



(11) **EP 3 343 124 A1**

(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 153(4) EPC

(43) Date of publication:  
**04.07.2018 Bulletin 2018/27**

(51) Int Cl.:  
**F24F 13/20 (2006.01)**

(21) Application number: **15902228.4**

(86) International application number:  
**PCT/JP2015/073703**

(22) Date of filing: **24.08.2015**

(87) International publication number:  
**WO 2017/033257 (02.03.2017 Gazette 2017/09)**

(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**  
Designated Validation States:  
**MA**

- **SUZUKI, Akimoto**  
Tokyo 102-0073 (JP)
- **KINAMI, Masahide**  
Tokyo 102-0073 (JP)
- **IKEDA, Hisanori**  
Tokyo 102-0073 (JP)
- **KOYANAGI, Youhei**  
Tokyo 102-0073 (JP)

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

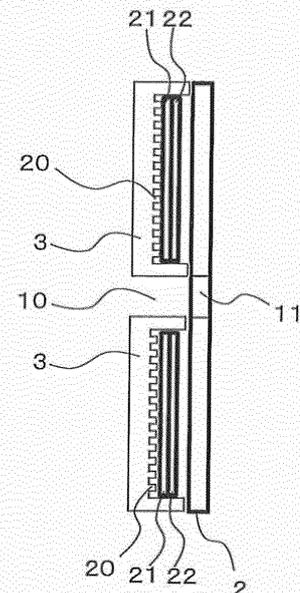
(74) Representative: **Pfenning, Meinig & Partner mbB**  
**Patent- und Rechtsanwälte**  
**Theresienhöhe 11a**  
**80339 München (DE)**

(72) Inventors:  
• **ISHIKAWA, Masato**  
**Tokyo 102-0073 (JP)**

(54) **INDOOR UNIT OF AIR-CONDITIONER**

(57) An air-conditioning apparatus indoor unit to be mounted on a wall includes: a front panel provided on a front side of an indoor unit main body; and a design cover formed of a transparent component and mounted so as to cover the front side of the front panel. The design cover includes a rectangular flat portion and peripheral wall portions provided at side portions of the flat portion and projecting on a back side of the flat portion. A plurality of projections each of which extends continuously from a left end portion of the flat portion to a right end portion of the flat portion in a front view, or a plurality of recesses each of which extends continuously from the left end portion of the flat portion to the right end portion of the flat portion, are provided on a back side of the flat portion, and the projections or the recesses are aligned in an up-down direction. A pearl coating is provided on a back side of the design cover, and a background color coating is further provided on the pearl coating.

FIG. 8



**EP 3 343 124 A1**

**Description**

## Technical Field

**[0001]** The present invention relates to a wall-mounted type air-conditioning apparatus indoor unit that is installed on a wall surface, and particularly relates to a front panel structure.

## Background Art

**[0002]** An air-conditioning apparatus indoor unit is installed within a room where a resident or other person is present, and thus the appearance thereof comes into sight of the resident or the other person. Therefore, in some air-conditioning apparatus indoor units, in order to improve the design property thereof, the front side of a front panel of an indoor unit main body is subjected to coating or printing. However, the front side of the front panel is often subjected to stimulation such as rubbing from the outside, and thus there is a problem in that the coated surface or the printed surface is easily flawed or peeled to deteriorate, so that the design surface deteriorates. Therefore, there are air-conditioning apparatus indoor units in which deterioration of a design surface is suppressed (see, for example, Patent Literature 1 and Patent Literature 2).

**[0003]** In Patent Literature 1, a transparent front panel is provided on the front side of an indoor unit main body, and color or a pattern is provided on the back side of the transparent front panel. In addition, in Patent Literature 2, a transparent front panel is provided on the front side of an indoor unit main body, a plurality of recesses and projections are provided on the back side of the transparent front panel, pearl coating is applied thereonto, and coating of a background color is further applied thereonto.

**[0004]** As described above, in Patent Literature 1 and Patent Literature 2, by providing a design on the back side of the transparent front panel by means of coating or the like, the design is made hard to be subjected to stimulation such as rubbing from the outside, thereby improving the design property while suppressing deterioration of the design surface.

