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(72) Inventors:
• **TORII Naoki**
Tokyo 100-8310 (JP)
• **KATO Yohei**
Tokyo 100-8310 (JP)
• **SAKAI Yoshiyuki**
Tokyo 100-8310 (JP)
• **YAMAMOTO Katsuyuki**
Tokyo 100-8310 (JP)

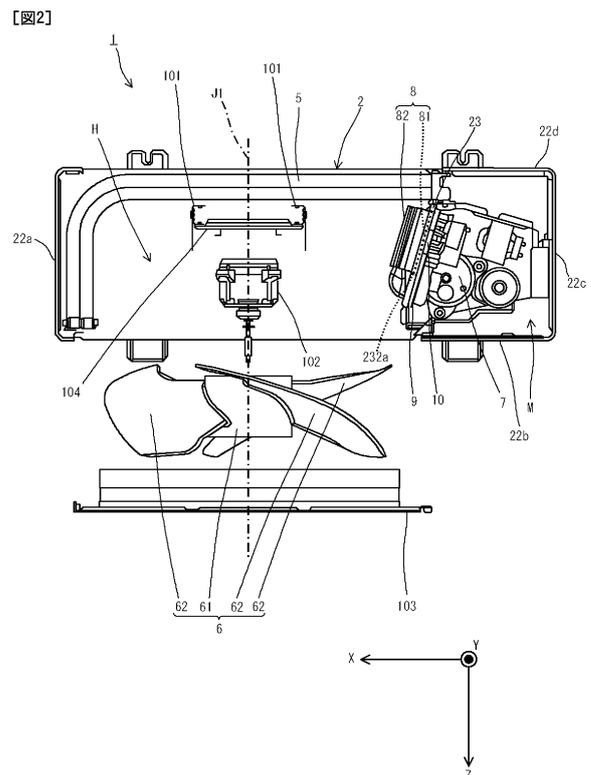
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(74) Representative: **Parker, Andrew James**
Meissner Bolte Patentanwälte
Rechtsanwälte Partnerschaft mbB
Postfach 86 06 24
81633 München (DE)

(71) Applicant: **Mitsubishi Electric Corporation**
Chiyoda-ku
Tokyo 100-8310 (JP)

(54) **OUTDOOR UNIT FOR AIR CONDITIONER, AND AIR CONDITIONER**

(57) An outdoor unit (1) includes a heat exchanger (5), a blower fan (6), an electronic board (9) on which a heat-generating element (10) is mounted, a housing (2), and a heatsink (8). The housing (2) includes a partition plate (23) partitioning the inside of the housing into a heat exchanger chamber (H) in which the heat exchanger (5) and the blower fan (6) are placed and a machine chamber (M) in which the electronic board (9) and a compressor (7) are placed, and a portion of the partition plate (23) has an opening (232a). The heatsink (8) includes a main plate (81) placed to cover the opening (232a) from the heat-exchanger-room-(H) side of the partition plate (23) and heat-releasing fins (82) projecting from the main plate (81) to the blower fan-(23) side, and a portion of the main plate (81) comes into contact with the heat-generating element (10) via the opening (232a). The greater the amounts of heat transferred from the heat-generating element (10) the heat-releasing fins (82), the larger the heat-releasing fins (82).



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Description

Technical Field

5 **[0001]** The present disclosure relates to an outdoor unit for an air conditioner and the air conditioner.

Background Art

10 **[0002]** Heretofore-proposed outdoor units for air conditioner include an outdoor unit including a housing, a propeller fan, a partition plate partitioning the inside of the housing into a machine chamber and a heat-exchanger chamber, an electronic board placed on the machine-room side of the partition plate, and a heatsink placed such that the heatsink projects to the heat-exchanger chamber of the partition plate, where the heatsink cools the electronic board (for example, refer to Patent Literature 1). In this outdoor unit, the heatsink includes heat-releasing fins projecting into the heat-exchanger chamber, and the partition plate inclines relative to a rotary shaft for the propeller fan.

15 Citation List

Patent Literature

20 **[0003]** Patent Literature 1: Unexamined Japanese Patent Application Kokai Publication JP 2010-236781 A

Summary of Invention

25 Technical Problem

[0004] Reducing the size of and the weight of this type of outdoor unit is required. One of the ways of reducing the size of and the weight of the outdoor unit is to downsize the heatsink. However, downsizing the heatsink results in reduction in the cooling capacity of the heatsink.

30 **[0005]** In consideration of the aforementioned circumstances, an objective of the present disclosure is to provide a downsized and lightweight outdoor unit for air conditioner having a high cooling capacity and an air conditioner.

Solution to Problem

35 **[0006]** In order to achieve the above objective, an outdoor unit for an air conditioner of the present disclosure includes a heat exchanger to exchange heat between outdoor air and refrigerant, a blower fan disposed facing the heat exchanger, an electronic board on which a heat-generating element is mounted, a housing including a partition plate, where the partition plate partitions the inside of the housing into a heat-exchanger chamber in which the heat exchanger and the blower fan are placed and a machine chamber in which the electronic board is placed and a portion of the partition plate has an opening, and a heatsink including (i) a main plate disposed covering the opening from the heat-exchanger chamber side of the partition plate and (ii) heat-releasing fins projecting from the main plate to the blower fan side, where the main plate thermally connects to the heat-generating element via the opening, wherein, the greater the amount of heat transferred from the heat-generating element to each of the heat-releasing fins is, the greater the size of each of the heat-releasing fins is.

45 Advantageous Effects of Invention

[0007] In the present disclosure, the heat-releasing fins are configured such that, the greater the amount of heat transferred from the heat-generating element to each of the heat-releasing fins is, the greater the size of each of the heat-releasing fins is. As a result, the greater the amounts of heat transferred from the heat-generating element to the heat-releasing fins are, the greater the heat radiating surface areas of the heat-releasing fins are, thereby improving cooling capacity of the electronic board. Additionally, the less the amount of heat radiation transferred from the heat-generating element to each of the heat-releasing fins is, the less the size of each of the heat-releasing fins is. Therefore upon comparison between heatsinks having the same total radiation capacity, the heatsink of the present disclosure is smaller and lighter than the heatsink that includes heat-releasing fins that are all the same size.

55 Brief Description of Drawings

[0008]

- FIG. 1 is a perspective view illustrating an outdoor unit for an air conditioner according to an embodiment of the present disclosure in a state in which a front plate and a ceiling plate are removed from the outdoor unit, when the outdoor unit is diagonally viewed from the front of the outdoor unit;
- FIG. 2 is an exploded plain view illustrating the outdoor unit for the air conditioner according to the embodiment in the state in which the ceiling plate is removed from the outdoor unit, when the outdoor unit is viewed from above;
- FIG. 3 is a perspective view illustrating a portion of the outdoor unit for air conditioner according to the embodiment when the portion of the outdoor unit is diagonally viewed from the front of the portion of the outdoor unit;
- FIG. 4 is a drawing illustrating a heatsink and an electronic board according to the embodiment;
- FIG. 5 is a drawing illustrating the heatsink and heat-generating elements according to the embodiment;
- FIG. 6 is a drawing for describing a positional relationship between the heatsink and the electronic board and a blower fan according to the embodiment;
- FIG. 7 is a drawing illustrating a relationship between the ratio of the shortest distance from between an end of a propeller of the blower fan and an end of the heatsink to the diameter of the blower fan, and a noise level "SPL" in the outdoor unit for air conditioner according to the embodiment and
- FIG. 8 is a drawing for describing a positional relationship between the heatsink and the electronic board and a blower fan according to a variation of the present disclosure.

