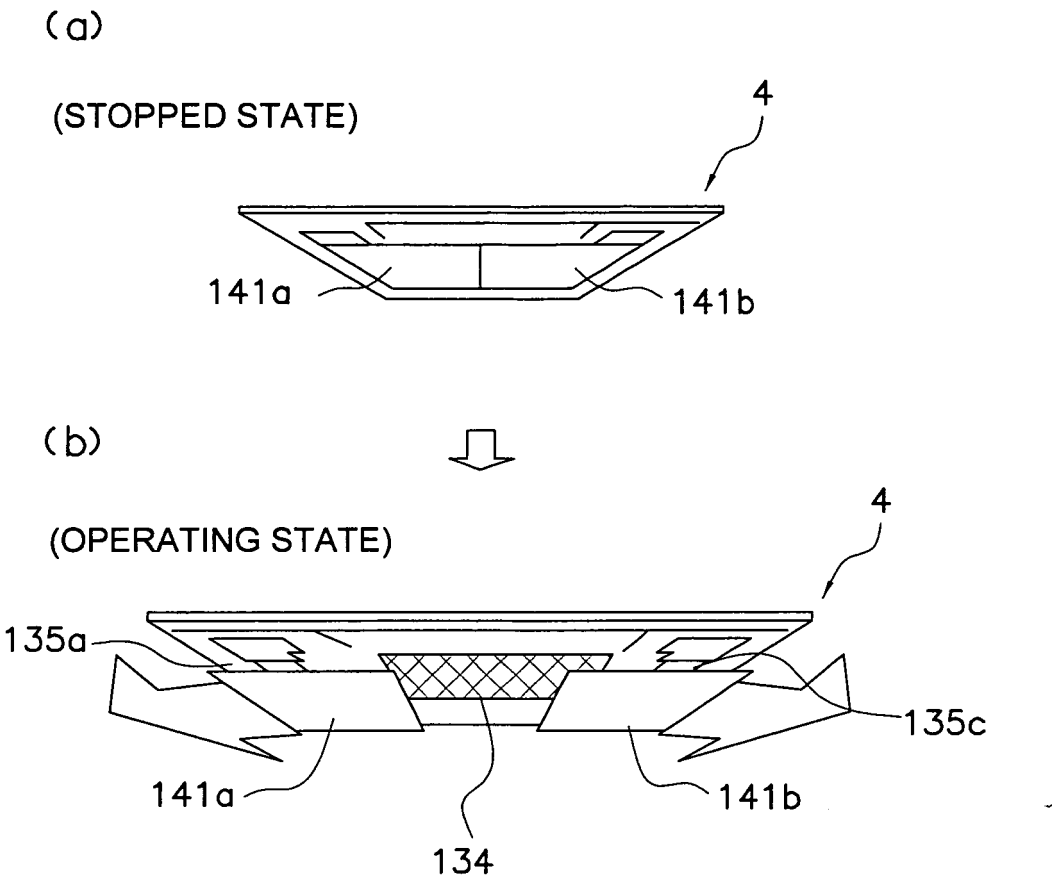
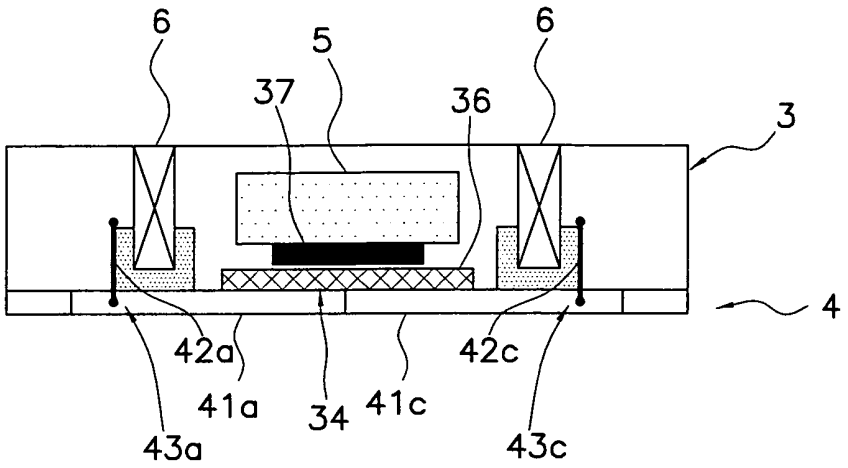

(a)
(STOPPED STATE)
4
141a
141b
(b)
(OPERATING STATE)
4
135a
135c
141a
141b
134

FIG. 9

(a)

(STOPPED STATE)



(b)

(OPERATING STATE)

