



(11) **EP 2 719 961 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.04.2014 Bulletin 2014/16

(51) Int Cl.:
F24F 1/00 (2011.01)

(21) Application number: **13188246.6**

(22) Date of filing: **11.10.2013**

(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

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(30) Priority: **12.10.2012 JP 2012226887**

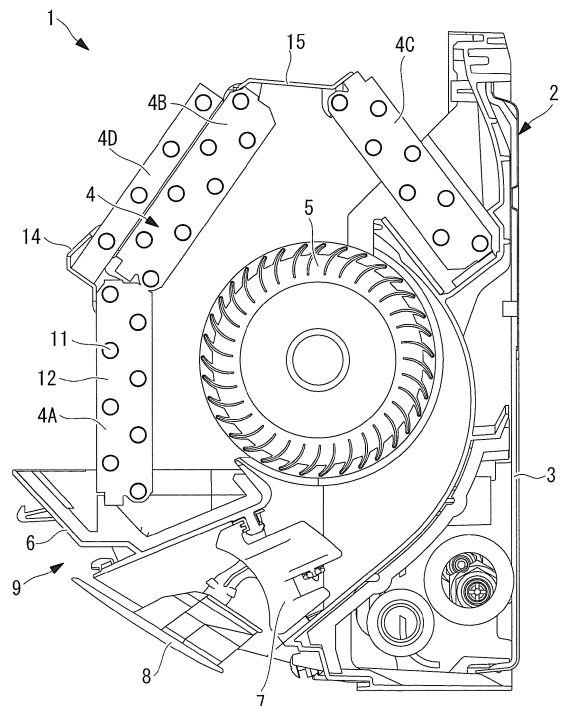
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(54) **Indoor unit of air conditioner**

(57) Provided is an indoor unit (1) of an air conditioner capable of facilitating installation of air shield members (14,15) at folded or divided portions of an indoor heat exchanger, and capable of enhancing workability in this installation as well as preventing deterioration of performance of the indoor heat exchanger due to deformation or the like of plate fins. The indoor unit of an air conditioner includes an indoor heat exchanger (4) folded or divided into plural heat exchangers; and air shield members (14,15) disposed at folded or divided portions of the indoor heat exchanger, wherein each air shield member is detachably installed to the indoor heat exchanger through pairs of claws for holding heat transfer tubes of the indoor heat exchanger, and the claws of each pair are arranged at positions deviating from each other by a multiple of a pitch (P) between two adjacent plate fins.

FIG. 3



Description

Technical Field

[0001] The present invention relates to an indoor unit of an air conditioner of which unit body includes an indoor heat exchanger equipped with air shield members disposed at folded or divided portions of the indoor heat exchanger.

Background Art

[0002] There has been known such a conventional indoor unit of an air conditioner in which an indoor heat exchanger having a relatively large surface area is arranged in an air flow passage in a unit body by folding or dividing the indoor heat exchanger into plural heat exchangers, and these plural heat exchangers are arranged in an approximate Λ (lambda) shape, for example. In this case, in order to prevent a bypass of air flow flowing through the folded or divided portions of the indoor heat exchanger, air shield members are disposed at the folded or divided portions of the indoor heat exchanger, as shown in Patent Literatures 1 and 2.

[0003] As shown in Patent Literatures 3 and 4, the air shielding member is detachably installed to the indoor heat exchanger by employing the following technique: in order to install the aforementioned air shield member at the folded or divided portion of the indoor heat exchanger, pairs of claws for holding heat transfer tubes of the indoor heat exchanger are disposed at plural positions on the air shield member, and each pair of the claws is inserted into a pitch between two adjacent plate fins of the indoor heat exchanger so as to hold the heat transfer tube from its both sides therebetween and to fixedly install the air shield member to the indoor heat exchanger.

Citation List

Patent Literature

[0004]

- {PTL 1} Japanese Unexamined Patent Application, Publication No. 2009-144982
- {PTL 2} Japanese Unexamined Patent Application, Publication No. 2010-121826
- {PTL 3} Japanese Examined Utility Model Application, Publication No. Sho62-19858
- {PTL 4} PCT International Publication No. W02011/083519

Summary of Invention

Technical Problem

[0005] Unfortunately, as shown in the aforementioned Patent Literatures 3 and 4, in the configuration of fixedly

installing the air shield member to the indoor heat exchanger by holding heat transfer tubes with pairs of claws therebetween, each pair of the claws is arranged at plural positions on the air shield member, and the claws of each pair are usually disposed at the same position so as to be inserted into a same pitch between two adjacent plate fins of the indoor heat exchanger. If the pair of the claws have a slight positional deviation because the air shield member becomes inclined at the time of inserting the each pair of the claws into a pitch between two adjacent plate fins, or other reasons, the pair of the claws may be inserted across a plate fin made of an extremely thin aluminum plate or the like into a wrong pitch next to a correct pitch of the plate fins.

