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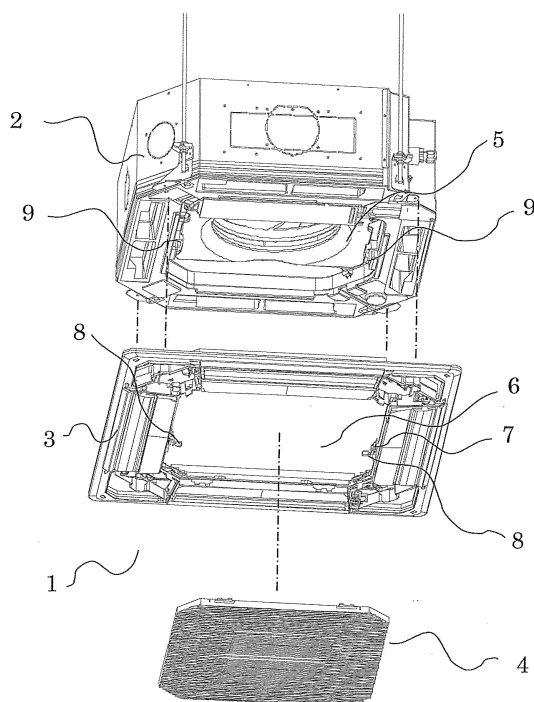
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(54) **INDOOR UNIT AND REFRIGERATION CYCLE DEVICE**

(57) An indoor unit includes a case 2 having an opening part on a lower surface thereof when the indoor unit is installed, and a decorative panel 3 having a substantially rectangular air inlet being open to the opening part of the case 2 and being attached to the lower surface of the case 2. The decorative panel 3 has temporary hanging levers 8 attached to opposed positions shifted from midpoints on any opposed two of four sides on edges of the air inlet parallelly toward any opposed vertexes. The case 2 has temporary hanging hooks 9 corresponding to the temporary hanging levers 8 on edges of the opening part.

FIG. 1



Description

Solution to Problem

Technical Field

[0001] The present invention relates to, for example, an indoor unit of a refrigeration cycle apparatus used in an air-conditioning apparatus. More specifically, the present invention relates to a temporary hanging of a decorative panel disposed at, for example, an air inlet of the indoor unit.

Background Art

[0002] For example, in a conventional air-conditioning apparatus, for example a four direction cassette type indoor unit has such a structure that a decorative panel covering the lower surface (the surface facing the inside of the room) is attached to an indoor unit body suspended in a space above a ceiling. It has been proposed that, when the decorative panel is to be attached to the indoor unit body, the decorative panel is temporarily hung, for example, by hooking two temporary hanging levers disposed on the edge of an air inlet of the decorative panel on L-shaped temporary hanging hooks provided on the indoor unit body, and then the decorative panel is fixed to the indoor unit body with screws (see, for example, Patent Literature 1 and Patent Literature 2).

Citation List

Patent Literature

[0003]

Patent Literature 1: Japanese Unexamined Utility Application Publication No. 62-117428 (Fig. 5)

Patent Literature 2: Japanese Unexamined Patent Application Publication No. 2008-75985 (Fig. 5)

Summary of Invention

Technical Problem

[0004] For example, when a decorative panel is to be attached to an indoor unit body above a ceiling, the decorative panel is often held by hooking the edges of two sides opposed to each other (opposed sides) of an air inlet with thumbs to stably lift the decorative panel. However, for example, if temporary hanging levers are provided on the same side or two adjacent sides of the air inlet of the decorative panel and the decorative panel is to be temporarily hung on a case forming the indoor unit body, the opposed sides of the air inlet cannot be held and the decorative panel is to be lifted unstably.

[0005] An object of the present invention is to provide an indoor unit or the like in which a decorative panel can be easily temporarily hung.

[0006] An indoor unit according to the present invention includes a case having an opening part on a lower surface thereof when the indoor unit is installed, and a decorative panel having a rectangular air inlet being open to the opening part of the case and being attached to the lower surface of the case. The decorative panel has temporary hanging levers attached to opposed positions shifted from midpoints on any opposed two of four sides on edges of the air inlet parallelly toward any opposed vertexes. The case has temporary hanging hooks corresponding to the temporary hanging levers on edges of the opening part.

Advantageous Effects of Invention

[0007] According to the indoor unit of the present invention, the temporary hanging levers hooked on the temporary hanging hooks of the case to temporarily hang the decorative panel are attached to opposed positions shifted from midpoints on opposed two sides on edges of the air inlet of the decorative panel parallelly toward opposed vertexes. Thus, an installation worker can insert their fingers into the edges of the air inlet of the decorative panel, hold temporary hanging levers while pressing them with their fingers, and temporarily hang the decorative panel on the case in a stable state. At this time, the worker can hold the temporary hanging levers in front of their head, and thus the temporary hanging levers are easily seen during the temporary hanging.

Brief Description of Drawings

[0008]

[Fig. 1] Fig. 1 is an exploded perspective view of an indoor unit of an air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 is an enlarged view showing a state before the temporary hanging of the temporary hanging lever 8 disposed on the air inlet side surface 7 on the indoor unit according to Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 is a view showing a state where the decorative panel 3 according to Embodiment 1 of the present invention is temporarily hung on the case 2.

[Fig. 4] Fig. 4 is an enlarged view of the temporary hanging lever 8 and the temporary hanging hook 9 according to Embodiment 1 of the present invention.