Description of Embodiments

[0009] An outdoor unit for an air conditioner according to one embodiment of the present disclosure is described hereinafter with reference to drawings. The outdoor unit according to the present embodiment is connected to an indoor unit via refrigerant pipe, where the indoor unit is placed in a building, for example. The air conditioner includes the outdoor unit and the indoor unit. As illustrated in FIG. 1, the outdoor unit 1 includes a housing 2, a heat exchanger 5 to exchange heat between outdoor air and refrigerant, a compressor 7 to compress the refrigerant, a blower fan 6 to supply air to the heat exchanger 5, and a motor 102 to drive the blower fan 6. Also, as illustrated in FIG. 2, the outdoor unit 1 further includes an electronic board 9 for controlling the compressor 7 and the motor 102, and a heatsink 8 for cooling the electronic board 9. To facilitate understanding, an X-Y-Z coordinate system is set and referred to appropriately as illustrated in FIGS. 1 and 2, in which a forward direction of the outdoor unit 1 is set to the positive Z direction, an upward direction of the outdoor unit 1 is set to the positive Y direction, and a leftward direction of the outdoor unit 1 is set to the positive X direction. Also, a symbol, "J1" illustrated in FIG. 2 denotes a rotation axis of the blower fan 6.

[0010] The housing 2 includes a rectangular-shaped bottom plate 21, side walls 22a, 22b, 22c and 22d that are erected on the periphery of the bottom plate 21, a ceiling plate fixed to edges of the side walls 22a, 22b, 22c and 22d (and not illustrated in the drawings), and a front plate 103. The housing 2 as a whole is contoured so as to have a rectangular box-like shape. Part of the front-side portion of and part of the rear-side portion of the housing 2 are not covered with the side walls 22b and 22d and thus are opened. The front plate 103 is arranged to cover the opened area that is not covered with the side wall 22b on the front side of the housing 2.

[0011] Also, the housing 2 includes a partition plate 23. The partition plate 23 partitions the inside of the housing 2 into a heat-exchanger chamber H and a machine chamber M, where the heat exchanger 5 and the blower fan 6 are placed in the heat-exchanger chamber H, and the compressor 7 and the electronic board 9 are placed in the machine chamber M. The partition plate 23 includes a lower-side partition plate 231 and an upper-side partition plate 232. The lower-side partition plate 231 extends from the bottom plate 21 of the housing 2 toward the ceiling plate. The upper-side partition plate 232 is arranged on the upper side of the lower-side partition plate 231 and extends from the upper edge of the lower-side partition plate 231 to the ceiling plate. As illustrated in FIG. 3, a portion of the upper-side partition plate 232 is provided with an opening 232a that has a rectangular shape in a plan view. The partition plate 23 is arranged in the periphery of a region in which airflow generated by rotation of the blower fan 6 flows.

[0012] Additionally, as illustrated in FIGS. 1 and 2, two elongate support elements 101 extending from the bottom plate 21 upward are placed near the rear-side edge of the bottom plate 21 of the housing 2. The support elements 101 support the motor 102. A fixation element 104 for fixing the motor 102 to the support elements 101 is placed in the central portions of the two support elements 101 with respect to the longitudinal direction of the support elements. The motor 102 is fixed to the two support elements 101 via the fixation element 104.

[0013] The heat exchanger 5 is arranged to cover the opened area that is located on the rear side of the heat-exchanger chamber H of the housing 2 and that is not covered with the side wall 22d. The heat exchanger 5 exchanges heat between outdoor air and refrigerant.

[0014] The compressor 7 is arranged on the lower side of the machine chamber M of the housing 2 and is connected to the heat exchanger 5 via a refrigerant pipe (not illustrated in the drawings). The compressor 7 compresses the refrigerant that is supplied from the heat exchanger 5 through the refrigerant pipe.

[0015] The blower fan 6 includes blades 62 (three blades in the example illustrated in FIGS. 1 and 2) and a hub 61 to which the blades 62 are fixed. The blower fan 6 is arranged to face the heat exchanger 5. The motor 102 is coupled to

the hub 61 of the blower fan 6 to drive the blower fan 6.

[0016] The electronic board 9 is used for controlling the compressor 7, the motor 102 and the like. The electronic board 9 includes a circuit board having a conductive pattern and circuit elements mounted on the circuit board. Heat-generating elements such as a switching element, a rectifier element and the like are mounted on the electronic board 9.

[0017] As illustrated in FIG. 3, the heatsink 8 includes a main plate 81 placed to cover the opening 232a of the upper-side partition plate 232 and heat-releasing fins 82 projecting from the main plate 81. Flanges 811 provided on the both edges of the main plate 81 with respect to the longitudinal direction of the main plate 81 are fixed to the outer peripheral portion of the opening 232a of the upper-side partition plate 232. As a result, the heatsink 8 is fixed to the upper-side partition plate 232. As illustrated in FIGS. 1 and 2, the heatsink 8 is arranged to cover the opening 232a from the heat-exchanger-chamber-H side of the partition plate 23. The heat-releasing fins 82 of the heatsink 8 project into the heat exchanger chamber H. As illustrated in FIG. 3, the electronic board 9 is fixed to the upper-side partition plate 232 with a board holder 105 placed between the electronic board 9 and the upper-side partition plate 232. In a state in which the electronic board 9 is fixed to the upper-side partition plate 232, the heat-generating elements 10 are arranged to the inside of an opening 105a of the board holder 105 and to the inside of the opening 232a of the upper-side partition plate 232. The main plate 81 of the heatsink 8 comes into contact with the heat-generating elements 10 through the opening 232a of the upper-side partition plate 232.

[0018] Each of the heat-releasing fins 82 is shaped like a rectangular plate. The heat-releasing fins 82 are arranged at fixed intervals in the vertical direction and have the same length in the Z direction. Also, the top edges of the heat-releasing fins 82 are parallel to one another. As illustrated in FIG. 2, the heatsink 8 is placed in the housing 2 such that the heat-releasing fins 82 extend in a direction intersecting the axis of the rotation of the blower fan 6. Also, the heat-releasing fins 82 are configured such that, the greater the amounts of heat transferred from the heat-generating elements 10 to the heat-releasing fins 82 are, the greater the heights of the heat-releasing fins 82 from the main plate 81 are. The shorter the distance between a portion of the main plate 81 connected to the base of a heat-releasing fin 82 and a portion of the main plate 81 coming into contact with a heat-generating element 10 (thermally connected portion) is, the greater the amount of heat transferred from the heat-generating element 10 to the heat-releasing fin 82 is. As illustrated in FIG. 4, heat-releasing fins 82, the bases of which are connected to portions of the main plate 81 coming into contact with heat-generating elements 10A and 10B, are configured to have heights H1 and H2 that are greater than the height of a heat-releasing fin 82, the base of which is connected to a portion of the main plate 81 other than the portions coming into contact with the heat-generating elements 10A and 10B. Also, in the case where an amount of heat radiated from the heat-generating element 10A is greater than an amount of heat radiated from the heat-generating element 10B, the heat-releasing fin 82, the base of which is connected to the portion coming into contact with the heat-generating element 10A, is configured to have the height H1 greater than the height H2 of the heat-releasing fin 82, the base of which is connected to the portion coming into contact with the heat-generating element 10B. Additionally, the heat-releasing fins 82 are configured such that, the longer the distances from portions of the main plate 81 connected to the bases of the heat-releasing fins 82 to a portion of the main plate 81 coming into contact with a heat-generating element 10 are, the smaller the heights of the heat-releasing fins 82 from the main plate 81 are. For example, as illustrated in FIG. 4, heat-releasing fins 82A, 82B and 82C are configured such that, the longer the distances L21, L22 and L23 between a portion CP21 of the main plate 81 connected to the base of the heat-releasing fin 82A and a contact portion P12 of the main plate 81 coming into contact with the heat-generating element 10B, between a portion CP22 of the main plate 81 connected to the base of the heat-releasing fin 82B and the contact portion P12 of the main plate 81, and between a portion CP23 of the main plate 81 connected to the base of the heat-releasing fin 82C and the contact portion P12 of the main plate 81 are, the smaller the heights H21, H22 and H23 of the heat-releasing fins 82A, 82B and 82C from the main plate 81 are.