[0006] This case may cause insufficient insertion of each pair of the claws, which results in incomplete installation of the air shield member, and may also cause inconveniences such as deformation of the plate fins due to biting the plate fins with the claws, generation of noises, and deterioration of the heat exchanging performance.

[0007] An object of the present invention, which has been made in order to solve problems as described above, is to provide an indoor unit of an air conditioner capable of facilitating installation of air shield members at folded or divided portions of an indoor heat exchanger, and capable of enhancing workability in this installation as well as preventing deterioration of performance of the indoor heat exchanger due to deformation or the like of plate fins.

Solution to Problem

[0008] An indoor unit of an air conditioner according to the present invention includes: a unit body having an indoor heat exchanger folded or divided into plural heat exchangers, and an indoor fan therein; and air shield members disposed at folded or divided portions of the indoor heat exchanger, wherein each air shield member is detachably installed to the indoor heat exchanger through pairs of claws for holding heat transfer tubes of the indoor heat exchanger, and the claws of each pair are arranged at positions deviating from each other by a multiple of a pitch between two adjacent plate fins of the indoor heat exchanger.

[0009] In this configuration, each pair of the claws disposed to the air shield members is inserted into different pitches of the plate fins deviating from each other by a multiple of the pitch of two adjacent plate fins of the indoor heat exchanger, thereby detachably installing the air shield members to the indoor heat exchanger. Through this configuration, it is possible to prevent such conventional inconveniences that the pair of the claws to be inserted into a same pitch are incorrectly inserted in a next wrong pitch due to their slight positional deviation, which causes incomplete installation of the air shield members, or deformation of the plate fins because of biting the plate fins with the pair of the claws, thereby facilitating installation of the air shield members. In addition, it is possible

to prevent deterioration of performance of the indoor heat exchanger.

[0010] In the above indoor unit of an air conditioner, the claws of each pair may be disposed at positions deviating from each other by a single pitch between two adjacent plate fins.

[0011] In this configuration, the claws of each pair may be inserted into different pitches of the plate fins deviating from each other by a single pitch in a predefined manner, thereby preventing such an inconvenience that either one of the claws of the pair is inserted into a next wrong pitch due to their slight positional deviation generated at the time of inserting the pair of the claws. Accordingly, it is possible to facilitate installation of the air shield members, as well as to prevent deterioration of performance of the indoor heat exchanger due to deformation or the like of the plate fins.

[0012] In any one of the above indoor units of an air conditioner, each of the claws may have a thinner thickness at a front end to be inserted into a pitch between two adjacent plate fins than a thickness at a base end thereof.

[0013] This configuration facilitates insertion of each pair of the claws into the respective pitches of the plate fins when the heat transfer tube is held from its both sides with the claws inserted into the respective pitches of the plate fins so as to install the air shield members. Accordingly, the thinner front ends of the claws of each pair can absorb their slight positional deviation generated at the time of inserting the pair of the claws, thereby facilitating insertion of the claws into the respective pitches of the plate fins, resulting in enhancement of workability in installation of the air shield members. It is also possible to prevent deformation or the like of the plate fins as well as deterioration of performance of the indoor heat exchanger due to this deformation.

[0014] In the above indoor unit of an air conditioner, the front end of each claw may have a thickness of approximately 1/2 of a thickness of the pitch between two adjacent plate fins.

[0015] In this configuration, allowance for positional deviation generated at the time of installation of each pair of the claws into the respective pitches of the plate fins can be increased up to approximately 1/2 of the pitch between two adjacent plate fins. Through this configuration, it is possible to further enhance the workability in installation of the air shield members, and also to prevent deformation or the like of the plate fins as well as deterioration of performance of the indoor heat exchanger due to this deformation.

Advantageous Effects of Invention

[0016] Each pair of the claws disposed to the air shield members are inserted into pitches of the plate fins deviating from each other by a multiple of the pitch between two adjacent plate fins of the indoor heat exchanger, which allows to detachably install the air shield members

to the indoor heat exchanger. Through this configuration, it is possible to prevent such conventional inconveniences that the pair of the claws to be inserted into a same pitch are incorrectly inserted in a next wrong pitch due to their slight positional deviation, which causes incomplete installation of the air shield members, or deformation of the plate fins because of biting the plate fins with the pair of the claws, thereby facilitating installation of the air shield members. In addition, it is possible to prevent deterioration of performance of the indoor heat exchanger.

