



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

(43) Date of publication:
30.08.2017 Bulletin 2017/35

(51) Int Cl.:
F24F 13/072^(2006.01) F24F 13/20^(2006.01)

(21) Application number: **15852334.0**

(86) International application number:
PCT/JP2015/072226

(22) Date of filing: **05.08.2015**

(87) International publication number:
WO 2016/063596 (28.04.2016 Gazette 2016/17)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(30) Priority: **23.10.2014 PCT/JP2014/078200**

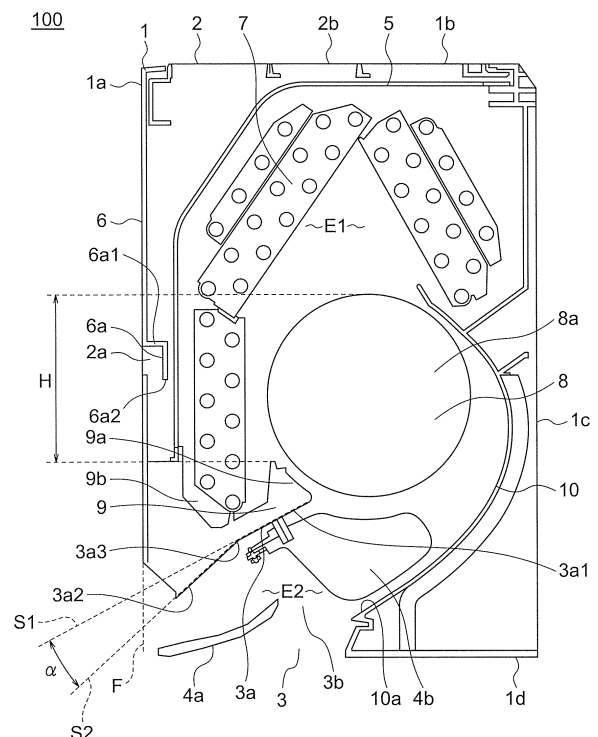
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(54) **AIR CONDITIONER**

(57) An air conditioner includes a main body that includes a suction port and an outlet port, wherein: the main body includes a front surface, a back surface, an upper surface, a lower surface, and a pair of side surfaces; the suction port is formed on any of the front surface, the upper surface, and the side surfaces; the outlet port is formed on at least the lower surface; an outlet air channel is upstream from the outlet port; a side of the outlet air channel near the front surface is formed by a diffuser; and the diffuser includes a portion that diverges from an imaginary straight line that constitutes a direction of extension of an upstream portion of the diffuser increasingly toward a downstream end of the diffuser in a side view.

FIG. 2



Description

TECHNICAL FIELD

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

BACKGROUND ART

[0002] In Patent Literature 1, an air conditioner is disclosed in which a blower fan is included inside a main body, and an outlet air channel that is delimited by wall surfaces is formed downstream from the blower fan. An outlet port is disposed in a downstream portion of the outlet air channel. The outlet port is disposed on a lower surface and a front surface of the main body of the air conditioner.

CITATION LIST

PATENT LITERATURE

[0003] Patent Literature 1: Japanese Patent No. 3872012 (Specification) (See Figure 3)

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] An air conditioner that is disposed inside a target space as an indoor unit can expel conditioned air over a wide area of the target space due to an outlet port being disposed on a lower surface of the main body of the air conditioner in question, or so as to span the lower surface and a front surface of the main body.

[0005] However, the expulsion load of the air conditioner may change as a result of elapsed service life, for example. At the time of shipment of the air conditioner from the factory (beginning of service life), for example, the expulsion load is a relatively low load, and conditioned air is expelled stably over a wide area from an outlet port that occupies a portion of a lower surface of the main body or a portion of the lower surface and a portion of a front surface of the main body.

[0006] When a certain amount of service life has elapsed, on the other hand, ventilation resistance increases due to accumulation of dust, etc., arising, and the expulsion load becomes a relatively high load. If the expulsion load becomes a relatively high load, then the wind speed distribution of the air that is expelled from the blower fan may become unstable, and reverse flow may occur from the outlet port to the blower fan, which ultimately may lead to the formation of condensation. If the outlet port is spread over the lower surface and the front surface of the main body, in particular, then the wind speed distribution of the air that is expelled from the blower fan becomes even more unstable.

[0007] The present invention has been conceived in

light of the above and an object of the present invention is to provide an air conditioner that can reduce formation of condensation while having an outlet port that occupies a portion of a lower surface of a main body or a portion of the lower surface and a portion of a front surface of the main body.

MEANS FOR SOLVING THE PROBLEM

[0008] In order to achieve the objective that is described above, an air conditioner according to the present invention includes: a main body that includes a suction port and an outlet port; a blowing portion that is disposed inside the main body; and a heat exchanging portion that is disposed inside the main body, wherein: the main body includes a front surface, a back surface, an upper surface, a lower surface, and a pair of side surfaces; the suction port is formed on any of the front surface, the upper surface, and the side surfaces; the outlet port is formed on at least the lower surface; an outlet air channel is upstream from the outlet port; a side of the outlet air channel near the front surface is delimited by a diffuser; and the diffuser includes a portion that diverges from an upstream portion imaginary straight line that constitutes a direction of extension of an upstream portion of the diffuser increasingly toward a downstream end of the diffuser when viewed from a side.

EFFECTS OF THE INVENTION

[0009] The air conditioner according to the present invention can reduce formation of condensation while having an outlet port that occupies a portion of a lower surface of a main body or a portion of the lower surface and a portion of a front surface of the main body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 is a diagram that shows an installed state of an air conditioner that represents Embodiment 1 according to the present invention, when viewed from inside a room;

Figure 2 is a diagram that shows an internal construction of the air conditioner according to Embodiment 1 from a side;

Figure 3 is a diagram that relates to Embodiment 1, and that shows portions in a vicinity of a diffuser and a downstream portion of a guiding wall enlarged;

Figure 4 is a graph that shows a relationship between angle α that is formed between an upstream portion imaginary straight line S1 and a downstream portion imaginary straight line S2 and ΔSPL (a difference in sound level compared to when angle α that is formed by the imaginary lines S1 and S2 is zero degrees, i.e., they are connected in a straight line);

Figure 5 is a diagram that relates to Embodiment 2

according to the present invention, that has similar features to Figure 2;

Figure 6 is a diagram that relates to Embodiment 3 according to the present invention, that has similar features to Figure 3;

Figure 7 is a diagram that relates to Embodiment 3 according to the present invention, that has similar features to Figure 3; and

Figure 8 is a diagram that relates to Embodiment 4 according to the present invention, that has similar features to Figure 2.

DESCRIPTION OF EMBODIMENTS

[0011] Preferred embodiments of the air conditioner (indoor unit) according to the present invention will now be explained based on the accompanying drawings. Moreover, in the figures, identical numbering indicates identical or corresponding portions. Furthermore, existing outdoor units can be used.

