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(71) Applicant: **MITSUBISHI HEAVY INDUSTRIES, LTD.**
Tokyo 108-8215 (JP)

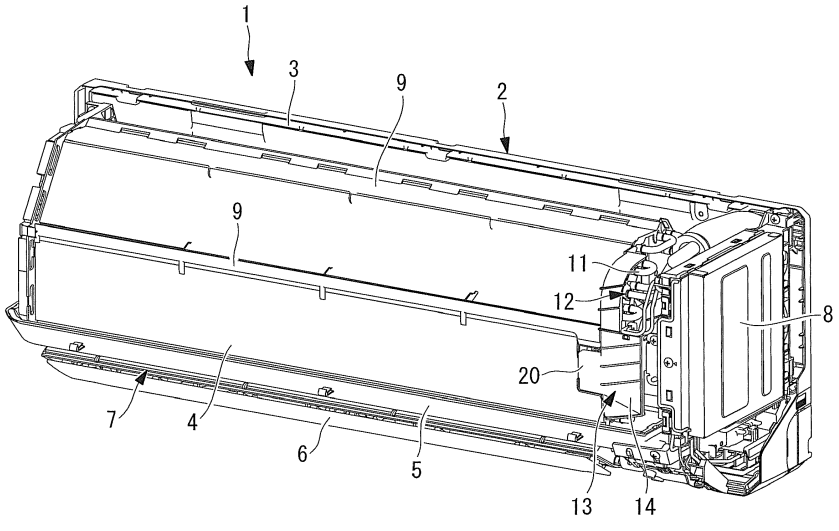
(72) Inventors:
- **HIGASHIURA, Kunihiro**
  TOKYO 108-8215 (JP)
- **NAITO, Yasuhiro**
  TOKYO 108-8215 (JP)
- **MORI, Hironori**
  TOKYO 108-8215 (JP)

(74) Representative: **Intès, Didier Gérard André et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cedex 07 (FR)

(54) Indoor unit of air conditioner

(57) Provided is an indoor unit (1) of an air conditioner capable of preventing breakage and damage to a pipe cover (13) and to other equipment when the indoor unit (1) falls down, and also capable of providing the pipe cover (13) commonly used for a change in capacity of the indoor heat exchanger (4). The indoor unit (1) of an air conditioner includes: a unit body (2) in which an indoor heat exchanger (4) is disposed; and a pipe cover (13) that covers a front of an exposed portion of heat exchanger piping (12) at an end portion of the indoor heat exchanger (4), and that prevents water drops dew-condensed on a surface of the heat exchanger piping (12) from splashing, wherein the pipe cover (13) includes an end fixing portion (15) fixedly disposed to the heat exchanger piping (12) of the indoor heat exchanger (4); a counter-end fixing portion (16) fixedly disposed to the unit body (2), or to other equipment fixedly disposed in the unit body (2); and an impact absorbing portion (17) provided at an appropriate position between the end fixing portion (15) and the counter-end fixing portion (16) of the pipe cover (13). Figure 4A, 4B, 4C, 4D, 4E

FIG. 2



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Description

Technical Field

[0001] The present invention relates to an indoor unit of an air conditioner equipped with a pipe cover that covers a front of a heat exchanger piping exposed from an end portion of an indoor heat exchanger.

Background Art

[0002] An indoor unit of an air conditioner includes an indoor heat exchanger, an indoor fan, a drain pan, a control box, and others in a unit body of the indoor unit, and a front cover assembly is detachably disposed at a front of this unit body, and in such an indoor unit using a plate fin and tube type heat exchanger as the indoor heat exchanger, dew-condensation may be generated on a surface of the heat exchanger piping outwardly projecting from its side plate during a cooling operation. In order to prevent dew-condensed water from splashing to the surroundings when it drops down, a pipe cover for covering the front of the heat exchanger piping is disposed at an end portion of the indoor heat exchanger (see Patent Literature 1, for example).

[0003] Usually, the pipe cover is fixedly disposed between the end portion of the indoor heat exchanger and the unit body, or the control box fixedly disposed in the unit body, or the like. The pipe cover is configured to cover the front of the heat exchanger piping that outwardly projects from the end portion of the indoor heat exchanger, thereby preventing dew-condensed water from splashing to the surroundings when it drops down from the heat exchanger piping, and leading the dew-condensed water to the drain pan.

Citation List

Patent Literature

[0004] {PTL 1}
Japanese Unexamined Patent Application, Publication No. 2010-121880

Summary of Invention

Technical Problem

[0005] The pipe cover is fixedly disposed between the end portion of the indoor heat exchanger and the unit body, or other equipment fixedly disposed in the unit body. Therefore, if the indoor unit falls down while the indoor unit is being transported or conveyed, an impact load from the indoor heat exchanger is directly applied to the pipe cover. Such an impact load may cause breakage and damage to the pipe cover, to the unit body to which the pipe cover is fixedly disposed, or to other equipment fixedly disposed in the unit body.