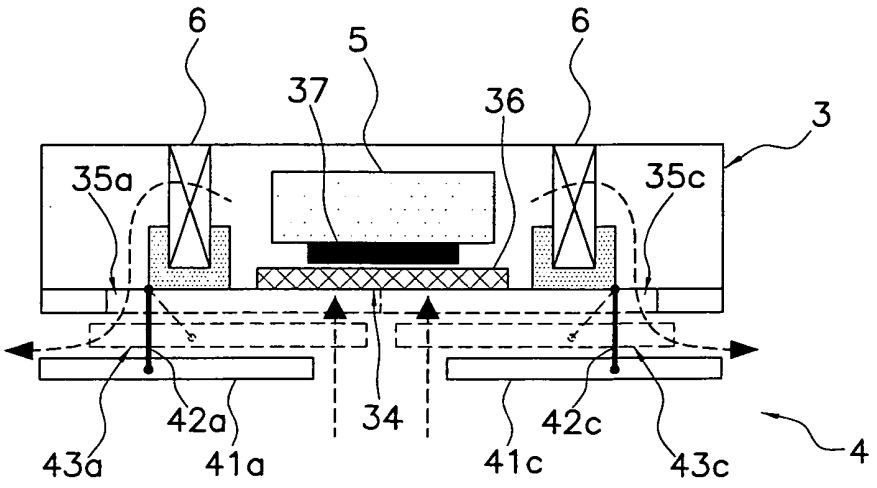


FIG. 10

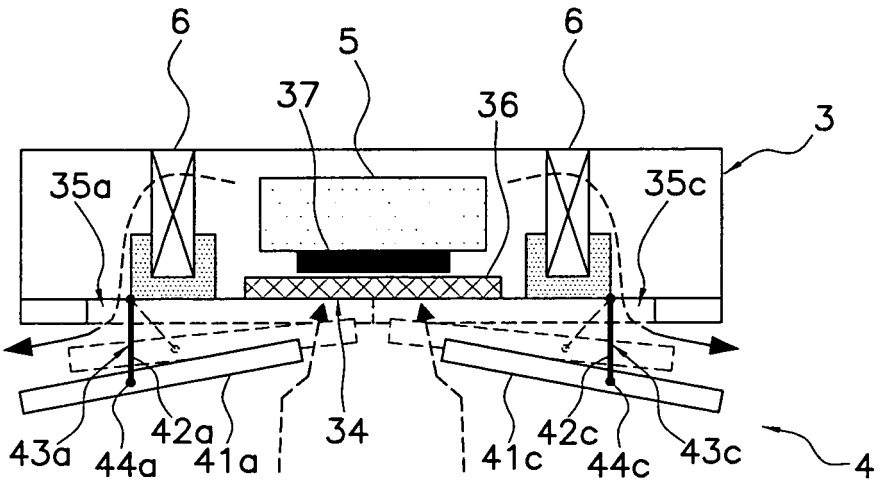
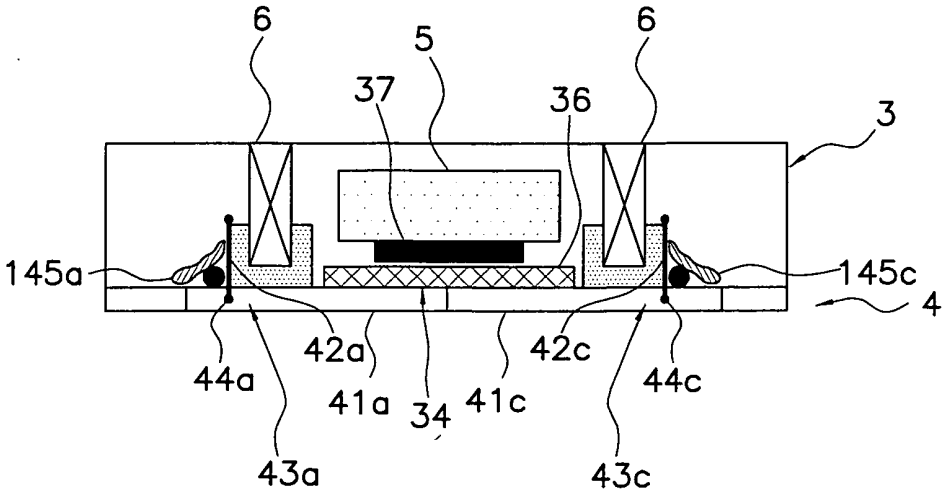


FIG. 11

(a)

(STOPPED STATE)



(b)

(OPERATING STATE)

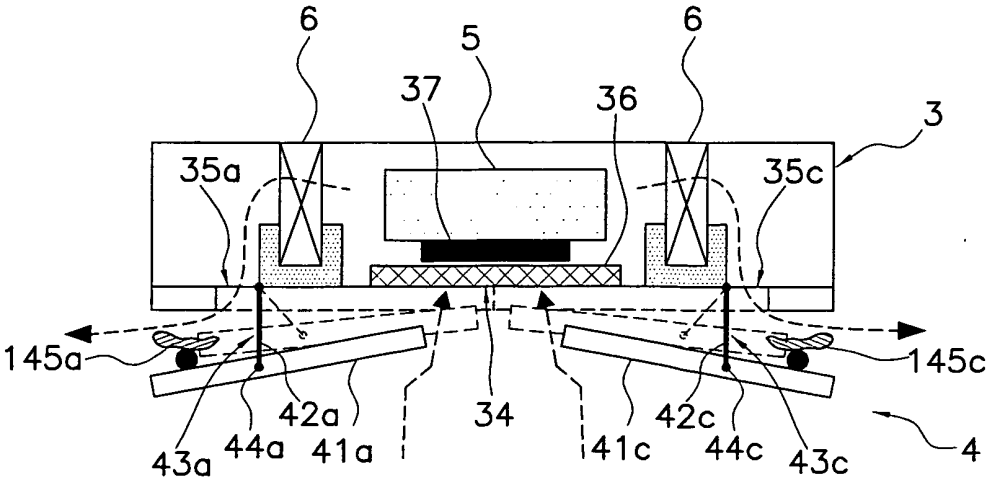


FIG. 12

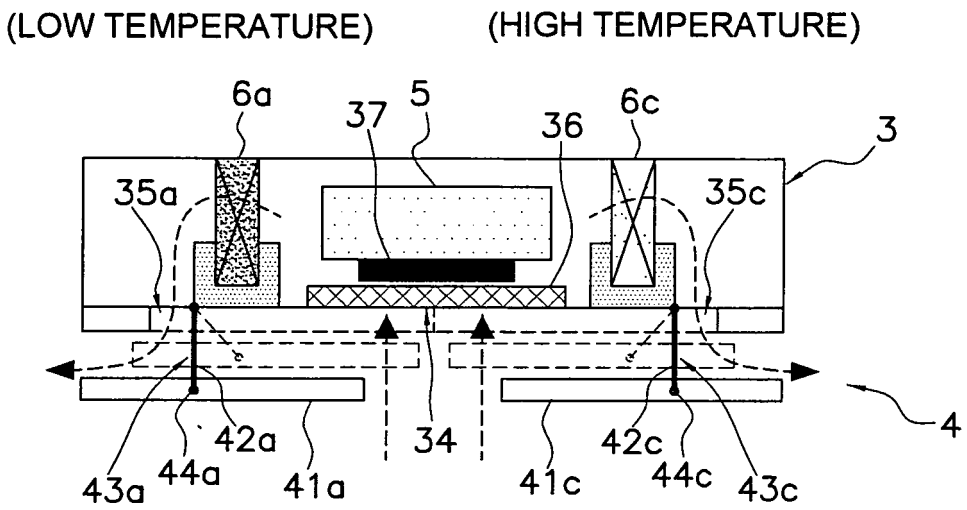

(LOW TEMPERATURE)
(HIGH TEMPERATURE)
6a
37
5
36
6c
3
35a
35c
4
42a
34
42c
43a
44a
41a
41c
44c
43c