[0019] Also, heat-releasing fins 82, the bases of which are connected to contact portions P11 and P12 of the main plate 81 coming into contact with the heat-generating elements 10A and 10B, are larger than heat-releasing fins 82, the bases of which are connected to portions of the main plate 81 other than the contact portions P11 and P12 and are adjacent to the heat-releasing fins 82, the bases of which are connected to the contact portions P11 and P12. For example, heat-releasing fins 82D, the bases of which are connected to the contact portion P12, are larger than a heat-releasing fin 82A that is adjacent to the heat-releasing fins 82D in the positive Y direction and have bases that are connected to a portion of the main plate 81 other than the contact portions P11 and P12. Heights of the heat-releasing fins 82 from the main plate 21 increase with increasing degree of inclusion of the heat-releasing fins in the projected area AA or AB of the heat radiating element 10A or the heat radiating element 10B in the thickness direction of the main plate 81 (the X direction).

[0020] Also, as illustrated in FIG. 5, the heat-generating element 10A has a rectangular shape when the heat-generating element 10A is viewed in the plan view, and notches 101A are formed at the both edges of the heat-generating element 10A in the longitudinal direction of the heat-generating element 10A. Also, the heat-generating element 10B has a rectangular shape when the heat-generating element 10B is viewed in the plan view, and two through holes 101B that penetrate the heat-generating element 10B in the thickness direction of the heat-generating element 10B are formed at

the both edges of the heat-generating element 10B in the longitudinal direction of the heat-generating element 10B. A screw hole 812 is drilled on the inside of each of the notches 101A in the main plate 81 of the heatsink 8 with the heat-generating element 10A arranged at a predetermined position on the main plate 81. Also, a screw hole 813 is drilled on the inside of each of the two through holes 101B in the main plate 81 with the heat-generating element 10B arranged at a predetermined position on the main plate 81. As a result, the heat-generating element 10A can be fixed at the predetermined position on the main plate 81 by screwing screws (not illustrated in the drawings) into the screw holes 812 of the main plate 81 with the heat-generating element 10A arranged at the predetermined position. Also, the heat-generating element 10B can be fixed at the predetermined position on the main plate 81 by inserting screws (not illustrated in the drawings) into the through holes 101B of the heat-generating element 10B and screwing the screws into the screw holes 813 of the main plate 81 with the heat-generating element 10B arranged at the predetermined position.

[0021] Also, in the case where heat-generating elements 10 are mounted on the electronic board 9, the greater the amount of heat radiated by the heat-generating element 10 is, the nearer the heat-generating element 10 is mounted on the electronic board 9 to the trajectory of the leading edges of the blades 62 of the blower fan 6. For example, an amount of heat radiated by a heat-generating element 10A is assumed to be greater than an amount of heat radiated by a heat-generating element 10B in FIG. 6. Also, in FIG. 6, the blower fan 6 is assumed to rotate around the rotation axis J1, and the leading edges of the blades 62 of the blower fan 6 are assumed to trace the trajectory C1. In this case, the shortest distance L1 between the heat-generating element 10A and the trajectory C1 of rotation of the leading edges of the blades 62 of the blower fan 6, is set to a distance shorter than the shortest distance L2 between the heat-generating element 10B and the trajectory C1.

[0022] Additionally, the shortest distance W1 between the leading edge of each of the heat heat-releasing fins 82 and the trajectory C1 of the leading edges of the blades 62 of the blower fan 6 is set to a distance that are 0.08 times or more as large as the diameter of the blower fan 6, that is, the diameter 2R1 of the trajectory C1. In FIG. 6, an arc C2 denotes an arc, the radius of which is greater than the radius R1 of the trajectory C1 by the length "W1". The leading edges of some of the blades 62 of the blower fan 6 are located on the arc C2. FIG. 7 illustrates the results of measurement of the relationship between a ratio of the shortest distance W1 between the leading edge of each of the heat-releasing fins 82 and the trajectory C1 to the diameter 2R1 of the trajectory C1, and a sound pressure level (SPL) of noise occurring in the outdoor unit 1. The results illustrated in FIG. 7 show that, when the ratios of the shortest distance W1 between the leading edge of each of the heat-releasing fins 82 and the trajectory C1 to the diameter 2R1 of the trajectory C1 was 0.08 or more, the sound pressure level of noise occurring in the outdoor unit 1 was zero. That is, the sound pressure level of noise occurring in the outdoor unit 1 can be made to decrease to zero by setting the shortest distance W1 between the leading edge of each of the heat-releasing fins 82 and the trajectory C1 to a distance that is larger than the distance that is 0.08 times as large as the diameter 2R1 of the trajectory C1.

[0023] As described above, the outdoor unit 1 according to the present embodiment is configured such that, the greater the amounts of heat transferred from the heat-generating elements 10 to the heat-releasing fins 82 are, the greater the heights of the heat-releasing fins 82 from the main plates 81 are. As a result, a heat-releasing fin of the heat-releasing fins 82 that receives a great amount of heat transferred from a heat-generating element 10 to heat up has a large heat-releasing area, and thus cooling capacity of the electronic board 9 is improved. Also, the outdoor unit 1 is configured such that, the less the amounts of heat transferred from the heat-generating elements 10 to the heat-releasing fins 82 are, the lower the heat-releasing fins 82 are, and thus the heatsink 8 of the present embodiment can be configured to be smaller and lighter than, for example, a heatsink including fins the number of which is equal to the number of the heat-releasing fins 82 of the heat sink 8, where the fins have a rectangular shape and the same dimensions in the X and Z directions and are arranged at regular intervals in the vertical direction.