Embodiment 1

[0012] Figure 1 is an installation schematic diagram that shows an air conditioner in Embodiment 1 according to the present invention when viewed from a room. Figure 2 is a diagram that shows an internal construction of the air conditioner according to Embodiment 1 from a side. Moreover, Figure 2 shows a state of the air conditioner during a horizontal blowing operation (during horizontal blowing).

[0013] As shown in Figure 1, an air conditioner (an indoor unit) 100 includes a main body 1 that functions as a case. The air conditioner 100 is an example of a wall-mounted type, and is supported by a wall 11a of a room 11 that constitutes an air conditioning target space. Moreover, the air conditioner according to the present invention is not limited to being installed in a room of an ordinary house, and may be installed in a room or storeroom of a building in a complex, for example.

[0014] Furthermore, the air conditioner according to the present invention is not a "ceiling-recessed" air conditioner, but is an air conditioner in which a back surface of the main body is placed in contact with or close to a wall surface that delimits the air conditioning target space (a wall rather than a ceiling or a floor), and in which a front surface of the main body is oriented toward the air conditioning target space in question. To put it another way, the air conditioner according to the present invention does not have a suction port and an outlet port in a common plane as in ceiling-embedded types, and may be disposed alongside a wall surface that delimits the air conditioning target space, away from a central portion of the air conditioning target space.

[0015] The main body 1 is an approximately rectangular parallelepiped housing. Specifically, the main body 1 includes: a back surface 1c that faces the wall 11a of the room 11; a front surface 1a that is on an opposite side

from the back surface 1c; an upper surface 1b; a lower surface 1d; and a pair of left and right side surfaces 1e.

[0016] In the air conditioner according to the present invention, at least one suction port is formed on any of the front surface, the upper surface, and the side surfaces of the main body, and an outlet port is formed so as to span at least a portion of the front surface of the main body and at least a portion of the lower surface. A specific example of the present embodiment will be further explained.

[0017] A front surface grill 6 is mounted to the front surface 1a of the main body 1. The front surface grill 6 is formed so as to have a flat surface that is flat in a vertical direction (a height direction) and in a lateral direction (a width direction). A first suction port 2a for sucking indoor air into the air conditioner 100 has an opening in a central portion in a main body height direction of the front surface grill 6. The suction port 2a extends along the front surface grill 6 in the width direction, and has an opening that has a length that corresponds to a length in a width direction of at least a heat exchanger 7 (described below). Moreover, the opening of the suction port 2a may be longer than the length in the width direction of the heat exchanger 7. An airflow guiding wall 6a is disposed downstream from the suction port 2a. A front surface side of a flow channel downstream from the suction port 2a is formed by a rear surface of the front surface grill 6, and a back surface side of the flow channel downstream from the suction port 2a is formed by the airflow guiding wall 6a. The airflow guiding wall 6a extends horizontally from the front surface grill 6 toward the back surface above the suction port 2a, then bends partway along and extends downward. In other words, the airflow guiding wall 6a is formed so as to have an L-shaped cross section that has: a horizontal surface 6a1 that extends so as to be perpendicular to the flat surface of the front surface grill 6; and a downward surface 6a2 that extends parallel to the flat surface of the front surface grill 6. Furthermore, the suction port 2a is disposed within a range H below an upper end of a crossflow fan 8 (described below) and above than an upper end of a stabilizer 9 (described below) in the main body height direction.

[0018] A grill-shaped second suction port 2b for sucking indoor air into the air conditioner 100 is formed on an upper surface 1b of the main body 1.

[0019] An outlet port 3 for supplying conditioned air inside a room is formed on the lower surface 1d and the front surface 1a of the main body 1. The outlet port 3 is formed so as to span the lower surface 1d and the front surface 1a of the main body 1. To put it another way, the outlet port 3 is spread continuously so as to occupy a region on a front portion of the lower surface 1d of the main body 1 and a region on a lower portion of the front surface 1a of the main body 1. The outlet port 3 has an opening only on the lower surface 1d and the front surface 1a of the main body 1, and does not have an opening on the upper surface 1b, the back surface 1c, or the left and right side surfaces 1e.

[0020] A crossflow fan (a blowing portion) 8 that has an impeller 8a, and a guiding wall 10 are installed inside the main body 1. The crossflow fan 8 is disposed between a suction flow channel *E1* and an expulsion flow channel *E2*, and sucks air in through the suction ports 2a and 2b, and expels the air out through the outlet port 3. The guiding wall 10 extends continuously downward from behind the crossflow fan 8, and directs the air that has been expelled from the crossflow fan 8 to the outlet port 3.

[0021] Also installed inside the main body 1 are: a filter (a ventilation resisting body) 5 that removes dust from the air that is sucked in through the suction ports 2a and 2b; a heat exchanger (a heat exchanging portion and ventilation resisting body) 7 that generates conditioned air by transmitting warmth or coldness of a refrigerant to the air; and a stabilizer 9 that partitions the suction flow channel *E1* and the expulsion flow channel *E2*.

[0022] Together with a diffuser 3a that is formed on a lower surface of the stabilizer 9, the guiding wall 10 forms part of the expulsion flow channel *E2* that constitutes the outlet air channel 3b. Specifically, the outlet air channel 3b on a side near the front surface 1a of the main body 1 is delimited by the diffuser 3a, and the outlet air channel 3b on a side near the back surface 1c of the main body 1 is delimited by the guiding wall 10, the outlet air channel being formed by the facing diffuser 3a and guiding wall 10. The guiding wall 10 forms a spiral surface from the crossflow fan 8 to the outlet port 3.

[0023] A filter 5 is formed so as to have a mesh shape, for example, and removes dust from the air that is sucked in through the suction ports 2a and 2b. The filter 5 is disposed downstream from the suction ports 2a and 2b and upstream from the heat exchanger 7 within the air channel from the suction port 2a and 2b to the outlet port 3. The filter 5 extends forward from above the heat exchanger 7.

[0024] The heat exchanger 7 (the indoor heat exchanger) functions as an evaporator to cool the air during cooling operation, and functions as a condenser (a radiator) to warm the air during heating operation. Within the air channel from the suction ports 2a and 2b to the outlet port 3 (a central portion inside the main body 1), this heat exchanger 7 is disposed downstream from the filter 5 and upstream from the crossflow fan 8. Moreover, in Figure 2, the shape of the heat exchanger 7 is a shape that surrounds a front portion and an upper portion of the crossflow fan 8, but this is merely one example, and is not particularly limited thereto.

[0025] The heat exchanger 7 is connected to an outdoor unit that may have conventional features such as including a compressor, an outdoor heat exchanger, and a throttling apparatus, etc., to constitute a refrigeration cycle. Furthermore, a cross fin fin-and-tube heat exchanger that is constituted by a heat exchanging tube and a plurality of fins, for example, can be used as the heat exchanger 7.

[0026] A vertical wind directing vane 4a and lateral wind directing vanes 4b are disposed in the outlet air

channel 3b. The lateral wind directing vanes 4b are disposed pivotably between the vertical wind directing vane 4a and the crossflow fan 8. The vertical wind directing vane 4a adjusts a vertical component of the air that is blown out from the crossflow fan 8, and the lateral wind directing vanes 4b adjust the direction of the air that is blown out from the crossflow fan 8 to the left and right. The vertical wind directing vane 4a and the lateral wind directing vanes 4b are driven so as to be pivoted independently from each other.