FIG. 13

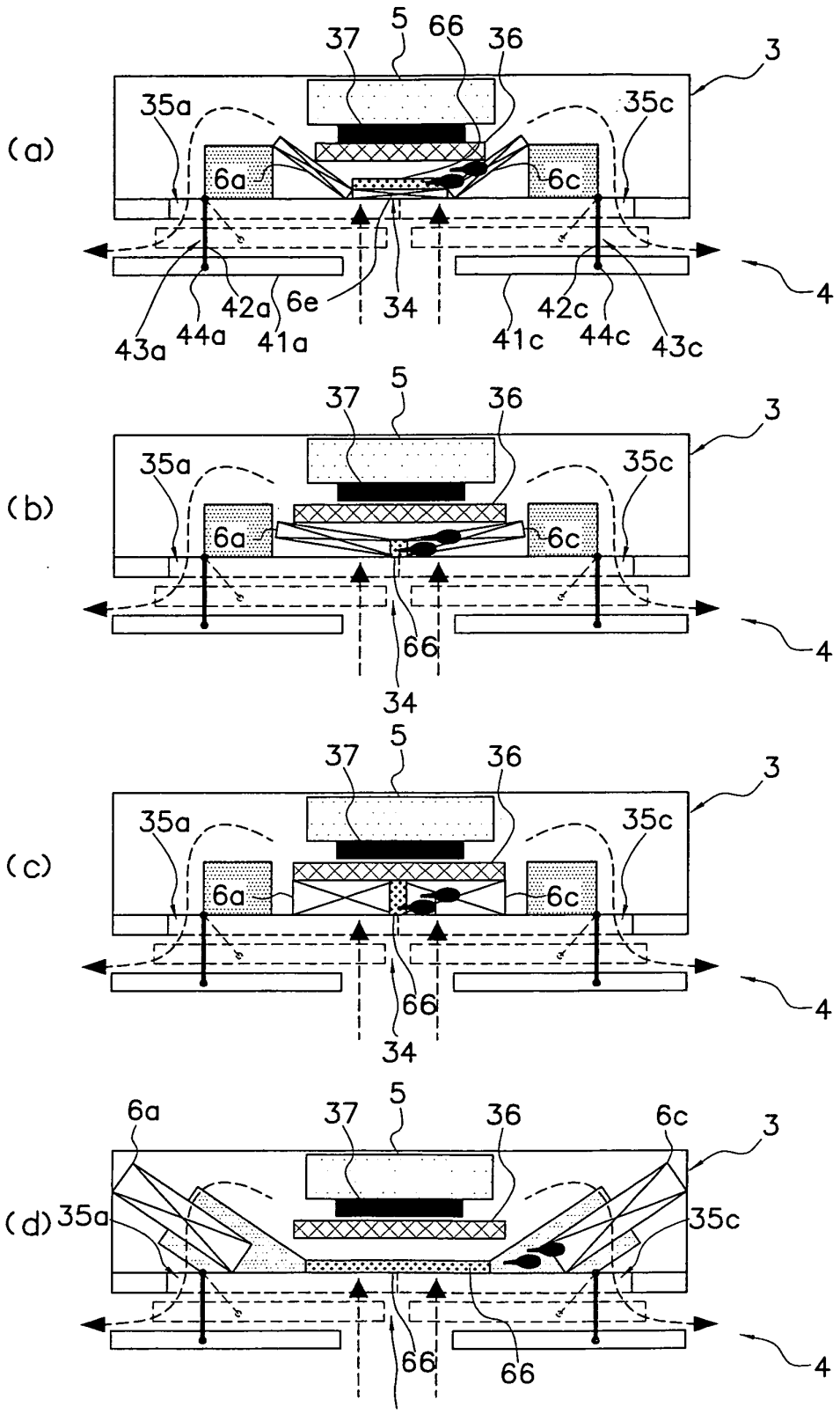
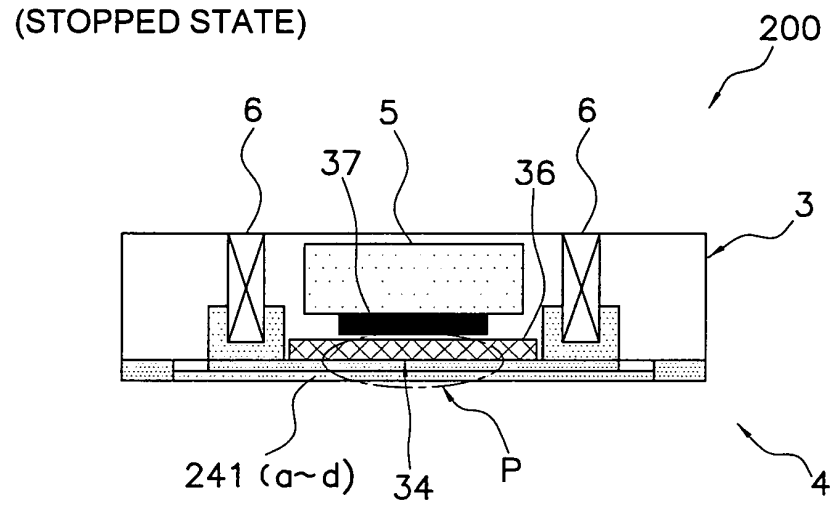

(a)
(b)
(c)
(d)
5
37
66
36
3
35a
35c
6a
6c
4
42a
6e
34
42c
43a
44a
41a
41c
44c
43c

FIG. 14

(a)


(STOPPED STATE)
200
6
5
6
37
36
3
241 (a~d)
34
P
4

(b)