## Citation List

## Patent Literature

**[0005]**

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2004-1 84051  
Patent Literature 2: Japanese Patent No. 5264860

## Summary of Invention

## Technical Problem

**[0006]** When the design surface is seen from below in a state where the air-conditioning apparatus indoor unit is installed on an upper portion of a wall surface, since a design is provided on the back side of the transparent front panel by means of coating or the like in the related art such as Patent Literature 1 and Patent Literature 2, the design is seen through transparency, but there is a problem in that it is hard to see the design through transparency.

**[0007]** The present invention has been made to solve the above-described problems, and an object of the present invention is to provide an air-conditioning apparatus indoor unit having an improved design property while deterioration of a design surface is suppressed.

## Solution to Problem

**[0008]** An air-conditioning apparatus indoor unit according to the present invention is an air-conditioning apparatus indoor unit to be mounted on a wall, including: a front panel provided on a front side of an indoor unit main body; and a design cover formed of a transparent component and mounted so as to cover the front side of the front panel, wherein the design cover includes a rectangular flat portion and peripheral wall portions provided at side portions of the flat portion and projecting on a back side of the flat portion, a plurality of projections each of which extends continuously from a left end portion of the flat portion to a right end portion of the flat portion in a front view, or a plurality of recesses each of which extends continuously from the left end portion of the flat portion to the right end portion of the flat portion, are provided on a back side of the flat portion, the projections or the recesses are aligned in an up-down direction, a pearl coating is provided on a back side of the design cover, and a background color coating is further provided on the pearl coating. Advantageous Effects of Invention

**[0009]** According to the air-conditioning apparatus indoor unit according to the present invention, by providing the plurality of projections on the back side of the flat portion of the design cover such that the projections project continuously from the left end portion of the flat portion to the right end portion of the flat portion and are aligned in the up-down direction, the pearl coating sufficiently enters between the projections. Thus, the projections that are provided in the right-left direction are prominently seen when the air-conditioning apparatus indoor unit is seen from below. In addition, it is possible to adjust the entire color tone further by the color coating, which is provided on the pearl coating. As a result, in a state where the air-conditioning apparatus indoor unit is installed on an upper portion of the wall surface, even when the design covers, which form the design surface, are seen from below, it is possible to clearly see the design

of the projections through transparency, and thus it is possible to improve the design property.

#### Brief Description of Drawings

#### [0010]

[Fig. 1] Fig. 1 is an external perspective view of an air-conditioning apparatus indoor unit according to Embodiment of the present invention as seen from the front side.

[Fig. 2] Fig. 2 is a vertical cross-sectional view of the air-conditioning apparatus indoor unit according to Embodiment of the present invention.

[Fig. 3] Fig. 3 is a perspective view showing a front panel and design covers of the air-conditioning apparatus indoor unit according to Embodiment of the present invention and is a diagram before the design covers are mounted to the front panel.

[Fig. 4] Fig. 4 is a perspective view showing the front panel and the design cover of the air-conditioning apparatus indoor unit according to Embodiment of the present invention and is a diagram after the design covers are mounted to the front panel.

[Fig. 5] Fig. 5 is a first side view schematically showing the design cover of the air-conditioning apparatus indoor unit according to Embodiment of the present invention.

[Fig. 6] Fig. 6 is a second side view schematically showing the design cover of the air-conditioning apparatus indoor unit according to Embodiment of the present invention.

[Fig. 7] Fig. 7 is a front view schematically showing the design cover of the air-conditioning apparatus indoor unit according to Embodiment of the present invention.

[Fig. 8] Fig. 8 is a vertical cross-sectional view schematically showing the front panel and the design covers of the air-conditioning apparatus indoor unit according to Embodiment of the present invention.

#### Description of Embodiments

[0011] Hereinafter, Embodiment of the present invention will be described with reference to the drawings. It should be noted that the present invention is not limited by Embodiment described below. In addition, the relationship of the size of each constituent element in the drawings described below may be different from the actual relationship.

#### Embodiment

[0012] Fig. 1 is an external perspective view of an air-conditioning apparatus indoor unit according to Embodiment of the present invention as seen from the front side, and Fig. 2 is a vertical cross-sectional view of the air-conditioning apparatus indoor unit according to Embod-

iment of the present invention.

[0013] Fig. 2 shows the indoor unit with the left side in the drawing being the front side of the indoor unit.

[0014] In the following description, for easy understanding, terms representing a direction (e.g. "up", "down", "right", "left", etc.) are used as appropriate, but are for description, and are not intended to limit the invention of the present application. In addition, in Embodiment, "up", "down", "right", and "left" are used in a state where an indoor unit main body 100 is seen in a front view.