Brief Description of Drawings

[0017]

{Fig. 1} Fig. 1 is a front view of an indoor unit of an air conditioner according to one embodiment of the present invention with a front cover assembly of the indoor unit removed;

{Fig. 2} Fig. 2 is a perspective view of the indoor unit of an air conditioner in Fig. 1 viewed from the right front of the indoor unit;

{Fig. 3} Fig. 3 is a longitudinal section view showing the vicinity of a central portion of the indoor unit of an air conditioner in Fig. 1;

{Fig. 4} Fig. 4 is a partial perspective view of a longitudinal section of an air shield member disposed at a folded or divided portion of the indoor heat exchanger in Fig. 3; and

{Fig. 5} Fig. 5 is a front view showing a side where claws of the air shield member in Fig. 4 are disposed.

Description of Embodiment

[0018] Hereinafter, description will be provided on one embodiment of the present invention with reference to Fig. 1 to Fig. 5.

Fig. 1 is a front view showing an indoor unit of an air conditioner according to one embodiment of the present invention with a front cover assembly of the indoor unit removed, Fig. 2 is a perspective view thereof, Fig. 3 is a longitudinal section view showing the vicinity of a central portion of the indoor unit, Fig. 4 is a partial perspective view of the air shield member, and Fig. 5 is a front view thereof.

The indoor unit 1 of an air conditioner includes a unit body 2 including a base 3 and a front cover assembly (not shown) detachably assembled at the front of the base 3.

[0019] As shown in Fig. 3, inside the unit body 2, an indoor heat exchanger 4 folded or divided in an approximate Λ (lambda) shape extending along the front face, the upper face, and the rear face of the unit body 2; an indoor fan 5 constituted by a cross flow fan horizontally disposed downstream of the indoor heat exchanger 4; a motor (not shown) for rotationally driving the indoor fan 5; an air outlet assembly 9 with which a drain pan 6 dis-

posed at the lower front of the indoor heat exchanger 4 is integrally formed, and in which a louver 7 and a flap 8 for regulating air flow direction are integrally incorporated; and a control box 10, and others are assembled to the base 3 in a known manner.

[0020] The front cover assembly is assembled to the base 3 so as to cover the upper face, the front face, and the right and left faces of the above component members assembled to the base 3. This front cover assembly is provided with a suction grille for sucking room air into the unit body 2, an air filter is disposed on the rear face of the grille, and further a filter cleaning mechanism and the like for self-cleaning the air filter may be optionally disposed.

[0021] The indoor heat exchanger 4 is configured to be a plate fin and tube type heat exchanger, and air shield plates 14 and 15 (described later) are disposed at the folded or divided portions of the indoor heat exchanger 4 so as to prevent a bypass of air flow flowing through the folded or divided portions. The plate fin and tube type heat exchanger is usually configured in such a manner that multiple plate fins 12 are installed at predetermined pitches between right and left side plates of heat transfer tubes 11 constituted by hair pin tubes, and thereafter each hair pin tube is expanded in diameter so as to allow the heat transfer tube 11, the plate fin 12, and the side plates to tightly contact to one another, and opening ends of every two adjacent hair pin tubes are connected to each other through a U bent pipe 13, thereby forming a serpentine piping passage; and the U bent pipes 13 and the bent portions of the hair pin tubes or the like outwardly project from the right and left side plates at the end portion of the heat exchanger.

[0022] As aforementioned, the indoor heat exchanger 4 is arranged in an air flow passage in the unit body 2 by folding or dividing the indoor heat exchanger 4 into plural heat exchangers 4A, 4B, 4C in an approximate Λ shape extending along the front face, the upper face, and the rear face of the unit body 2; in addition, an auxiliary heat exchanger 4D is further disposed at the front of the indoor heat exchanger 4B. In this case, gaps are generated at the folded or divided portions of the plural indoor heat exchangers 4A, 4B, 4C. In order to prevent the bypass of air flow flowing through the gaps, air shield members 14 and 15 are disposed at the front of these gaps to shield the gaps.

[0023] Each of the air shield members 14 and 15 has a dimension large enough to cover the gap generated at the folded or divided portion described above, and is made of a long thin plate member having the same length as that of a width of the indoor heat exchanger 4. Fig. 4 and Fig. 5 show a part of a longitudinal section of the air shield member. The air shield member 14 has a cross section folded in a chevron shape across the indoor heat exchanger 4A and the auxiliary indoor heat exchanger 4D so as to cover the front of the folded portion between the indoor heat exchanger 4A and 4B. The air shield member 15 is a tabular air shield member disposed

across the indoor heat exchanger 4B and the indoor heat exchanger 4C so as to cover the front of the divided portion between the indoor heat exchanger 4B and the indoor heat exchanger 4C.

[0024] As shown in Fig. 4 and Fig. 5 (the air shield member 15 is mainly shown in the drawings, but the air shield members 14 and 15 have the identical claw structure, hereinafter), each of the air shield members 14 and 15 is provided with plural pairs of claws 16A and 16B at plural positions with predetermined intervals on its longitudinal upper and lower edges. Each pair of the claws 16A and 16B holds one of the heat transfer tubes 11 constituting the indoor heat exchanger 4 from its both sides, thereby detachably installing the air shield members 14 and 15 to the indoor heat exchanger 4.