[0006] In addition, because the pipe cover is disposed at the front of the end portion of the indoor heat exchanger, a contact portion of the pipe cover to the front of the heat exchanger has a shape corresponding to the shape of the front of the end portion of the indoor heat exchanger. Meanwhile, the indoor unit may sometimes be adjusted for changes in capacity by altering the size of the indoor heat exchanger. In this case, a kind of an auxiliary heat exchanger is disposed at the front of the indoor heat exchanger with a small capacity so as to scale up the capacity of the heat exchanger, which brings about such inconvenience that a different pipe cover is required for this scaled-up heat exchanger.

[0007] An object of the present invention, which has been made in order to solve the problems according to the conventional art, is to provide an indoor unit of an air conditioner capable of preventing breakage and damage to a pipe cover, and to other equipment when the indoor unit falls down, and also capable of providing the pipe cover commonly used for the indoor heat exchangers of different capacities.

Solution to Problem

[0008] An indoor unit of an air conditioner according to the present invention is including: a unit body in which an indoor heat exchanger is disposed; and a pipe cover that covers a front of an exposed portion of heat exchanger piping at an end portion of the indoor heat exchanger, and that prevents water drops dew-condensed on a surface of the heat exchanger piping from splashing, wherein the pipe cover includes: an end fixing portion fixedly disposed to the heat exchanger piping of the indoor heat exchanger; a counter-end fixing portion fixedly disposed to the unit body, or to other equipment fixedly disposed in the unit body; and an impact absorbing portion provided at an appropriate position between the end fixing portion and the counter-end fixing portion of the pipe cover.

[0009] Through this configuration, it is possible to prevent water drops dew-condensed on the surface of the heat exchanger piping from splashing to the surroundings, and from leaking out to the room, and the like. Furthermore, if the indoor unit falls down during being transported or conveyed, an impact load is applied from the indoor heat exchanger to the pipe cover fixed between the indoor heat exchanger and the unit body, or other equipment disposed in the unit body, and this impact load can be absorbed and reduced by the impact absorbing portion of the pipe cover. Accordingly, when the indoor unit falls down, it is possible to prevent breakage and damage to the pipe cover, to the unit body to which the pipe cover is fixed, or to other equipment disposed in the unit body, or the like.

[0010] In the above indoor unit of an air conditioner, the impact absorbing portion may include a U-shaped curved portion formed in a vicinity of the counter-end fixing portion.

[0011] Through this configuration, when the indoor unit

falls down, the impact load applied to the pipe cover from the indoor heat exchanger can be absorbed and reduced with deflection of the U-shaped curved portion formed in the vicinity of the counter-end fixing portion for fixing the pipe cover to the unit body, or to other equipment disposed in the unit body. Accordingly, it is possible to securely prevent breakage to the pipe cover, or breakage and damage to the unit body to which the pipe cover is fixed, or to other equipment disposed in the unit body when the indoor unit falls down.

[0012] In any one of the above features of indoor unit of an air conditioner, the pipe cover may include knockout portions integrally formed with the pipe cover at a contact portion thereof to a surface of the end portion of the indoor heat exchanger so as to allow the pipe cover to be commonly used for the indoor heat exchangers of different capacities (for a change in capacity of the indoor heat exchanger).

[0013] Through this configuration, in the case of configuring the indoor unit to have a different capacity by altering the capacity of the indoor heat exchanger in the commonly used unit body and the like in which the capacity of the indoor heat exchanger is scaled up by disposing a kind of an auxiliary heat exchanger in front of the indoor heat exchanger, the knockout portions may be selectively used depending on the capacity of the indoor heat exchanger; specifically, in the case of using the basic capacity, the knockout portions of the pipe cover are used as they are, and in the case of using a scaled-up capacity, the knockout portions of the pipe cover are removed, thereby allowing the pipe cover of a single kind to be commonly used. Accordingly, it is unnecessary to prepare a different pipe cover corresponding to a change in capacity of the indoor heat exchanger, so that it is possible to attain reduction in number of molds of the pipe cover, and reduction in cost for the molds as well as enhancement of production efficiency of the pipe cover, thereby realizing cost reduction.

[0014] In any one of the above features of the indoor unit of an air conditioner, the pipe cover may include a protective wall integrally formed therewith, which covers a front of a ground stopper disposed at the end portion of the indoor heat exchanger.

[0015] Through this configuration, even if the indoor heat exchanger is exposed when the front cover is removed for maintenance or the like, the front of the ground stopper disposed at the end portion of the indoor heat exchanger is covered by the protective wall, and thus it is possible to prevent the ground stopper from being carelessly touched. Accordingly, this configuration can enhance a protective function against accidental electric shock and others, and also can reduce the number of component members by eliminating special protective covers.

