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(54) Outdoor unit of air conditioner

Außenraumeinheit für Klimaanlage

Unité extérieure pour climatiseur

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Description

Technical Field

[0001] The present invention relates to an outdoor unit of an air conditioner having a heat sink for efficiently cooling a power module as an electronic component for driving and controlling the air conditioner.

Background Art

[0002] An outdoor unit of an air conditioner in the related art has a structure in which an electric component box is provided along a partition plate for dividing the interior of the outdoor unit into a machinery chamber and a heat exchanger chamber, and in order to cool a power module on an electronic substrate provided in the electric component box, a heat radiation fin is projected from the heat exchanger chamber side of the electric component box, a heat sink is provided at an angle such that the longitudinal direction of the heat radiation fin extends vertically with respect to a heat exchanger on the back surface side of the outdoor unit, and an angular U-shaped wind direction guide is provided on the heat radiation fin. The angular U-shaped wind direction guide keeps a constant space with the heat sink, and is mounted in such a manner that an upstream side thereof projects toward the heat exchanger and a downstream side thereof is opened (for example, Patent Literature 1).

[0003] EP 1 956 310 A1 describes an outdoor unit of an air conditioner in which an substrate attachment plate is inclined and an control circuit board is fixed to an opening, a heat sink being fixed in parallel in contact with the control circuit board. Cooling fins protrude toward the inside of the fan chamber.

[Prior Art]

[Patent Literature]

[0004]

Patent Literature 1: JP-A-63-140232 (p.1, Fig. 2)
Summary of Invention
Patent Literature 2: EP 1956310 A1

Technical Problem

[0005] In an outdoor unit of an air conditioner in the related art, a heat sink can not be arranged along a main stream of air taken through a heat exchanger and blown to outdoor from a blowout port on a front surface of the outdoor unit. Therefore, only a small part of the whole air taken from the heat exchanger flows into the heat sink, and hence the volume of the air passing through a heat radiation fin of the heat sink is not sufficient. Consequently, a cooling efficiency of the heat sink is low.

[0006] Therefore, for example, under the circumstance of a high-load operation for the power module such as a case where a user operates the air conditioner to perform a cooling operation when the outside temperature is high, sufficient cooling of a power module cannot be achieved and, consequently, breakdown of the power module due to heat rupture may occur, and remarkable impairment of reliability is resulted.

[0007] In addition, in the outdoor unit of the air conditioner in the related art, since the cooling efficiency of the power module is low, there is the need to upsize the heat sink or to select expensive electronic part elements which resist the heat rupture in order to ensure operation reliability. These factors become contributor to the growing manufacturing cost or increase in weight.

[0008] In order to solve the above-described problems, it is an object of the present invention to provide an outdoor unit of an air conditioner in which breakdown of a power module due to heat rupture is prevented by achieving efficient cooling of a heat sink being configured to cool the power module and having heat radiation fins provided so as to project from one of side surfaces of an electric component box toward a heat exchanger chamber, whereby high operation reliability is ensured.

Solution to Problems

[0009] The problem is solved by the features of the independent claim.

[0010] An outdoor unit of an air conditioner according to the present invention including:

a partition plate provided so as to extend upright from a bottom plate of the outdoor unit to halfway to a top thereof;
an electric component box placed on the partition plate and configured to divide the interior of the outdoor unit into a machinery chamber and a heat exchanger chamber in cooperation with the partition plate;
an electronic substrate stored in the electric component box and having a power module mounted thereon;
a compressor provided in the machinery chamber;
a propeller fan driven by a fan motor and a heat exchanger provided in the heat exchanger chamber; and
an electric component partition plate being in contact at one end thereof with an end of the heat exchanger positioned on the side of a back surface of the heat exchanger chamber and at the other end thereof with a front plate of the outdoor unit, and configured to divide the interior of the electric component box and the heat exchanger chamber, wherein
the electric component partition plate is inclined so that an extended line thereof toward a front surface of the outdoor unit intersects a line of projection of a front edge of a vane of the propeller fan,
the electronic substrate is fixed to an opening pro-

vided on the electric component partition plate so as to be positioned within the electric component box and a heat sink for cooling the power module is fixed in parallel to a surface of the electric component partition plate in contact with the back side of the electronic substrate, and

a plurality of heat radiation fins are provided on one surface of the heat sink so as to project toward the heat exchanger chamber and extend in parallel to a flow of air on the electric component partition plate, the heat sink (17) is provided with a wind direction guide (18) that covers the heat radiation fins (16) attached thereto; and

the wind direction guide (18) includes a horn-shaped inlet member (19) having an inlet port widening toward the heat exchanger (5) on the side of the back surface of the heat exchanger chamber (H) and a lid portion (20) covering the section from an end on the side of the heat sink (17) of the inlet port to an end on the side of an outlet port of the heat sink (17).

Advantageous Effect of the Invention

[0011] According to the outdoor unit of the air conditioner in the present invention, the electric component partition plate, being in contact at the one end thereof with the end of the heat exchanger positioned on the side of the back surface of the heat exchanger chamber and at the other end thereof with the front plate of the outdoor unit and being configured to divide the interior of the electric component box and the heat exchanger chamber, is inclined so that the extended line thereof toward the front surface of the outdoor unit intersects a line of projection of the front edge of a vane of the propeller fan, the electronic substrate is fixed to the opening provided on the electric component partition plate so as to be positioned within the electric component box and the heat sink for cooling the power module is fixed in parallel to the one surface of the electric component partition plate in contact with the back side of the electronic substrate, and the plurality of heat radiation fins are provided on the one surface of the heat sink so as to project toward the heat exchanger chamber and extend in parallel to the flow of the air on the electric component partition plate. Therefore, the invention has advantages as follows. The heat radiation fins of the heat sink are capable of capturing a main stream of the air, and the speed of the air passing through the heat radiation fins may be increased. In addition, since the air flowing inward from an inlet port of the heat sink reaches an outlet port without leaving the heat sink at some midpoint and escaping therefrom, and generation of significant wind drift in an air duct of the outdoor unit is prevented, a pressure loss in the air duct is reduced, and a cooling efficiency of the heat sink is enhanced by being capable of increasing the air volume in the entire outdoor unit, so that operation reliability of the air conditioner is enhanced by preventing breakdown due to heat rupture of the power module.

[0012] Also, since the cooling can be achieved sufficiently even with the heat sink having a smaller volume than that in the related art by increasing the air volume of the entire outdoor unit, reduction of the manufacturing cost and reduction of the weight of the outdoor unit are achieved.

[0013] Furthermore, since the cooling efficiency of the heat sink can be enhanced, a power module which is low in heat resistance and required lower cost than in the related art can be employed. From this point of view as well, the reduction of the manufacturing cost is effectively achieved. Brief Description of Drawings

[0014]

Fig. 1 is a plan view of an outdoor unit of an air conditioner according to an Embodiment 1,which is not covered by the claims but useful for explaining the invention, viewed from the top.

Fig. 2 is an explanatory drawing showing a partition plate and an electric component partition plate viewed in the direction indicated by an arrow X in Fig. 1.

Fig. 3 is a plan view showing a principal portion of the outdoor unit of the air conditioner with a particular emphasis on an electric component box.