[0027] The vertical wind directing vane 4a has a convex shape in which an upper surface and a lower surface of the vertical wind directing vane 4a both protrude downward relative to attitude during a horizontal blowing operation.

[0028] The stabilizer 9 partitions the suction flow channel *E1* and the expulsion flow channel *E2* as described above, and is disposed below the heat exchanger 7 as shown in Figure 2. The suction flow channel *E1* is positioned above the stabilizer 9, and the expulsion flow channel *E2* is positioned below the stabilizer 9.

[0029] The stabilizer 9 has: a tongue portion 9a that separates the suction flow channel *E1* and the expulsion flow channel *E2*; a draining pan 9b that temporarily stores water from droplets that drip down from the heat exchanger 7; and the diffuser 3a. The diffuser 3a is formed on the lower surface of the stabilizer 9 as described above, and functions as an upper wall surface (a front surface-side wall surface) of the outlet air channel 3b of the outlet port 3.

[0030] Figure 3 is a diagram that relates to Embodiment 1, and that shows portions in a vicinity of a diffuser and a downstream portion of a guiding wall enlarged. As shown in Figures 2 and 3, an upstream portion 3a1 of the diffuser 3a extends in a direction that is similar or identical to the direction that the downstream portion 10a of the guiding wall 10 extends, such that the upstream portion 3a1 of the diffuser 3a lines up approximately parallel to the downstream portion 10a of the guiding wall 10 when viewed from a side.

[0031] The upstream portion 3a1 of the diffuser 3a has a rectilinear portion in a side view. In the side view in Figure 2, if a direction of extension of the rectilinear portion of the upstream portion 3a1 of the diffuser 3a is an upstream portion imaginary straight line *S1*, then a front portion of that upstream portion imaginary straight line *S1* extends so as to intersect with an imaginary straight line *F* that extends from the front surface 1a of the main body 1. A downstream portion 3a2 of the diffuser 3a extends so as to diverge downward from the upstream portion imaginary straight line *S1* increasingly toward a downstream end of the downstream portion 3a2. In other words, the diffuser 3a has a portion that diverges from the upstream portion imaginary straight line *S1*, which constitutes a direction of extension of the upstream portion 3a1 of the diffuser 3a, increasingly toward a downstream end of the diffuser 3a in a side view. In the example that is depicted in Figure 2, in particular, the diffuser

3a is configured so as not to have any portions that are positioned above the upstream portion imaginary straight line *S1* of the upstream portion 3a1 of the diffuser 3a.

[0032] The downstream portion 3a2 of the diffuser 3a has a rectilinear portion when viewed from a side. If a direction of extension of the rectilinear portion of the downstream portion 3a2 of the diffuser 3a is a downstream portion imaginary straight line *S2*, then the downstream portion imaginary straight line *S2* is lower than the upstream portion imaginary straight line *S1*. The diffuser 3a is bent or curved at a portion 3a3 of the diffuser 3a that is positioned between the upstream portion 3a1 and the downstream portion 3a2.

[0033] In addition, a length *A* of the rectilinear portion of the downstream portion 3a2 of the diffuser 3a that is shown in Figure 3 is a length that is greater than or equal to half of a length *B* of a chord that joins the upstream end 4a1 and the downstream end 4a2 of the vertical wind directing vane 4a.

[0034] It is preferable for the angle α that is formed between the upstream portion imaginary straight line *S1* and the downstream portion imaginary straight line *S2* to be 5 degrees through 40 degrees. Figure 4 is a graph that shows a relationship between angle α that is formed between an upstream portion imaginary straight line *S1* and a downstream portion imaginary straight line *S2* and ΔSPL . ΔSPL is a difference in sound level compared to when angle α that is formed by the upstream portion imaginary straight line *S1* and the downstream portion imaginary straight line *S2* is zero degrees, i.e., they are connected in a straight line. As can clearly be seen from the graph in Figure 4, there is a noise reducing effect in a range in which the angle α that is formed between the upstream portion imaginary straight line *S1* and the downstream portion imaginary straight line *S2* is 5 degrees through 40 degrees. When the angle α that is formed between the upstream portion imaginary straight line *S1* and the downstream portion imaginary straight line *S2* is less than 5 degrees, on the other hand, a soundproofing effect cannot be expected at the downstream portion 3a2 of the diffuser 3a, and when the angle α exceeds 40 degrees, although soundproofing effect is increased, at greater than or equal to that, the demerit of an increase in noise due to the outlet port being narrowed and ventilation resistance increasing is more pronounced, and in an overall evaluation of noise, noise deterioration increases. Consequently, it is preferable for the angle α that is formed between the upstream portion imaginary straight line *S1* and the downstream portion imaginary straight line *S2* to be 5 degrees through 40 degrees, whereby noise from the fan that is deflected by the guiding wall is deflected below the unit due to the wall surface at the downstream end of the diffuser, suppressing noise emission toward the front surface side of the air conditioner, and enabling noise reduction to be achieved.

[0035] In an air conditioner according to the present Embodiment 1 that is configured in the above manner,

because a diffuser has a portion that diverges from an upstream portion imaginary straight line that is a direction of extension of an upstream portion of the diffuser increasingly downstream thereon, flow of expelled air along a wall surface in a downstream portion of the diffuser (the downstream portion of the diffuser) can be accelerated. Because of that, reverse flow from an outlet port to a blower fan can be reduced even during relatively heavy expulsion loads such as ventilation resistance increasing due to dust depositing on a filter that is disposed near suction ports, for example. In other words, reverse flow from the outlet port to the blower fan can be reduced, and formation of condensation can also be reduced even during relatively heavier expulsion loads than immediately after factory shipment while still being able to expel conditioned air over a wide area of a target space due to the outlet port spanning across a front surface and a lower surface of a main body.

[0036] Because an outlet air channel is constituted by a diffuser and a guiding wall that face each other, flow is stabilized by ensuring a flow channel that functions as a duct, enabling air to be blown stably with respect to changes in environment such as changes in ventilation resistance due to upper and lower flaps being movable, and changes in ventilation resistance due to dust blockage on a filter, etc.

[0037] Another advantage is that noise from the fan that is reflected by the guiding wall is actively reflected below the main body of the air conditioner by the downstream portion of the diffuser, suppressing noise emission toward a front surface of the air conditioner, and enabling noise reduction.

[0038] By making a length *A* of the rectilinear portion of the downstream portion 3a2 of the diffuser 3a a length that is greater than or equal to half of a length *B* of a chord that joins the upstream end 4a1 and the downstream end 4a2 of the vertical wind directing vane 4a, flow between the diffuser 3a and the vertical wind directing vane 4a is stabilized, enabling controllability of wind direction to be improved.