[0024] Also, as illustrated in FIG. 4, the longer the distances L21, L22 and L23 are, the less the amounts of heat transferred from the heat-generating element 10B to the heat-releasing fins 82A, 82B and 82C are, thus further reducing the differences between a temperature of each of the heat-releasing fins 82A, 82B and 82C and a temperature of surrounding air around the heat-releasing fins 82A, 82B and 82C. As a result, the efficiencies of heat transfer from the heat-releasing fins 82A, 82B and 82C to the surrounding air decrease, and thus the heat-releasing fins 82A, 82B and 82C make a small contribution to cooling of the heat-generating element 10B. Therefore, the heat-releasing fins 82A, 82B and 82C of the present embodiment are configured such that, the longer the distances L21, L22 and L23 from the connection portions CP21, CP22 and CP23 of the heat-releasing fins 82A, 82B and 82C to the contact portion P12 of the heat-generating element 10B, the smaller the heights H1, H2 and H3 of the heat-releasing fins 82A, 82B and 82C are. As a result, the heat-releasing fins 82A, 82B and 82C to which small amounts of heat are transferred from the heat-generating element 10B have small heat capacities, and thus the differences between a temperature of each of the heat-releasing fins 82A, 82B and 82C and a temperature of the surrounding air are increased. As a result, the efficiencies of heat transferred from the heat-releasing fins 82A, 82B and 82C to the surrounding air are increased and thus the heat-releasing fins 82A, 82B and 82C make a large contribution to cooling of the heat-generating element 10B. Also, the small heights H21, H22 and H23 of the heat-releasing fins 82A, 82B and 82C enable reduction in the size and weight

of the whole of the heatsink 8.

[0025] Additionally, in the present embodiment, as illustrated in FIG. 6, the shortest distance W1 between the leading edge of each of the heat-releasing fins 82 and the trajectory C1 of the leading edge of each of the blades 62 of the blower fan 6 is set to a distance that is larger than the distance that is 0.08 as large as the diameter 2R1 of the blower fan 6. As a result, as illustrated in FIG. 7, the sound pressure level of the noise occurring in the outdoor unit 1 can be reduced to zero.

[0026] Also, in the present embodiment, the heat-generating elements 10 are mounted on the electronic board 9 such that, the greater amount of heat the heat-generating elements 10 radiate, the nearer the heat-generating elements 10 are to the trajectory C1 of the leading edges of the blades 62 of the blower fan 6. As a result, a heat-releasing fin 82 that is connected to a connection position of the main plate 81 that comes into contact with a heat-generating element radiating a large amount of heat, for example, the heat-generating element 10A in FIG. 6, can be exposed to air flow having higher flow speed, and thus cooling capacity of the heat-generating element 10A can be more improved. Therefore, heat-releasing fins 82 that are connected to portions of the main plate other than the connection portion of the main plate 81 that comes into contact with the heat-generating element 10A can be made to have a low ability necessary for cooling the heat-generating elements, and thus the heights of such heat-releasing fins 82 can be reduced so that the heatsink 8 can be downsized.

Variation

[0027] An embodiment according to the present disclosure is described above, although the present disclosure is not limited to the embodiment. For example, an orientation of the heatsink 8 is not limited to that of the heatsink 8 illustrated in FIG. 6, and the orientation of the heatsink 8 may be changed in accordance with a position at which a heat-generating element 10 is mounted. As illustrated in FIG. 8, the heat-generating element 10A radiating a large amount of heat is assumed to be mounted on the electronic board 9 upward of the heat-generating element 10B radiating a small amount of heat (in the positive Y direction). In this case, the electronic board 9 may tilt relative to the vertical direction (Y direction). As a result the shortest distance L201 between the heat-generating element 10A and the trajectory C1 is set to a distance that is shorter than the shortest distance L202 between the heat-generating element 10B and the trajectory C1, and thus the same effect as the above embodiment can be obtained. Also, a position of the heatsink 8 is not limited to that of the heatsink 8 illustrated in FIG. 1 and may be changed in accordance with the position of the electronic board 9.

[0028] The above-described embodiment is an example in which, the greater the amount of heat transferred from the heat-generating elements 10 to each of the heat-releasing fins 82 is, the greater the height of each of the heat-releasing fins 82 from the main plate 81 is. However, the present disclosure is not limited to a structure in which the heat-releasing fins 82 are made to be different from one another in size by making the heights of the heat-releasing fins 82 different from one another. For example, in the present disclosure, the heat-releasing fins 82 may be configured such that, the greater the amount of heat transferred from the heat-generating elements 10 to each of the heat-releasing fins 82 is, the longer the length of each of the heat-releasing fins 82 in the Z direction is. Alternatively, the heat-releasing fins 82 may be configured such that, the greater the amount of heat transferred from the heat-generating elements 10 to each of the heat-releasing fins 82 is, the greater the thickness of each of the heat-releasing fins 82 is.

[0029] The above-described embodiment is an example in which, the main plate 81 of the heatsink 8 directly comes into contact with the heat-generating elements 10. However, the present disclosure is not limited to the above structure of the present embodiment. In the present disclosure, the main plate 81 of the heatsink 8 may be thermally connected to the heat-generating elements 10 via another heat transfer member such as thermal grease.

[0030] The foregoing describes some example embodiments for explanatory purposes. Although the foregoing discussion has presented specific embodiments, persons skilled in the art will recognize that changes may be made in form and detail without departing from the broader spirit and scope of the invention. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense. This detailed description, therefore, is not to be taken in a limiting sense, and the scope of the invention is defined only by the included claims, along with the full range of equivalents to which such claims are entitled.

[0031] This application claims the benefit of Japanese patent Application No. 2016-187900, filed on September 27, 2016, the entire disclosure of which is incorporated by reference herein.

Industrial Applicability

[0032] The present disclosure can be suitably applied to outdoor units for air conditioners.

Reference Signs List

[0033]

	1	Outdoor unit
	2	Housing
	5	Heat exchanger
	6	Blower fan
5	7	Compressor
	8	Heatsink
	9	Electronic board
	10, 10A, 10B	Heat-generating element
	21	Bottom plate
10	22a, 22b, 22c, 22d	Side wall
	23	Partition plate
	61	Hub
	62	Blade
	81	Main plate
15	82, 82A, 82B, 82C, 82D	Heat-releasing fin
	101	Support elements
	101A	Notch
	101B	Through hole
	102	Motor
20	103	Front plate
	104	Fixation element
	105	Board holder
	105a, 232a	Opening
	231	Lower-side partition plate
25	232	Upper-side partition plate
	811	Flange
	812, 813	Screw hole
	AA, AB	Projected area
	C1	Trajectory
30	CP21, CP22, CP23	Connection portions
	H	Heat-exchanger chamber
	J1	Rotation axis
	L1, L2, L201, L202, W1	The shortest distance
	L21, L22, L23	Distance
35	M	Machine chamber
	P11, P12	Contact portions

Claims

- 40
1. An outdoor unit for an air conditioner, comprising:
- a heat exchanger to exchange heat between outdoor air and refrigerant;
 - a blower fan disposed facing the heat exchanger;
 - 45 - an electronic board on which at least one heat-generating element is mounted;
 - a housing comprising a partition plate partitioning an inside of the housing into a heat-exchanger chamber in which the heat exchanger and the blower fan are placed and a machine chamber in which the electronic board is placed, a portion of the partition plate having an opening; and
 - a heatsink comprising (i) a main plate disposed covering the opening from a heat-exchanger chamber side of the partition plate and (ii) a plurality of heat-releasing fins projecting from the main plate to a blower fan side, the main plate thermally coupled to the heat-generating element via the opening,
 - 50 wherein the greater an amount of heat transferred from the heat-generating element to each of the plurality of heat-releasing fins, the greater a size of each of the plurality of heat-releasing fins.
- 55
2. The outdoor unit for an air conditioner according to claim 1, wherein the greater the amount of heat transferred from the heat-generating element to each of the plurality of heat-releasing fins, the greater a height of each of the plurality of heat-releasing fins from the main plate.