[0025] Each pair of the claws 16A and 16B is required to be locked to the heat transfer tube 11 by inserting each claw into a pitch between every two adjacent fins among a number of the plate fins 12 arranged in series at predetermined pitches P (see Fig. 1). Hence, each claw is formed to be a claw with a thinner thickness than the fin pitch P, as shown in Fig. 5. Particularly, a thickness T1 at the front end of the claw is thinner than a thickness T2 at the base end of this claw, and the thickness T1 is defined to be approximately " $T1 = 1/2 P$ " relative to the pitch P between two adjacent plate fins 12.

[0026] For the purpose of facilitating each pair of the claws 16A and 16B to be inserted into respective pitches of the plate fins 12, the claws 16A and 16B of each pair are arranged at positions deviating from each other in the longitudinal direction by a multiple of the fin pitch P between two adjacent plate fins 12. In the present embodiment, Fig. 4 and Fig. 5 show a case of arranging the claws 16A and 16B of each pair at positions deviating from each other by a single pitch P between two adjacent plate fins 12.

[0027] Through the aforementioned configuration, the present embodiment attains the following advantageous effects.

When the air conditioner is in operation, room air is sucked into the unit body 2 through the indoor fan 5, and is circulated through the indoor heat exchanger 4. During this operation, the room air is heat-exchanged with coolant flowing through the heat transfer tubes 11 of the indoor heat exchanger 4 so as to be cooled and heated, and is allowed to blow into the room, thereby cooling and warming the room air.

[0028] When the air being circulated through the indoor heat exchanger 4 passes through the plural indoor heat exchangers 4A, 4B, 4C arranged to be folded and divided into the Λ shape, as well as through the auxiliary heat exchanger 4D, the air flows through the indoor heat exchangers 4A, 4B, 4C and the auxiliary indoor heat exchanger 4D without bypassing these indoor heat exchangers because of the air shield members 14 and 15 installed at the folded or divided portions of the indoor heat exchangers. Accordingly, it is possible to provide air conditioning without causing loss and variation in tem-

perature.

[0029] Meanwhile in installation of the air shield members 14 and 15 to the indoor heat exchanger 4, the pairs of the claws 16A, 16B arranged at plural positions in the longitudinal direction of the air shield members 14 and 15 are inserted into the pitches P of the plate fins 12 such that the air shield member 14 is installed across the indoor heat exchanger 4A and the auxiliary indoor heat exchanger 4D, and the air shield member 15 is installed across the indoor heat exchanger 4B and the indoor heat exchanger 4C. The heat transfer tube 11 is held with each pair of the claws 16A and 16B so that the pair of the claws 16A and 16B is locked to the heat transfer tube 11, thereby detachably installing the air shield members 14 and 15 to the indoor heat exchanger 4.

[0030] In this case, the claws 16A and 16B of each pair provided to the air shield members 14 and 15 are arranged at positions deviating from each other by a multiple of the pitch P between two adjacent plate fins 12 of the indoor heat exchanger 4. The claws 16A and 16B of each pair provided to the air shield members 14 and 15 are inserted into different pitches P of the plate fins 12 deviating from each other by a multiple of the pitch P of two adjacent plate fins 12 of the indoor heat exchanger 4, thereby detachably installing the air shield members 14 and 15 to the indoor heat exchanger 4.

[0031] Accordingly, it is possible to prevent such conventional inconveniences that the pair of the claws 16A and 16B to be inserted into a same pitch P is incorrectly inserted in a next wrong pitch P due to their slight positional deviation, which causes incomplete installation of the air shield members 14 and 15, or deformation of the plate fins 12 because of biting the plate fins 12 with the pair of the claws 16A and 16B, thereby facilitating installation of the air shield members 14 and 15. In addition, it is possible to prevent deterioration of performance of the indoor heat exchanger 4 due to deformation or the like of the plate fins 12.

[0032] In the present embodiment, the claws 16A and 16B of each pair are arranged at positions deviating from each other by a single pitch P between two adjacent plate fins 12 so that the claws 16A and 16B of each pair are inserted on purpose into different pitches P of the plate fins 12 deviating from each other by a single pitch P, thereby preventing such an inconvenience that either one of the claws 16A or 16B of the pair is inserted into a next wrong pitch due to their slight positional deviation generated at the time of inserting the pair of the claws 16A and 16B. Accordingly, it is possible to facilitate installation of the air shield members 14 and 15, as well as to prevent deterioration of performance of the indoor heat exchanger 4 due to deformation or the like of the plate fins 12.