Fig. 4 is a perspective view of the outdoor unit of the air conditioner viewed obliquely from the front.

Fig. 5 is a graph showing a relation between the position of a point of intersection c between an extension of the electric component partition plate and a line of projection of a front edge of a vane in the outdoor unit of the air conditioner and the wind speed in a heat sink.

Fig. 6 is a schematic plan view showing a state of Arrangement 1 of a case where an angle of inclination α of the electric component partition plate in the outdoor unit of the air conditioner is narrow.

Fig. 7 is a schematic plan view showing a state of Arrangement 2 of a case where the angle of inclination α of the electric component partition plate in the outdoor unit of the air conditioner is wide.

Fig. 8 is a plan view of an outdoor unit of an air conditioner according to Embodiment 2, which is covered by the claims, viewed from the top.

Fig. 9 is a cross-sectional view showing an electric component box and a heat sink in the outdoor unit of the air conditioner.

Fig. 10 is a perspective view showing the heat sink and a wind direction guide in the outdoor unit of the air conditioner.

Description of Embodiments

Embodiment 1

[0015] Fig. 1 is a plan view of an outdoor unit of an air conditioner according to an explanatory Embodiment 1 when viewed from a top, Fig. 2 is an explanatory drawing

showing a partition plate and an electric component partition plate viewed in the direction indicated by an arrow X in Fig. 1, Fig. 3 is a plan view showing a principal portion of the outdoor unit of the air conditioner with a particular emphasis on an electric component box, Fig. 4 is a perspective view of the outdoor unit of the air conditioner viewed obliquely from the front, Fig. 5 is a graph showing a relation between the position of a point of intersection c between an extension of the electric component partition plate and a line of projection of the electric component partition plate and a front edge of a vane in the outdoor unit of the air conditioner and the wind speed in a heat sink, Fig. 6 is a schematic plan view showing a state of Arrangement 1 of a case where an angle of inclination α of the electric component partition plate in the outdoor unit of the air conditioner is narrow, and Fig. 7 is a schematic plan view showing a state of Arrangement 2 of a case where the angle of inclination α of the electric component partition plate in the outdoor unit of the air conditioner is wide.

[0016] In the drawings, an outdoor unit 1 of the air conditioner has a configuration in which the interior of the outdoor unit is divided into a machinery chamber M and a heat exchanger chamber H by a partition plate 3 formed of a sheet metal extending upright from a bottom plate 2 to halfway to a top thereof and an electric component box 14 placed on the partition plate 3.

[0017] The machinery chamber M includes a compressor 4 and the like for compressing a refrigerant to a high-temperature high-pressure state. A heat exchanger 5 for performing heat exchange between the refrigerant compressed to high-temperature and high-pressure by the compressor 4 and the outdoor air, a propeller fan 6 for blowing air to the heat exchanger 5 for promoting the heat exchange in the heat exchanger 5, and a fan motor 7 for rotating the propeller fan 6 are provided in the heat exchanger chamber H when the air conditioner is in a cooling operation.

[0018] A front plate 8 which constitutes the outdoor unit 1 is provided with a horn-shaped bell mouth 10 so as to project toward the propeller fan. The bell mouth 10 is configured to rectify air blown out from a blowout port 9 being opened in the front plate 8, and is arranged outside the propeller fan 6 so as to keep a constant distance from the propeller fan 6.

[0019] The propeller fan 6 has a structure having a plurality of curved vanes formed integrally around a hub 11, and a portion of the vane on the side of a front surface of the outdoor unit is referred to as a front edge of a vane 12. The propeller fan 6 is fixed at a center of the hub 11 to a shaft of the fan motor 7. The rotation of the propeller fan 6 in association with driving of the fan motor 7 generates a flow of air in the interior of the heat exchanger chamber H in the outdoor unit 1.

[0020] Provided in the interior of the electric component box 14 mounted on the partition plate 3 is an electronic substrate 13 and the like having a power module mounted thereon.

[0021] One end of an electric component partition plate 15 which forms a surface of the electric component box 14 and divides the interior of the electric component box 14 and the heat exchanger chamber H is in contact with an end of the heat exchanger 5 on the side of a back surface of the heat exchanger chamber H, and the other end thereof is in contact with the front plate 8, so that the electric component box 14 is secured to the heat exchanger 5 and the front plate 8 by screws or the like.

[0022] The electric component partition plate 15 is arranged so that a surface on the side of a back surface of the outdoor unit forms an angle of inclination α with respect to the heat exchanger 5. The angle of inclination α of the electric component partition plate 15 is an angle falling within a range which allows an extended line A, being an extended line of the electric component partition plate 15 toward the front surface of the outdoor unit, to intersect the line of projection B of the front edge of a vane 12 of the propeller fan 6 on the side of the electric component box projecting from the top of the outdoor unit.

[0023] In other words, the angle of inclination α is an angle which allows the point of intersection c between the extended line A of the electric component partition plate 15 extending toward the front surface of the outdoor unit and the line of projection B of the front edge of a vane 12 to fall within a range from an end point d of the hub 11 to an outer diameter point e of the front edge of a vane 12 of the propeller fan 6 on the side of the electric component box.

[0024] The electric component partition plate 15 is bent into an elbow shape at a midpoint toward inside the electric component box so as to avoid interference with the propeller fan 6 and the bell mouth 10, and is fixed at the end thereof to the front plate 8.

[0025] The electric component partition plate 15 is provided with an opening, and the electronic substrate 13 having the power module or the like for driving and controlling the compressor 4 and the fan motor 7 is fitted and fixed to the opening so as to be positioned inside the electric component box.

[0026] In addition, a heat sink 17 for cooling the power module, which includes a plurality of heat radiation fins 16 provided upright on one surface thereof, is attached to the opening of the electric component partition plate 15 in parallel to a front surface of the electric component partition plate 15 with screws or the like so as to be in contact with the back side of the electronic substrate 13.

[0027] The plurality of heat radiation fins 16 of the heat sink 17 project toward the heat exchanger chamber side of the electric component partition plate 15, and are arranged with intervals in the vertical direction toward the bottom plate 2 when viewed from the ceiling of the outdoor unit. The heat sink 17 and the plurality of heat radiation fins 16 are arranged so as to extend in parallel to a flow of the air on the electric component partition plate 15.

[0028] The heat sink 17 for cooling the power module, which includes the plurality of heat radiation fins 16 on

one surface thereof, is molded by an extrusion method or the like using a metal having a high thermal conductivity such as aluminum as a material in order to prevent the temperature of the power module from exceeding a heat resistant temperature and causing damages and breakdown.

[0029] Subsequently, an operation of the outdoor unit 1 of the air conditioner of the explanatory Embodiment 1 will be described.

[0030] Air taken by the rotation of the propeller fan 6 from the back surface of the outdoor unit is subjected to the heat exchange with respect to the refrigerant in the heat exchanger 5, passes through the spaces among the plurality of vanes of the propeller fan 6 or a space between the propeller fan 6 and the bell mouth 10, and is blown out from the blowout port 9 of the front plate 8 of the outdoor unit.