[0015] Hereinafter, the configuration of the indoor unit will be described with reference to Figs. 1 and 2.

[0016] The indoor unit according to Embodiment supplies conditioned air to an air-conditioning target area such as an indoor space by using a refrigeration cycle through which refrigerant circulates. In Embodiment, the case where the indoor unit is a wall-mounted type indoor unit to be mounted on a wall surface in the air-conditioning target area is shown as an example.

[0017] As shown in Fig. 1, the indoor unit main body 100 includes: a back case 1 that is provided on a back side and mounted on a wall surface; a front panel 2 that is provided on a front side and in which a recess 11 and front air inlets 12 are formed; design covers 3 that are mounted on the front side of the front panel 2; an upper air inlet 4 that is formed in an upper portion for mainly sucking indoor air into the inside; and an air outlet 5 that is formed in a lower portion for supplying conditioned air to the air-conditioning target area.

[0018] As shown in Fig. 2, an air-sending fan 6 that sucks indoor air through the upper air inlet 4 and the front air inlets 12 and blows out conditioned air through the air outlet 5, and a heat exchanger 7 that is disposed so as to cover the air-sending fan 6 from above and produces conditioned air by exchanging heat between the refrigerant and the indoor air, are housed within the indoor unit main body 100. An air passage is communicated within the indoor unit main body 100 by these components. In addition, an electrical item box that houses a circuit board, etc. and is not shown, and a drain pan 8 that is provided below a lower end portion of the heat exchanger 7 and collects dew condensation water from the heat exchanger 7, are further provided within the indoor unit main body 100.

[0019] The air-sending fan 6 is, for example, a cross-flow fan, and the heat exchanger 7 is, for example, a fin-tube-type heat exchanger, but the air-sending fan 6 and the heat exchanger 7 are not limited thereto.

[0020] A filter 9 for removing dust, etc. included in the sucked indoor air is provided between the upper air inlet 4 and the front air inlets 12, and the heat exchanger 7. Furthermore, a vertical air direction adjusting plate 10 that controls the direction in which air flow is blown out is provided at the air outlet 5.

[0021] Next, flow of air within the indoor unit main body 100 will be briefly described.

[0022] First, indoor air flows through the upper air inlet 4 and the front air inlets 12 of the indoor unit main body

100 into the indoor unit main body 100 by the air-sending fan 6. At this time, dust, etc. included in the air is removed by the filter 9. The indoor air is heated or cooled into conditioned air by the refrigerant flowing within the heat exchanger 7, when passing through the heat exchanger 7. Then, the conditioned air is adjusted in direction by the vertical air direction adjusting plate 10, and is blown out through the air outlet 5 to the outside of the indoor unit main body 100, that is, to the air-conditioning target area.

[0023] Fig. 3 is a perspective view showing the front panel 2 and the design covers 3 of the air-conditioning apparatus indoor unit according to Embodiment of the present invention and is a diagram before the design covers 3 are mounted to the front panel 2, and Fig. 4 is a perspective view showing the front panel 2 and the design covers 3 of the air-conditioning apparatus indoor unit according to Embodiment of the present invention and is a diagram after the design covers 3 is mounted to the front panel 2. The arrows in Fig. 3 indicate a position to which the design covers 3 are mounted.

[0024] The front panel 2 has a front surface with a flat surface shape as a whole for improving the design property thereof. In addition, the front panel 2 has a rectangular shape, and the lengthwise direction of the front panel 2 is the right-left direction, that is, the horizontal direction, and the crosswise direction of the front panel 2 is the up-down direction, that is, the vertical direction, in a state where the indoor unit main body 100 is mounted on the wall surface. In addition, the recess 11 is formed at the center in the up-down direction in a front view so as to extend from the inner side of a left end portion to the inner side of a right end portion. Thus, as shown in Fig. 3, the front panel 2 is recessed at the center in the up-down direction from the front side toward the back side, and the front surface is flat at the left side and the right side of the recess 11. In addition, the recess 11 is recessed from the front side toward the back side, and the front air inlets 12 are formed below the recess 11.

[0025] The position at which the recess 11 is formed may not be exactly the center in the up-down direction.