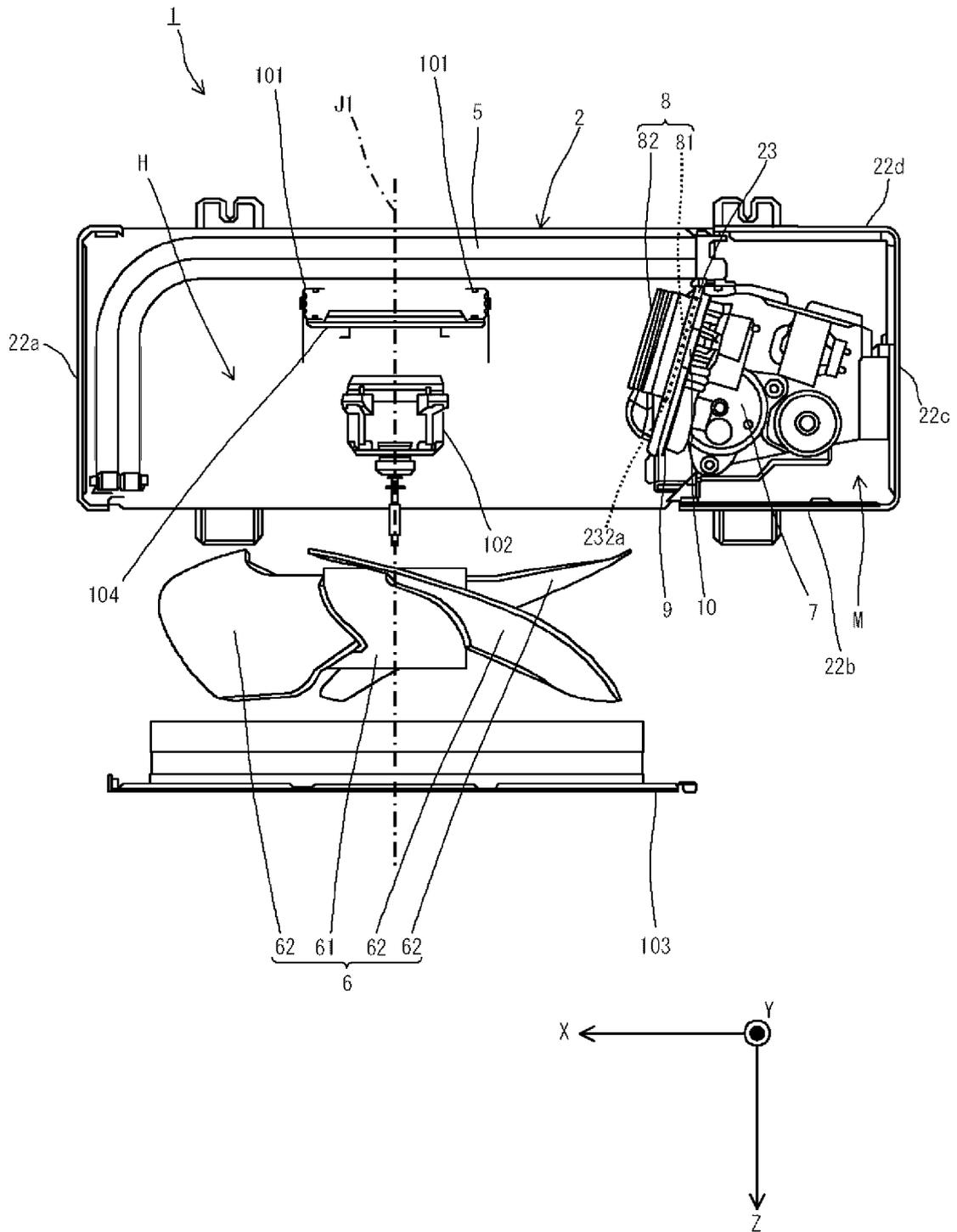
3. The outdoor unit for an air conditioner according to claim 2, wherein,
the longer a distance between a connection portion of the main plate connected to a base of each of the plurality
of heat-releasing fins and a thermally coupled portion of the main plate thermally connected to the heat-generating
element, the less the height of each of the plurality of the heat-releasing fins from the main plate.
- 5
4. The outdoor unit for an air conditioner according to any one of claims 1 to 3, wherein
the blower fan comprises a hub and blades fixed to the hub, and
a shortest distance between a leading edge of each of the plurality of heat-releasing fins and a trajectory of leading
edges of the blades of the blower fan is larger than a distance that is 0.08 times as large as a diameter of the blower fan.
- 10
5. The outdoor unit for an air conditioner according to any one of claims 1 to 4, wherein
the blower fan comprises a hub and blades fixed to the hub,
the heat-generating element mounted on the electronic board is a plurality of heat-generating elements, and
the greater an amount of heat generated by each of the plurality of heat-generating elements, the nearer each of
the plurality of heat-generating elements is mounted to the trajectory of the leading edges of the blades of the blower
fan on the electronic board.
- 15
6. An outdoor unit for an air conditioner, comprising:
- 20
- a heat exchanger to exchange heat between outdoor air and refrigerant;
 - a blower fan disposed facing the heat exchanger;
 - an electronic board on which at least one heat-generating element is mounted;
 - a housing comprising a partition plate partitioning an inside of the housing into a heat-exchanger chamber in
which the heat exchanger and the blower fan are placed and a machine chamber in which the electronic board
 - is placed, a portion of the partition plate having an opening; and
 - a heatsink comprising (i) a main plate disposed covering the opening from a heat-exchanger chamber side of
the partition plate and (ii) a plurality of heat-releasing fins projecting from the main plate to the blower fan side,
the main plate thermally coupled to the heat-generating element via the opening,
 - wherein from among the plurality of heat-releasing fins, a first heat-releasing fin including a base that is connected
to a contact portion of the main plate, the contact portion coming into contact with the heat-generating element
is larger than a second heat-releasing fin including a base that is connected to a portion of the main plate other
than the contact portion and is adjacent to the first heat-releasing fin including the base that is connected to the
contact portion.
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7. The outdoor unit for an air conditioner according to claim 6,
wherein the height of each of the plurality of heat-releasing fins from the main plate increases with increasing degree
of inclusion of each of the plurality of the heat-releasing fins in a projected area of the contact portion in a thickness
direction of the main plate.
- 35
8. The outdoor unit for an air conditioner according to claim 7,
wherein the longer a distance from each of the plurality of heat-releasing fins to the contact portion, the less the
height of each of the plurality of heat-releasing fins from the main plate.
- 40
9. The outdoor unit for an air conditioner according to any one of claims 6 to 8, wherein
the blower fan comprises a hub and blades fixed to the hub, and
a shortest distance between a leading edge of each of the plurality of heat-releasing fins and a trajectory of leading
edges of the blades of the blower fan is larger than a distance that is 0.08 times as large as a diameter of the blower fan.
- 45
10. The outdoor unit for an air conditioner according to any one of claims 6 to 9, wherein
the blower fan comprises a hub and blades fixed to the hub,
the heat-generating element mounted on the electronic board is a plurality of heat-generating elements, and
the greater an amount of heat generated by each of the plurality of heat-generating elements, the nearer each of
the plurality of heat-generating elements is mounted to the trajectory of the leading edges of the blades of the blower
fan on the electronic board.
- 50
- 55
11. An air conditioner comprising an outdoor unit and an indoor unit connected to the outdoor unit via a refrigerant pipe,
wherein
the outdoor unit for the air conditioner comprises

