(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 096 370 A1**

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

(43) Date of publication:
**02.09.2009 Bulletin 2009/36**

(21) Application number: **07831076.0**

(22) Date of filing: **01.11.2007**

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

(86) International application number:
**PCT/JP2007/071342**

(87) International publication number:
**WO 2008/062649 (29.05.2008 Gazette 2008/22)**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR**

(30) Priority: **22.11.2006 JP 2006315351**
**22.11.2006 JP 2006315352**
**22.11.2006 JP 2006315027**
**29.11.2006 JP 2006320999**

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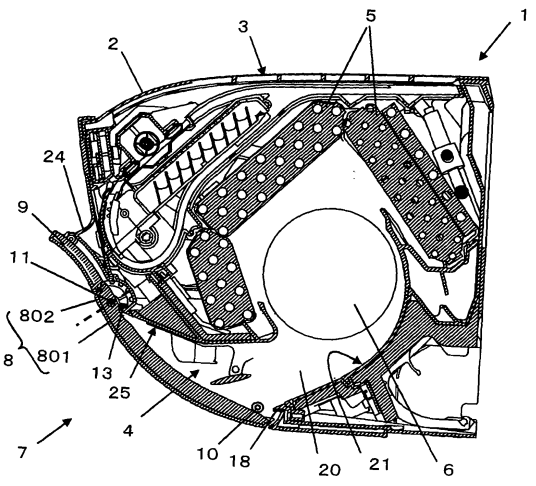
# (54) AIR CONDITIONING APPARATUS

(57) The present invention is to provide an air conditioning apparatus capable of efficiently blowing out conditioned air to a distance by preventing the short-circuits. Specifically, the air conditioning apparatus is configured such that a wind guide panel 7, which is configured by a cover panel body 8 covering a blow out port 4 and an extending panel body 9 extending the cover panel body 8, is provided rotatably in the vicinity of the lower end edge of the blow out port 4, and that a wind guide surface 22 of the cover panel body 8 is formed in a recessed curved surface so that when the wind guide panel 7 is rotated to take an attitude for opening the blow out port 4, the wind guide surface 22 is connected to a lower side wall surface 21 in a recessed curved surface which wall surface configures an air flow channel 20.

FIG. 1

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## Description

### Technical Field

**[0001]** The present invention relates to an air conditioning apparatus capable of efficiently blowing out conditioned air to a distance.

### Background Art

**[0002]** In the case where conditioned air is blown out from an indoor unit of an air conditioner, in order to uniform the distribution of room temperature, it is effective that the conditioned air is blown out forward from a casing in the horizontal direction in a cooling operation, and that the conditioned air is blown out downward in a heating operation. However, in the case where the conditioned air is blown out from a blow out port forward from the casing in the horizontal direction, when turbulence is caused in the air flow, there may be caused so-called short-circuits in which a part of the conditioned air is sucked from a suction port so as to thereby lower the heat exchange rate.

**[0003]** In order to solve the above described problem, there is described in patent document 1 an air conditioning apparatus configured such that a first panel and a second panel are rotatably attached to a lower end edge and an upper end edge of a blow out port, respectively, and that the direction of the two panels is controlled so that a blowout passage can be connected to the blow out port and narrowed to a predetermined range.

Patent document 1: Japanese Patent Laid-Open No. 2005-315536

### Disclosure of the Invention

### Problems to Solved by the Invention

**[0004]** However, in the above described air conditioning apparatus, the rotation control of the two panels, which is required to prevent the short-circuits, is complicated, and further, turbulence is caused in the flow of the conditioned air blown out from the blow out port because the blowout passage is narrowed to the predetermined range. The turbulence in the air flow makes it difficult to smoothly send the conditioned air to a distance.

**[0005]** Further, in order to send the conditioned air blown in the horizontal direction to a distance, it is effective to send out the air in such a manner that the air flow is adjusted by making the length of the louver for adjusting the direction of the air flow as long as possible. However, in the above described air conditioning apparatus, there is also a problem that the length of the first panel, to which the air blown out from the blow out port is directly blown, is almost equal to the length of the blow out port and is insufficient for sending the conditioned air to a distance. Further, it seems to be very difficult to send the conditioned air to a distance, because the shape of the lower wall surface from the fan to the blow out port is not continuous with the shape of the first panel so as to thereby cause a pressure loss and a turbulent flow.