[0026] Fig. 5 is a first side view schematically showing the design cover 3 of the air-conditioning apparatus indoor unit according to Embodiment of the present invention, Fig. 6 is a second side view schematically showing the design cover 3 of the air-conditioning apparatus indoor unit according to Embodiment of the present invention, Fig. 7 is a front view schematically showing the design cover 3 of the air-conditioning apparatus indoor unit according to Embodiment of the present invention, and Fig. 8 is a vertical cross-sectional view schematically showing the front panel 2 and the design covers 3 of the air-conditioning apparatus indoor unit according to Embodiment of the present invention.

[0027] Each design cover 3 is formed of a transparent component, and has a front surface with a flat surface shape as a whole similarly to the front panel 2. The lengthwise direction of the design cover 3 is the right-left direc-

tion, that is, the horizontal direction, and the crosswise direction of the design cover 3 is the up-down direction, that is, the vertical direction, in a state where the indoor unit main body 100 is mounted on the wall surface. In addition, as shown in Fig. 5, the design cover 3 includes a rectangular flat portion 3a and peripheral wall portions 3b that are provided at four side portions of the flat portion 3a, respectively, and project on the back side. The design cover 3 improves the design property by being mounted to the front side of the front panel 2 by means of claws that are provided at part or all of the peripheral wall portions 3b and are not shown.

[0028] The peripheral wall portions 3b may not be provided at all of the four side portions of the flat portion 3a, and may be provided at part of the four side portions. In addition, the method for mounting the design cover 3 to the front panel 2 is not limited to the method using the claws, and the design cover 3 may be mounted, for example, by using an adhesive.

[0029] As shown in Fig. 6, a design is provided on the back side of the design cover 3 by projections 20, a pearl coating 21, and a color coating 22. Since the design is provided on the back side of the design cover 3 as described above, the design is hard to be subjected to stimulation such as rubbing from the outside, and it is possible to suppress deterioration of the design surface.

[0030] As shown in Figs. 5 to 7, a plurality of projections 20 are provided on the back side of the flat portion 3a of the design cover 3 so as to project continuously from the left end portion of the flat portion 3a to the right end portion of the flat portion 3a, and are aligned in the up-down direction. In addition, as shown in Fig. 7, the projections 20 are provided such that the widths thereof in the up-down direction and the depths thereof are irregular. Furthermore, the projections 20 are also provided such that the intervals between the adjacent projections 20 are irregular. That is, the back side of the flat portion 3a of the design cover 3 is subjected to hairline processing in which the plurality of minute projections 20 are provided in a single direction. By providing the projections 20 as described above, part of the projections 20 is easily shaded, and the projections 20 are easily seen due to contrast between the shaded part and the other part of the projections 20 on which light is reflected. Moreover, it is possible to represent a sophisticated design with quality appearance.

[0031] As shown in Fig. 6, the pearl coating 21 is provided on the back side of the design cover 3, that is, on the back side of the flat portion 3a and the inner side of the peripheral wall portions 3b, and the color coating 22 that provides a background color is provided thereon.

[0032] The pearl coating 21 is a coating obtained by mixing fine particles of mica of stone, and gives a shine by the fine particles when light is applied thereto. Thus, light of pearl color is refracted and scattered by the projections 20 with the color of the color coating 22 as the background color. Due to the scattering of the light, pearl-color glow prominently appears even when the design

cover 3, which is a transparent component, is seen from any angle.

**[0033]** As described above, the projections 20 are provided on the back side of the flat portion 3a, and the pearl coating 21 and the color coating 22 are provided on the back side of the flat portion 3a, but such projections 20 are not provided on the peripheral wall portions 3b, and the pearl coating 21 and the color coating 22 are merely provided on the inner side thereof. Therefore, the peripheral wall portions 3b are not shaded like the flat portion 3a and are seen shiningly due to the transparency thereof, so that the flat portion 3a and the peripheral wall portions 3b are seen differently. Then, this produces contrast and accent and thus is able to improve the design property.

**[0034]** In addition, by providing the plurality of projections 20 on the back side of the flat portion 3a of the design cover 3 such that the projections 20 project continuously from the left end portion of the flat portion 3a to the right end portion of the flat portion 3a and are aligned in the up-down direction, the pearl coating 21 sufficiently enters between the projections 20. Thus, the projections 20 that are provided in the right-left direction are prominently seen when the air-conditioning apparatus indoor unit is seen from below, and it is further possible to adjust the entire color tone by the color coating 22, which is provided on the pearl coating 21.