Advantageous Effects of Invention

[0016] According to the present invention, if the indoor unit falls down during being transported or conveyed, an impact load is applied from the indoor heat exchanger to the pipe cover fixed between the indoor heat exchanger and the unit body, or other equipment disposed in the unit body, and this impact load can be absorbed and reduced by the impact absorbing portion of the pipe cover. Accordingly, when the indoor unit falls down, it is possible to prevent breakage and damage to the pipe cover, to the unit body to which the pipe cover is fixed, or to other equipment disposed in the unit body.

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 of Fig. 1 viewed from the right front of the indoor unit;

{Fig. 3} Fig. 3 is an enlarged view of the vicinity of a portion where the pipe cover is disposed in the indoor unit of an air conditioner of Fig. 1; and

{Fig. 4A} Fig. 4A is a front view of the pipe cover used in the indoor unit of an air conditioner of Fig. 1;

{Fig. 4B} Fig. 4B is a left side view thereof;

{Fig. 4C} Fig. 4C is a right side view thereof;

{Fig. 4D} Fig. 4D is a plan view thereof; and

{Fig. 4E} Fig. 4E is a bottom view thereof.

Description of Embodiment

[0018] With reference to Fig. 1 to Fig. 4, description will be provided on one embodiment of the present invention, hereinafter.

Fig. 1 shows a front view of an indoor unit of an air conditioner according to the present 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 an enlarged view of the vicinity of a portion where the pipe cover is disposed, and Fig. 4 is a drawing showing a configuration of the pipe cover.

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

[0019] Inside the unit body 2, an indoor heat exchanger 4 folded or divided in an approximate A shape extending along a front face, an upper face and a rear face of the unit body 2, a cross flow fan (not shown) horizontally disposed in downstream of the indoor heat exchanger 4, a motor for driving this fan, and a drain pan 5 disposed at a lower front of the indoor heat exchanger 4 are integrally assembled, as well as an air outlet assembly 7 that integrally incorporates a louver and a flap 6 for adjusting air flow, a control box 8, and others are assembled and disposed to the base 3 in a conventional manner.

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

[0021] The indoor heat exchanger 4 is configured to be a plate fin and tube type heat exchanger, and air shield plates 9 for blocking a bypass of air flow is disposed at the folded or divided portion of the indoor heat exchanger 4. The plate fin and tube type heat exchanger is usually configured in such a manner that multiple plate fins 10 are installed between right and left side plates of the hair pin tubes, and thereafter each hair pin tube is expanded in diameter so as to allow the tubes, the fins, 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 11, thereby forming a serpentine piping passage; and the heat exchanger piping 12 including the U bent pipes 11 and the bent portions of the hair pin tubes projects from the right and left side plates of the heat exchanger.

[0022] A low pressure coolant flows through the indoor heat exchanger 4 when the indoor unit 1 equipped with the indoor heat exchanger 4 is in cooling operation or dehumidifying operation, so that moisture in the air becomes dew-condensed on the surface of the heat exchanger piping 12 outwardly projecting from the end portion of the indoor heat exchanger 4, and then becomes water drops to drop down. If such water drops drop on component members disposed below, and splash to the surroundings, it may bring about various inconveniences. Particularly, on the right side of the indoor heat exchanger 4 where the control box 8 is disposed, such water drops may cause influences on electric systems, or water leakage to the room, etc.; therefore, the front of the heat exchanger piping 12, that is, the front of the end portion of the indoor heat exchanger 4 is covered with the pipe cover 13.

[0023] As shown in Fig. 4, this pipe cover 13 includes a cover body 14 for preventing the dew-condensed water from splashing, an end fixing portion 15 for fixedly disposing one end of the pipe cover 13 to the end portion of the indoor heat exchanger 4, a counter-end fixing portion 16 for fixedly disposing the other end of the pipe cover 13 to the control box 8 that is other equipment in the unit body 2, an impact absorbing portion 17 for absorbing and reducing an impact load applied from the indoor heat exchanger 4 to the pipe cover 13 when the indoor unit 1 falls down during being transported or conveyed, knockout portions 18, 19 selectively used depending on the capacity of the indoor heat exchanger 4, and to be removed in the case of scaling up the capacity of the indoor heat exchanger 4, and a protective wall 20 for covering the front of a ground stopper disposed at the end portion of the indoor heat exchanger 4.

[0024] The cover body 14 has a shape that covers the right end portion of the indoor heat exchanger 4 in the vertical direction, and particularly, the cover body 14 has a greater width at a portion that covers the front of a gap between the right end portion of the indoor heat exchanger 4 and the control box (other equipment) 8. The end fixing portion 15 that is fixedly disposed at the end portion of the indoor heat exchanger 4 serves as a fitting portion to be fixedly fit on the heat exchanger piping 12 outwardly projecting from one end portion of the indoor heat exchanger 4. The counter-end fixing portion 16 fixedly disposed to the control box 8 is formed in a flange having holes 22 to be fixed to one surface of the control box 8 with screws 21.