a heat exchanger to exchange heat between outdoor air and refrigerant,
a blower fan disposed facing the heat exchanger,
an electronic board on which at least one heat-generating element is mounted,
5 a housing comprising a partition plate partitioning an inside of the housing into a heat-exchanger chamber in which
the heat exchanger and the blower fan are placed and a machine chamber in which the electronic board is placed,
a portion of the partition plate having an opening, and
a heatsink comprising (i) a main plate disposed covering the opening from a heat-exchanger chamber side of the
partition plate and (ii) a plurality of heat-releasing fins projecting from the main plate to the blower fan side, the main
10 plate thermally coupled to the heat-generating element via the opening, and
the greater an amount of heat transferred from the heat-generating element to each of the plurality of heat-releasing
fins, the greater a size of each of the plurality of heat-releasing fins.

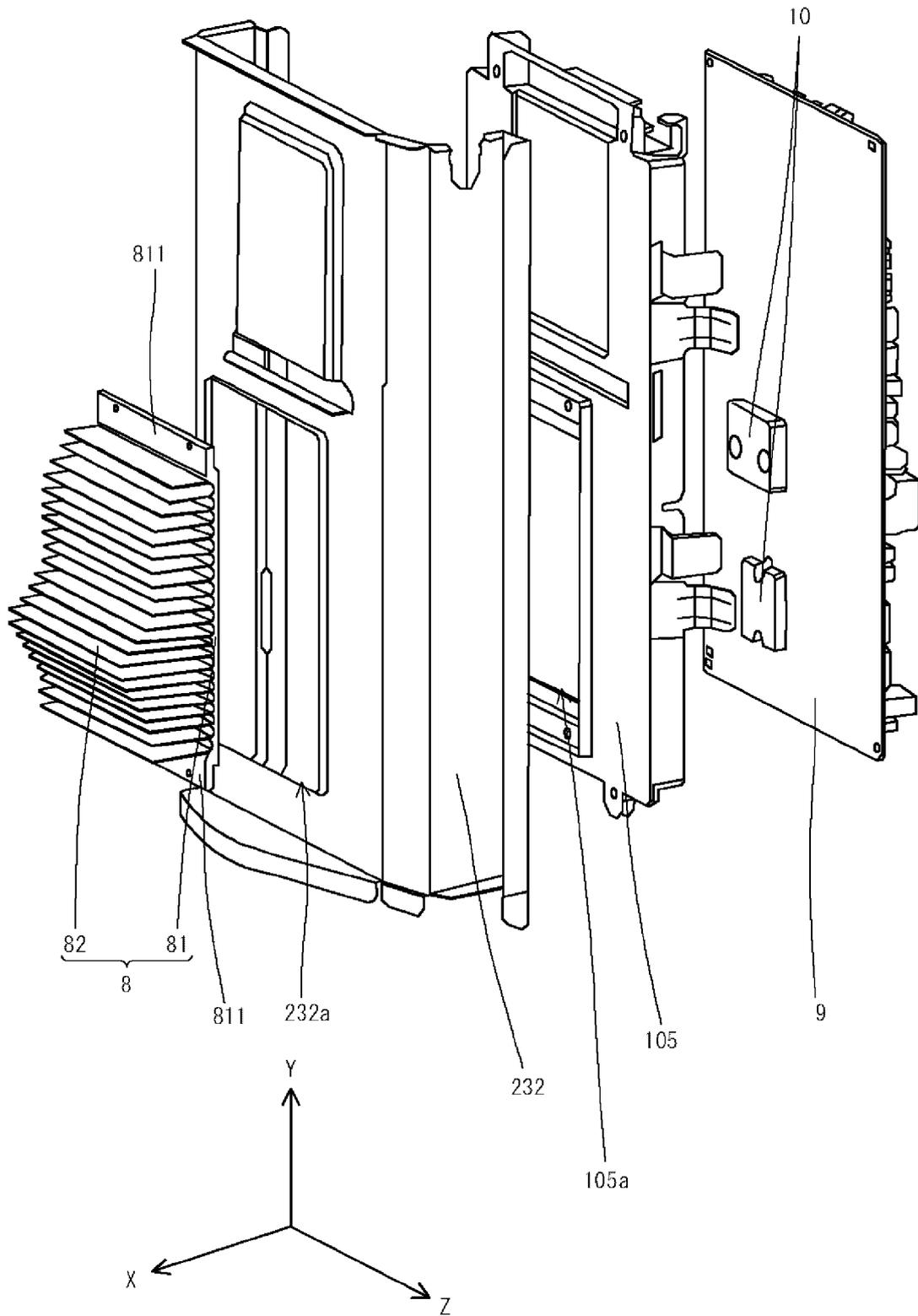
12. An air conditioner comprising an outdoor unit and an indoor unit connected to the outdoor unit via a refrigerant pipe,
wherein

15 the outdoor unit for the air conditioner comprises
a heat exchanger to exchange heat between outdoor air and refrigerant,
a blower fan disposed facing the heat exchanger,
an electronic board on which at least one heat-generating element is mounted,
a housing comprising a partition plate partitioning an inside of the housing into a heat-exchanger chamber in which
20 the heat exchanger and the blower fan are placed and a machine chamber in which the electronic board is placed,
a portion of the partition plate having an opening, and
a heatsink comprising (i) a main plate disposed covering the opening from a heat-exchanger chamber side of the
partition plate and (ii) a plurality of heat-releasing fins projecting from the main plate to the blower fan side, the main
plate thermally coupled to the heat-generating element via the opening, and
25 from among the plurality of heat-releasing fins, a first heat-releasing fin including a base that is connected to a
contact portion of the main plate, the contact portion coming into contact with the heat-generating element is larger
than a second heat-releasing fin including a base that is connected to a portion of the main plate other than the
contact portion and is adjacent to the first heat-releasing fin including the base that is connected to the contact portion.