[0039] In addition, by forming the front surface grill 6 so as to be vertically flat, dust is less likely to attach to the surface of the front surface grill 6, enabling it to be kept clean. Furthermore, by forming the front surface grill 6 so as to be laterally flat, air channel depth is identical across a width direction of the main body 1, enabling the crossflow fan 8 and the heat exchanger 7 to be mounted inside the main body 1 at a high density, thereby enabling fan blowing performance and heat exchanging performance to be improved.

[0040] By making the airflow guiding wall 6a so as to have an L-shaped cross section, only the downward surface 6a2 is visible inside the air intake apertures 2a in a front view, improving decorative design because a flat surface is visible at a deepest position in a depth direction. Because a buffer area for suction flow is formed at a corner portion between the horizontal surface 6a1 and the downward surface 6a2, suction air is not parallel to

a wall surface, making dust less likely to attach. Furthermore, if noise from the crossflow fan 8, etc., that is generated inside the main body 1 propagates out of the suction ports 2a, because the upper surface (the horizontal surface 6a1) of the airflow guiding wall 6a is formed so as to be horizontal, noise that is reflected outside is reduced, enabling reduced noise to be ensured.

[0041] In addition, by making an opening of the suction ports 2a a length that corresponds to a length of a width direction of the heat exchanger 7, the air that has been sucked in through the suction ports 2a can exchange heat effectively at the heat exchanger 7. Furthermore, if the opening of the suction port 2a is made longer than the length of the width direction of the heat exchanger 7, then suction pressure loss can be reduced due to the aperture area of the suction ports 2a being increased.

[0042] By disposing the suction ports 2a within a range *H* in the main body height direction that is described above, ventilation resistance is reduced because air is sucked in through a position near the crossflow fan 8, improving blowing efficiency. By supplying the air that has been sucked in through the suction ports 2a to the fan circulating flow, throughflow is stabilized, reducing fluctuations in the amount of blowing and maintaining quality even if changes in load arise due to dust depositing on the filter, or due to differences between heating and cooling. In addition, it is unnecessary to drive the front surface grill 6 to open the suction ports 2a, making it compact, reducing changes in configuration during operation, and enabling feelings of user discomfort to be suppressed. Furthermore, the front surface grill 6 is a shape that is divided into top and bottom at a central portion in the main body height direction, and because height dimensions are equal on an upper portion side and a lower portion side of the front surface grill 6, and strength is equal on the upper portion side and the lower portion side, making it unlikely to bend, and enabling quality to be maintained.

Embodiment 2

[0043] Next, Embodiment 2 of the present invention will be explained using Figure 5. Figure 5 is a diagram that relates to Embodiment 2 according to the present invention, that has similar features to Figure 2. Moreover, Embodiment 2, is similar or identical to Embodiment 1 except for portions that will be explained below.

[0044] In the example that is depicted in Figure 2 relating to Embodiment 1 that is described above, the diffuser 3a was configured so as not to have any portions that are positioned above the upstream portion imaginary straight line *S1* of the upstream portion 3a1 of the diffuser 3a, but the present invention is not limited thereto. Specifically, in the present invention, the diffuser 3a can be formed such that a portion between the upstream portion 3a1 of the diffuser 3a that determines the upstream portion imaginary straight line *S1* and the downstream portion 3a2 of the diffuser 3a that determines the down-

stream portion imaginary straight line *S2* has various shapes. Figure 5 is one example thereof.

[0045] As shown in Figure 5, the diffuser 3a has an intermediate portion 3a4 between the upstream portion 3a1 of the diffuser 3a that determines the upstream portion imaginary straight line *S1* and the downstream portion 3a2 of the diffuser 3a that determines the downstream portion imaginary straight line *S2*. This intermediate portion 3a4 is positioned higher than the upstream portion imaginary straight line *S1*.

[0046] Similar or identical working effects to those in Embodiment 1 can also be achieved using Embodiment 2 or the like, and in particular formation of condensation can be reduced while having an outlet port that occupies a portion of the lower surface and a portion of the front surface of the main body.

Embodiment 3

[0047] Next, Embodiment 3 of the present invention will be explained using Figures 6 and 7. Figures 6 and 7 are diagrams that relate to Embodiment 3 according to the present invention, that have similar features to Figure 3. Moreover, Embodiment 3, is similar or identical to Embodiments 1 or 2 except for portions that will be explained below. Figures 6 and 7 are examples of cases that are configured in a similar or identical manner to Embodiment 1 except for portions that will be explained below.

[0048] In the example depicted in Figure 2 relating to Embodiment 1 that is described above, the upstream portion of the diffuser 3a and the downstream portion of the guiding wall 10 are in an approximately parallel configuration, but the present invention is not limited thereto. In other words, the present invention may have a configuration in which a distance between an upstream portion of a diffuser and a downstream portion of a guiding wall widens gradually downstream. Figures 6 and 7 are examples thereof.

[0049] First, in the configuration that is shown in Figure 6, the direction in which an upstream portion 303a1 of a diffuser extends is set so as to be further away from a downstream portion 10a of a guiding wall 10 toward a downstream end than the direction in which the upstream portion 3a1 of the diffuser in the configuration in Figure 2 of Embodiment 1 that is described above extends. In other words, an outlet air channel in Figure 6 is wider than the outlet air channel in Figure 2 on a side near the upstream portion 303a1 of the diffuser.

[0050] In the configuration that is shown in Figure 7, the direction in which a downstream portion 310a of a guiding wall extends is set so as to be further away from an upstream portion 3a1 of a diffuser 3a toward a downstream end than the direction in which the downstream portion 10a of a guiding wall in the configuration in Figure 2 of Embodiment 1 that is described above extends. In other words, an outlet air channel in Figure 7 is wider than the outlet air channel in Figure 2 on a side near the downstream portion 310a of the guiding wall.

[0051] Similar or identical working effects to those in Embodiment 1 can also be achieved using Embodiment 3 or the like, and in particular formation of condensation can be reduced while having an outlet port that occupies a portion of the lower surface and a portion of the front surface of the main body. Because the distance between the upstream portion of the diffuser and the downstream portion of the guiding wall widens toward a downstream end, the fan expulsion flow is expanded in a vicinity of the fan expulsion region 8b, and is made uniform in a height direction of the outlet port. As a result thereof, flow is stabilized, and more stable blowing is enabled relative to ventilation resistance increases due to dust blockage of the filter, enabling improvements in quality.

Embodiment 4

[0052] Next, Embodiment 4 of the present invention will be explained using Figure 8. Figure 8 is a diagram that relates to Embodiment 4 according to the present invention, that has similar features to Figure 2. Moreover, Embodiment 4, is similar or identical to Embodiment 1 except for portions that will be explained below.

[0053] In the example depicted in Figure 2 relating to Embodiment 1 that is described above, an air conditioner 100 is shown in which an outlet port 3 is formed so as to span at least a portion of the front surface 1a of a main body 1 and at least a portion of a lower surface 1d, but the present invention is not limited thereto. In other words, the present invention can also be applied to an air conditioner in which the outlet port 3 is formed only on the lower surface 1d of the main body 1, and similar or identical working effects can be achieved. Figure 8 is one example thereof.