[0025] The impact absorbing portion 17 is a U-shaped curved portion formed between the cover body 14 and the counter-end fixing portion 16 extending from the cover body 14. The knockout portions 18, 19 are integrally formed with the cover body 14 at its contact portions to the surface of the end portion of the indoor heat exchanger 4. In the case of using the indoor heat exchanger 4 with the basic capacity, the knockout portions 18, 19 are used as they are; and in the case of installing a kind of an auxiliary heat exchanger at the front of the indoor heat exchanger 4 so as to scale up the capacity of the indoor heat exchanger 4 for the sake of providing the indoor unit 1 with large capacity specifications, the knockout portions 18, 19 are removed.

[0026] Furthermore, the protective wall 20 is a wall integrally extending from the lower portion of the cover body 14 in the lateral direction. The protective wall 20 has a dimension large enough to cover the front of the ground stopper 23 (see Fig. 3) that fixes a terminal of a ground wire extending from the control box 8 to one end of the lower portion of the indoor heat exchanger 4. In turn, the lower edge of the cover body 14 is formed to be a slanted edge so that water drops drop down from a slanted front end 24 of the slanted edge into the drain pan 5 so as to be collected through the drain pan 5. Meanwhile, the outer surface of the cover body 14 is integrally formed with the appropriate number of reinforcing ribs 25.

[0027] According to the present embodiment, the following advantageous effects can be attained through the aforementioned configuration.

When the air conditioner is in a cooling or dehumidifying operation, the indoor heat exchanger 4 in the indoor unit 1 functions as an evaporator. Through this function, the room air circulating through the indoor fan can be cooled and dehumidified, and the cooled and dehumidified air is allowed to blow into the room, thereby cooling and dehumidifying the room air. At this time, at the end portion of the indoor heat exchanger 4 through which the low pressure coolant flows, moisture in the air is dew-condensed on the surface of the heat exchanger piping 12 outwardly projecting, and becomes water drops, and they may drop down. The pipe cover 13 is disposed in order to prevent the water drops from splashing to the surroundings, and leaking out to the room, and the water

drops can be collected through the pipe cover 13 into the drain pan 5, and discharged outside the room.

[0028] On the other hand, the pipe cover 13 is fixed in such a manner that the end fixing portion 15 is fixedly fit on the heat exchanger piping 12 located at the end portion of the indoor heat exchanger 4, and the counter-end fixing portion 16 is fixed with screws 21 through the flange thereof to one surface of the control box 8 that is equipment housed in the unit body 2. The indoor unit 1 is packaged in a corrugated cardboard box for convenience of transportation and conveyance, and may fall down while being transported and conveyed. In this case, an impact load applied to the indoor heat exchanger 4 is applied to the pipe cover 13 from the indoor heat exchanger 4.

[0029] For this reason, in the present embodiment, the impact absorbing portion 17 is disposed at an appropriate position between the end fixing portion 15 and the counter-end fixing portion 16 of the pipe cover 13. Hence, if the indoor unit 1 falls down during being transported or conveyed, an impact load is applied from the indoor heat exchanger 4 to the pipe cover 13 fixed between the indoor heat exchanger 4 and the control box 8 disposed in the unit body 2, and this impact load can be absorbed and reduced by the impact absorbing portion 17 of the pipe cover 13. Accordingly, when the indoor unit 1 falls down, it is possible to prevent breakage and damage to the pipe cover 13, to the unit body 2 to which the pipe cover 13 is fixed, or to other equipment such as the control box 8 disposed in the unit body 2.

[0030] In addition, the impact absorbing portion 17 is constituted by a U-shaped curved portion formed in the vicinity of the counter-end fixing portion 16. Hence, when the indoor unit 1 falls down, the impact load applied to the pipe cover 13 from the indoor heat exchanger 4 can be absorbed and reduced with deflection of the U-shaped curved portion. Accordingly, it is possible to securely prevent breakage to the pipe cover 13, or breakage and damage to the unit body 2 to which the pipe cover 13 is fixed, or to other equipment such as the control box 8 disposed in the unit body 2 when the indoor unit 1 falls down.

[0031] In addition, in the present embodiment, the knockout portions 18, 19 are integrally formed with the pipe cover 13 at its contact portion to the surface of the end portion of the indoor heat exchanger 4 so that the pipe cover 13 can commonly be used for a change in capacity of the indoor heat exchanger 4. In the case of configuring the indoor unit 1 to have a different capacity by altering the capacity of the indoor heat exchanger 4 in the commonly used unit body 2 in which the capacity of the indoor heat exchanger 4 is scaled up by disposing a kind of an auxiliary heat exchanger at the front of the indoor heat exchanger 4, the knockout portions 18, 19 may be selectively used depending on the capacity of the indoor heat exchanger 4; specifically, in the case of using the indoor heat exchanger 4 with the basic capacity, the knockout portions 18, 19 of the pipe cover 13 are used as they are, and in the case of using the indoor heat exchanger 4 with a scaled-up capacity, the knockout portions 18, 19 of the pipe cover 13 are removed, thereby allowing the pipe cover 13 of a single kind to be commonly used.