[0031] At this time, part of the air taken through the heat exchanger 5 flows from an inlet port of the heat sink 17 smoothly along the electric component partition plate 15 without meandering significantly, passes through the plurality of heat radiation fins 16 arranged in parallel to the flow of air on the electric component partition plate 15 without allowing the air escaping from a midsection of the heat sink 17, and is blown out from an outlet port of the heat sink 17, so that the heat sink 17 is cooled, and the power module on the electronic substrate 13, which is in contact with the heat sink 17, is also cooled.

[0032] As described thus far, the electric component partition plate 15 is provided in such a manner that the point of intersection c between the extended line A of the electric component partition plate 15 extending toward the front surface of the outdoor unit and the line of projection B of the front edge of a vane 12 of the propeller fan 6 on the side of the electric component box falls within the range from the end point d of the hub 11 on the line of projection to the outer diameter point e of the front edge of a vane 12 of the propeller fan 6 on the side of the electric component box, the plurality of heat radiation fins 16 of the heat sink 17 are arranged at intervals in the vertical direction toward the bottom plate 2 when viewed from the top of the outdoor unit, and the plurality of heat radiation fins 16 are arranged in parallel to the flow of the air on the electric component partition plate 15. Therefore, advantages described from (1) to (5) are achieved.

[0033]

(1) Since the heat sink 17 having the plurality of heat radiation fins 16 can be arranged along a main stream of the air flowing from the heat exchanger 5 to the blowout port 9 of the front plate 8, the heat radiation fins 16 of the heat sink 17 are capable of capturing the main stream of the air at high flow velocities.

[0034] Consequently, the flow speed of the air passing through the heat radiation fins 16 is higher than in the related art, so that a cooling efficiency of the heat sink 17 is enhanced. In order to prove this advantage, a result of measurement of wind velocities at the inlet port and the outlet port of the heat sink 17 with a several different angles of inclination α of the electric component partition plate 15 is shown in the graph in Fig. 5.

[0035] Fig. 5 is the graph showing flow velocities at the inlet port and the outlet port of the heat sink 17 and average flow velocities of the inlet port and the outlet port with respect to the position of the point of intersection c between the extended line A of the electric component partition plate 15 and the line of projection B of the front edge of a vane 12, in which the lateral axis shows from the axial center of the propeller fan 6 as an original point 0 to an end point of the blowout port 9 on the side of the electric component box as 0.6.

[0036] As shown in Fig. 5, when the point of intersection c falls within the range from the end point d of the hub 11 to the outer diameter point e of the front edge of a vane 12, high wind speeds not lower than 1.8 m^3/min in average of the wind velocities at the inlet port and the outlet port of the heat sink 17 are obtained and, specifically, when the point of intersection c is at the position of 0.45, a highest wind speed is obtained and hence the highest cooling efficiency of the heat sink 17 is expected.

[0037] In contrast, in the case of Arrangement 1 in which the angle of inclination α of the electric component partition plate 15 is small and the point of intersection c is positioned on the side of the axial center of the propeller fan 6 with respect to the end point d of the hub 11 as shown in FIG. 6, the average velocity of the wind passing through the heat sink 17 is lowered in comparison with the case where the point of intersection c falls within the range from the point d to the point e.

[0038] It is because if the angle α of inclination of the electric component partition plate 15 is small, the air flowing along the electric component partition plate 15 is caused to meander significantly at a portion of the electric component partition plate 15 bent into an elbow shape to increase the pressure loss in an air duct as shown by a typical flow of the air taken through the heat exchanger 5 as indicated by an arrow in a broken line in Fig. 6.

[0039] In contrast, in the case of Arrangement 2 in which the angle α of inclination of the electric component partition plate 15 is large, and the intersection c is positioned on the side of the electric component box with respect to the outer diameter point e of the propeller fan 6 as shown in FIG. 7, the average velocity of the air passing through the heat sink 17 is lowered and the air speed on the side of the outlet port of the heat sink 17 is significantly lowered in comparison with the case where the intersection c falls within the range from the point d to the point e. It is because the air flowing in from the inlet port of the heat sink 17 leaves the heat radiation fins 16 on the way and escapes therefrom.

[0040]

(2) Since the electric component partition plate 15 and the heat sink 17 can be arranged along the flow

of the air flowing in the outdoor unit 1, the air flowing inward from the inlet port of the heat sink 17 is prevented from leaving the heat sink 17 at some midpoint and escaping therefrom, and reaches the side of the outlet port, and hence the heat exchange can be performed using the entire heat radiation fins 16 of the heat sink 17 effectively. Threfore, the cooling efficiency of the heat sink 17 is enhanced.

(3) With the advantages described in (1) and (2) described above, even under the circumstance of a high-intensity operation for the power module, such as a case where a user operates the air conditioner to perform a cooling operation when the outside temperature is high, damages or breakdown of the power module due to excessive heating is prevented, and high operation reliability of the air conditioner can be obtained.

(4) Since the cooling effect of the heat sink 17 is enhanced, the power module can be cooled sufficiently even with the heat sink 17 having a smaller volume than that in the related art. Therfore, reduction of manufacturing cost and reduction of the weight of the outdoor unit 1 are achieved.

(5) Since the air flowing in the outdoor unit 1 of the air conditioner is prevented from meandering significantly in the midpoint and hence causes a wind drift in the air duct, the pressure loss in the air duct is restrained to a low level. Therefore, the volume of air taken through the heat exchanger 5 is increased, the heat exchange between the refrigerant and the air performed in the heat exchanger 5 is accelerated, and the cooling performance and the heating performance of the air conditioner can be improved.

Embodiment 2

[0041] Fig. 8 is a plan view of an outdoor unit of an air conditioner according to inventive Embodiment 2 when viewed from the top, Fig. 9 is a cross-sectional view showing an electric component box and a heat sink in the outdoor unit of the air conditioner, and Fig. 10 is a perspective view showing the heat sink and a wind direction guide in the outdoor unit of the air conditioner.

[0042] In explanatory Embodiment 1, the electric component partition plate 15 is provided at the angle of inclination α which allows the point of intersection c between the extended line A of the electric component partition plate 15 extending toward the front surface of the outdoor unit and the line of projection B extending toward the propeller fan 6 on the side of the electric component box to fall within the range between the end point d of the hub 11 on the line of projection B and the outer diameter point e of the front edge of a vane 12, the plurality of heat radiation fins 16 of the heat sink 17 are arranged at the intervals in the vertical direction toward the bottom plate 2 when viewed from the top of the outdoor unit, and the plurality of heat radiation fins 16 are arranged in parallel to the flow of the air on the electric component partition plate 15. However, in Embodiment 2, the cooling efficiency of the heat sink 17 is further improved by adding a certain configuration to the configuration in Embodiment 1.

[0043] In Embodiment 2, a wind direction guide 18 molded using a material such as resin is srcewed and fixed to the heat sink 17 of the outdoor unit 1 of the air conditioner configured in the same manner as in Embodiment 1 with screws or the like so as to cover the plurality of heat radiation fins 16.

[0044] As shown in Fig. 9 and Fig. 10, with the wind direction guide 18, a horn-shaped inlet member 19 having a port widening toward the heat exchanger and a lid portion 20 covering a section of the inlet member 19 from an end on the side of the heat sink 17 to the outlet port of the heat sink 17 while keeping a constant space with respect to the heat radiation fins 16 are integrally formed.