[0054] As shown in Figure 8, an outlet port 3 for supplying conditioned air inside a room is formed on the lower surface 1d of the main body 1. The outlet port 3 has an opening only on the lower surface 1d of the main body 1, and does not have an opening on the front surface 1a, the upper surface 1b, the back surface 1c, or the left and right side surfaces 1e. A front surface grill 6 that is equal in height to the main body height direction is mounted to the front surface 1a of the main body 1. Moreover, in Figure 8, an example is shown in which a vertical wind directing vane 4a is constituted by two members, but it may be constituted by a single member in a similar or identical manner to Embodiment 1.

[0055] Similar or identical working effects to those of Embodiment 1 above can also be achieved using Embodiment 4 or the like.

[0056] Finally, the contents of the present invention have been explained in detail with reference to preferred embodiments, but it is self-evident that various modified configurations can be adopted by any person skilled in the art based on the basic technical concepts and teachings of the present invention.

EXPLANATION OF NUMBERING

[0057]

5 1 MAIN BODY; 1a FRONT SURFACE; 1b UPPER SURFACE; 1c BACK SURFACE; 1d LOWER SURFACE; 1e BACK SURFACE; 2a, 2b SUCTION PORT; 3 OUTLET PORT; 3a DIFFUSER; 3a1, 303a1 UPSTREAM PORTION OF DIFFUSER; 3a2 DOWNSTREAM PORTION OF DIFFUSER; 7 HEAT EXCHANGER (HEAT EXCHANGING PORTION); 8 CROSSFLOW FAN (BLOWING PORTION); 10a, 310a DOWNSTREAM PORTION OF GUIDING WALL; 100 AIR CONDITIONER; S1 UPSTREAM PORTION IMAGINARY STRAIGHT LINE; and S2 DOWNSTREAM PORTION IMAGINARY STRAIGHT LINE.

20 **Claims**

1. An air conditioner comprising:

a main body that comprises a suction port and an outlet port;
a blowing portion that is disposed inside said main body; and
a heat exchanging portion that is disposed inside said main body,
wherein:

said main body includes a front surface, a back surface, an upper surface, a lower surface, and a pair of side surfaces;
said suction port is formed on any of said front surface, said upper surface, and said side surfaces;
said outlet port is formed on at least said lower surface;
an outlet air channel is upstream from said outlet port;
a side of said outlet air channel near said front surface is delimited by a diffuser; and
said diffuser comprises a portion that diverges from an upstream portion imaginary straight line that constitutes a direction of extension of an upstream portion of said diffuser increasingly toward a downstream end of said diffuser when viewed from a side.

2. The air conditioner according to Claim 1, wherein said outlet port is formed so as to span said front surface and said lower surface.

3. The air conditioner according to Claim 1 or Claim 2, wherein:

a vertical wind directing vane that adjusts a vertical component of direction of expulsion of air that is blown out from said blowing portion is disposed in said outlet air channel; and
 a length of a rectilinear portion of a downstream portion of said diffuser is a length that is greater than or equal to half of a length of a chord that joins an upstream end and a downstream end of said vertical wind directing vane when viewed from a side.

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4. The air conditioner according to any one of Claims 1 through 3, wherein:

a side of said outlet air channel near said back surface is delimited by a guiding wall, said outlet air channel being configured by said diffuser and said guiding wall, which face each other.

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5. The air conditioner according to Claim 4, wherein a distance between an upstream portion of said diffuser and a downstream portion of said guiding wall widens toward a downstream end.

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6. The air conditioner according to any one of Claims 1 through 5, wherein an angle α that is formed between an upstream portion imaginary straight line S1 and a downstream portion imaginary straight line S2 is 5 degrees through 40 degrees when viewed from a side, where said upstream portion imaginary straight line S1 is a direction of extension of a rectilinear portion of an upstream portion of said diffuser and said downstream portion imaginary straight line S2 is a direction of extension of a rectilinear portion of a downstream portion of said diffuser.

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7. The air conditioner according to any one of Claims 1 through 6, further comprising a stabilizer that is disposed below said heat exchanging portion, said diffuser being formed on a lower surface of said stabilizer,
 said suction port being formed on said front surface of said main body and being disposed within a range that is lower than an upper end of said blowing portion and higher than an upper end of said stabilizer in a height direction of said main body.

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8. The air conditioner according to Claim 7, wherein said suction port is formed on said front surface of said main body and has an opening that has a length that corresponds to a length in a width direction of at least said heat exchanging portion.

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9. The air conditioner according to Claim 7 or Claim 8, wherein:

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an airflow guiding wall is disposed downstream from said suction port; and

said airflow guiding wall has an L-shaped cross section comprising:

a horizontal surface that extends horizontally toward a back surface side of said main body; and
 a downward surface that extends downward.