[0032] Accordingly, it is unnecessary to prepare a different pipe cover 13 corresponding to a change in capacity of the indoor heat exchanger 4, so that it is possible to attain reduction in number of molds of the pipe cover 13, and reduction in cost for the molds as well as enhancement of production efficiency of the pipe cover 13, thereby realizing cost reduction.

[0033] Furthermore, in the present embodiment, the protective wall 20 is integrally formed with the pipe cover 13 such that the protective wall 20 covers the front of the ground stopper 23 disposed at the end portion of the indoor heat exchanger 4. Through this configuration, even if the indoor heat exchanger 4 is exposed when the front cover assembly is removed for maintenance or the like, the front of the ground stopper 23 disposed at the end portion of the indoor heat exchanger 4 is covered by the protective wall 20, and thus it is possible to prevent the ground stopper 23 from being carelessly touched. Accordingly, this configuration can enhance a protective function against accidental electric shock and the like, and also can reduce the number of component members by eliminating a special protective cover.

[0034] While the present invention is not limited to the invention as described in the aforementioned embodiment, various modifications may be made without departing from the scope of the present invention. For example, in the aforementioned embodiment, the counter-end fixing portion 16 of the pipe cover 13 is fixedly disposed to one surface of the control box 8, but the present invention is not limited to this. The counter-end fixing portion 16 of the pipe cover 13 may be directly fixedly disposed to the unit body 2, or may be fixedly disposed to equipment other than the control box 8.

Reference Signs List

[0035]

1	Indoor unit
2	Unit body
4	Indoor heat exchanger
8	Control box (other equipment)
12	Heat exchanger piping
13	Pipe cover
15	End fixing portion
16	Counter-end fixing portion

17 Impact absorbing portion

18, 19 Knockout portion

20 Protective wall

23 Ground stopper

Claims

1. An indoor unit (1) of an air conditioner **characterized in that** it comprises:

   a unit body (2) in which an indoor heat exchanger (4) is disposed; and
   a pipe cover (13) that covers a front of an exposed portion of heat exchanger piping (12) at an end portion of the indoor heat exchanger (4), and that prevents water drops dew-condensed on a surface of the heat exchanger piping (12) from splashing,
   wherein
   the pipe cover includes: an end fixing portion (15) fixedly disposed to the heat exchanger piping (12) of the indoor heat exchanger (4); a counter-end fixing portion (16) fixedly disposed to the unit body (2), or to other equipment (8) fixedly disposed in the unit body; and
   an impact absorbing portion (17) provided at an appropriate position between the end fixing portion (15) and the counter-end fixing portion (16) of the pipe cover.

2. The indoor unit (1) of an air conditioner according to claim 1, wherein
   the impact absorbing portion (17) includes a U-shaped curved portion formed in a vicinity of the counter-end fixing portion (16).

3. The indoor unit (1) of an air conditioner according to claim 1 or claim 2, wherein
   the pipe cover (13) includes knockout portions (18,19) integrally formed with the pipe cover (13) at a contact portion thereof to a surface of the end portion of the indoor heat exchanger (4) so as to allow the pipe cover to be commonly used for a change in capacity of the indoor heat exchanger (4).

4. The indoor unit (1) of an air conditioner according to any one of claim 1 to claim 3, wherein
   the pipe cover (13) includes a protective wall (20) integrally formed therewith so as to cover a front of a ground stopper (23) disposed at the end portion of the indoor heat exchanger (4).