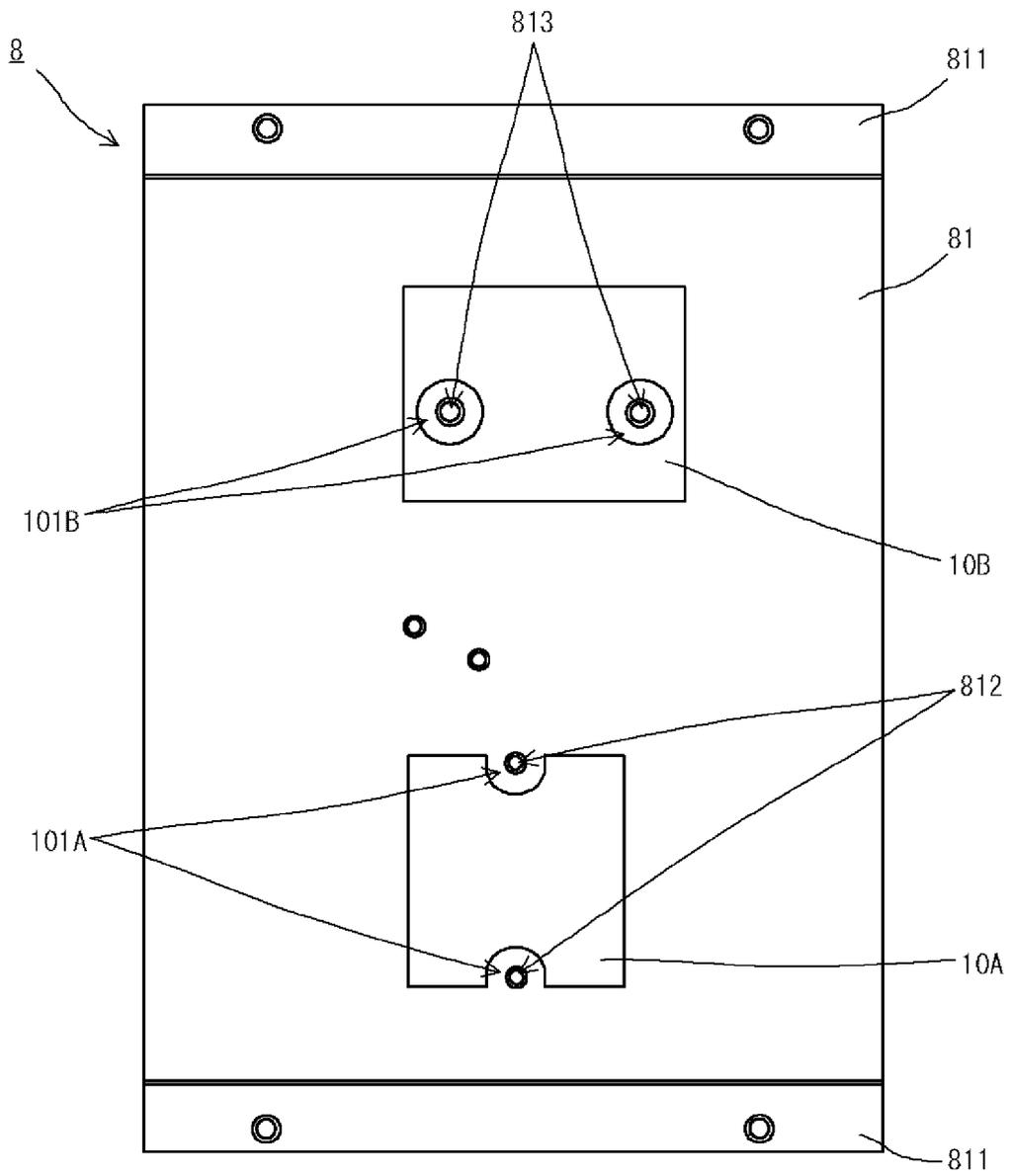
[FIG. 2]



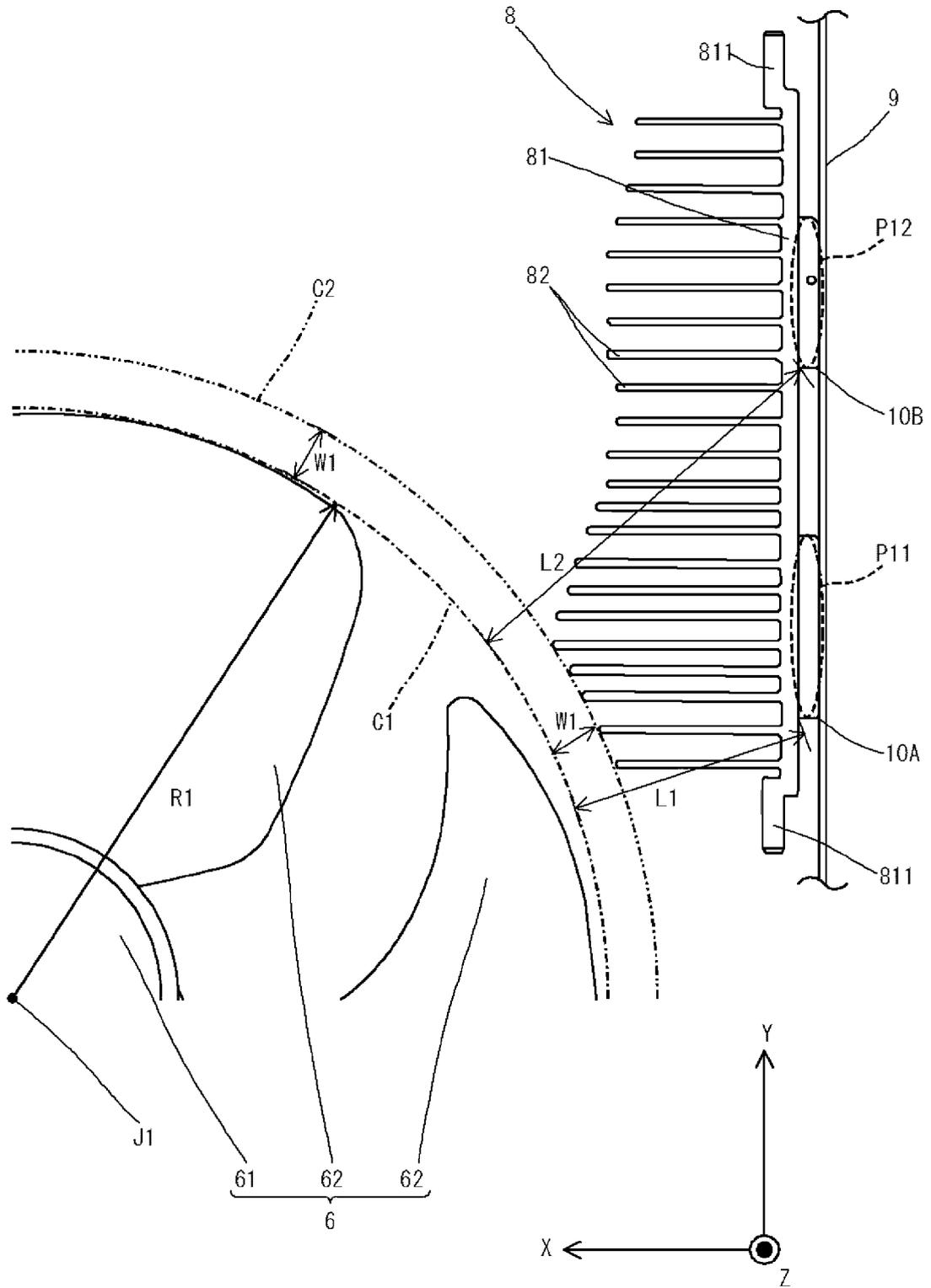
[FIG. 3]