[Fig. 5] Fig. 5 is a front view of the indoor unit in a state where the decorative panel 3 according to Embodiment 1 of the present invention is temporarily hung on the case 2.

[Fig. 6] Fig. 6 is a perspective view showing a state where a raisable and lowerable electric component box 11 according to Embodiment 2 of the present

invention is attached to the decorative panel 3.

[Fig. 7] Fig. 7 is a diagram showing an example configuration of a refrigeration cycle apparatus according to Embodiment 3 of the present invention. Description of Embodiments

Embodiment 1

[0009] Fig. 1 is an exploded perspective view of an indoor unit of an air-conditioning apparatus according to Embodiment 1 of the present invention. In the following description, the upper side (vertical direction) in Fig. 1 will be referred to as the upper side, and the lower side in Fig. 1 will be referred to as the lower side. The indoor unit of the air-conditioning apparatus according to Embodiment 1 is connected with an outdoor unit by refrigerant pipes and forms a refrigerant circuit that circulates refrigerant and performs refrigeration, air conditioning, or the like. The indoor unit of Embodiment 1 is a ceiling embedded indoor unit, and a four direction cassette type indoor unit will be described as an example thereof.

[0010] As shown in Fig. 1, the indoor unit is installed in an indoor space 1. At this time, a case (cabinet) 2 forming an indoor unit body housing an indoor fan, an indoor heat exchanger, and the like (not shown) is embedded in a ceiling recess of the indoor space. The case 2 has a bell mouth 5 for rectifying air when the indoor fan is driven. The case 2 of Embodiment 1 has, on the outside of the bell mouth 5, temporary hanging hooks 9 on which temporary hanging levers 8 of a decorative panel 3 described later are hooked to temporarily hang the decorative panel 3. The temporary hanging hooks 9 are formed at positions corresponding to the temporary hanging levers 8 as described later.

[0011] The decorative panel 3 is attached to the lower part of the case 2 to cover the case 2 and to face the indoor side. The central part of the decorative panel 3 is open in a substantially rectangular shape (square shape) (to have a rectangular shape). This opening is an air inlet space 6 serving as an air inlet through which indoor air is sucked in when the indoor fan is driven. The edges of four sides that surround the opening (define the air inlet space 6) are air inlet side surfaces 7. A suction grille 4 covers the air inlet space 6. Air outlets through which air passing through the indoor heat exchanger is blown out into the room when the indoor fan is driven are provided along the air inlet side surfaces 7.

[0012] In Embodiment 1, of edges of the four sides that are the air inlet side surfaces 7, a pair of sides opposed to one another each have a temporary hanging lever 8 attached to the air inlet side surface 7 thereof to protrude into the air inlet space 6. The temporary hanging lever 8 is attached not to a central part of the air inlet side surface 7 (a position at the midpoint of the side) but to a position slightly shifted toward a vertex of the rectangle. The temporary hanging levers 8 are attached to positions opposed to each other on two opposed sides (positions line-symmetric with respect to a line parallel to the two op-

posed sides and passing through the center of the air inlet space 6 (positions in a mirror-image relationship)). Attaching the temporary hanging levers 8 to positions shifted from the centers makes the temporary hanging levers 8 and the temporary hanging hooks 9 easily seen when the decorative panel 3 is lifted and temporarily hung on the case 2, facilitating the temporary hanging.

[0013] Fig. 2 is an enlarged view showing a state before the temporary hanging of the temporary hanging lever 8 disposed on the air inlet side surface 7 on the indoor unit according to Embodiment 1 of the present invention. As shown in Fig. 2, the temporary hanging lever 8 is formed of, for example, iron wire. The temporary hanging lever 8 is formed by processing iron wire, and has a hook portion 8a, rotating shaft portions 8b and 8c, and an operating portion 8d. The hook portion 8a has a space that enables the hook portion 8a to be hooked on the temporary hanging hook 9 of the case 2. In Embodiment 1, the hook portion 8a is formed in a substantially U-shape. The rotating shaft portions 8b and 8c are inserted, utilizing the elasticity of iron wire, into bearing holes 7a and 7b formed on the air inlet side surface 7. The rotating shaft portions 8b and 8c serve as rotating shafts when the temporary hanging lever 8 turns. The present invention is not limited to this configuration as long as the temporary hanging lever 8 can be turned. The operating portion 8d is formed of two pieces of iron wire, and is a part on which a finger (thumb) is placed, for example, when a person lifts the decorative panel 3 and turns the temporary hanging lever 8.

[0014] Fig. 3 is a view showing a state where the decorative panel 3 according to Embodiment 1 of the present invention is temporarily hung on the case 2. As shown in Fig. 3, the decorative panel 3 has, in the four corners thereof, installation screw portions 10 for installing and fixing the decorative panel 3 with screws.

[0015] Fig. 4 is an enlarged view of the temporary hanging lever 8 and the temporary hanging hook 9 according to Embodiment 1 of the present invention. A person applies a force, with their finger, to the operating portion 8d of the temporary hanging lever 8 protruding into the air inlet space 6 before the temporary hanging, and the hook portion 8a is thereby hooked on the temporary hanging hook 9 while the temporary hanging lever 8 is turned as shown in Fig. 4. At this time, the temporary hanging lever 8 is caused to get over a protruding portion 7c of the air inlet side surface 7 utilizing the elasticity of iron wire so that the protruding portion 7c prevents the temporary hanging lever 8 from turning again toward the air inlet space 6. After the decorative panel 3 is temporarily hung on the case 2, the decorative panel 3 is fixed with screws to the case 2 through the installation screw portions 10 in the four corners of the decorative panel 3.