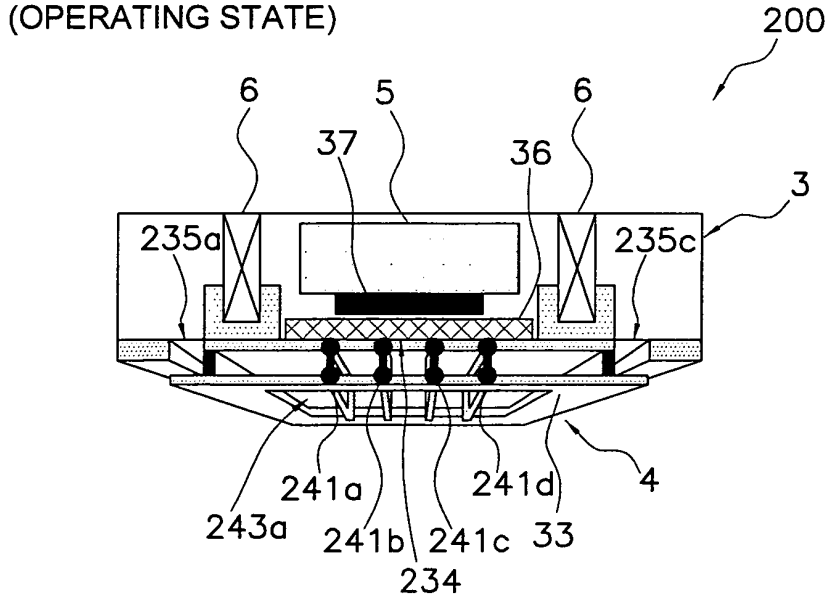

(OPERATING STATE)
200
6
5
6
37
36
3
235a
235c
241a
241d
4
243a
241b
241c
33
234

FIG. 15

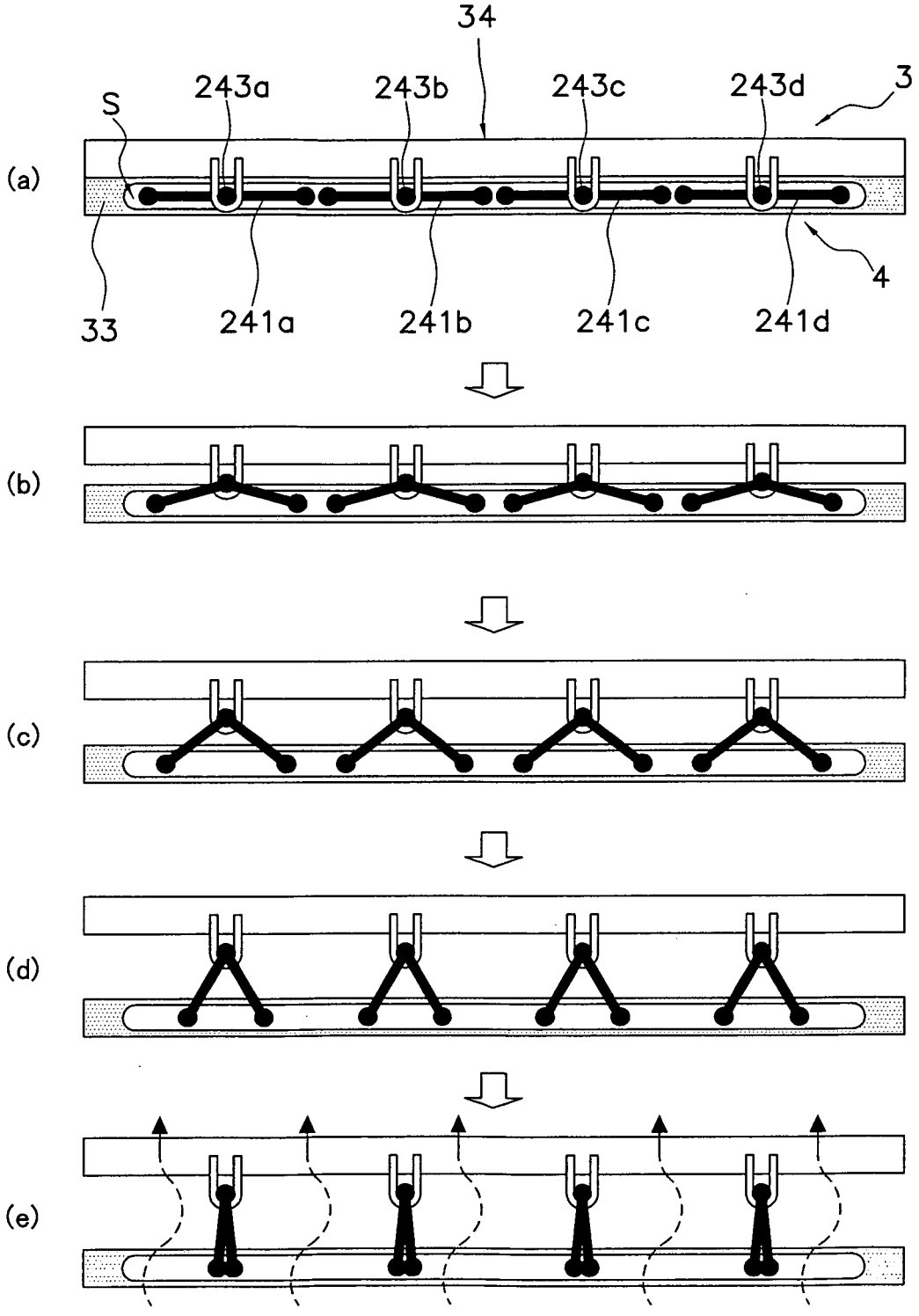