[0045] The inlet member 19 is attached at a certain angle β of inclination with respect to one side portion of the heat radiation fins 16 in the longitudinal direction when viewed from the top of the outdoor unit, and the surface area of the opening of the inlet member 19 on the side of the heat exchanger is larger than the surface area of the opening of the heat sink 17 on the side of the inlet port.

[0046] As described above, since the wind direction guide 18 is provided with the horn-shaped inlet member 19 having the port widening toward the heat exchanger 5 on the side of the inlet port of the heat sink 17, a configuration in Embodiment 2 has advantages such that the flow rate of the air flowing into the heat sink 17 is increased, the flow speed of the air passing through the heat radiation fins 16 can be increased, and the cooling efficiency of the heat sink 17 can be enhanced.

[0047] In addition, since the section of the inlet member 19 from the end on the side of the inlet port of the heat sink 17 to the end on the side of the outlet port of the heat sink 17 is covered with the lid portion 20, the air flowing inward from the inlet port of the heat sink 17 is prevented from leaving and escaping from the heat radiation fins 16 at some midpoint of the heat sink 17 as shown by an arrow of a solid line in Fig. 9, and reaches the outlet port of the heat sink 17.

[0048] Accordingly, since the heat exchange can be performed using the entire heat radiation fins 16 effectively, the cooling efficiency of the heat sink 17 is enhanced. Granted that the lid portion 20 is not provided, with the provision of the inlet member 19 on the side of the inlet port of the heat sink 17, the air is curved at some midpoint of the heat sink 17, leaves the heat radiation fins 16 as indicated by an arrow of a broken line in Fig. 9, and cannot reach the outlet port of the heat sink 17. Therefore, the cooling efficiency of the heat sink 17 is lowered in comparison with the case where the lid portion 20 is provided.

[0049] Since the wind direction guide 18 may be molded using synthetic resin or the like, the shape can be changed freely to some extent. Therefore, when further

enhancement of the cooling efficiency of the heat sink 17 is wanted, the angle β of attachment of the inlet member 19 of the wind direction guide 18 may be increased so that the surface area of the opening is increased in order to increase the volume of the air flowing into the inlet port of the heat sink 17.

[0050] Also, by molding the wind direction guide 18 with resin, molding of the wind direction guide 18 having a relatively light weight at a relatively low cost is enabled. Therefore, the reduction of the manufacturing cost and the weight is achieved.

Reference Sign List

[0051] 1: outdoor unit of air conditioner, 2: bottom plate, 3: partition plate, 4: compressor, 5: heat exchanger, 6: propeller fan, 7: fan motor, 8: front plate, 9: blowout port, 10: bell mouth, 11: hub, 12: front edge of a vane, 13: electronic substrate, 14: electric component box, 15: electric component partition plate, 16: heat radiation fin, 17: heat sink, 18: wind direction guide, 19: inlet member, 20: lid portion

Claims

1. An outdoor unit of an air conditioner comprising:

   a partition plate (3) provided so as to extend upright from a bottom plate (2) of the outdoor unit to halfway to a top thereof;
   an electric component box (14) placed on the partition plate (3) and configured to divide the interior of the outdoor unit into a machinery chamber (M) and a heat exchanger chamber (H) with the partition plate (3);
   an electronic substrate (13) stored in the electric component box (14) and having a power module mounted thereon;
   a compressor (4) provided in the machinery chamber (M);
   a propeller fan (6) driven by a fan motor (7) and a heat exchanger (5), both provided in the heat exchanger chamber (H); and
   an electric component partition plate (15) being in contact at one end thereof with an end portion of the heat exchanger (5) positioned on the side of a back surface of the heat exchanger chamber (H) and at the other end thereof with a front plate (8) of the outdoor unit, and configured to divide the interior of the electric component box (14) and the heat exchanger chamber (H), wherein the electric component partition plate (15) is inclined so that an extended line thereof toward a front surface of the outdoor unit intersects a line of projection of a front edge of a vane (12) of the propeller fan (6),
   the electronic substrate (13) is fixed to an opening provided on the electric component partition plate (15) so as to be positioned within the electric component box (14) and a heat sink (17) for cooling the power module is fixed in parallel to a surface of the electric component partition plate (15) in contact with the back side of the electronic substrate (13), and
   a plurality of heat radiation fins (16) are provided on one surface of the heat sink (17) so as to project toward the heat exchanger chamber side and extend in parallel to a flow of air on the electric component partition plate (15),
   characterized in that the heat sink (17) is provided with a wind direction guide (18) that covers the heat radiation fins (16) attached thereto; and the wind direction guide (18) includes a horn-shaped inlet member (19) having an inlet port widening toward the heat exchanger (5) on the side of the back surface of the heat exchanger chamber (H) and a lid portion (20) covering the section from an end on the side of the heat sink (17) of the inlet member (19) to an end on the side of an outlet port of the heat sink (17), while keeping constant space with respect to the heat radiation fins (16).

2. The outdoor unit of the air conditioner of claim 1, wherein an angle of inclination of the electric component partition plate (15) is an angle which allows a point of intersection between the extended line of the electric component partition plate (15) and the line of projection of the front edge of a vane (12) to fall within a range from an end point of a hub (11) attached to the propeller fan (6) to an outer diameter point of the front edge of a vane (12).

3. The outdoor unit of an air conditioner of claim 1 or 2, wherein the wind direction guide (18) is formed of synthetic resin.

Patentansprüche

1. Außeneinheit für eine Klimaanlage, umfassend:

   eine Trennplatte (3), die so bereitgestellt ist, dass sie sich aufrecht von einer Bodenplatte(2) der Außeneinheit auf halbem Wege bis zu deren Oberbereich erstreckt;
   eine Elektrokomponentenbox (14), die auf der Trennplatte (3) platziert ist und ausgestaltet ist, um das Innere der Außeneinheit in eine Maschinenkammer (M) und eine Wärmetauscherkammer (H) mit der Trennplatte (3) zu teilen;
   ein elektronisches Substrat (13), das in der Elektrokomponentenbox (14) verwahrt wird und ein darauf montiertes Leistungsmodul aufweist;
   einen Kompressor (4), der in der Maschinen-