[0016] Fig. 5 is a front view of the indoor unit in a state where the decorative panel 3 according to Embodiment 1 of the present invention is temporarily hung on the case 2. As described above, the temporary hanging lever 8 and the temporary hanging hook 9 are disposed at posi-

tions shifted from the central part of the air inlet side surface 7 of the decorative panel 3. For example, if a person holds the decorative panel 3 that is rotated 180 degrees from the correct orientation by mistake when attaching the decorative panel 3 to the case 2, the temporary hanging levers 8 are not aligned with the temporary hanging hooks 9, and the temporary hanging cannot be performed. Thus, wrong attachment can be prevented.

[0017] As described above, according to the indoor unit of the air-conditioning apparatus of Embodiment 1, the temporary hanging levers 8 of which the hook portion 8a are hooked on the temporary hanging hooks 9 of the case 2 to temporarily hang the decorative panel 3 are attached to opposed positions shifted from midpoints on opposed two sides of the air inlet side surfaces 7 on edges of the air inlet formed on the decorative panel 3 parallelly toward opposed vertexes. Thus, for example, a worker can hold the edges of the air inlet while pressing the temporary hanging levers 8 with their thumbs, and temporarily hang the decorative panel 3 on the case 2 in a stable state. At this time, the worker can hold the temporary hanging levers 8 in front of their head, and thus the temporary hanging levers 8 are easily seen during the temporary hanging. The worker can attach even a square decorative panel 3 such as a four direction cassette type without any error in the orientation of installation, for example, without attaching in an orientation rotated 180 degrees. Thus, the decorative panel 3 can be easily screwed to the case.

[0018] In the indoor unit of Embodiment 1, in relation to the temporary hanging levers 8 formed of iron wire to each have a hook portion 8a, rotating shaft portions 8b and 8c, and an operating portion 8d, the worker pushes up the operating portions 8d of the temporary hanging levers 8 protruding into the air inlet space 6 with their thumbs or the like to turn the temporary hanging levers 8 so that the hook portions 8a are hooked on the temporary hanging hooks 9 of the case 2. Thus, the temporary hanging can be easily performed. By causing the operating portions 8d of the temporary hanging levers 8 to get over the protruding portions 7c when turning the temporary hanging levers 8, the temporary hanging levers 8 can be fixed in an upward position, facilitating the temporary hanging.

Embodiment 2

[0019] Fig. 6 is a perspective view showing a state where a raisable and lowerable electric component box 11 according to Embodiment 2 of the present invention is attached to the decorative panel 3. In Fig. 6, the raisable and lowerable electric component box 11 is a box (case) that houses electric components (not shown) such as a drive circuit for driving a fan or the like of the indoor unit. For example, by detaching the suction grille 4 and turning the raisable and lowerable electric component box 11, the electric components can be raised and lowered together with the box.

[0020] Although, in the above-described Embodiment

1, attaching the temporary hanging lever 8 to a position shifted from the central part of the side toward a vertex has been described, the direction of shifting is not particularly limited. For example, the center of gravity, which is normally at substantially the center of the air inlet, moves forward when the raisable and lowerable electric component box 11 is attached to the decorative panel 3.

[0021] In Embodiment 2, the temporary hanging lever 8 is shifted toward a position on which the raisable and lowerable electric component box 11 is installed. The raisable and lowerable electric component box 11 is located on the position in front of the worker, and thus the worker can stably lift the decorative panel 3 on which the raisable and lowerable electric component box 11 is installed.

[0022] For example, when the raisable and lowerable electric component box 11 is attached to an air inlet side surface 7, the position of the center of gravity of the decorative panel 3 shifts from the center to the side of the position where the raisable and lowerable electric component box 11 is attached. However, if the temporary hanging levers 8 are disposed on the positions shifted from the center of the air inlet space 6 toward the position on which the raisable and lowerable electric component box 11 is installed, the temporary hanging can be performed such that the balance of the decorative panel 3 is kept even when the decorative panel 3 is lifted and the temporary hanging levers 8 are hooked on the temporary hanging hooks 9 of the case 2.

Embodiment 3

[0023] Fig. 7 is a diagram showing an example configuration of a refrigeration cycle apparatus according to Embodiment 3 of the present invention. In Fig. 7, an air-conditioning apparatus is shown as a refrigeration cycle apparatus. In the air-conditioning apparatus of FIG. 7, an outdoor unit 300 and the indoor unit 200 described in Embodiment 1 and Embodiment 2 are connected by a gas refrigerant pipe 400 and a liquid refrigerant pipe 500. The outdoor unit 300 includes a compressor 311, a four-way valve 312, an outdoor heat exchanger 313, and an expansion valve 314.

[0024] The compressor 311 compresses and discharges sucked refrigerant. Although the invention is not particularly limited, the compressor 311 may have a capability of varying the capacity (the amount of refrigerant fed per unit time) by arbitrarily varying the operating frequency, for example, with an inverter circuit. The four-way valve 312 is a valve for switching the flow of refrigerant, for example, between the flow for a cooling operation and the flow for a heating operation.

[0025] The outdoor heat exchanger 313 exchanges heat between refrigerant and air (outdoor air). For example, during the heating operation, the outdoor heat exchanger 313 functions as an evaporator, and evaporates and gasifies refrigerant. During the cooling operation, the outdoor heat exchanger 313 functions as a condenser,

and condenses and liquefies refrigerant.