FIG. 16

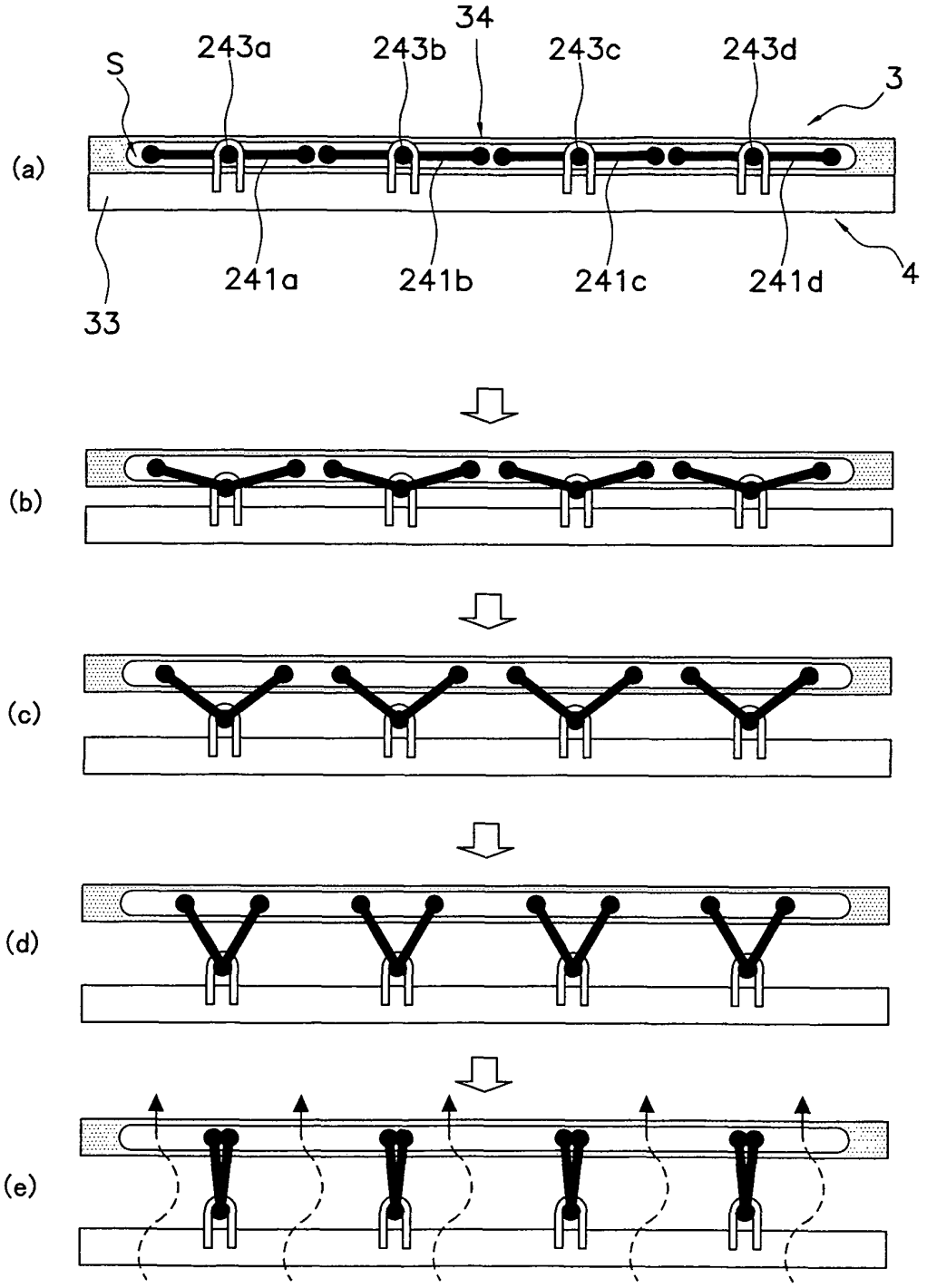


FIG. 17

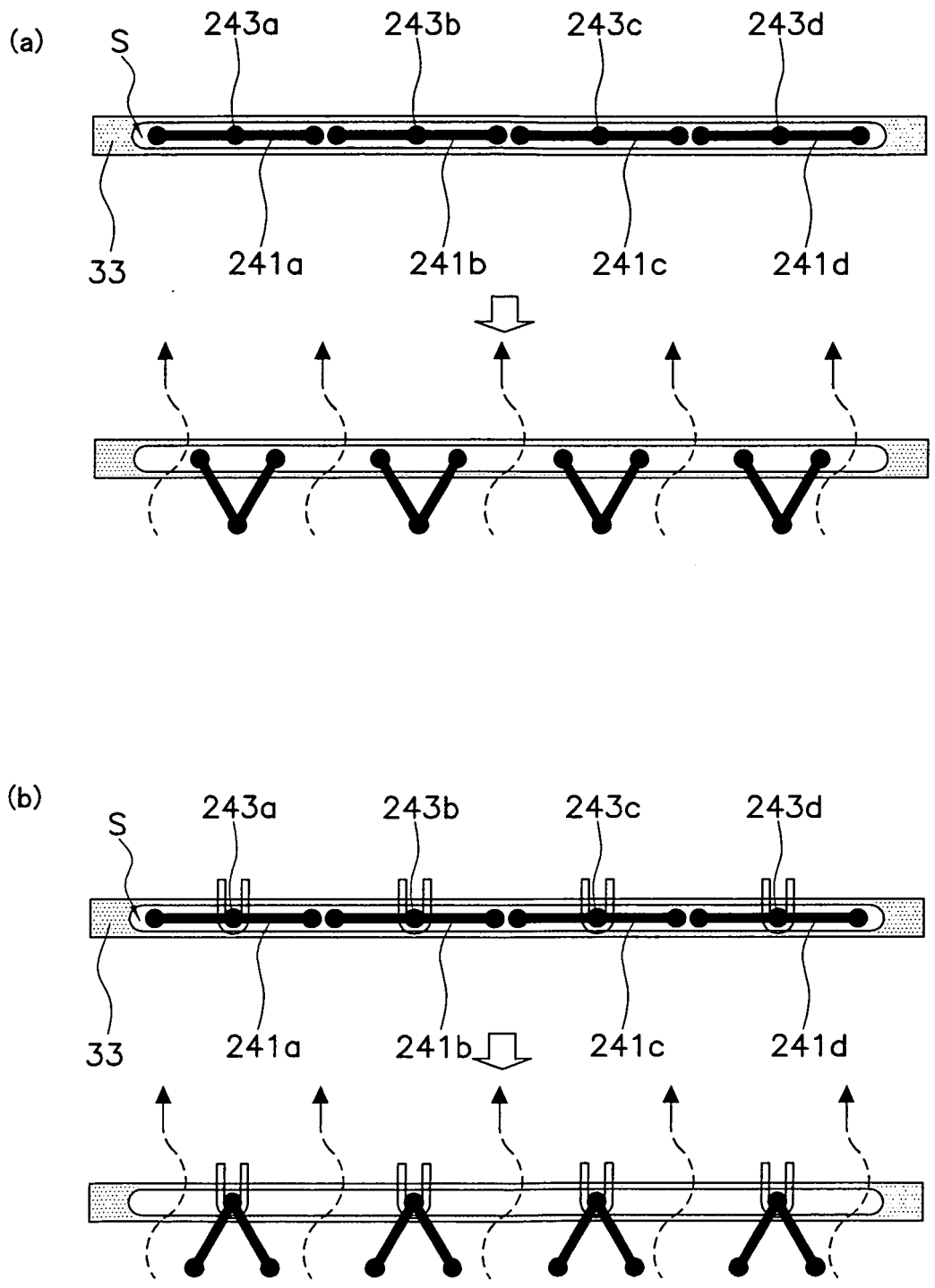
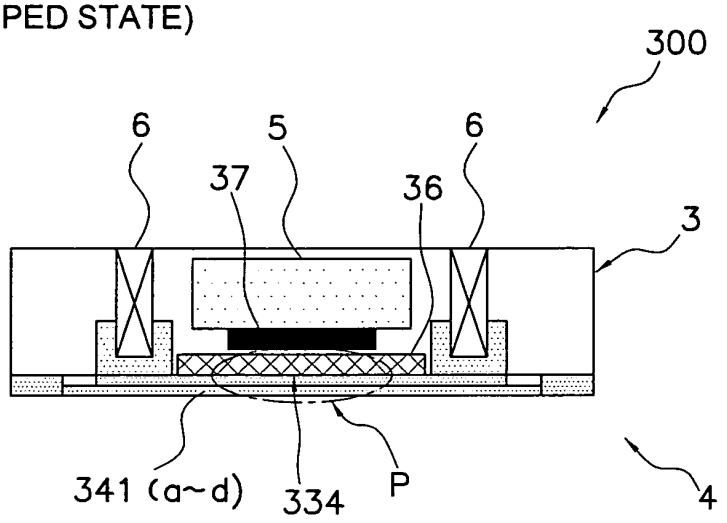