FIG. 1

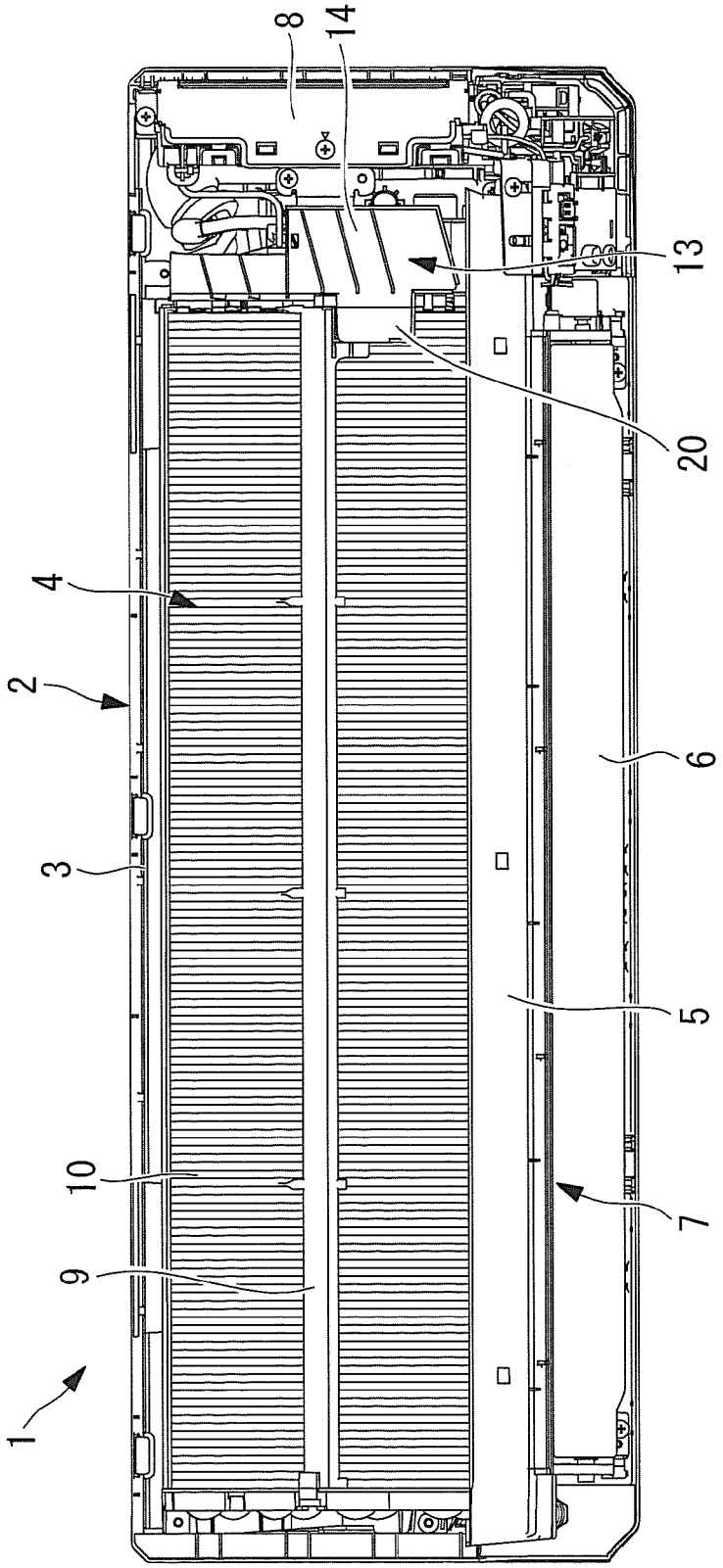


FIG. 2

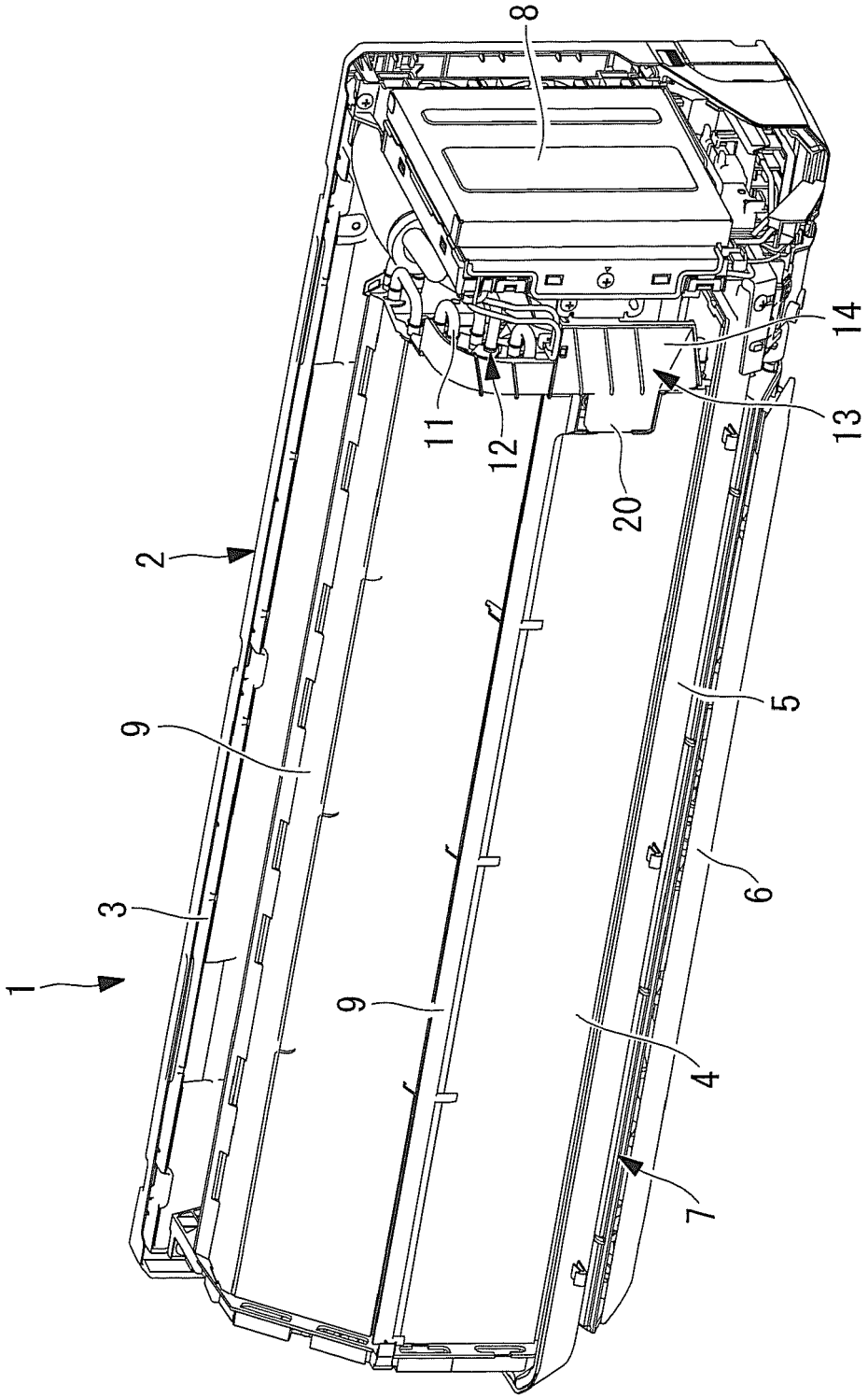