[0033] Furthermore, each pair of the claws 16A and 16B has a thinner thickness T1 at a front end to be inserted into a pitch between two adjacent plate fins than a thickness T2 at a base end thereof. This configuration facilitates insertion of each pair of the claws 16A and 16B into the respective pitches P of the plate fins 12 when

the heat transfer tube 11 is held from its both sides with each pair of the claws 16A and 16B inserted into the respective pitches P of the plate fins 12 so as to install the air shield members 14 and 15. Accordingly, the thinner front ends of the claws 16A and 16B can absorb their slight positional deviation generated at the time of inserting the claws 16A and 16B, thereby facilitating insertion of the claws 16A and 16B into the respective pitches P of the plate fins 12, resulting in enhancement of workability in installation of the air shield members 14 and 15. It is also possible to prevent deformation or the like of the plate fins 12 as well as deterioration of performance of the indoor heat exchanger 4 due to this deformation.

[0034] Each pair of the claws 16A and 16B has a front end with a thickness of approximately 1/2 of the pitch P between two adjacent plate fins 12. Hence, allowance for positional deviation generated at the time of installation of each pair of the claws 16A and 16B into the respective pitches P of the plate fins 12 can be increased up to approximately 1/2 of the pitch P between two adjacent plate fins 12. Through this configuration, it is possible to further enhance the workability in installation of the air shield members 14 and 15. In addition, it is possible to prevent deformation or the like of the plate fins 12 as well as deterioration of performance of the indoor heat exchanger 4 due to this deformation.

[0035] The present invention is not limited to the invention according to the aforementioned embodiment, and various modifications, as appropriate, may be made without departing from the scope of the present invention. For example, the aforementioned embodiment has been described by using an example of disposing the auxiliary indoor heat exchanger 4D to the indoor heat exchanger 4 so as to scale up the capacity of the indoor unit 1, but the present invention may be applicable to the indoor unit 1 having a smaller capacity without using this auxiliary indoor heat exchanger 4D, of course. In this case, the air shield member 14 is disposed between the indoor heat exchangers 4A and 4B.

[0036] Furthermore, various embodiments may be employed in the air shield members 14 and 15 in accordance with the configuration of the indoor heat exchanger 4, and for example, in such a configuration that the indoor heat exchangers 4A and 4B are integrally formed, and only the indoor heat exchanger 4C is arranged to be folded or divided, only the air shield member 15 may be disposed as the air shield member. The pairs of claws 16A and 16B may be arranged at plural positions, that is, at two or three positions, for example, in accordance with the length dimension of the air shield members 14 and 15.

Reference Signs List

[0037]

| | |
|---|-------------|
| 1 | Indoor unit |
| 2 | Unit body |

| | | |
|---------------|--|----|
| 4, 4A, 4B, 4C | Indoor heat exchanger (heat exchanger) | |
| 4D | Auxiliary indoor heat exchanger | |
| 5 | Indoor fan | 5 |
| 11 | Heat transfer tube | |
| 12 | Plate fin | 10 |
| 14, 15 | Air shield member | |
| 16A, 16B | Pair of claws | 15 |
| P | Pitch between plate fins | |
| T1 | Thickness at front end of claw | |
| T2 | Thickness at base end of claw | 20 |

Claims

1. An indoor unit (1) of an air conditioner **characterized in that** it comprises:
 - a unit body (2) including an indoor heat exchanger (4,4A,4B,4C) and an indoor fan (5), wherein the indoor heat exchanger is folded or divided into plural heat exchangers, and an indoor fan therein; and
 - air shield members (14,15) disposed at folded or divided portions of the indoor heat exchanger, wherein
 - the air shield member (14,15) is detachably installed to the indoor heat exchanger (4,4A,4B,4C) through pairs of claws (16A,16B) for holding heat transfer tubes (11) of the indoor heat exchanger, and
 - the claws of each pair are arranged at positions deviating from each other by a multiple of a pitch (P) between two adjacent plate fins of the indoor heat exchanger.
2. The indoor unit (1) of an air conditioner according to claim 1, wherein the claws (16A,16B) of each pair are arranged at positions deviating from each other by a single pitch (P) between two adjacent plate fins.
3. The indoor unit (1) of an air conditioner according to claim 1 or claim 2, wherein each of the claws (16A,16B) has a thinner thickness at a front end to be inserted into the pitch (P) between two adjacent plate fins than a thickness at a base end thereof.