(a)
S
243a
243b
243c
243d
33
241a
241b
241c
241d
(b)
S
243a
243b
243c
243d
33
241a
241b
241c
241d

FIG. 18

(a)

(STOPPED STATE)



(b)

(OPERATING STATE)

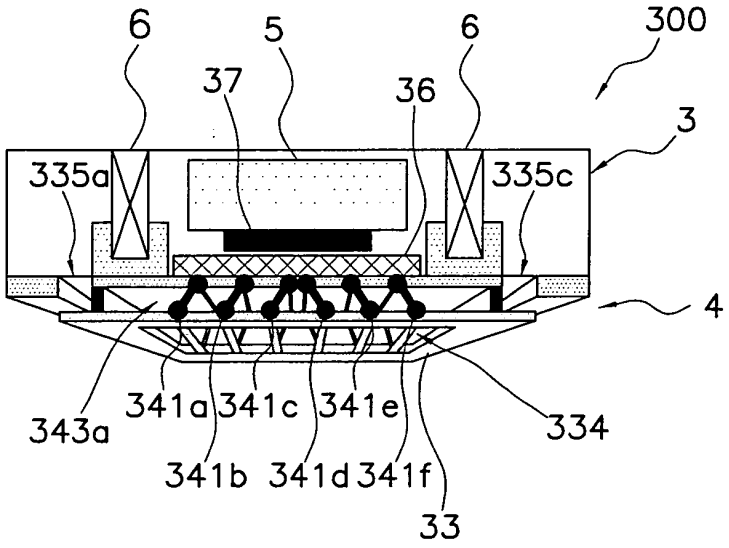


FIG. 19

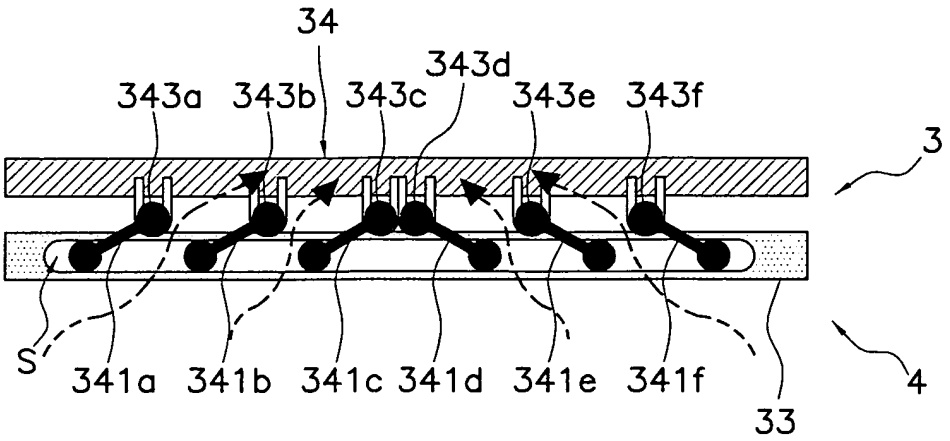

34
343a
343b
343c
343d
343e
343f
3
S
341a
341b
341c
341d
341e
341f
33
4

FIG. 20

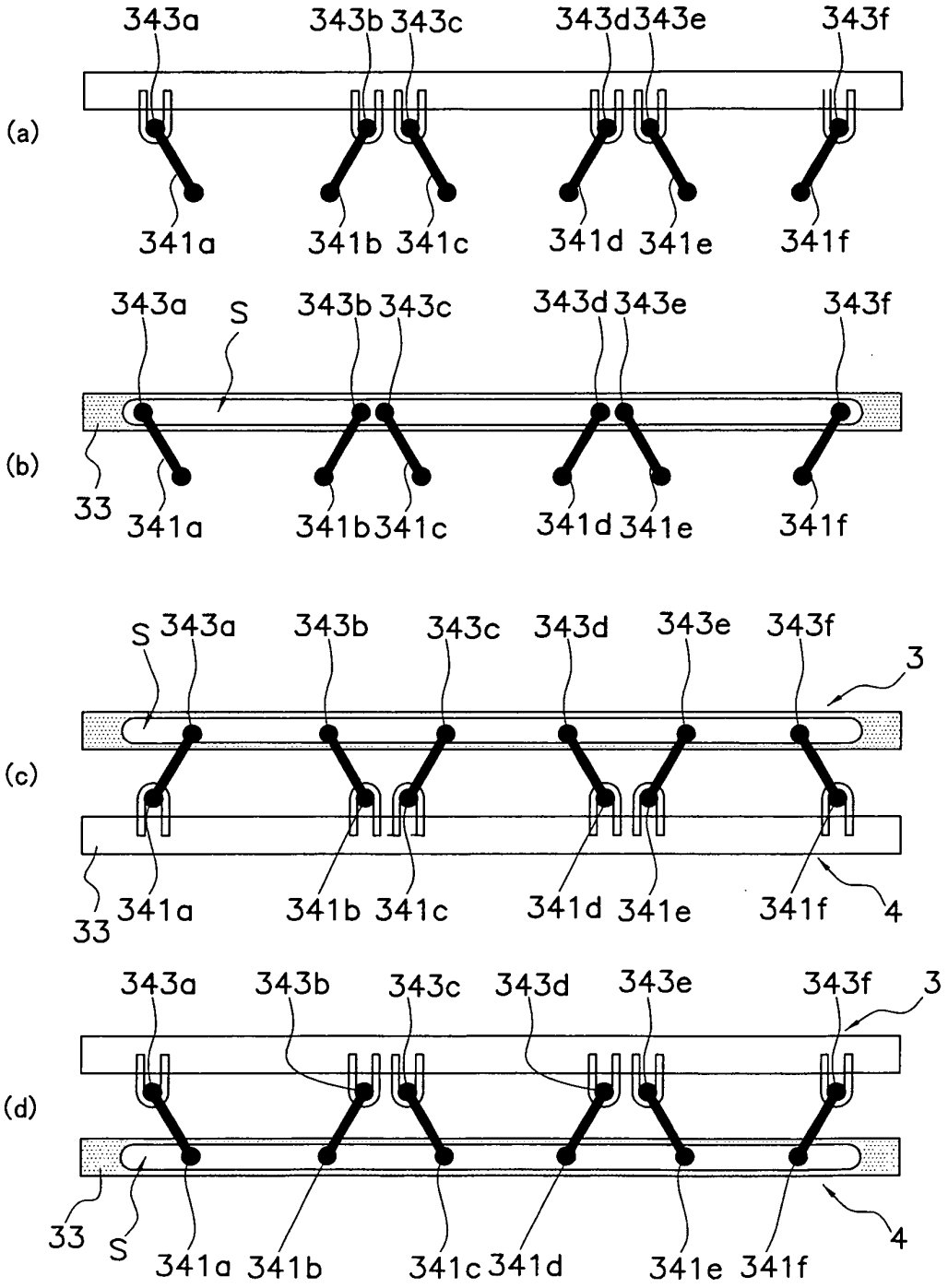