FIG. 3

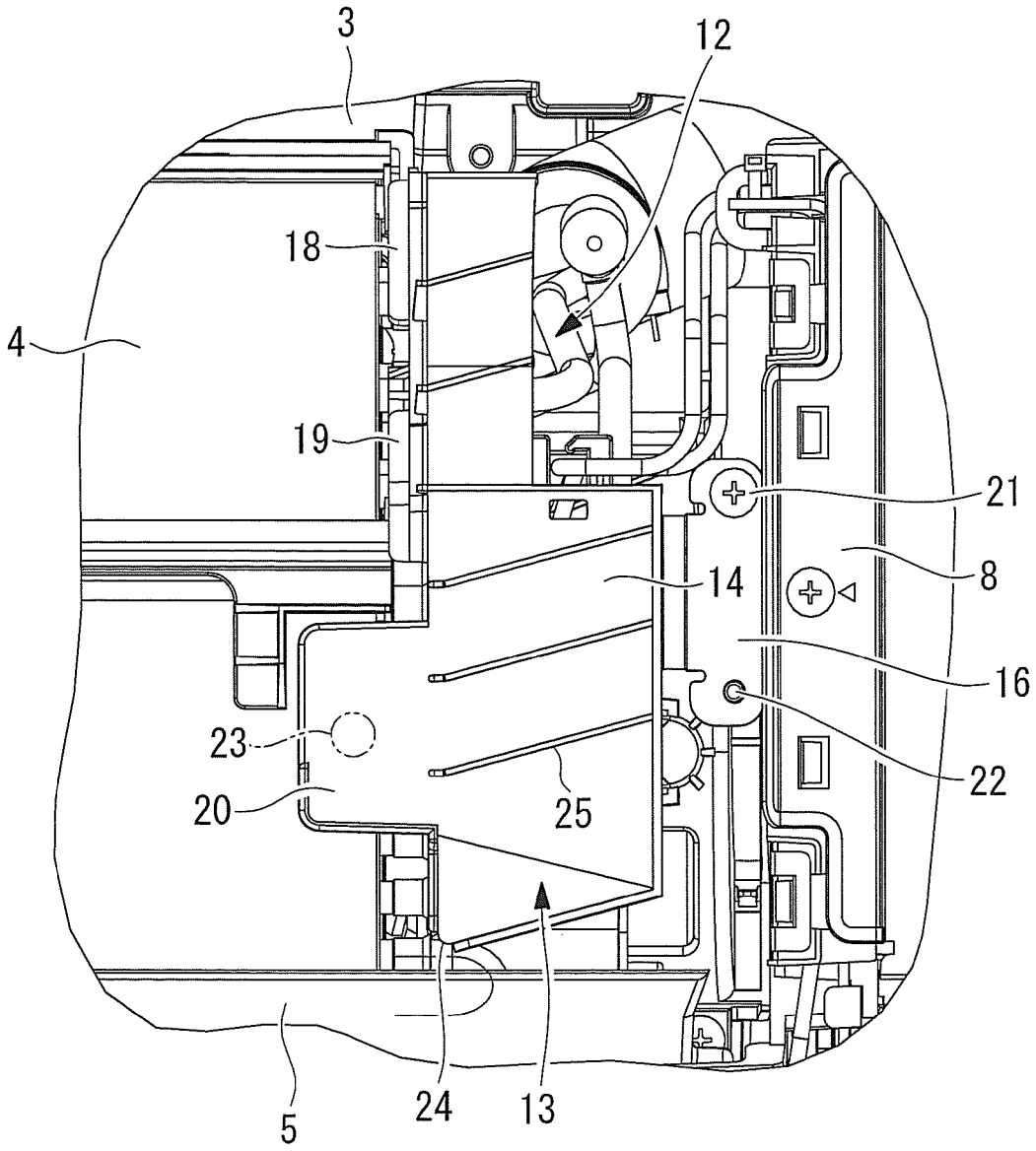