kammer (M) bereitgestellt wird;
ein Propellergebläse (6), das von einem Gebläsemotor (7) angetrieben wird, und einen Wärmetauscher (5), die beide in der Wärmetauscherkammer (H) bereitgestellt werden; und
eine Elektrokomponententrennplatte (15), die an einem ihrer Enden mit einem Endabschnitt des Wärmetauschers (5) in Kontakt ist, der an der Seite einer rückwärtigen Fläche der Wärmetauscherkammer (H) angeordnet ist, und an ihrem anderen Ende mit einer Frontplatte (8) der Außeneinheit in Kontakt ist, und ausgestaltet ist, um das Innere der Elektrokomponentenbox (14) und der Wärmetauscherkammer (H) zu teilen, wobei
die Elektrokomponententrennplatte (15) geneigt ist, so dass eine in Richtung einer Frontfläche der Außeneinheit verlängerte Linie davon eine Projektionslinie von einer Vorderkante eines Flügels (12) des Propellergebläses (6) schneidet,
das elektronische Substrat (13) an einer Öffnung befestigt ist, die auf der Elektrokomponententrennplatte (15) bereitgestellt ist, um innerhalb der Elektrokomponentenbox (14) positioniert zu werden, und eine Wärmesenke (17) zur Kühlung des Leistungsmoduls parallel zu einer Fläche der Elektrokomponententrennplatte (15) in Kontakt mit der Rückseite des elektronischen Substrats (13) befestigt ist, und
eine Vielzahl von Wärmeabstrahlungslamellen (16) auf einer Fläche der Wärmesenke (17) bereitgestellt wird, um zu der Wärmetauscherkammerseite zu weisen und sich parallel zu einem Luftstrom auf der Elektrokomponententrennplatte (15) zu erstrecken,
dadurch gekennzeichnet, dass die Wärmesenke (17) mit einer Windrichtungsleitvorrichtung (18) ausgestattet ist, die die an ihr angebrachten Wärmeabstrahlungslamellen (16) bedeckt; und
die Windrichtungsleitvorrichtung (18) ein hornförmiges Einlasselement (19) mit einer Einlassöffnung, die sich zu dem Wärmetauscher (5) auf der Seite der rückwärtigen Fläche der Wärmetauscherkammer (H) hin aufweitet, und einen Deckelabschnitt (20) einschließt, welcher den Teilbereich von einem Ende auf der Seite der Wärmesenke (17) des Einlasselements (19) bis zu einem Ende an der Seite einer Auslassöffnung der Wärmesenke (17) bedeckt, während in Bezug auf die Wärmeabstrahlungslamellen (16) ein konstanter Raum erhalten bleibt.

2. Außeneinheit für die Klimaanlage nach Anspruch 1, wobei ein Neigungswinkel der Elektrokomponententrennplatte (15) ein Winkel ist, der es ermöglicht, dass ein Schnittpunkt zwischen der verlängerten Linie der Elektrokomponententrennplatte (15) und der Projektionslinie der Vorderkante eines Flügels (12) in einen Bereich von einem Endpunkt einer Nabe (11), die an dem Propellergebläse (6) angebracht ist, bis zu einem Außendurchmesserpunkt der Vorderkante eines Flügels (12) fällt.

3. Außeneinheit für eine Klimaanlage nach Anspruch 1 oder 2, wobei die Windrichtungsleitvorrichtung (18) aus synthetischem Harz gebildet ist.

Revendications

1. Unité extérieure d'un climatiseur comprenant :

une plaque de séparation (3) disposée de façon à s'étendre tout droit à partir d'une plaque inférieure (2) de l'unité extérieure jusqu'à mi-chemin vers le haut de celle-ci ;
un boîtier de composant électrique (14) disposé sur la plaque de séparation (3) et configuré de façon à diviser l'intérieur de l'unité extérieure en une chambre de machinerie (M) et en une chambre d'échangeur de chaleur (H) grâce à la plaque de séparation (3) ;
un substrat électronique (13) stocké dans le boîtier de composant électrique (14) et qui présente un module de puissance monté sur celui-ci ;
un compresseur (4) disposé dans la chambre de machinerie (M) ;
une soufflante à hélice (6) entraînée par un moteur de soufflante (7) et un échangeur de chaleur (5), tous deux étant disposés dans la chambre d'échangeur de chaleur (H) ; et
une plaque de séparation de composant électrique (15) étant en contact au niveau de l'une de ses extrémités avec une partie extrémité de l'échangeur de chaleur (5) positionnée du côté d'une surface arrière de la chambre d'échangeur de chaleur (H), et au niveau de l'autre de ses extrémités, avec une plaque avant (8) de l'unité extérieure, et configurée de façon à diviser l'intérieur du boîtier de composant électrique (14) et la chambre d'échangeur de chaleur (H), dans laquelle :

la plaque de séparation de composant électrique (15) est inclinée de telle sorte qu'une ligne qui s'étend à partir de celle-ci vers la surface avant de l'unité extérieure coupe une ligne de projection d'un bord avant d'une ailette (12) de la soufflante à hélice (6) ;
le substrat électronique (13) est fixé dans une ouverture prévue sur la plaque de séparation de composant électrique (15) de façon à être positionné à l'intérieur du boîtier

de composant électrique (14), et un dissipateur de la chaleur (17) destiné à refroidir le module de puissance est fixé en parallèle sur une surface de la plaque de séparation de composant électrique (15) en contact avec le côté arrière du substrat électronique (13) ; et
une pluralité d'ailettes de rayonnement de la chaleur (16) sont disposées sur une surface du dissipateur de la chaleur (17) de façon à faire saillie vers le côté de la chambre d'échangeur de la chaleur, et s'étendent en parallèle avec un flux d'air sur la plaque de séparation de composant électrique (15) ;

caractérisée en ce que le dissipateur de la chaleur (17) est doté d'un dispositif de guidage de l'air (18) qui couvre les ailettes de rayonnement de la chaleur (16) fixées dessus ; et
le dispositif de guidage de l'air (18) comprend un élément d'entrée en forme de cornet (19) qui présente un orifice d'entrée qui s'élargit vers l'échangeur de chaleur (5) du côté de la surface arrière de la chambre d'échangeur de chaleur (H), et une partie couvercle (20) qui couvre la section à partir d'une extrémité du côté du dissipateur de la chaleur (17) de l'élément d'entrée (19) jusqu'à une extrémité du côté d'un orifice de sortie du dissipateur de la chaleur (17), tout en maintenant constant l'espace par rapport aux ailettes de rayonnement de la chaleur (16).

2. Unité extérieure du climatiseur selon la revendication 1, dans laquelle l'angle d'inclinaison de la plaque de séparation de composant électrique (15) est un angle qui permet au point d'intersection entre la ligne qui s'étend de la plaque de séparation de composant électrique (15), et la ligne de projection du bord avant d'une ailette (12), de se situer à l'intérieur d'une plage qui part d'un point d'extrémité d'un moyeu (11) fixé sur la soufflante à hélice (6) et qui se termine en un point de diamètre extérieur du bord avant d'une ailette (12).

3. Unité extérieure d'un climatiseur selon la revendication 1 ou la revendication 2, dans laquelle le dispositif de guidage de l'air (18) est réalisé en une résine synthétique.