(a)
343a
343b
343c
343d
343e
343f
341a
341b
341c
341d
341e
341f
(b)
343a
S
343b
343c
343d
343e
343f
33
341a
341b
341c
341d
341e
341f
(c)
S
343a
343b
343c
343d
343e
343f
3
33
341a
341b
341c
341d
341e
341f
4
(d)
343a
343b
343c
343d
343e
343f
3
33
S
341a
341b
341c
341d
341e
341f
4

FIG. 21

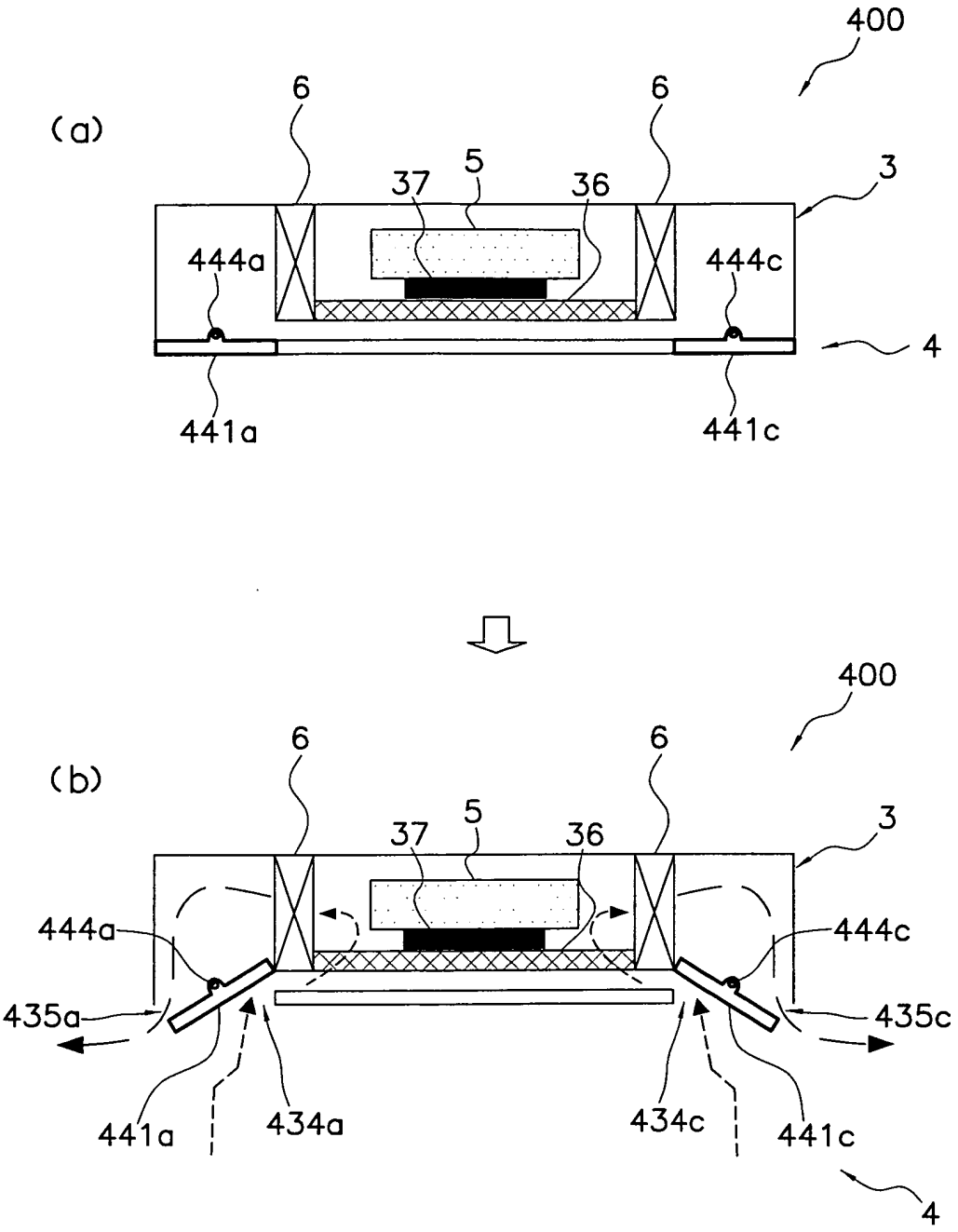
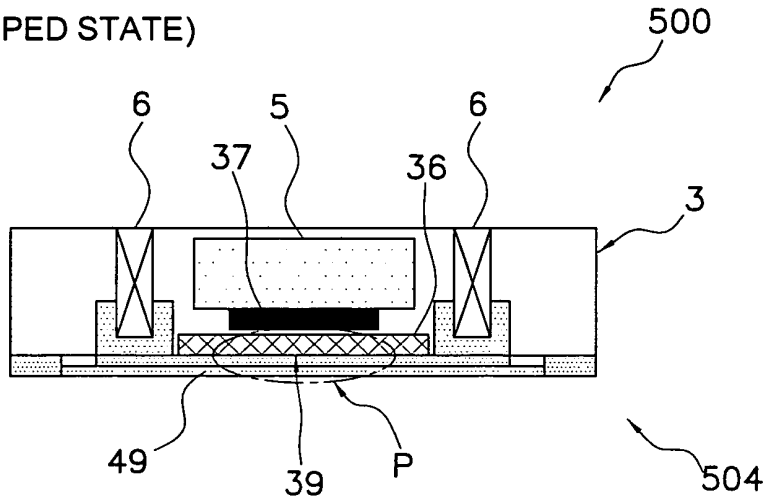