FIG. 1

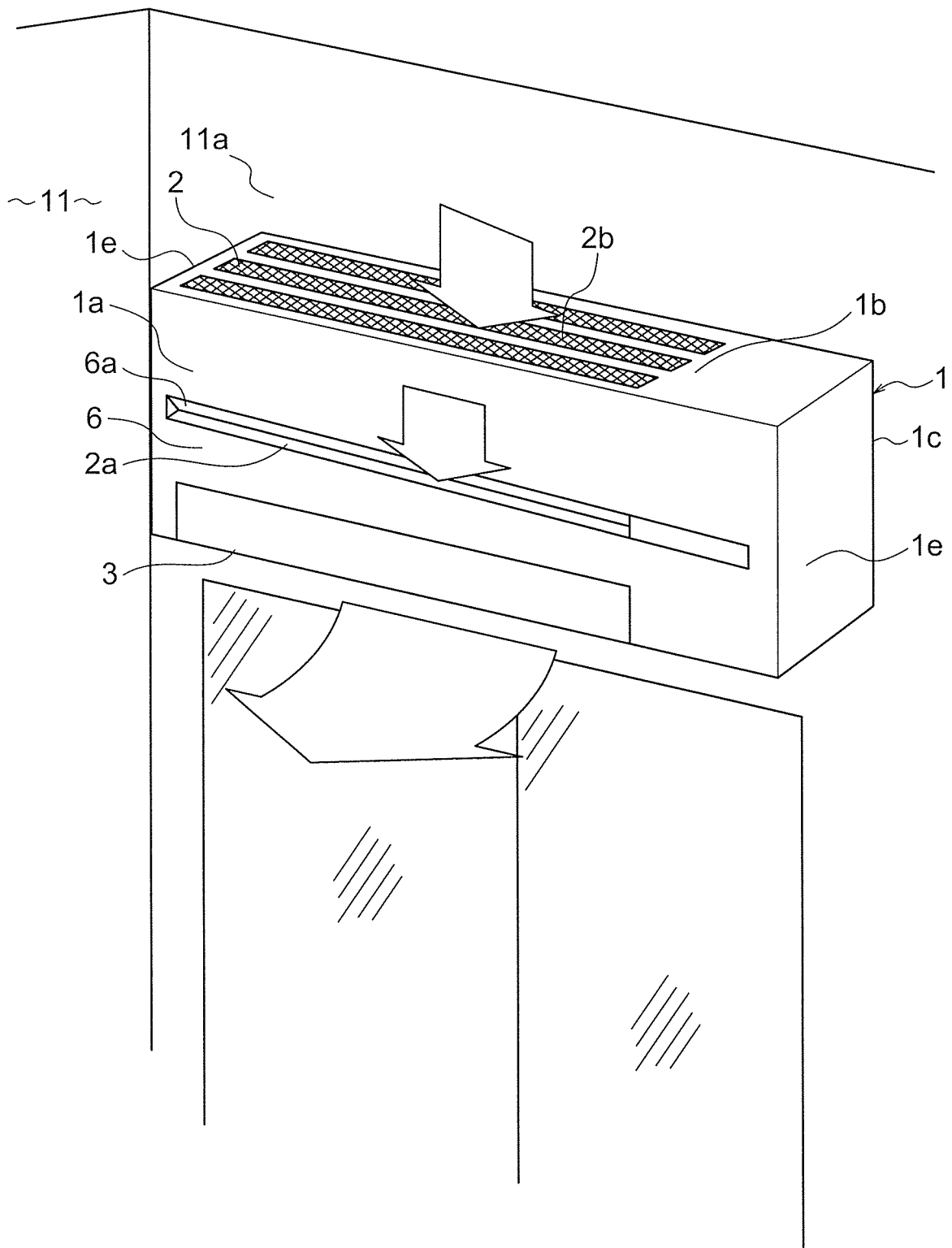


FIG. 2

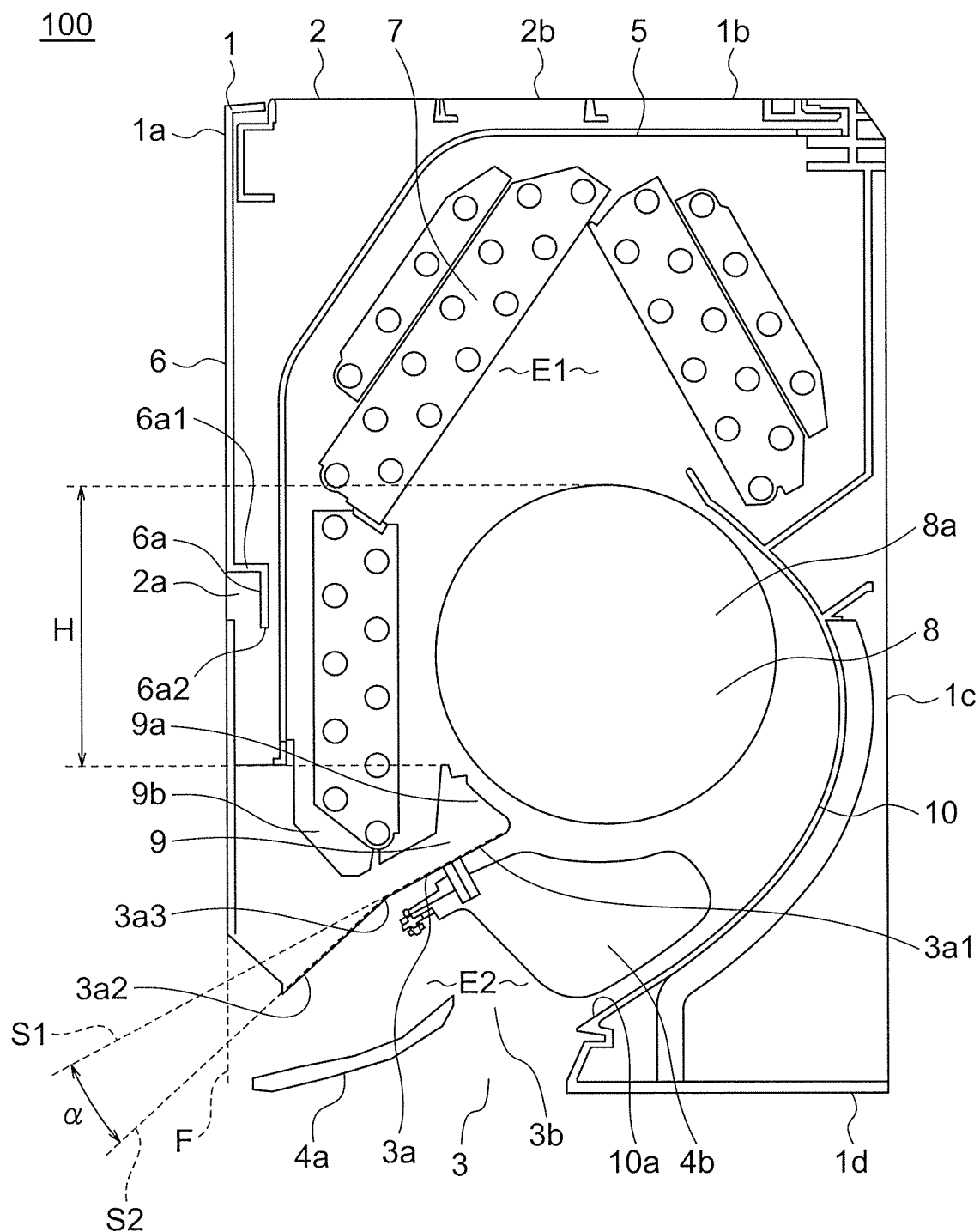


FIG. 3

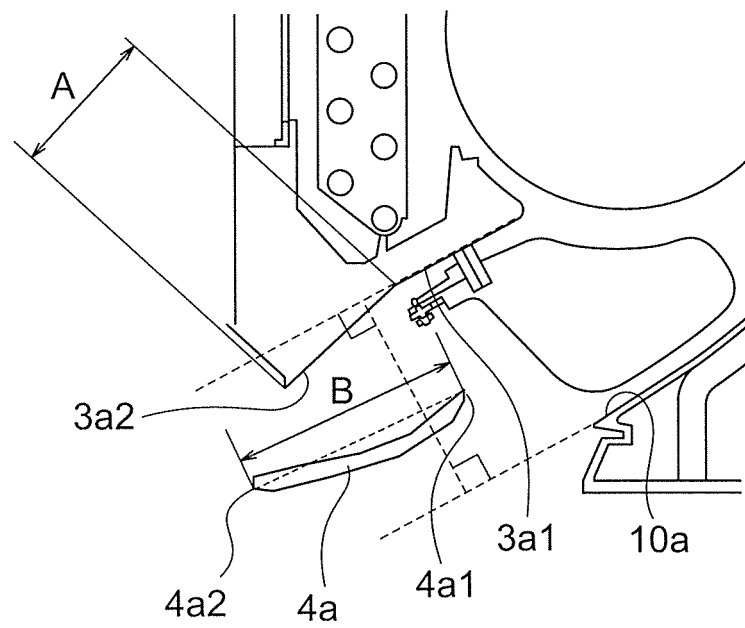


FIG. 4

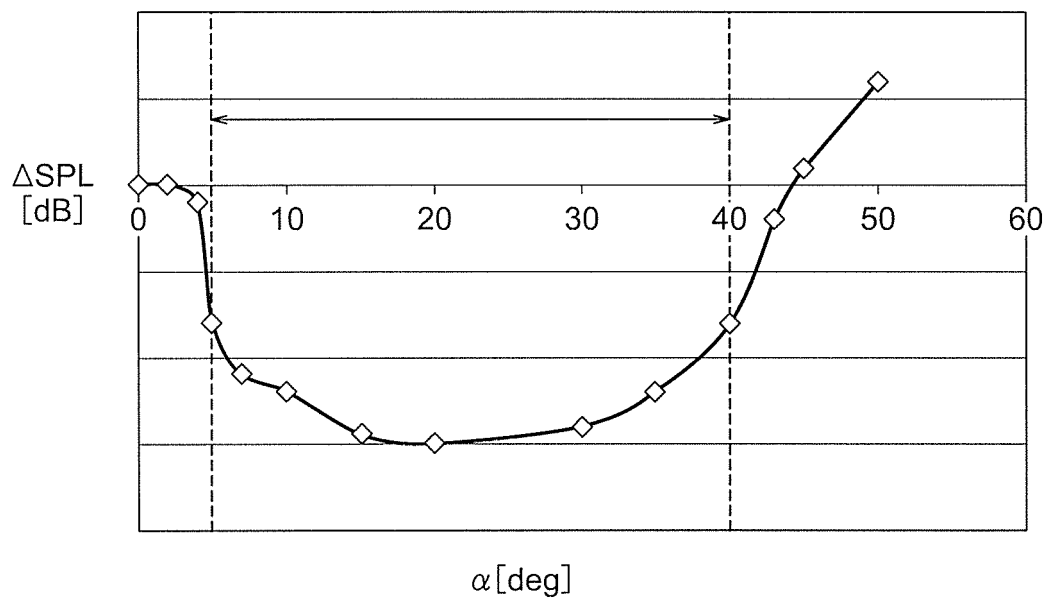


FIG. 5

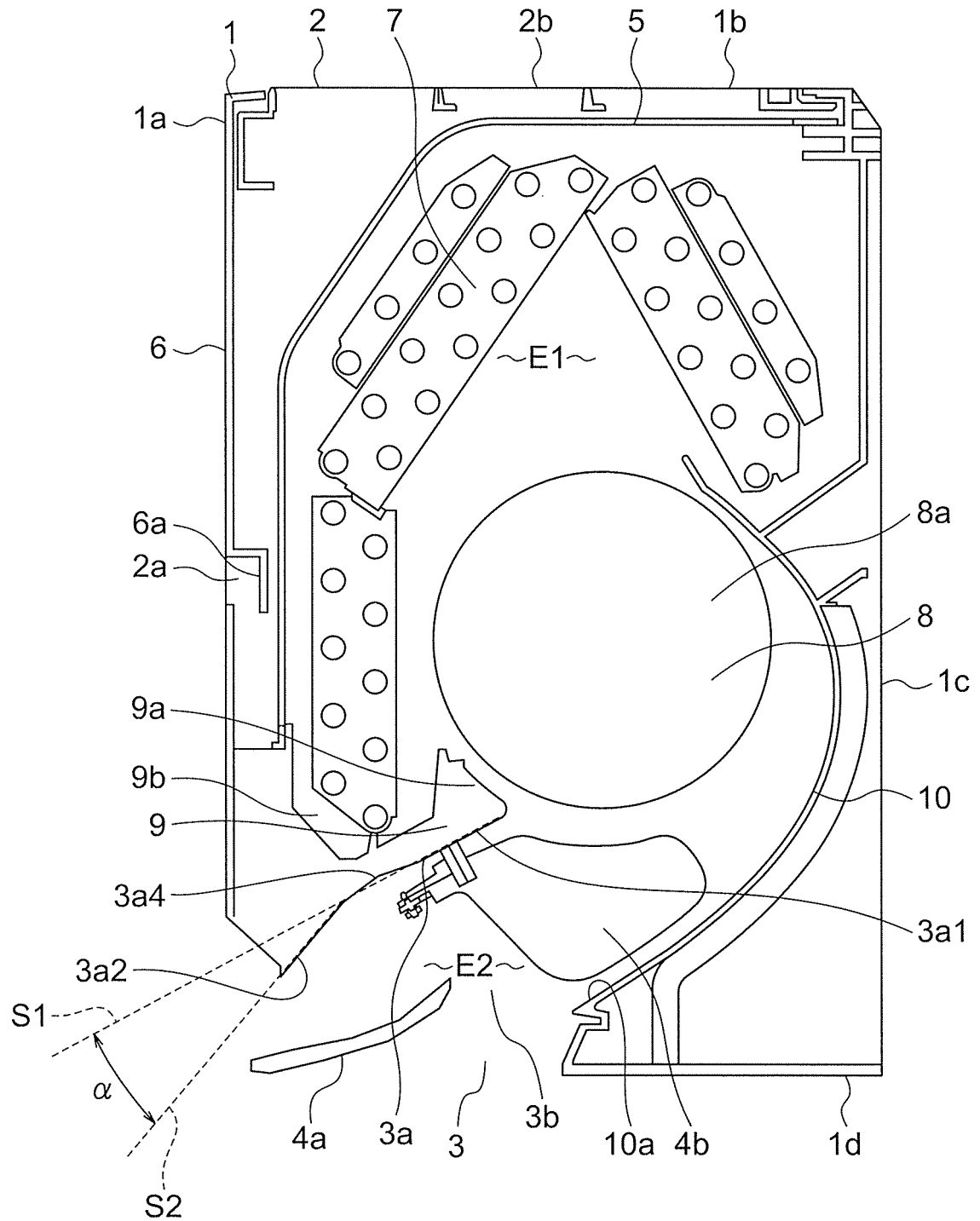


FIG. 6

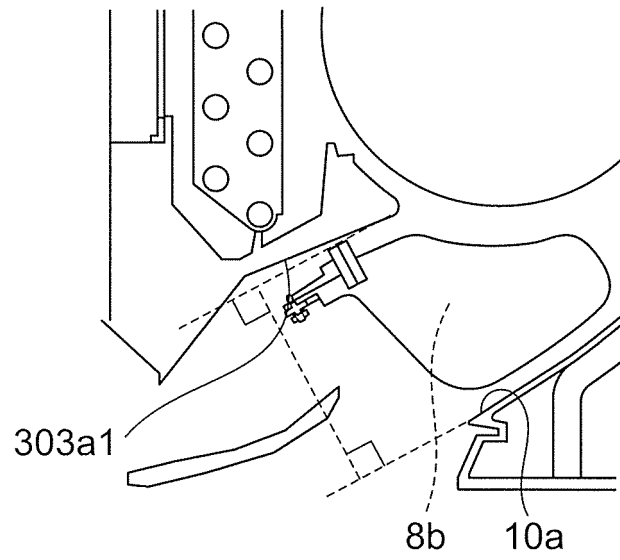


FIG. 7

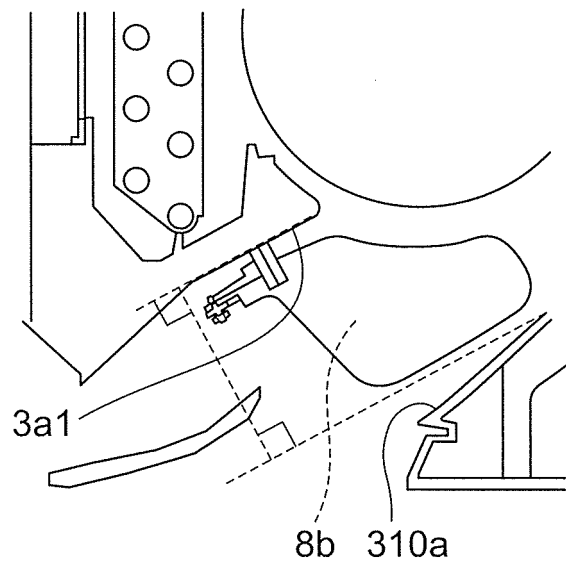
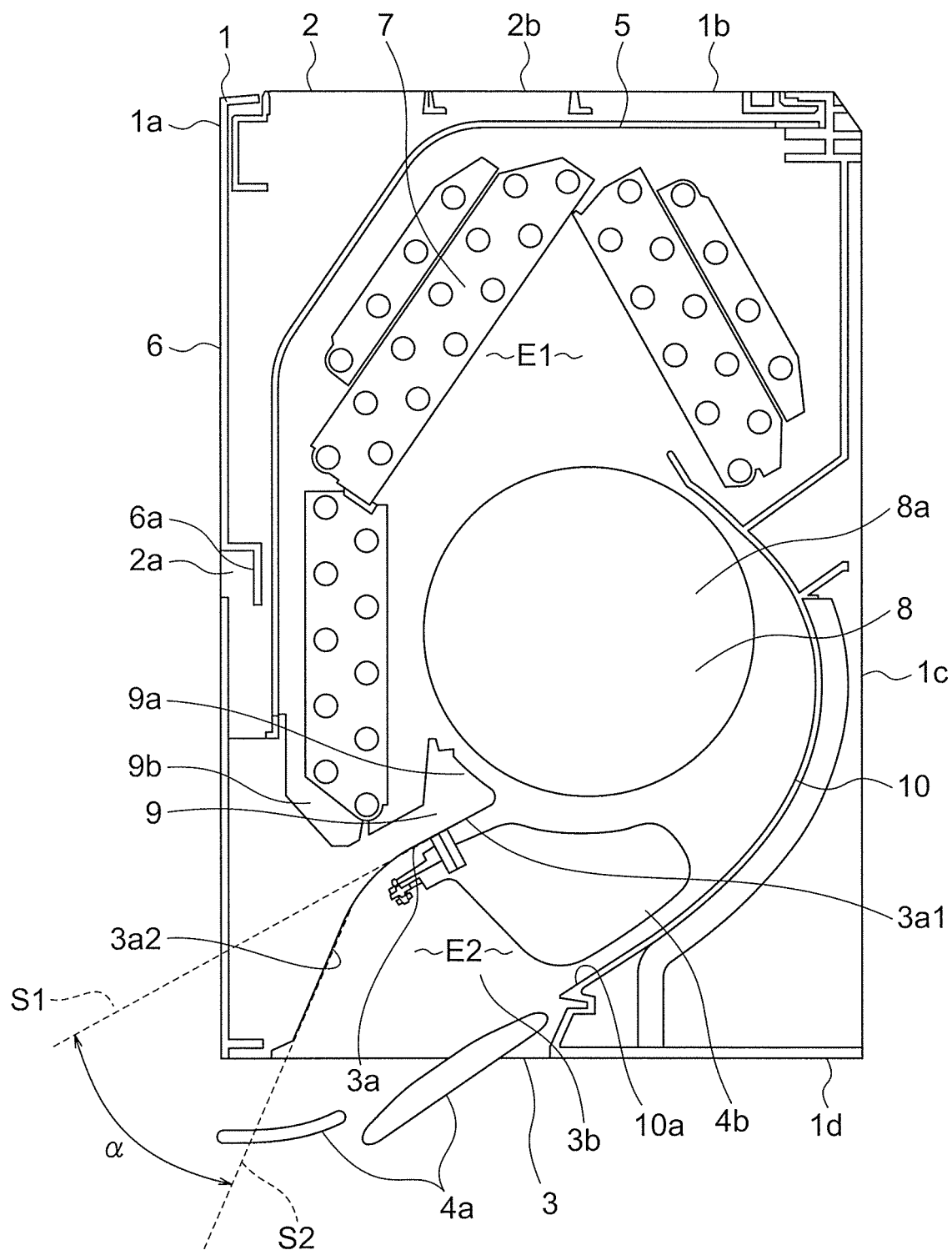


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/072226

A. CLASSIFICATION OF SUBJECT MATTER

F24F13/072(2006.01)i, F24F13/20(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)

F24F13/072, F24F13/20

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 1996-2015
 Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 3872012 B2 (Mitsubishi Electric Corp.), 24 January 2007 (24.01.2007), fig. 1 to 5 & US 2002/0172588 A1 fig. 1 to 5 & EP 1321721 A1 fig. 1 to 5 & WO 2002/029331 A1 & CN 1392940 A	1-6 7-9
X Y	JP 2014-70811 A (Daikin Industries, Ltd.), 21 April 2014 (21.04.2014), paragraphs [0015] to [0027], [0062] to [0066], [0079] to [0080]; fig. 1 to 6 (Family: none)	1-2, 4 3, 5-9

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

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 Date of the actual completion of the international search
 16 October 2015 (16.10.15)

 Date of mailing of the international search report
 27 October 2015 (27.10.15)

 Name and mailing address of the ISA/
 Japan Patent Office
 3-4-3, Kasumigaseki, Chiyoda-ku,
 Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/072226

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 8-61768 A (Samsung Electronics Co., Ltd.), 08 March 1996 (08.03.1996), fig. 1 & US 5626517 A fig. 1 & DE 19512451 A & KR 20-0119913 Y	3, 5-9
Y	JP 10-61965 A (Mitsubishi Electric Corp.), 06 March 1998 (06.03.1998), fig. 1 & US 5924923 A fig. 1 & EP 825390 A2 fig. 1	5-9
Y	JP 2014-52183 A (Mitsubishi Electric Corp.), 20 March 2014 (20.03.2014), paragraphs [0011] to [0017]; fig. 1 to 4 & US 2012/0111045 A1 paragraphs [0027] to [0040]; fig. 1 to 4 & WO 2011/016152 A1 & EP 2463599 A1 paragraphs [0011] to [0017]; fig. 1 to 4	7-9
A	JP 8-61769 A (Samsung Electronics Co., Ltd.), 08 March 1996 (08.03.1996), fig. 4 & US 5658197 A fig. 1 & KR 20-0126751 Y	1-4

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Patent documents cited in the description

- JP 3872012 B [0003]