**[0006]** The present invention has been made in order to solve the above described problem. An object of the present invention is to provide an air conditioning apparatus capable of efficiently blowing out conditioned air to a distance by suppressing the short-circuits.

### Means for Solving the Problems

**[0007]** In order to solve the above described problem, an air conditioning apparatus according to the present invention is characterized by comprising: a casing which includes a suction port on the upper surface thereof and a blow out port in a front lower section thereof, and in which an air flow channel from the suction port to the blow out port is formed; a fan for blowing air; and a wind guide panel which covers the blow out port and is extended upward from the blow out port, wherein the wind guide panel is provided to freely open and close the blow out port by being rotated around the axis line of a lower shaft which is set in the vicinity of the lower end edge of the blow out port in parallel with the left and right direction of the casing, and wherein a wind guide surface formed in a recessed curved surface is formed on the inside surface of the wind guide panel so that when the wind guide panel is rotated to take an attitude for opening the blow out port, the wind guide surface is connected to a lower side wall surface in a recessed curved surface, which wall surface configures an air flow channel from the fan to the blow out port.

**[0008]** According to the above described configuration, when the wind guide panel is rotated to take the attitude for opening the blow out port in order to make conditioned air blown out from the blow out port, the wind guide surface of the cover section is formed in the recess curved surface so as to be connected to the lower side wall surface. Thus, without disturbing the flow of the conditioned air blown out along the air flow channel formed slightly downward toward the blow out port, the direction of the conditioned air can be smoothly guided slightly upward forward from the casing. Thereby, the conditioned air can be efficiently blown out to a distance by suppressing the short-circuits. Here, the wind guide surface means the surface of the wind guide panel on the side which is brought into contact with the air blown out from the blow out port, that is, means the rear side surface of the wind guide panel at the time when the wind guide panel takes the covering attitude for closing the blow out port.

**[0009]** The wind guide panel is configured by a cover panel body which covers the blow out port, and an extending panel body which is a separate member from the cover panel body and which extends the cover panel body. The wind guide panel can also be configured such that the cover panel body and the extending panel body are integrally freely rotated around the axis line of the

lower shaft.

**[0010]** According to the above described configuration, the wind guide panel is formed to have a length equal to the total length of the cover panel body and the extending panel body, that is, to have a length longer than the length between the lower end edge and the upper end edge of the blow out port. Thereby, it is possible to efficiently deliver the conditioned air to a distance. Further, since the cover panel body is formed as a separate member from the extending panel body, it is possible to change the blow out direction of the air from the blow out port by operating the respective members separately from each other.

**[0011]** Specifically, the cover panel body can be provided to freely open and close the blow out port in such a manner that the cover panel body is rotated around the axis line of an upper shaft set at the upper end section of the cover panel body in parallel with the right and left direction of the casing. In the above described configuration, it is possible to make the air from the blow out port blown out downward of the casing by rotating the cover panel body around the axis line of the upper shaft in the state where the casing is left covered by the extending panel body.

**[0012]** Thereby, it is possible to make the conditioned air efficiently blown out according to an operation mode. Here, the lower shaft and the upper shaft are separately set to the lower end section of the wind guide panel and the upper end section of the cover panel body, respectively. Each of the lower shaft and the upper shaft is set in parallel with the left and right direction of the casing.

**[0013]** Further, an upper side wall surface, which configures an air flow channel from the fan to the blow out port, is formed so that the upper side wall surface is connected to the recessed curved wind guide surface of the cover panel body at the time when the cover panel body is rotated to take the attitude for opening the blow out port. Thereby, even when the conditioned air is blown out downward from the blow out port, it is possible to smoothly send the conditioned air without the air flow being disturbed.

**[0014]** Specifically, the upper side wall surface may be formed so as to be inclined upward from the inside of the air flow channel toward the blow out port. According to the above described configuration, it is possible to form a surface in which the upper side wall surface is connected to the recessed curved wind guide surface of the cover panel body, and thereby it is possible to smoothly send the conditioned air.