(a)
400
6
6
37
5
36
3
444a
444c
4
441a
441c
(b)
400
6
6
37
5
36
3
444a
444c
435a
435c
441a
434a
434c
441c
4

FIG. 22

(a)

(STOPPED STATE)



(b)

(OPERATING STATE)

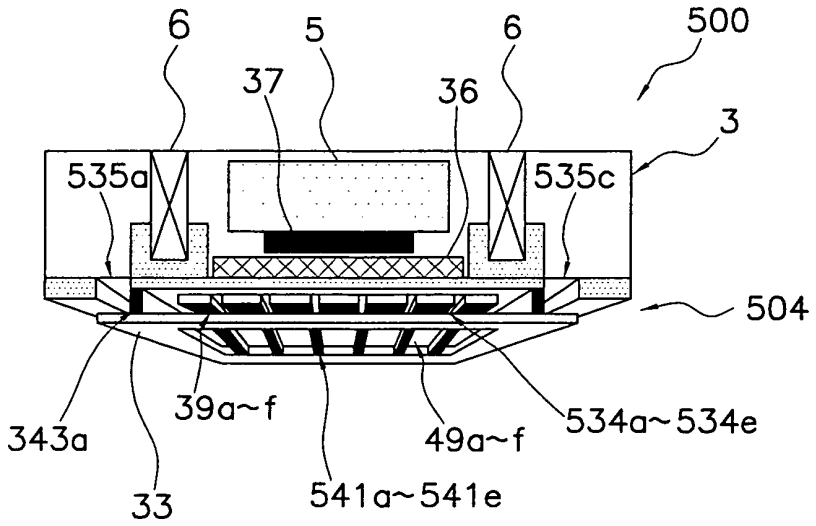


FIG. 23

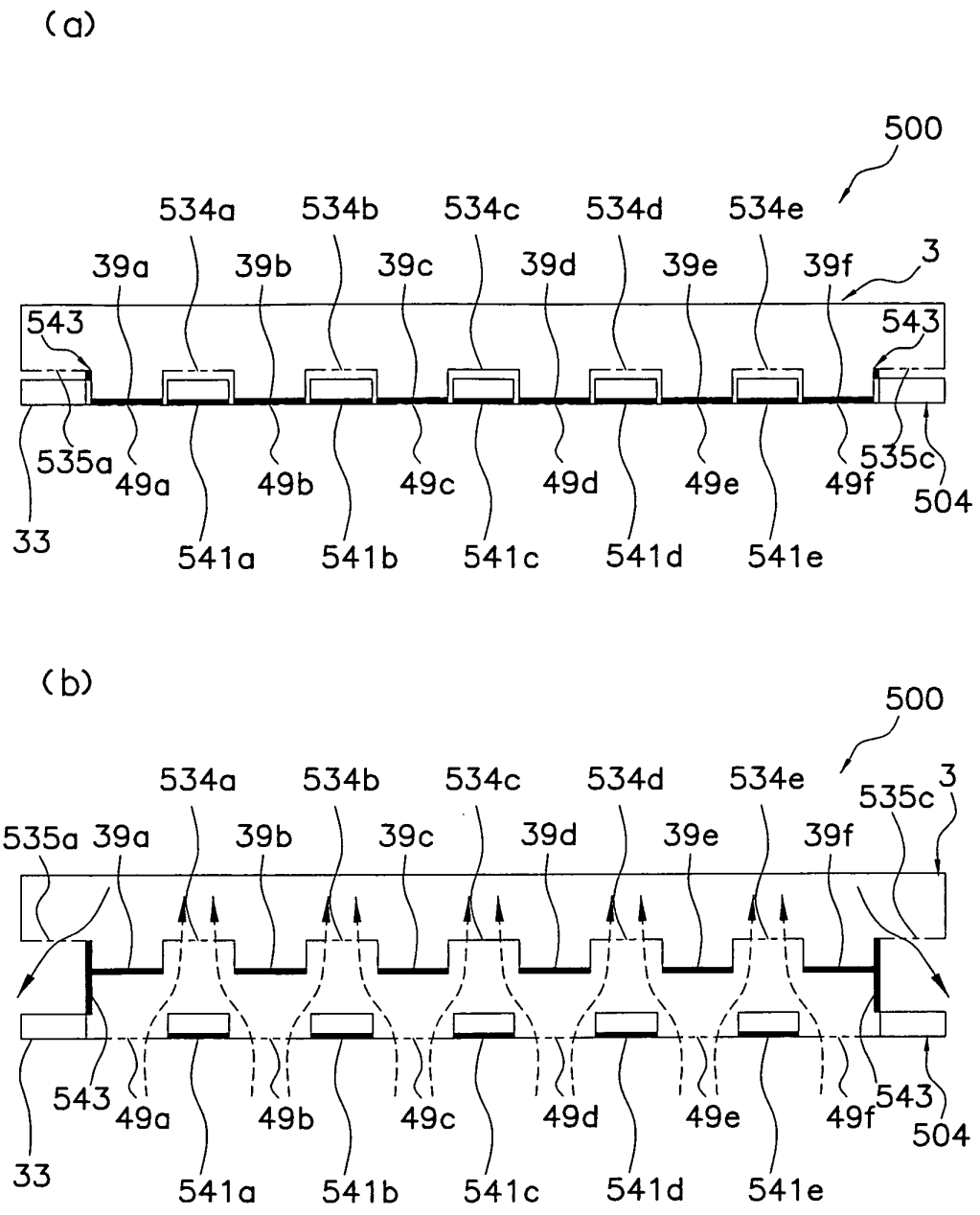

(a)
500
534a
534b
534c
534d
534e
39a
39b
39c
39d
39e
39f
3
543
543
535a
49a
49b
49c
49d
49e
49f
535c
504
33
541a
541b
541c
541d
541e
(b)
500
534a
534b
534c
534d
534e
535c
3
535a
39a
39b
39c
39d
39e
39f
543
543
49a
49b
49c
49d
49e
49f
504
33
541a
541b
541c
541d
541e

FIG. 24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/058310

A. CLASSIFICATION OF SUBJECT MATTER
F24F13/20(2006.01)i, *F24F13/15*(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)
F24F13/20, F24F13/15

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.
A	WO 01/79762 A1 (Daikin Industries, Ltd.), 25 October, 2001 (25.10.01), Page 10, lines 1 to 15; Fig. 7 (Family: none)	1-16

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 July, 2007 (17.07.07)	31 July, 2007 (31.07.07)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 6042768 A **[0005]**