**[0035]** As a result, in a state where the air-conditioning apparatus indoor unit is installed on an upper portion of the wall surface, even when the design covers 3, which form the design surface, are seen from below, it is possible to clearly see the design of the projections 20 through transparency, and thus it is possible to improve the design property.

**[0036]** The color coating 22 corresponds to a "background color coating" of the present invention.

**[0037]** As shown in Figs. 3, 4, and 8, the design covers 3 are mounted on the front side of the front panel 2 and at the upper side and the lower side of the recess 11. Specifically, the design cover 3 that is mounted at the upper side of the recess 11 of the front panel 2 is mounted so as to cover the area from the left end portion of the front panel 2 to the right end portion of the front panel 2 over the area from the upper end portion of the recess 11 to the upper end portion of the front panel 2. In addition, the design cover 3 that is mounted at the lower side of the recess 11 of the front panel 2 is mounted so as to cover the area from the left end portion of the front panel 2 to the right end portion of the front panel 2 over the area from the lower end portion of the recess 11 to the lower end portion of the front panel 2. By mounting the design covers 3 on the front side of the front panel 2 in this manner, the design property is improved when the indoor unit main body 100 is seen from the front.

**[0038]** In Embodiment, the design covers 3 are mounted at the upper side and the lower side of the recess 11 of the front panel 2 one by one, but the configuration is not limited thereto, the design cover 3 that is mounted at

the upper side of the recess 11 of the front panel 2 may be divided into a plurality of sections, for example, two sections, and the design cover 3 that is provided on the lower side of the recess 11 of the front panel 2 may be similarly divided into a plurality of sections, for example, two sections. Moreover, the recess 11 may be eliminated from the front panel 2, and one design cover 3 may be mounted so as to cover the entire front surface of the front panel 2.

**[0039]** As described above, according to the air-conditioning apparatus indoor unit according to Embodiment, the design is provided on the back side of the design covers 3, and thus it is possible to suppress deterioration of the design surface. In addition, by providing the plurality of projections 20 on the back side of the flat portion 3a of the design cover 3 such that the projections 20 project continuously from the left end portion of the flat portion 3a to the right end portion of the flat portion 3a and are aligned in the up-down direction, the pearl coating 21 sufficiently enters between the projections 20. Thus, the projections 20 that are provided in the right-left direction are prominently seen when the air-conditioning apparatus indoor unit is seen from below, and it is further possible to adjust the entire color tone by the color coating 22, which is provided on the pearl coating 21.

**[0040]** As a result, in a state where the air-conditioning apparatus indoor unit is installed on an upper portion of the wall surface, even when the design covers 3, which form the design surface, are seen from below, it is possible to clearly see the design of the projections 20 through transparency, and thus it is possible to improve the design property.

**[0041]** In Embodiment, the plurality of projections 20 are provided on the back side of each design cover 3 so as to project continuously from the left end portion of the flat portion 3a to the right end portion of the flat portion 3a, but a plurality of recesses may be provided so as to be recessed continuously from the left end portion of the flat portion 3a to the right end portion of the flat portion 3a, instead of the projections 20, or both projections 20 and recesses may be provided.

#### Reference Signs List

**[0042]** 1 back case 2 front panel 3 design covers 3a flat portion 3b peripheral wall portion 4 upper air inlet 5 air outlet 6 air-sending fan 7 heat exchanger 8 drain pan 9 filter 10 vertical air direction adjusting plate 11 recess 12 front air inlet 20 projection 21 pearl coating 22 color coating 100 indoor unit main body

#### Claims

1. An air-conditioning apparatus indoor unit to be mounted on a wall, comprising:

a front panel provided on a front side of an indoor

unit main body; and  
 a design cover formed of a transparent component and mounted so as to cover the front side of the front panel,  
 the design cover including a flat portion having 5  
 a rectangular shape and peripheral wall portions provided at side portions of the flat portion and projecting on a back side of the flat portion,  
 a plurality of projections each extending continuously from a left end portion of the flat portion to a right end portion of the flat portion in a front view, or a plurality of recesses each extending 10  
 continuously from the left end portion of the flat portion to the right end portion of the flat portion, being provided on a back side of the flat portion, 15  
 the projections or the recesses being aligned in an up-down direction,  
 a pearl coating being provided on a back side of the design cover, and a background color coating being further provided on the pearl coating. 20

2. The air-conditioning apparatus indoor unit of claim 1, wherein the front panel and the design cover have front surfaces that are wholly flat. 25