FIG. 1

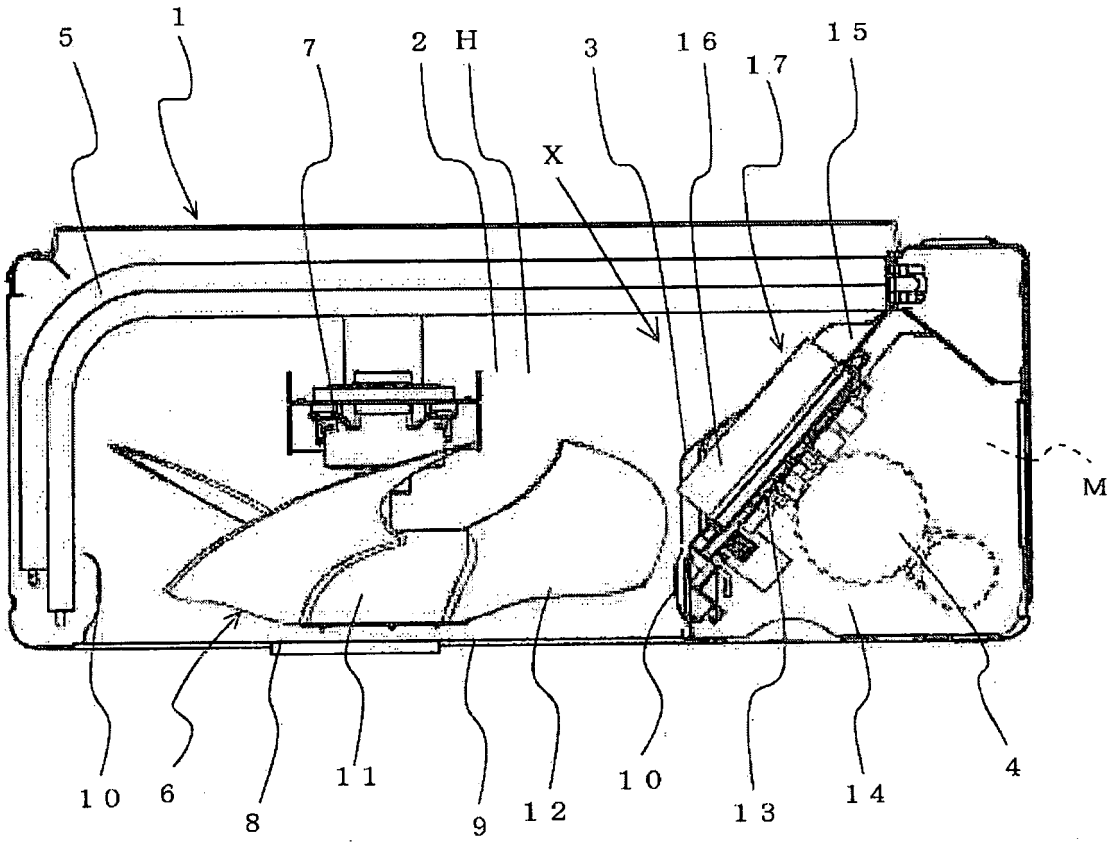


FIG. 2

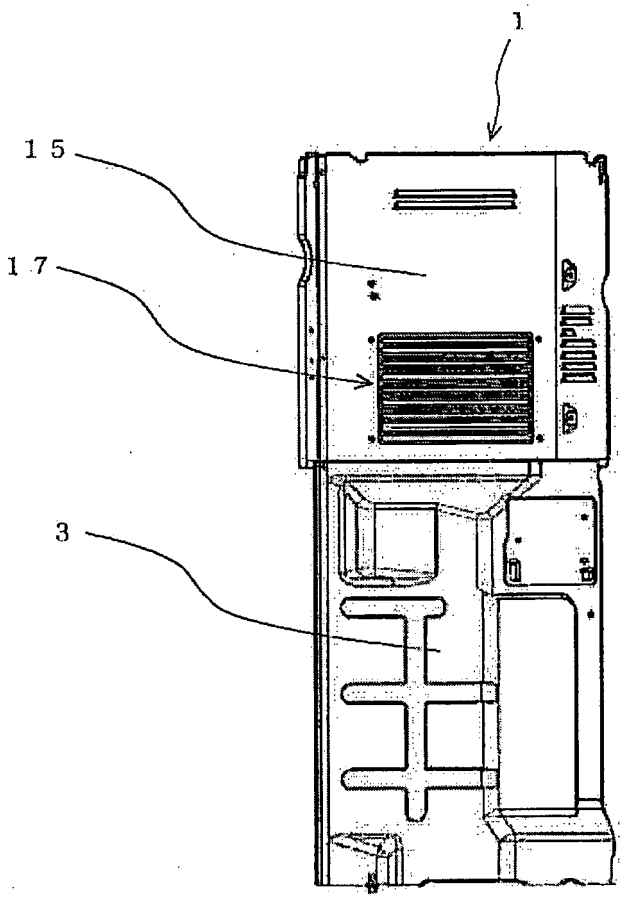


FIG. 3

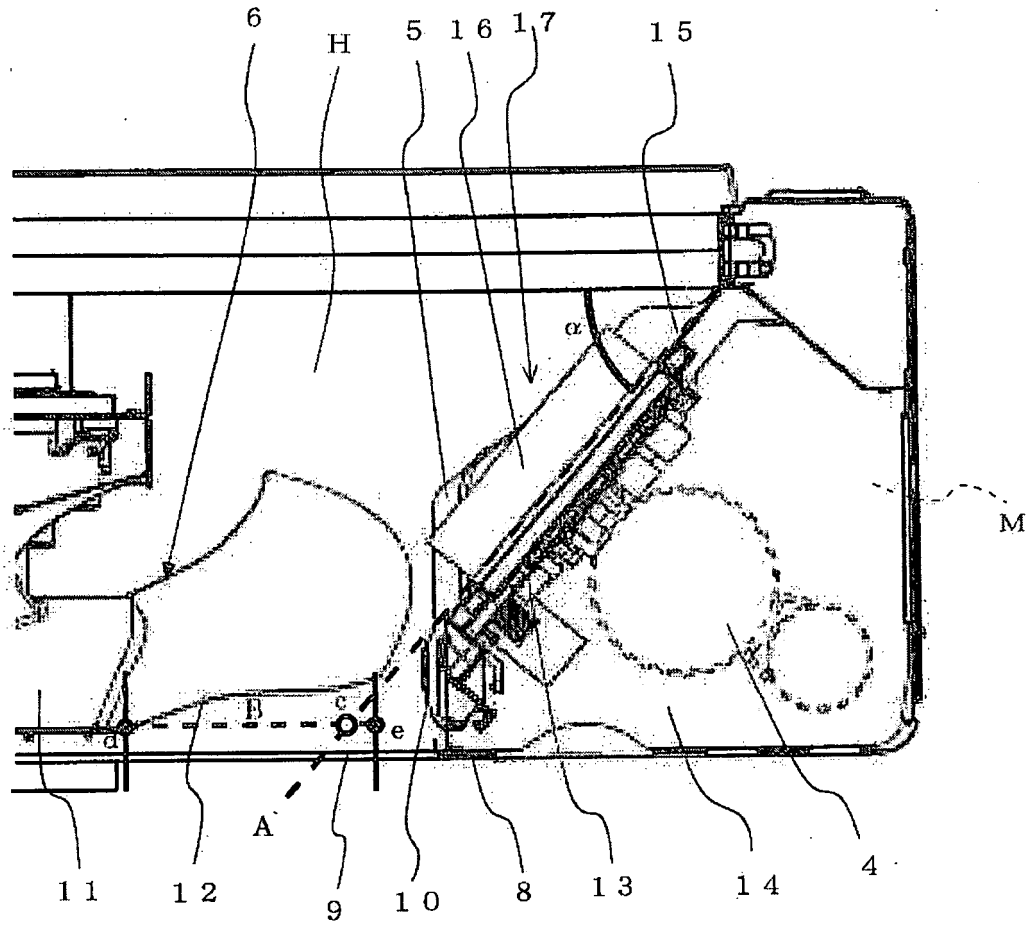


FIG. 4

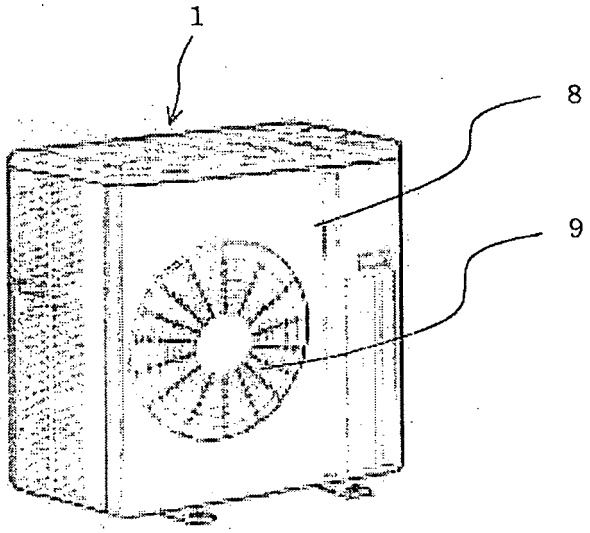


FIG. 5