[0026] The expansion valve 314 of an expansion device (flow rate control unit) or the like decompresses and expands refrigerant. For example, when the expansion valve 314 is an electronic expansion valve or the like, the opening degree is adjusted based on the instruction of a control unit (not shown) or the like.

[0027] The indoor heat exchanger 211 of the indoor unit 200 exchanges heat, for example, between air in the indoor space 1 and refrigerant. During the heating operation, the indoor heat exchanger 211 functions as a condenser, and condenses and liquefies refrigerant. During the cooling operation, the indoor heat exchanger 211 functions as an evaporator, and evaporates and gasifies refrigerant.

[0028] First, the cooling operation of the refrigeration cycle apparatus will be described based on the flow of refrigerant. In the cooling operation, the four-way valve 312 is switched to establish a connection relationship shown by solid lines. High-temperature high-pressure gas refrigerant compressed and discharged by the compressor 311 passes through the four-way valve 312 and flows into the outdoor heat exchanger 313. Then, the refrigerant condensed and liquefied by passing through the outdoor heat exchanger 313 and exchanging heat with the outdoor air (liquid refrigerant) flows into the expansion valve 314. The refrigerant brought into a two-phase gas-liquid state by being decompressed by the expansion valve 314 flows out of the outdoor unit 300.

[0029] The two-phase gas-liquid refrigerant flowing out of the outdoor unit 300 flows through the liquid refrigerant pipe 500 into the indoor unit 200, and passes through the indoor heat exchanger 211. The refrigerant evaporated and gasified by exchanging heat, for example, with the air in the indoor space 1 (gas refrigerant) flows out of the indoor unit 200.

[0030] The gas refrigerant flowing out of the indoor unit 200 flows through the gas refrigerant pipe 400 into the outdoor unit 300. The refrigerant then passes through the four-way valve 312 and is sucked into the compressor 311 again. As described above, the refrigerant of the air-conditioning apparatus is circulated and air-conditioning (cooling) is performed.

[0031] Next, the heating operation will be described based on the flow of refrigerant. In the heating operation, the four-way valve 312 is switched to establish a connection relationship shown by dotted lines. High-temperature high-pressure gas refrigerant compressed and discharged by the compressor 311 passes through the four-way valve 312 and flows out of the outdoor unit 300. The gas refrigerant flowing out of the outdoor unit 300 flows through the gas refrigerant pipe 400 into the indoor unit 200. The refrigerant condensed and liquefied by exchanging heat, for example, with air in the indoor space 1 while passing through the indoor heat exchanger 211 flows out of the indoor unit 200.

[0032] The refrigerant flowing out of the indoor unit 200 flows through the liquid refrigerant pipe 500 into the out-

door unit 300. The refrigerant brought into a two-phase gas-liquid state by being decompressed by the expansion valve 314 flows into the outdoor heat exchanger 313. Then, the refrigerant evaporated and gasified by passing through the outdoor heat exchanger 313 and exchanging heat with the outdoor air (gas refrigerant) passes through the four-way valve 312 and is sucked into the compressor 311 again. Thus, the refrigerant of the air-conditioning apparatus is circulated and air-conditioning (heating) is performed.

[0033] As described above, the air-conditioning apparatus (refrigeration cycle apparatus) of Embodiment 3 achieves the same advantageous effects as those of Embodiments 1 and 2 by employing the indoor unit 200 described in Embodiments 1 and 2 to form the configuration.

Industrial Applicability

[0034] Although, in the above-described Embodiments 1 to 3, a four direction cassette type ceiling embedded indoor unit that blows out air in four directions has been described, the technique herein can also be applied to indoor units that blow out air, for example, in two directions and three directions.

[0035] Although, in the above-described Embodiments 1 to 3, an air-conditioning apparatus has been described as an example of a refrigeration cycle apparatus, the technique herein can also be applied, for example, to a refrigerating apparatus or the like that is another refrigerating cycle apparatus. The technique herein can be applied not only to refrigeration cycle apparatus but also, for example, to a ventilation apparatus.

Reference Signs List

[0036] 1 indoor space 2 case 3 decorative panel 4 suction grille 5 bell mouth 6 air inlet space 7 air inlet side surface 7a, 7b bearing hole 7c protruding portion 8 temporary hanging lever 8a hook portion 8b, 8c rotating shaft portion 8d operating portion 9 temporary hanging hook 10 installation screw portion 11 raisable and lowerable electric component box 200 indoor unit 211 indoor heat exchanger 300 outdoor unit 311 compressor 312 four-way valve 313 outdoor heat exchanger 314 expansion valve 400 gas refrigerant pipe 500 liquid refrigerant pipe

Claims

1. An indoor unit comprising:

a case having an opening part on a lower surface thereof when the indoor unit is installed; and
a decorative panel having a rectangular air inlet being open to the opening part of the case, the decorative panel being attached to the lower surface of the case,
the decorative panel having temporary hanging

levers attached to opposed positions shifted from midpoints on any opposed two of four sides on edges of the air inlet parallelly toward any opposed vertexes,

the case having temporary hanging hooks corresponding to the temporary hanging levers on edges of the opening part. 5

2. The indoor unit of claim 1, wherein the temporary hanging levers each have a hook portion hooked on one of the temporary hanging hooks, and an operating portion on which a finger can be placed to turn the hook portion. 10