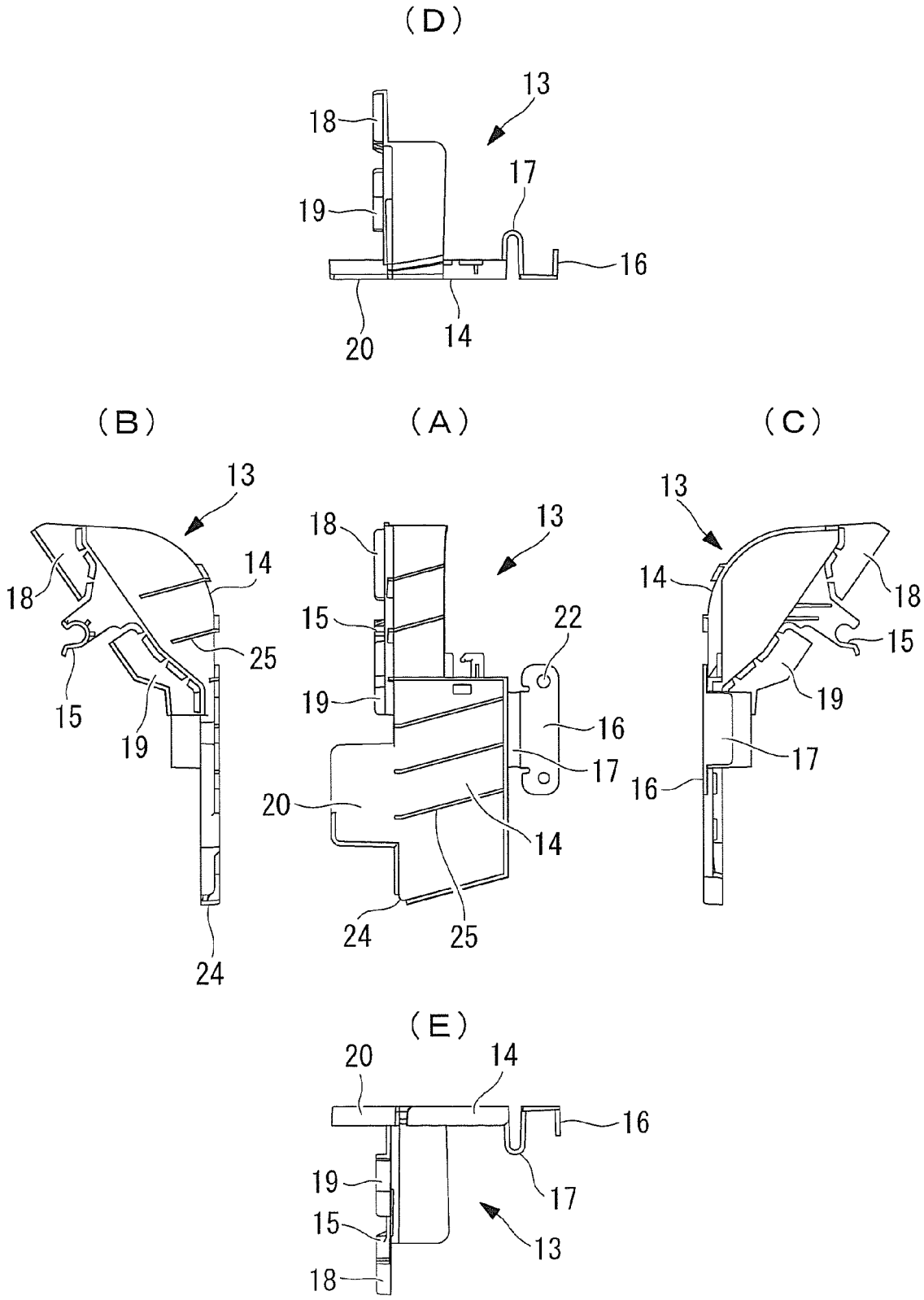


FIG. 4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