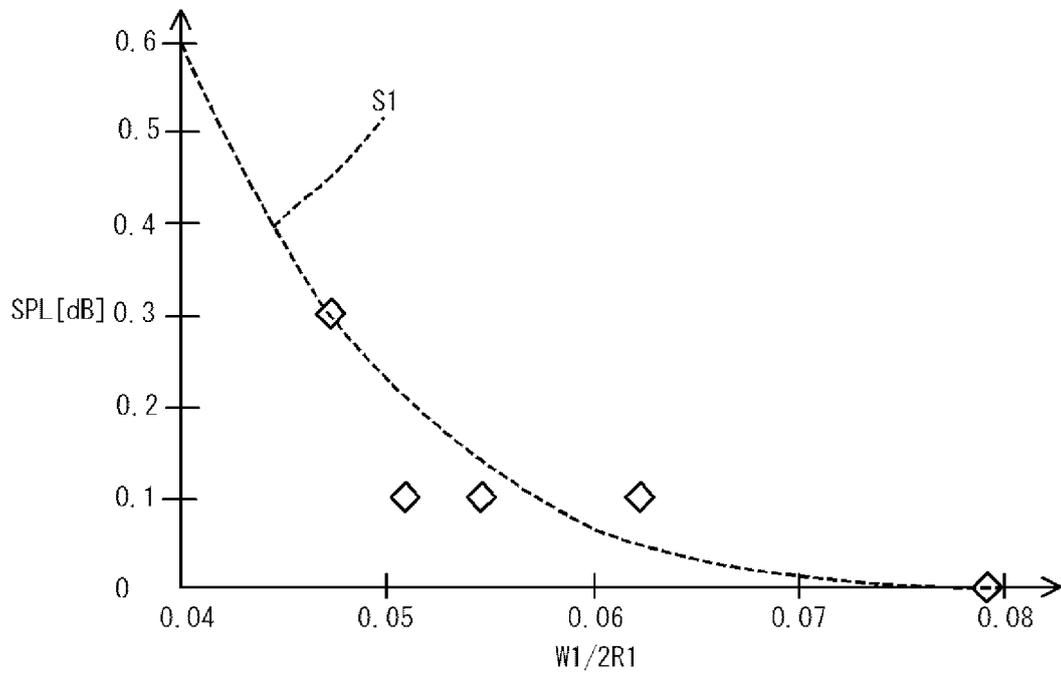
[FIG. 5]



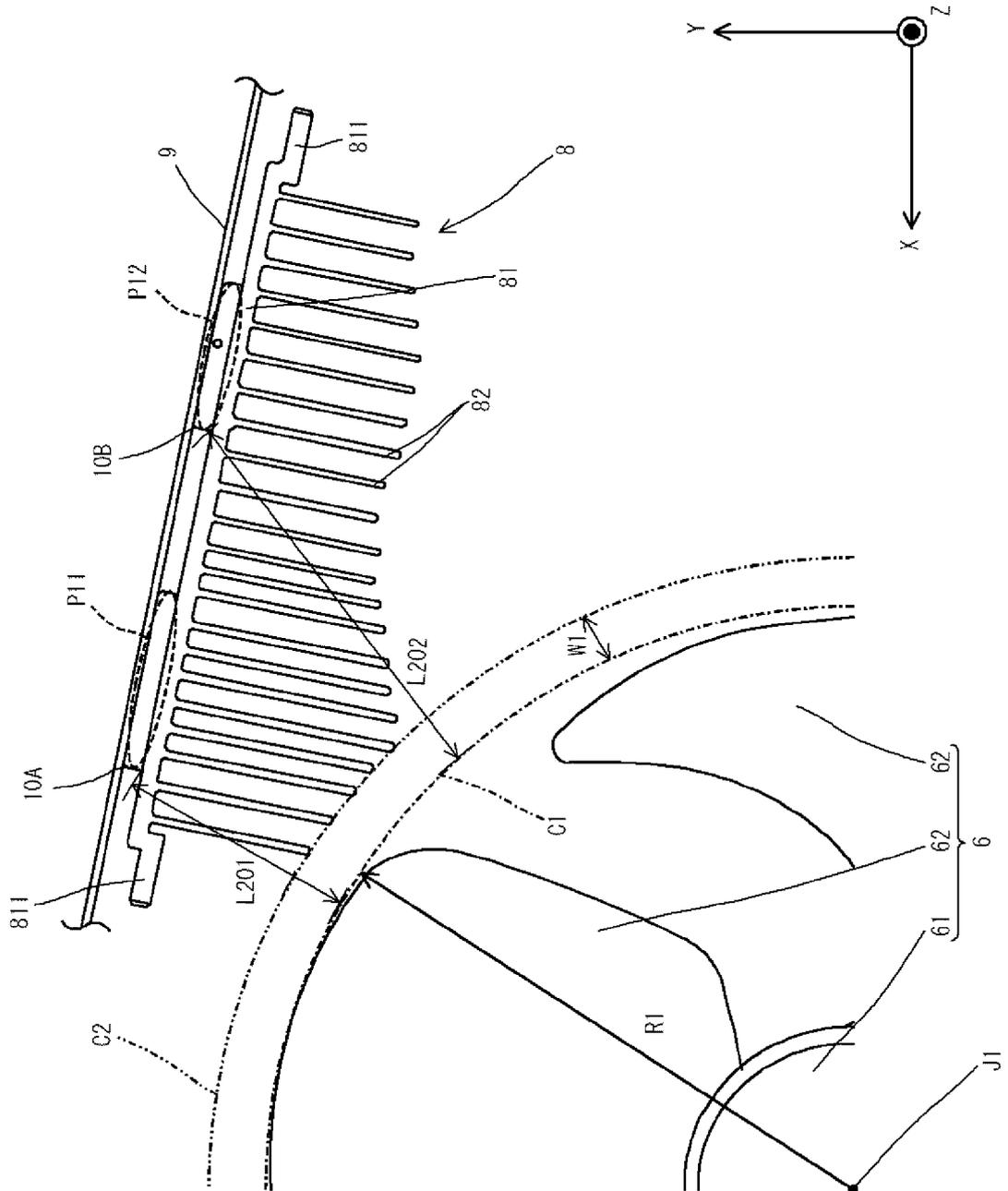
[FIG. 6]



[FIG. 7]



[FIG. 8]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/034721

5	A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. F24F1/24(2011.01) i, F24F1/22(2011.01) i	
	According to International Patent Classification (IPC) or to both national classification and IPC	
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl. F24F1/24, F24F1/22	
15	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2017 Registered utility model specifications of Japan 1996-2017 Published registered utility model applications of Japan 1994-2017	
20	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
25	Y	JP 2015-48990 A (FUJITSU GENERAL LIMITED) 16 March 2015, paragraphs [0010]-[0028], fig. 3-7 (Family: none)
30	Y	JP 2016-66639 A (FANUC LTD.) 28 April 2016, paragraphs [0011]-[0015], fig. 1A, 1B & US 2016/0088770 A1 paragraphs [0020]-[0025], fig. 1A, 1B & DE 102015115507 A1 & CN 205017770 U & CN 105451512 A
35		Relevant to claim No.
40	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.	
45	* 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	
50	Date of the actual completion of the international search 21 December 2017	Date of mailing of the international search report 09 January 2018
55	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.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2002-89493 A (HITACHI, LTD.) 27 March 2002, paragraph [0004], fig. 5 (Family: none)	4-5, 9-10 1-3, 6-8, 11-12

REFERENCES CITED IN THE DESCRIPTION

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