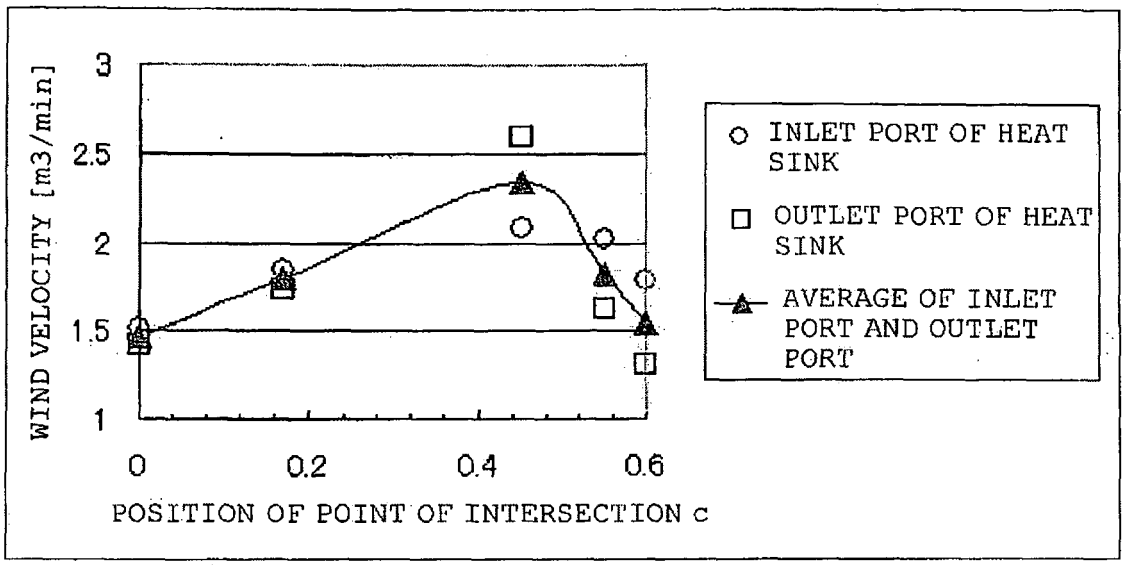

WIND VELOCITY [m3/min]
3
2.5
2
1.5
1
0
0.2
0.4
0.6
POSITION OF POINT OF INTERSECTION c
INLET PORT OF HEAT SINK
OUTLET PORT OF HEAT SINK
AVERAGE OF INLET PORT AND OUTLET PORT