3. The air-conditioning apparatus indoor unit of claim 1 or 2, wherein the design cover is colorless and transparent, and the background color coating is white. 30

35

40

45

50

55

FIG. 1

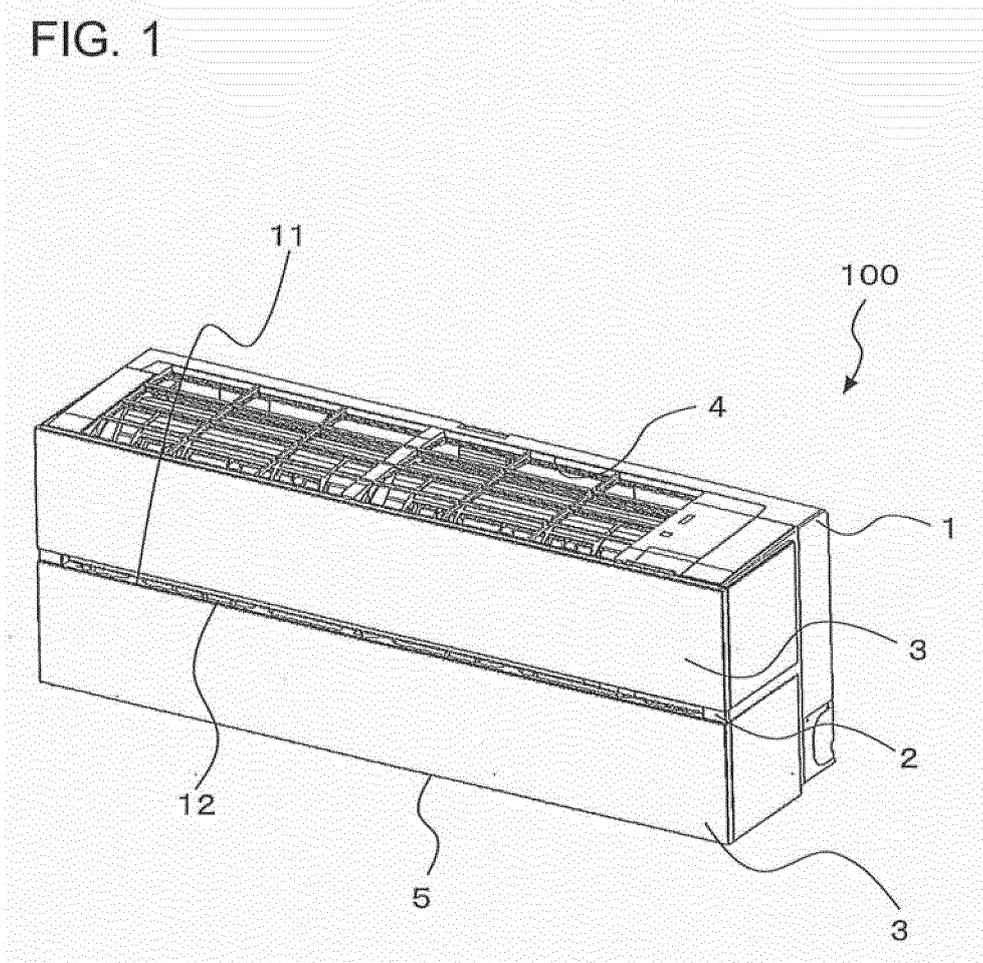


FIG. 2

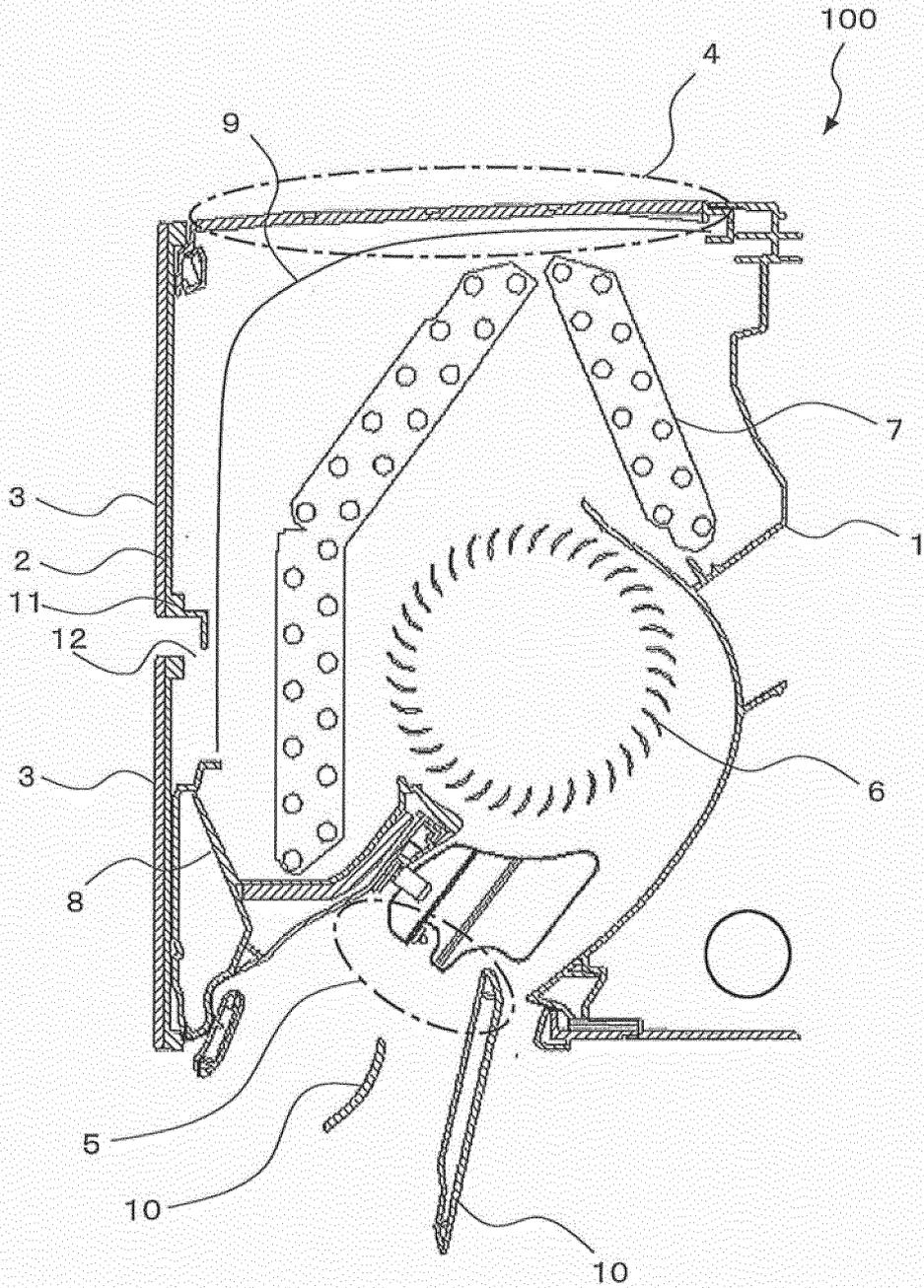


FIG. 3

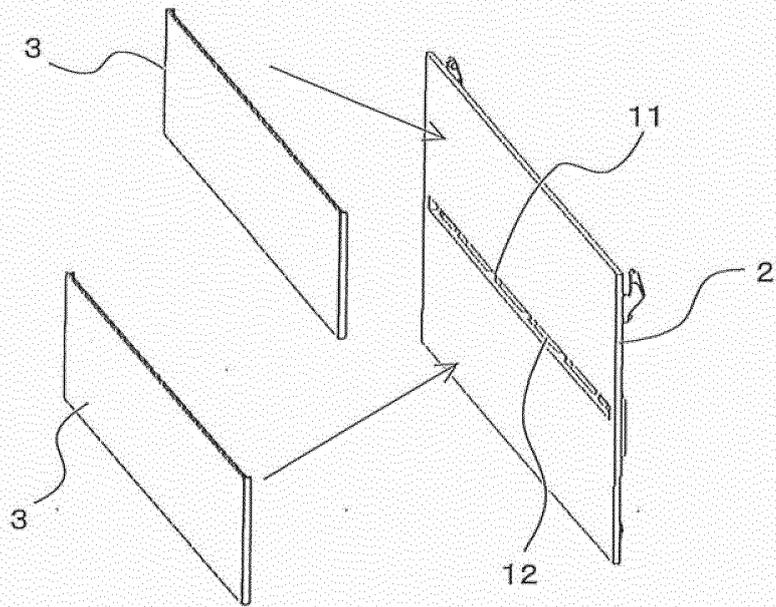


FIG. 4

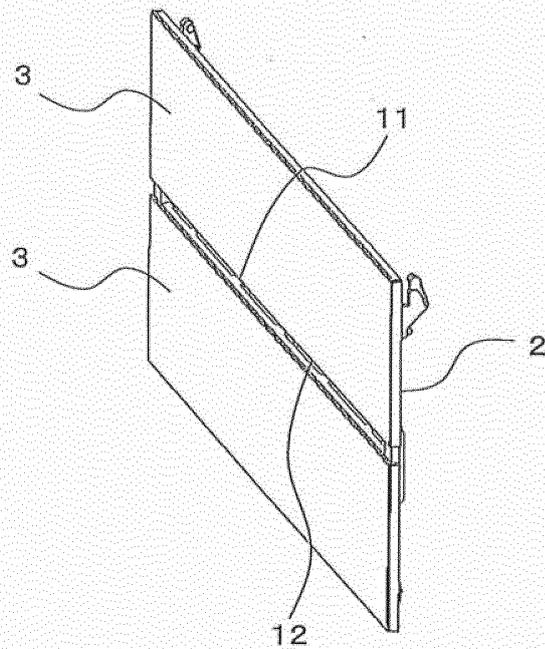




FIG. 7

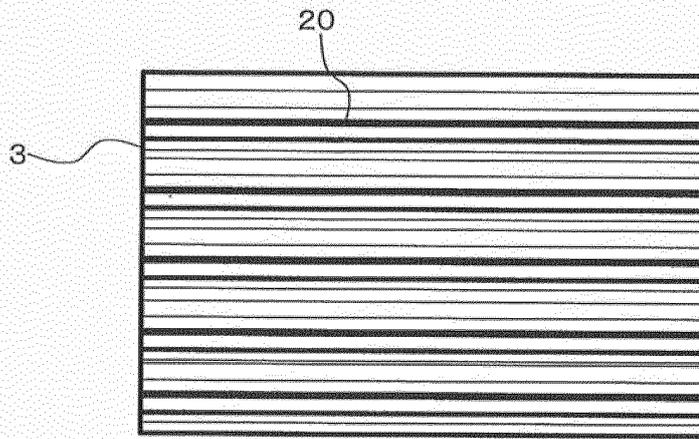
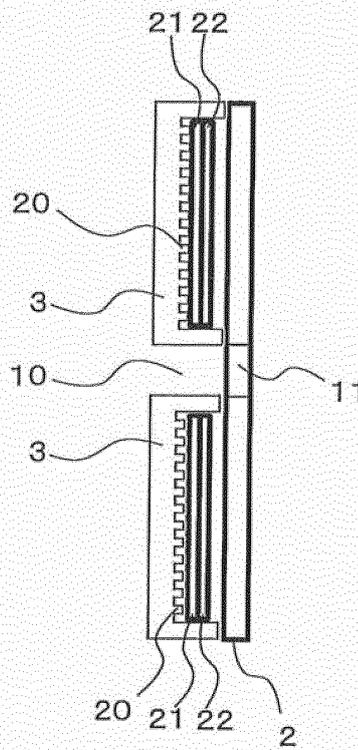


FIG. 8



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/073703

5	A. CLASSIFICATION OF SUBJECT MATTER F24F13/20(2006.01) 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) F24F13/20	
15	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 1996-2015 Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015	
	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)	
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
	Category*	Citation of document, with indication, where appropriate, of the relevant passages
25	Y	JP 2013-100939 A (Fujitsu General Ltd.), 23 May 2013 (23.05.2013), paragraphs [0014] to [0024]; fig. 1 to 5 (Family: none)
30	Y	JP 5264860 B2 (Mitsubishi Electric Corp.), 14 August 2013 (14.08.2013), paragraphs [0019], [0021] & CN 102455049 A
35	Y	JP 2006-234335 A (Daikin Industries, Ltd.), 07 September 2006 (07.09.2006), fig. 2 to 3 (Family: none)
40	<input 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:	"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
	"A" document defining the general state of the art which is not considered to be of particular relevance	"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
	"E" earlier application or patent but published on or after the international filing date	"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
	"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)	"&" document member of the same patent family
	"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	
50	Date of the actual completion of the international search 13 November 2015 (13.11.15)	Date of mailing of the international search report 24 November 2015 (24.11.15)
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.

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

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- JP 2004184051 A [0005]
- JP 5264860 B [0005]