**[0015]** Further, it is possible that the wind guide surface of the cover panel body is formed in the recessed curved surface, and that the wind guide surface of the extending panel body is formed in a convex curved surface reversely to the cover panel body. Thereby, the direction of the conditioned air to be blown out slightly upward forward from the casing can be corrected as a whole by the cover section so as to be closer to the front of the casing. Thereby, it is possible to effectively suppress the short-circuits of the conditioned air.

**[0016]** That is, unlike a general louver installed in the air flow so that the both surfaces of the louver are brought into contact with the flow of the air, the present invention is characterized, in the wind guide panel which is brought into contact with the flow of the air only on the wind guide surface of one side of the wind guide panel, in that the direction of the flow of the air is changed in such a manner that the wind guide surface is curved so as to intervene in the flow of the air, and also in that the wind guide surface is curved in the direction to be away from the flow of the air so as to thereby guide the flow of the air to the direction.

**[0017]** The reason why the above is made possible is that the wind guide surface forms a gentle and smooth curved surface having the recessed surface continuous with the convex surface, and that the cross section in the lengthwise direction of the wind guide surface is formed in an S-shape. Thereby, the air is made to flow along the wind guide surface without the air flow being disturbed.

**[0018]** In the present invention, the casing is preferably formed in a shape in which when the cover panel body and the extending panel body of the wind guide panel are integrated to each other so as to take the attitude for covering the blow out port, a gap is prevented from being formed between the extending panel body and the casing. Thereby, it is possible to prevent dust from being deposited between the extending panel body and the casing, and possible to avoid the case where the dust is blown out at the time of operation start of the air conditioning apparatus.

**[0019]** In order to prevent the dust from being deposited between the extending panel body and the casing, it is also possible to form in the casing a projecting section which is configured, when the cover panel body and the extending panel body of the wind guide panel are integrated to take the attitude for closing the blow out port, to close the gap between the extending panel body and the casing.

**[0020]** Further, if there is a gap between the cover panel body and the casing at the time when the cover panel body is rotated around the upper shaft to take the attitude for opening the blow out port, cool air is leaked from the gap to the surface side of the cover panel body, so as to cool the surfaces of the panel body and the casing. When unconditioned moisture-containing air is brought into contact with such cooled portion, there arises a problem that dew condensation occurs there so as to cause the soiling and the breeding of bacteria.

**[0021]** Thus, the present invention is configured so as to provide sealing means which closes the gap between the cover panel body and the casing at the time when the cover panel body takes the attitude for opening the blow out port.

**[0022]** According to the above described configuration, it is possible to effectively prevent the conditioned air from leaking from the gap between the cover panel body and the casing by closing the gap with the sealing

means. Thereby, the air can be efficiently blown in a desired direction without causing dew condensation. In this configuration, the cover panel body is capable of closing and opening the blow out port in the state where the extending panel body covers the casing.

**[0023]** The sealing means can be configured, for example, such that a sealing material for closing the gap between the cover panel body and the casing is arranged in the gap so that the gap is always closed. Further, another form of the sealing means can also be configured such that, as described above, the cover panel body includes a main body section which closes the blow out port and a sealing section which extends the main body section, that the sealing section is provided so as to be positioned on the side opposite to the main body section across the upper shaft, that a contact section is provided in the casing, which contact section closes a gap between the sealing section and the casing by being in contact with the sealing section at the time when the cover panel body takes the attitude for opening the blow out port, and that the sealing means is configured by the sealing section and the contact section. Thereby, it is possible to reduce friction as much as possible during the rotation of the cover panel body.

**[0024]** The contact section may be formed so as to intervene in the rotation track of the sealing section. For example, a projecting contact section can be formed at the upper end edge or the lower end edge of the blow out port. As another form of the contact section, it is also possible to configure such that a groove section which does not hinder the rotation of the sealing section is provided above the blow out port of the casing in the left and right direction of the casing, and that the lower wall section of the groove section is set to be brought into contact with the sealing section by intervening in the rotation track of the sealing section, so as to function as the contact section.