FIG. 6

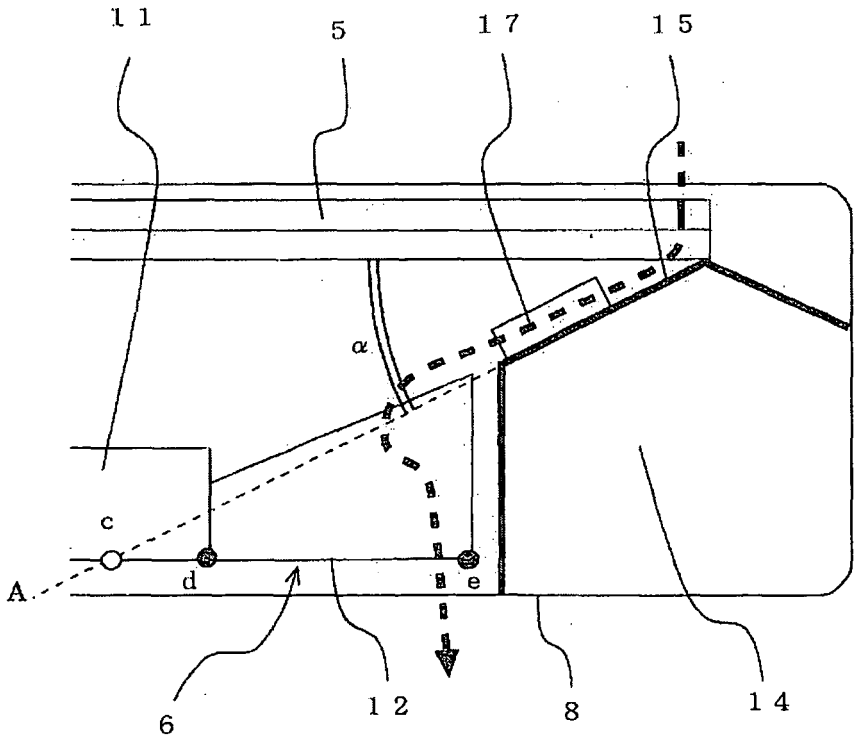

11
5
17
15
α
c
d
e
A
6
12
8
14

FIG. 7

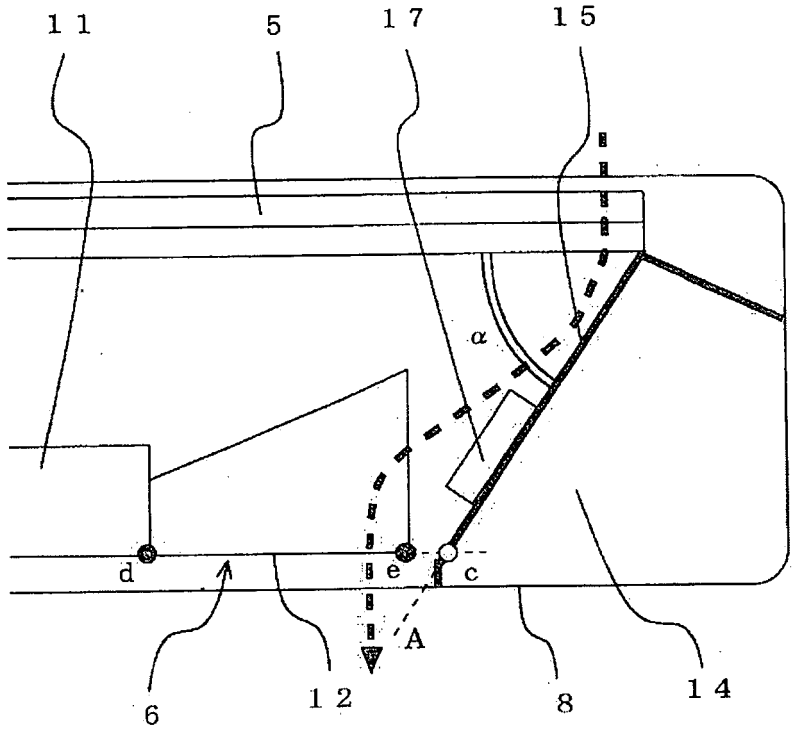


FIG. 8

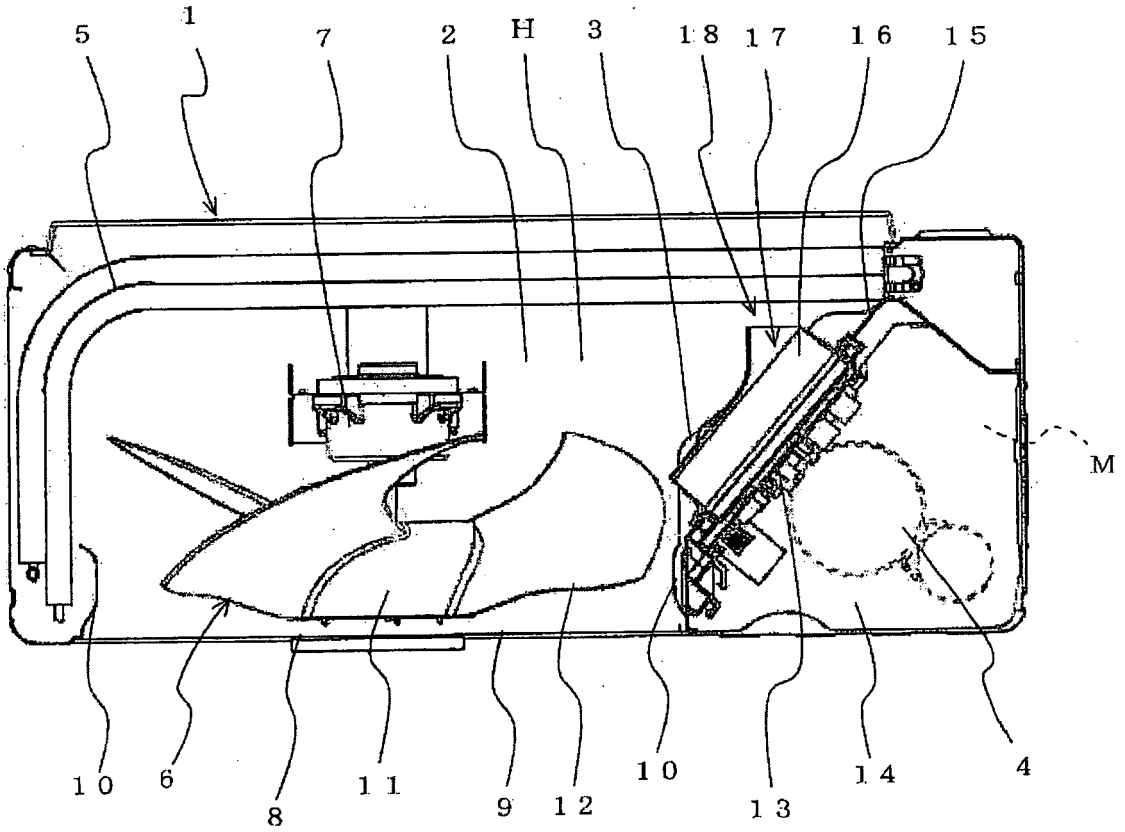


FIG. 9

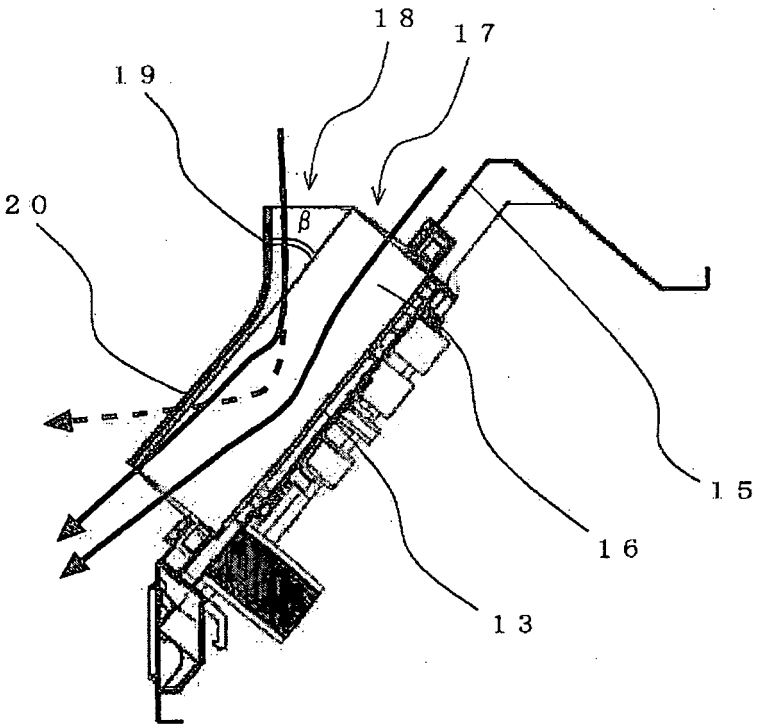
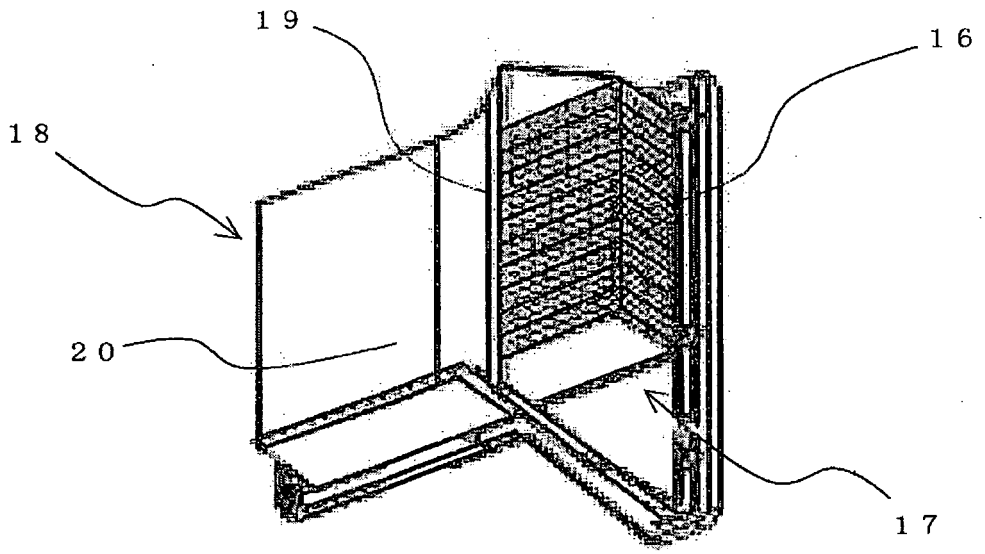


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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- JP 63140232 A **[0004]**