3. The indoor unit of claim 2, further comprising protruding portions for catching the turned temporary hanging levers, on the edges of the air inlet. 15

4. The indoor unit of any one of claims 1 to 3, wherein the temporary hanging levers are attached to opposed positions shifted toward opposed vertexes close to a position of the decorative panel to which an electric component box is attached. 20

5. The indoor unit of any one of claims 1 to 4, wherein, after the temporary hanging levers are hooked on the temporary hanging hooks, the case and the decorative panel are fixed with screws. 25

6. A refrigeration cycle apparatus comprising: the indoor unit of any one of claims 1 to 5; and an outdoor unit, the refrigeration cycle apparatus having a refrigerant circuit connecting, by pipes, a compressor compressing and discharging refrigerant, a condensor condensing the refrigerant by heat exchange, an expansion device decompressing the condensed refrigerant, and an evaporator exchanging heat between the decompressed refrigerant and air. 30 35 40

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FIG. 1

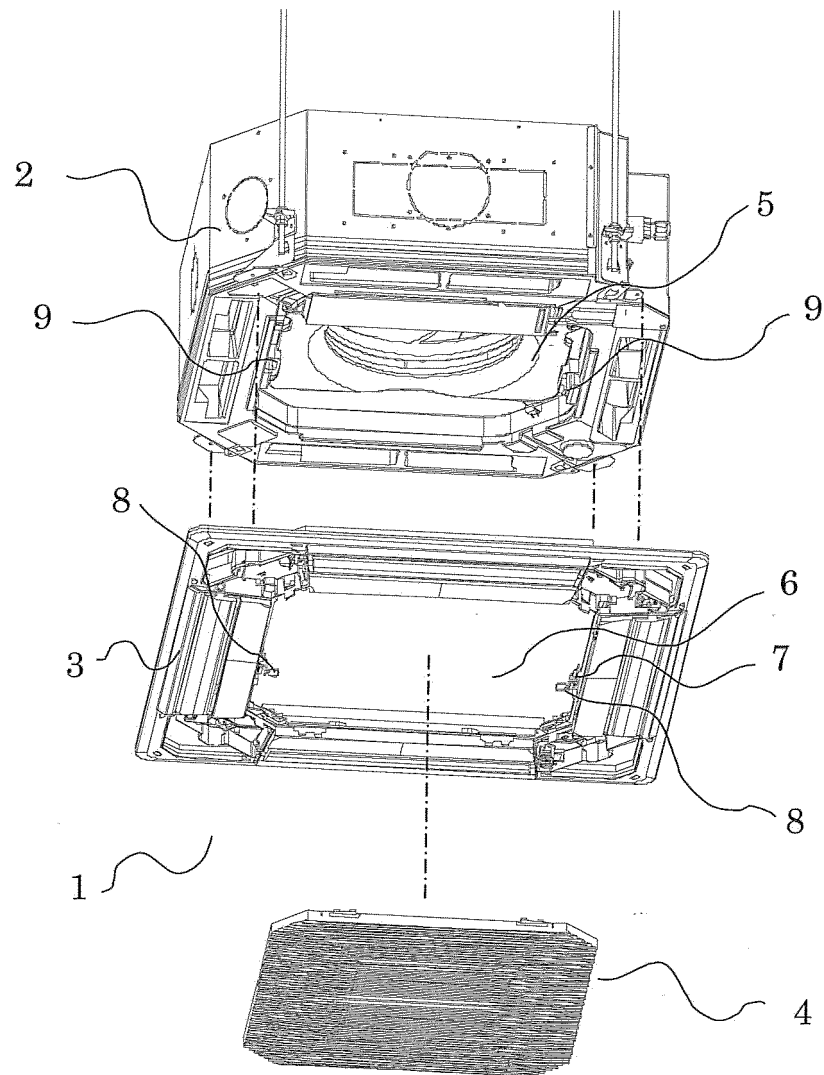


FIG. 2

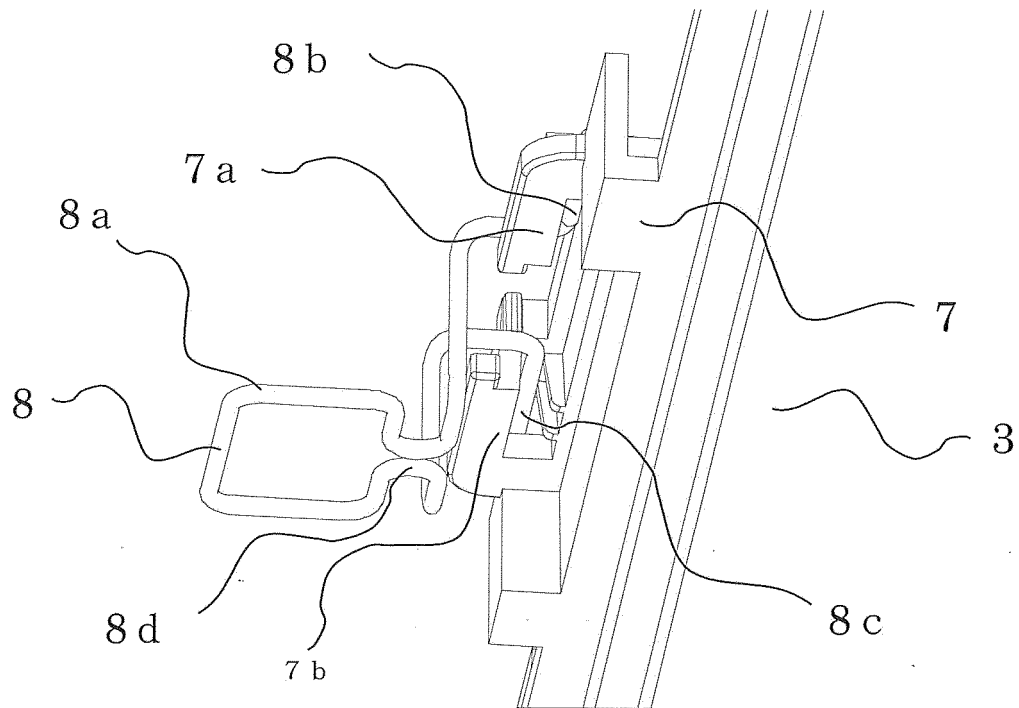


FIG. 3

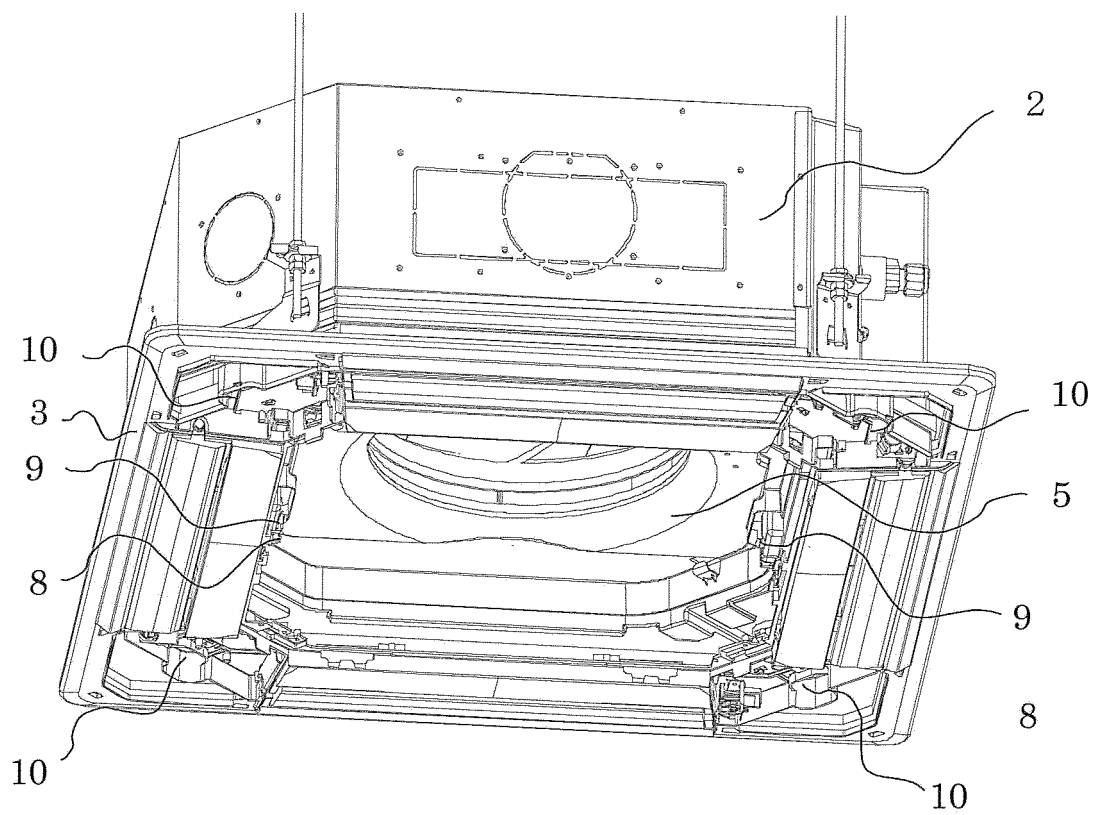


FIG. 4

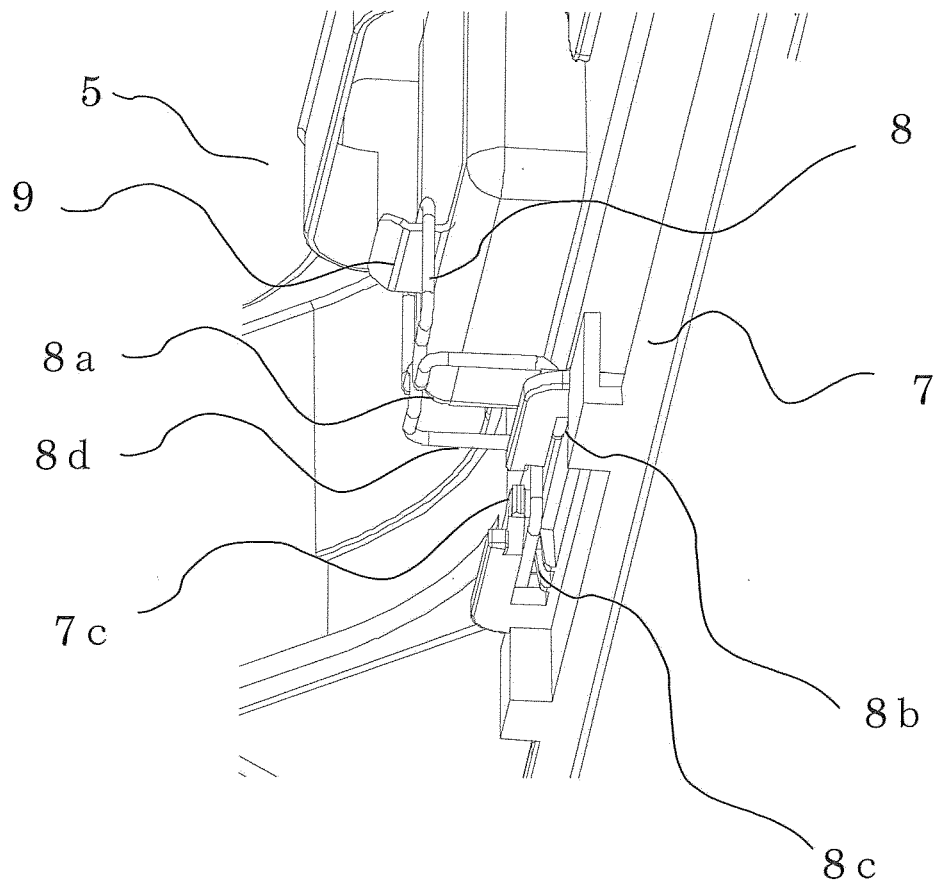


FIG. 5

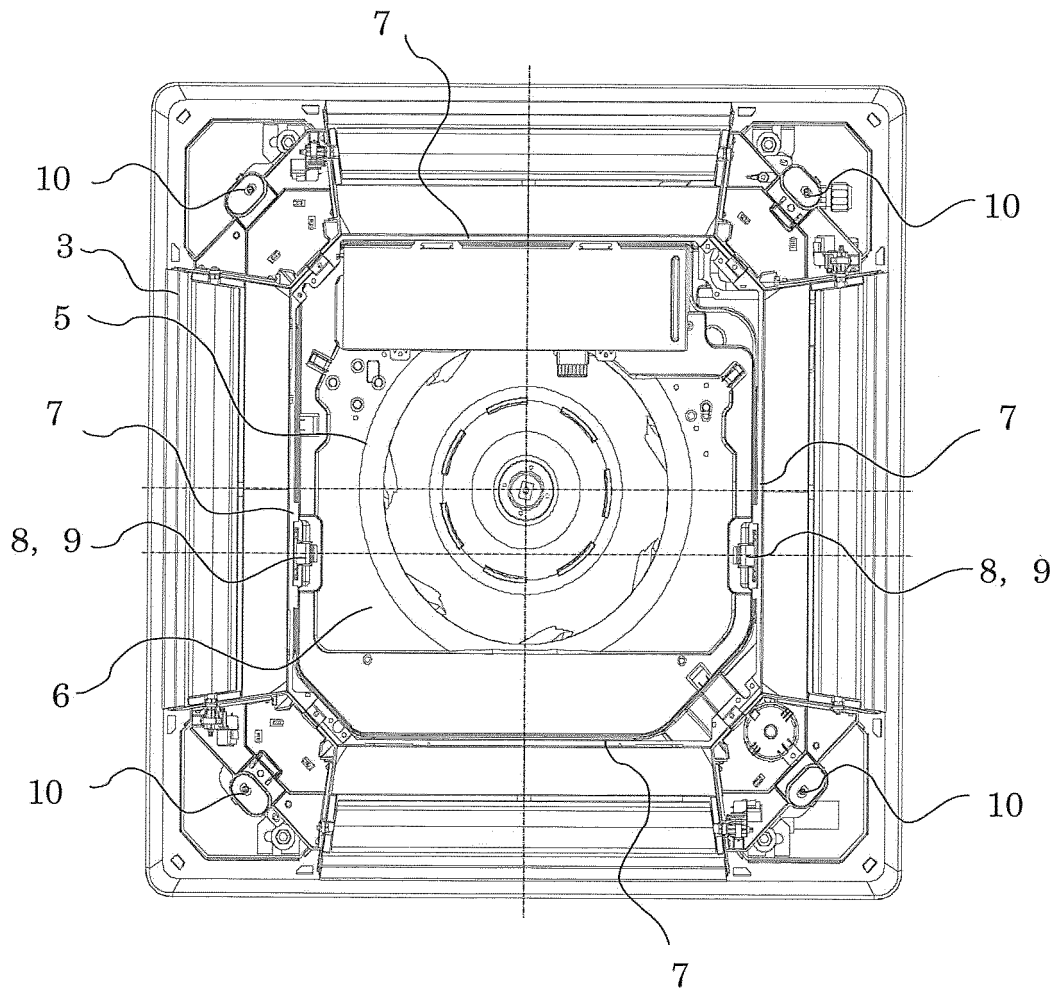


FIG. 6

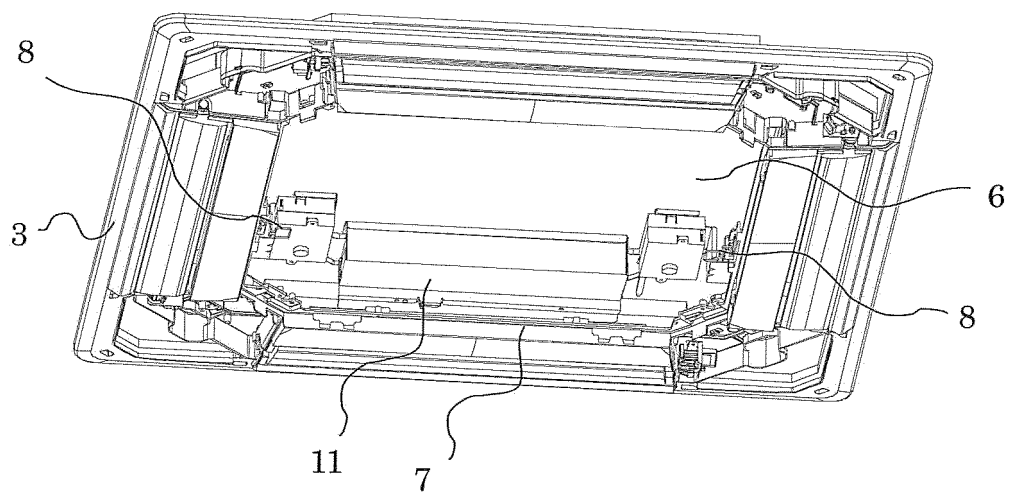