**[0025]** It is preferred that the upper shaft is provided at a position above the blow out port. In the above described configuration, a portion in the contact section, which portion is brought into direct contact with the sealing section, can be formed on the surface opposite to the blow out port. This prevents the wind pressure of the conditioned air blown out from the blow out port from being directly applied to the contact portion between the sealing section and the contact section, so that the leakage of the conditioned air can be more surely suppressed.

**[0026]** Further, even when the cover panel body is deflected, it is possible to surely seal the gap between the sealing section and the contact section in such a manner that a sealing material is provided at a portion on at least one of the sealing section and the contact section, at which portion, when the cover panel body is rotated around the upper shaft to take the downward attitude, the sealing section and the contact section are brought into contact with each other. Therefore, it is possible to effectively prevent the conditioned air from leaking from the gap, so that the air can be efficiently blown out in a desired direction without causing dew condensation in a cooling operation.

**[0027]** Further, in the configuration in which the wind guide panel covering the blow out port and extending upward from the blow out port is made rotatable around the lower shaft in the vicinity of the lower end edge of the blow out port, it is possible to arrange a sealing material on at least one of the wind guide panel and the casing, which material seals a gap between the wind guide panel and the casing at the time when the wind guide panel is rotated around the lower shaft to take the attitude for opening the blow out port. This makes it possible to efficiently deliver the conditioned air along the wind guide panel to a distance, without the conditioned air leaking from the gap between the wind guide panel and the casing.

**[0028]** Further, in the case where the wind guide panel is configured by the cover panel body covering the blow out port and the extending panel body extending the cover panel body, it is possible to arrange a sealing material for sealing a gap between the cover panel body and the extending panel body on at least one of the cover panel body and the extending panel body. Thereby, when the conditioned air is blown out forward from the blow out port by integrally rotating the wind guide panel, it is possible to deliver the conditioned air along the wind guide panel to a further distance without the conditioned air leaking from the gap between the sealing section of the cover panel body and the extending panel section.

**[0029]** Further, as in the case of the wind guide panel according to the present invention, in the case where the cover panel body having a size to open and close the blow out port is used, when the cover panel body is formed by die molding, warpage and deflection may be easily generated, so as to deteriorate the appearance of the air conditioning apparatus. In the present invention, the wind guide panel is formed in a plate shape, and the wind guide surface is formed by one surface of the wind guide panel, so that a reinforcing material can be provided on the side of the wind guide surface.

**[0030]** According to the above described configuration, it is possible to suppress the warpage and deflection of the wind guide panel by the reinforcing material, and possible to maintain excellent design properties of the air conditioning apparatus without the reinforcing material being exposed on the surface of the wind guide panel. Here, the wind guide surface means a surface of the wind guide panel on the side which is brought into contact with the air blown out from the blow out port, that is, means the rear surface side of the wind guide panel at the time when the wind guide panel takes the attitude for closing the blow out port.

**[0031]** The wind guide panel can be configured such that a foamed layer is laminated on the rear surface of a plate-shaped exterior material, and that the reinforcing material is embedded in the foamed layer. According to the above describe configuration, the foamed layer is

laminated on the exterior material and the reinforcing material is embedded in the foamed layer. Thus, dew condensation is prevented from being caused on the surface side of the wind guide panel, that is, on the surface of the exterior material. Therefore, it is possible to obtain an air conditioning apparatus capable of achieving compatibility between a design aspect and a function aspect.

**[0032]** That is, since the foamed layer having heat insulation property is formed, even when the cool air is blown out from the blow out port, the exterior member is not subjected to be cooled. Thereby, it is possible to effectively prevent the dew condensation.

**[0033]** Further, when the foamed layer is laminated on the exterior material, one surface side can be formed in a shape different from that of the other surface side. Therefore, even in the case where the frame material forming the one surface side of the panel is formed with priority on design, the foamed layer laminated on the inner surface side can be formed so as to be curved in a target wind guide shape. Thereby, it is possible to freely set the wind guide direction.