FIG. 1

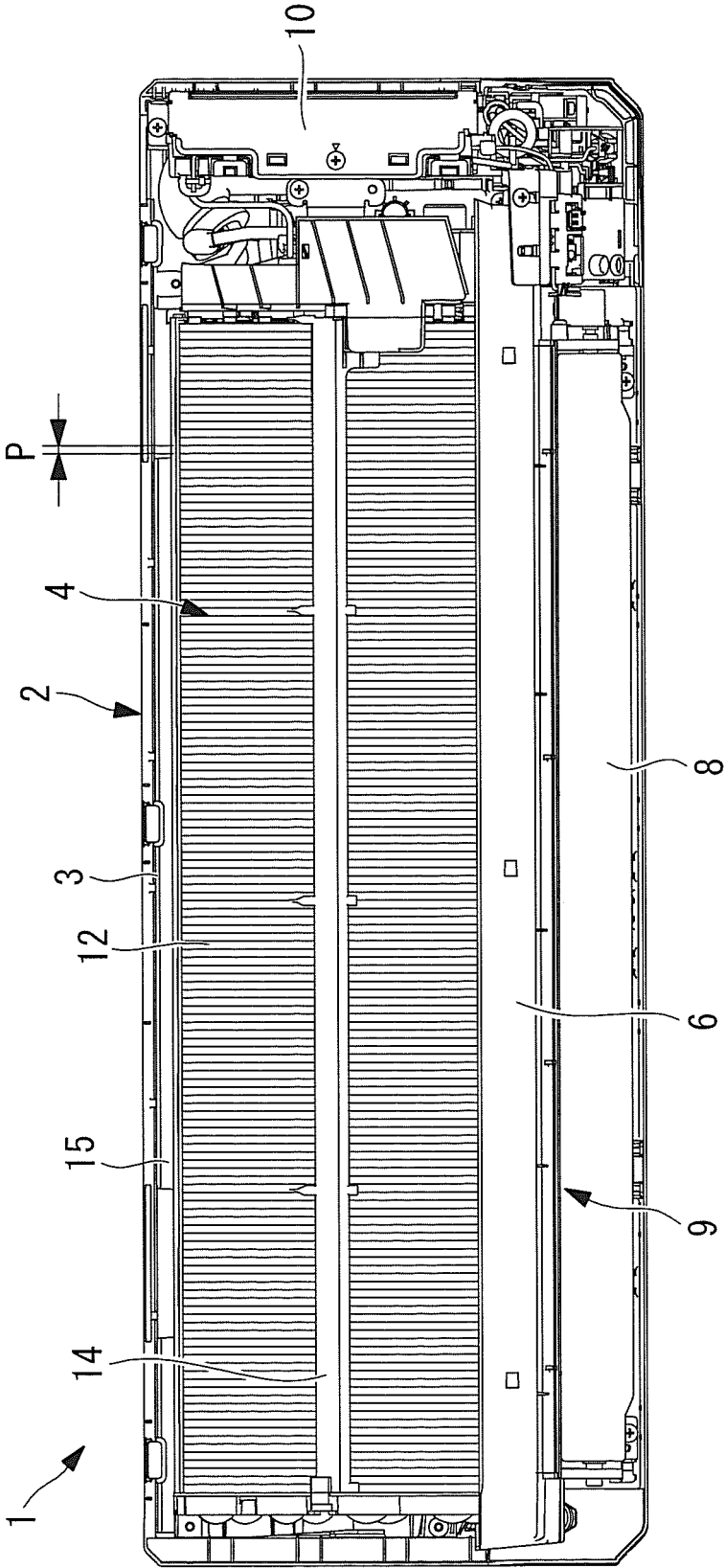


FIG. 2

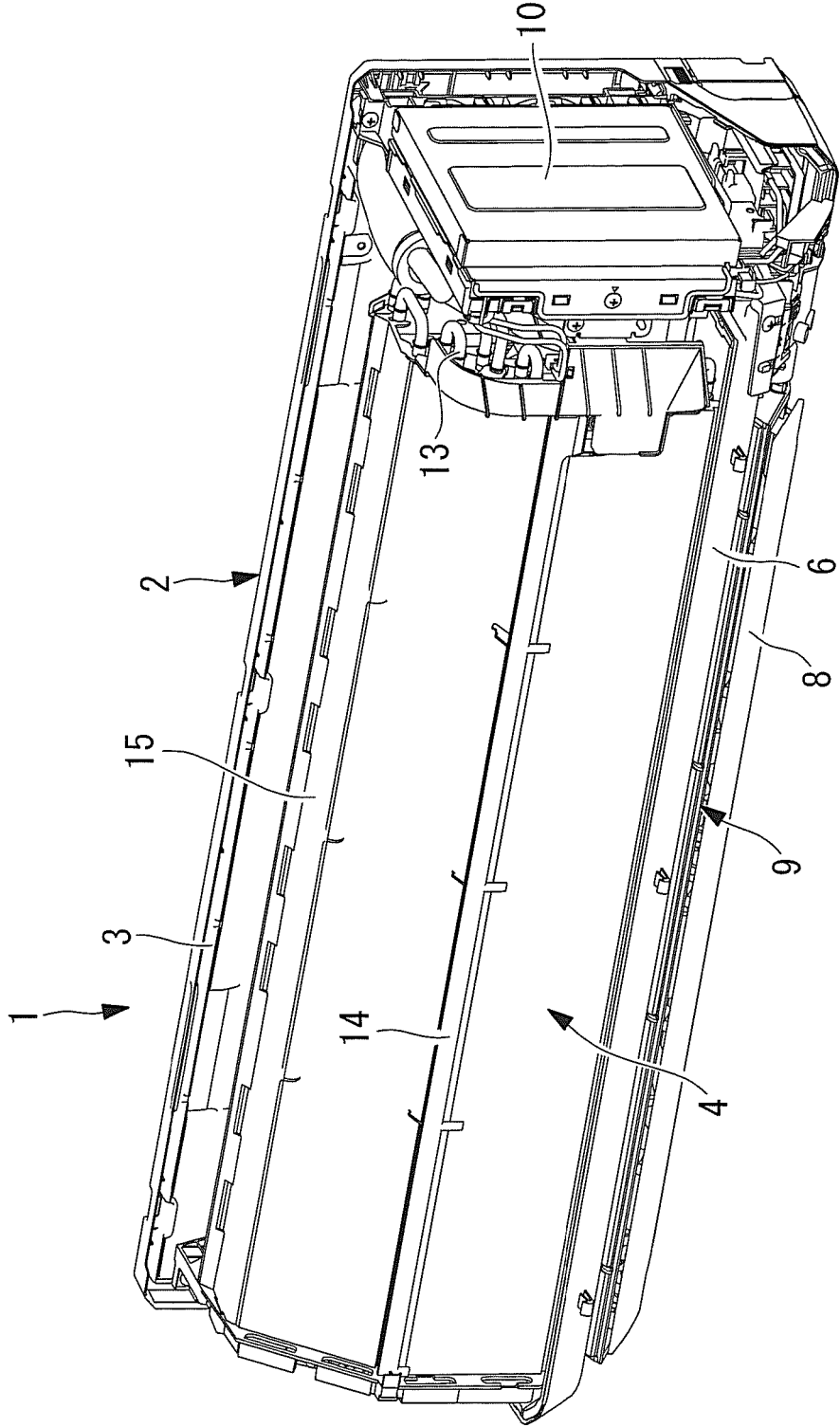


FIG. 3