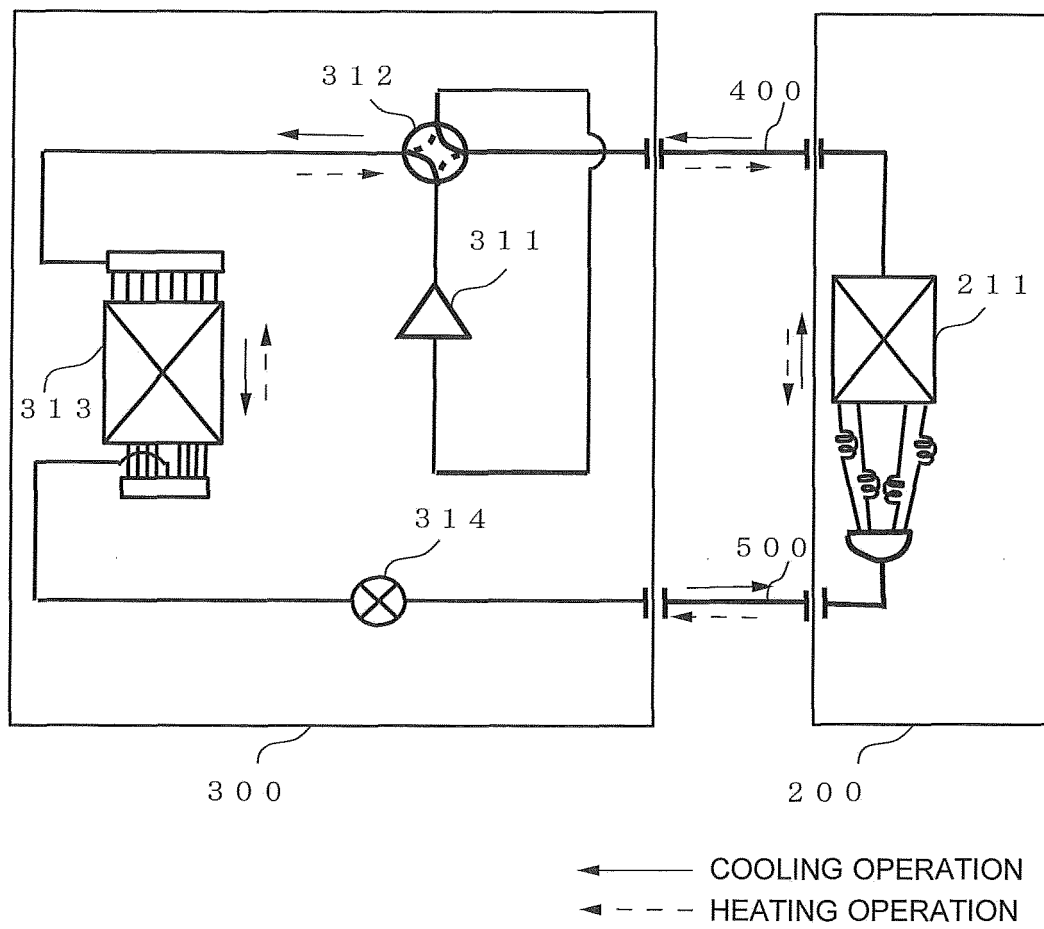


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/064342

A. CLASSIFICATION OF SUBJECT MATTER

F24F13/20(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F13/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2006-17342 A (Matsushita Electric Industrial Co., Ltd.), 19 January 2006 (19.01.2006), paragraphs [0014] to [0026]; fig. 1 to 6 (Family: none)	1-6
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 193658/1983(Laid-open No. 116122/1985) (Pacific Industrial Co., Ltd.), 06 August 1985 (06.08.1985), fig. 3 to 4 (Family: none)	1-6

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

* Special categories of cited documents:

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Date of the actual completion of the international search

22 August, 2014 (22.08.14)

Date of mailing of the international search report

02 September, 2014 (02.09.14)

Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/064342

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 2003-95025 A (Piolax Inc.), 03 April 2003 (03.04.2003), paragraph [0010]; fig. 4 to 5 (Family: none)	3-6
A	JP 2008-75985 A (Daikin Industries, Ltd.), 03 April 2008 (03.04.2008), fig. 2 (Family: none)	1
A	JP 10-205804 A (Sanyo Electric Co., Ltd.), 04 August 1998 (04.08.1998), fig. 2 (Family: none)	1

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2008075985 A [0003]