**[0034]** In the case where the foamed layer is laminated on the exterior material, the wind guide panel having the foamed layer laminated on the exterior material can be obtained in such a manner that a foaming raw material is injected into a metallic mold with the exterior material set therein and is then foamed and formed. However, when the different materials, such as the exterior material and the foamed layer, are laminated, warpage and deflection are liable to be generated. In particular, in the wind guide panel, when the width direction length is increased as compared with the length direction length, the warpage and deflection at the width direction central section are liable to be increased.

**[0035]** Therefore, when the foamed layer is laminated and formed on the exterior material, in the state where the reinforcing material having rigidity is set in the metallic mold together with the exterior material, the foamed material is injected into the metallic mold so as to be foamed and formed. Thereby, it is possible to obtain the wind guide panel having the reinforcing material embedded in the foamed layer. Thus, it is possible to suppress the warpage and deflection of the wind guide panel and possible to maintain the beauty of appearance of the wind guide panel.

**[0036]** Further, in the configuration in which the wind guide panel includes the cover panel body covering the blow out port and the extending panel body extending the cover panel body, in which the cover panel body and the extending panel body are configured to be integrally freely rotated around the lower shaft, and in which the cover panel body is provided to freely open and close the blow out port by being rotated around the upper shaft set at the upper end section of the cover panel body in parallel with the left and right direction of the casing, the reinforcing material can also be embedded in the end section of the cover panel body, which end section faces the extending panel body.

**[0037]** According to the above describe configuration, even when the warpage and deflection are caused in the extending panel body and the cover panel body due to the opening and closing operations, variation with time, and the like, of the wind guide panel, the original state can be maintained as much as possible by the reinforcing material. This is preferred from the viewpoint of beauty and also makes it possible to prevent the conditioned air from leaking from the gap between the extending panel body and the cover panel body. Further, this also makes it possible to prevent dew condensation and deterioration in air blowing efficiency.

**[0038]** Further, when the air is blown out downward from the blow out port in such a manner that only the cover panel body is rotated around the upper shaft to face downward while the extending panel body is left in the covering attitude for covering the blow out port, it is possible to maintain the beauty of appearance of the wind guide panel by reinforcing the end section of the cover panel body with the reinforcing material.

**[0039]** That is, it is necessary to provide the gap between the extending panel body and the cover panel body in order to rotate the cover panel body. However, when the warpage and deflection of the cover panel body on the rotating side is increased, the size of the gap needs to be set large. The large gap between the extending panel body and the cover panel body significantly spoils the beauty of appearance of the wind guide panel.

**[0040]** Thus, according to the present invention, as described above, it is possible to reduce the gap between the extending panel body and the cover panel body in such a manner that the warpage, deflection, and the like, in the end section of the cover panel body, which end section faces the extending panel body, are suppressed by reinforcing the end section with the reinforcing material. Thereby, it is possible to enhance the visual sense of unity as the wind guide panel, and possible to obtain an air conditioning apparatus having an excellent appearance design properties.

**[0041]** Further, it possible to suppress warpage and deflection of the extending panel body by embedding a reinforcing material also in the end section of the extending panel body, which end section faces the cover panel body. Thereby, it is possible to further reduce the gap between the extending panel body and the cover panel body.

**[0042]** In the cover panel body, the gap between the cover panel body and the extending panel body needs to be set larger, as the position of the upper shaft is closer to the upper end of the cover panel body. However, it is possible to effectively reduce the gap between the cover panel body and the extending panel body by applying the present invention.

**[0043]** The reason of the above will be described in detail as follows. Figure 14 to Figure 16 are diagrammatic views in the case where the end sections of both the cover panel body and the extending panel body, at which end sections the panel bodies face each other, are seen

from the side of the panel bodies. As shown in Figure 14, in the case where the cover panel body 8 is not deflected and where the cover panel body 8 and the extending panel body 9 have substantially the same thickness, the size of the gap between the cover panel body 8 and the extending panel body 9 needs to be set to X1 in order to make the cover panel body 8 rotatable around the axis line 11a of the upper shaft formed at the end section of the cover panel body 8.