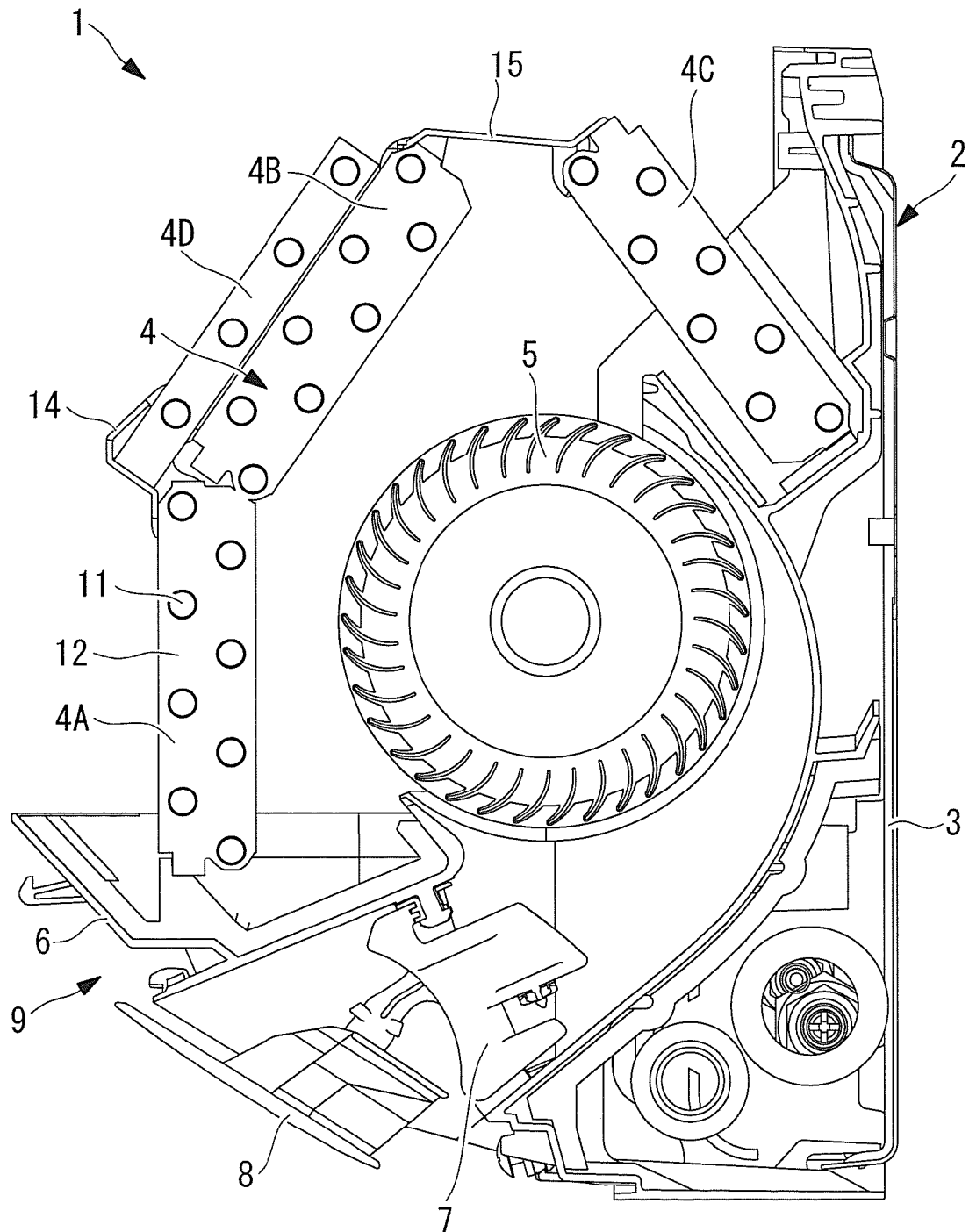


FIG. 4

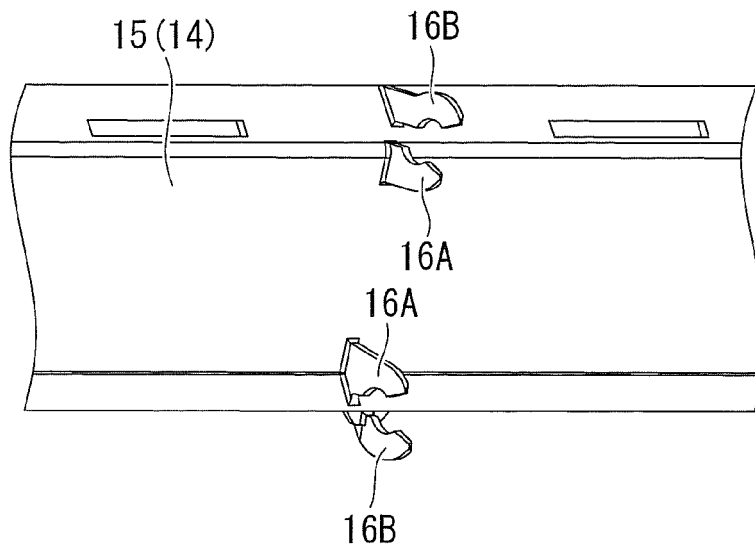
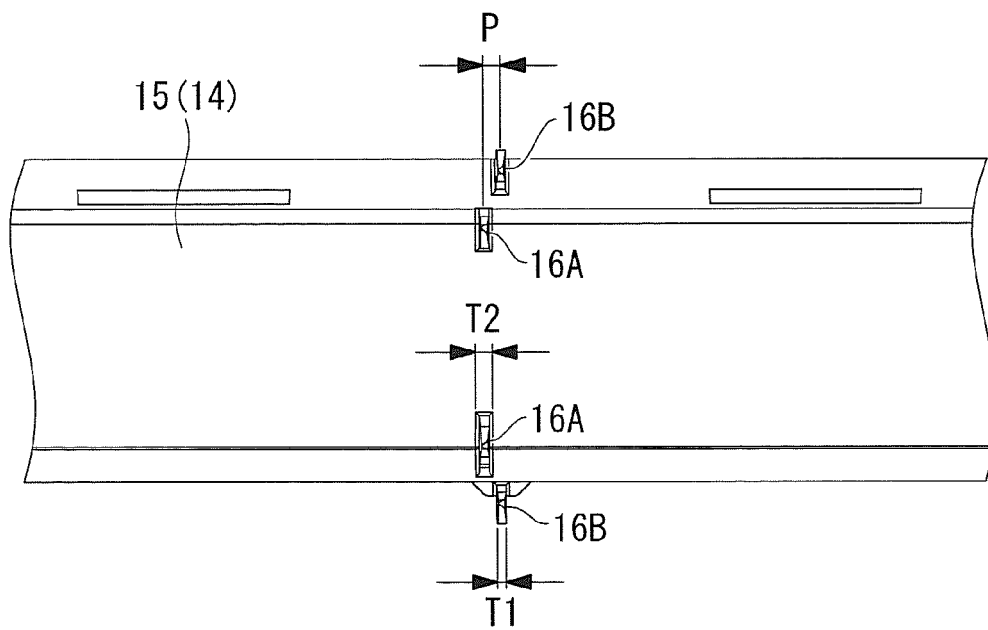


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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