**[0044]** Next, in the case where the deflection D is generated in the cover panel body 8, in order to make the cover panel body 8 including the portion of deflection D rotatable around the axis line 11a of the upper shaft as shown in Figure 15, the size of the gap between the cover panel body 8 and the extending panel body 9 needs to be increased to X2 in consideration of the portion of deflection D.

**[0045]** However, even in the case where the deflection D is generated in the cover panel body 8 as shown in Fig. 16, when the distance from the end edge of the cover panel body 8 to the axis line 11a is increased from Y1 to Y2, the size of the gap between the cover panel body 8 and the extending panel body 9 can be reduced to X3 (X3 < X2). That is, as the axis line 11a approaches the end edge of the cover panel body, the gap between the cover panel body 8 and the extending panel body 9 needs to be increased.

**[0046]** As the reinforcing material, there may be used any material having higher rigidity than the exterior plate and the foamed layer which configure the wind guide panel, but it is preferred to use a metallic material. Further, as the reinforcing material, it is possible to use a shaft, an L-shaped angle, a U-shaped angle, and the like. In the case where the shaft is used as the reinforcing material of the cover panel body, when the shaft is used as the rotary shaft, it is not necessary to separately provide a rotary shaft. The configuration has an advantage that the structure of the cover panel body can be simplified.

## Effect of the Invention

**[0047]** As described above, according to the present invention, the wind guide panel which covers the blow out port and which is extended upward from the blow out port, is provided so as to freely open and close the blow out port by being rotated around the axis line of the lower shaft set in the vicinity of the lower end edge of the blow out port in parallel with the left and right direction of the casing. Further, the wind guide surface formed in the recessed curved surface is formed on the inside surface of the wind guide panel so that when the wind guide panel is rotated to take the attitude for opening the blow out port, the wind guide surface is connected to the lower side wall surface in the recessed curved surface, which wall surface configures the air flow channel from the fan to the blow out port. Thereby, it is possible to prevent the short-circuits and possible to efficiently blow out the conditioned air to a distance.

## Brief Description of the Drawings

**[0048]**

Figure 1 is a sectional view of an indoor unit of an air conditioning apparatus showing an embodiment according to the present invention;
Figure 2 is a perspective view showing an appearance of the indoor unit in Figure 1;
Figure 3 is a sectional view showing a state where a cover panel body of the indoor unit in Figure 1 is rotated;
Figure 4 is a perspective view showing an appearance of the indoor unit in Figure 3;
Figure 5 is a sectional view showing a state where a wind guide panel of the indoor unit in Figure 1 is rotated;
Figure 6 is a perspective view showing an appearance of the indoor unit in Figure 5;
Figure 7 is a sectional view showing the cover panel body;
Figure 8 is a sectional view showing a wind guide section;
Figure 9 is an exploded perspective view of an extending panel;
Figure 10 is a partial sectional view showing a form different from that in Figure 8;
Figure 11 is a partial sectional view showing a form different from that in Figure 10;
Figure 12 is a view showing a manufacturing process of the wind guide section;
Figure 13 is a view showing a manufacturing process of the cover panel body;
Figure 14 is a diagrammatic view showing a portion near the boundary between the cover panel body and the extending panel body;
Figure 15 is a diagrammatic view showing a second form of Figure 14; and
Figure 16 is a diagrammatic view showing a third form of Figure 14.

## Description of Symbols

**[0049]**

| | |
|---|---|
| 1 | Indoor unit |
| 2 | Casing |
| 3 | Suction port |
| 4 | Blow out port |
| 5 | Heat exchanger |
| 6 | Indoor fan |
| 7 | Wind guide panel |
| 8 | Cover panel body |
| 8a | Recessed section |
| 9 | Extending panel body |
| 9a | Ventilating section |

| | |
|---|---|
| 9b | Panel leg section |
| 10 | Lower shaft |
| 11 | Upper shaft |
| 13 | Contact section |
| 14 | Sealing material |
| 15 | Fan-shaped gear |
| 16 | Arm |
| 16a | Rack section |
| 17, 18 | Sealing material |
| 19 | Groove section |
| 20 | Air flow channel |
| 21 | Lower side wall surface |
| 22, 23 | Wind guide surface |
| 24 | Projecting section |
| 25 | Upper side wall surface |
| 801 | Main body section |
| 802 | Sealing section |
| 811 | Exterior material |
| 812 | Foamed layer |
| 813 | Decorative sheet |
| 911 | Exterior material |
| 912 | Foamed layer |
| 913 | Decorative sheet |
| 914 | Wall section |
| 915 | Locking claw |
| 916 | Locking hole |
| 917 | Locking section |
| A | Casing left and right direction |
| B | Air flow |

Best Mode for Carrying Out the Invention

**[0050]** In the following, a first embodiment according to the present invention will be described with reference to the accompanying drawings. Figure 1 is a sectional view showing an indoor unit of a separate type air conditioning apparatus according to the present embodiment, and Figure 2 is a perspective view of the indoor unit.

**[0051]** As shown in Figure 1 and Figure 2, in an indoor unit 1 according to the present embodiment, a suction port 3 of air is formed in the upper surface of a casing 2, and a blow out port 4 of air is formed in the front lower section of the casing 2. Further, a heat exchanger 5 is arranged in an inner air flow channel 20 extending from the suction port 3 to the blow out port 4 in the casing 2. An indoor fan 6 configured by a cross flow fan is incorporated on the side of the blow out port 4 so as to be surrounded by the heat exchanger 5.

**[0052]** A wind direction changing apparatus 36 configured by a vertical louver 36a and a lateral louver 36b is provided in the blow out port 4 (see Figure 3), so as to be able to change the direction of the wind blown out from the blow out port 4. The wind direction changing apparatus 36 has a known configuration. In the present invention, a wind guide panel 7 is provided on the front surface of the casing 2 separately from the wind direction changing apparatus 36.

**[0053]** The wind guide panel 7 is formed from the front lower section to the front of the casing 2 so as to cover the blow out port 4 and a portion thereabove. That is, the wind guide panel 7 is formed larger than the blow out port 4 and is formed to have a size to cover almost the whole area of the front surface of the casing 2. Further, the wind guide panel 7 is configured by a cover panel body 8 which covers the blow out port 4, and an extending panel body 9 which extends the cover panel body 8 to the distal end side of the wind guide panel.

**[0054]** Therefore, as will be described below, when the wind guide panel 7 is rotated to take an attitude for forward blowing out conditioned air, a wind guide surface having a sufficient length can be secured, and the conditioned air can be efficiently delivered to a distance. The extending panel body 9 is configured by a wind guide section 9c which forms a wind guide surface, and leg sections 9b which respectively extend from the lower end of left and right side sections of the wind guide section 9c, so that a ventilating section 9a is formed in the space between the left and right leg sections 9b (see Figure 3 and Figure 4).

**[0055]** The cover panel body 8 is configured to have almost the same length as that of the blow out port 4 and configured to have almost the same width as that of the extending panel body 9. Further, a wind guide surface 23 of the extending panel body 9 exhibits a function to extend a wind guide surface 22 of the cover panel body 8 (see Figure 5).

**[0056]** The ventilating section 9a for passing the air blown out from the blow out port 4 is formed in the lower portion of the extending panel body 9. The ventilating section 9a is configured to have almost the same size as that of the blow out port 4. In the present embodiment, a cut-off portion is formed at the lower end of the extending panel body 9 so as to be used as the ventilating section 9a. However, other than the configuration, it is also possible that an opening is formed in the extending panel body 9 so as to be used as the ventilating section 9a.

**[0057]** The extending panel body 9 is arranged on the front surface side of the blow out port 4, and further, the cover panel body 8 is arranged on the front surface side of the extending panel body 9. The cover panel body 8 is configured so as to cover not only the ventilating section 9a of the extending panel body 9 but also the leg sections 9b on both sides of the ventilating section 9a. That is, recessed sections 8a are formed on both left and right end sections on the rear surface of the cover panel body 8 so that when the cover panel body 8 is superposed on the extending panel body 9 by setting the panel leg sections 9b to the recessed sections 8a, the recessed sections 8a in the set state are leveled with the other portion of the rear surface of the cover panel body 8.

**[0058]** The cover panel body 8 is attached so as to be rotatable with respect to the extending panel body 9 around an axis line 11a of an upper shaft 11 provided at the upper end section of the cover panel body 8. That is, the upper shaft 11 is formed in the recessed section 8a formed at each of both the left and right end sections of

the cover panel body 8 in parallel with the left and right direction of the casing 2, and a bearing section (not shown) is formed at each of the panel leg sections 9b. The bearing section journals the upper shaft 11 at a position above the upper end of the blow out port 4.
Note that the upper shaft 11 may be formed on the each side of the panel leg sections 9b and the bearing section may be formed on the each side of the left and right recessed sections 8a of the cover panel body.

**[0059]** The cover panel body 8 includes a main body section 801 which closes the ventilating section 9a, and a sealing section 802 which extends the main body section 801. The main body section 801 and the sealing section 802 are formed so as to face each other across the upper shaft 11a.

**[0060]** Further, the air flow channel 20 is formed from the indoor fan 6 to the blow out port 4. A lower side wall surface 21 forming the lower side of the air flow channel 20 is formed in a curved shape which is recessed downward while being inclined downward from the indoor fan 6. On the other hand, an upper side wall surface 25 of the air flow channel 20 is formed in a shape in which an approximately horizontal section is formed from a stabilizer section and is then further expanded upward to the blow out port 4. The air flow channel 20 forms, together with the lower side wall surface 21, a spirally spread shape, that is, forms a shape which allows the conditioned air from the indoor fan 6 to be efficiently blown out without causing the pressure loss.

**[0061]** Figure 3 is a sectional view showing a state where the cover panel body 8 is rotated around the axis line 11a of the upper shaft to open the ventilating section 9a so that the conditioned air is blown downward. Figure 4 is a perspective view showing the state. In the casing 2, a groove section 19 is formed above the blow out port 4 in the left and right direction A of the casing. This enables a configuration in which when the cover panel body 8 is rotated around the axis line 11a to open the ventilating section 9a, the sealing section 802 is not prevented from being rotated in the direction to approach the casing 2.

**[0062]** Further, the lower wall section of the groove section 19 is set to intervene in the rotation track of the sealing section 802 so as to be brought into contact with the sealing section 802. Thus, the lower wall section of the groove section 19 is utilized as a contact section 13. In the present embodiment, the groove section 19 is formed in the casing 2 and the lower wall section of the groove section 19 is used as the contact section 13. However, it is also possible to form a projecting contact section at the blow out port 4 without providing the groove section.

**[0063]** The axis line 11a of the upper shaft of the cover panel body 8 and the sealing section 802 is set at a position above the upper end of the blow out port 4 of the casing 2. Thereby, the surface of the contact section 13, which surface is brought into contact with the sealing section 802, can be formed on the surface opposite to the blow out port 4. A sealing material 14 is provided at a portion in the contact section 13 which portion is brought into contact with the sealing section 802. This enables a configuration in which when the sealing section 802 is brought into contact with the contact section 13, the gap between the sealing section 802 and the contact section 13 is completely closed.

**[0064]** A fan-shaped gear 15 centered on the upper shaft 11 is provided for the cover panel body 8. In the state where the extending panel body 9 is brought into contact with the casing, the fan-shaped gear 15 is meshed with a drive gear (not shown) installed in the casing so that the cover panel body 8 is rotated.

**[0065]** When the cover panel body 8 is rotated so as to open the ventilating section 9a, an upper side section 12 from the upper shaft 11 of the cover panel body 8 in the sealing section 802 is rotated so as to approach the casing 2. Therefore, the upper section of the panel leg section 9b is configured to have a curved shape so as not to interfere with the rotation track of the upper side section 12 of the cover panel body in the sealing section 802.

**[0066]** The extending panel body 9 is configured to be rotatable with respect to the casing 2 around an axis line 10a of a lower shaft 10 formed in the lower end section of the panel leg section 9b. The axis line 10a of the lower shaft and the axis line 11a of the upper shaft are arranged so that the direction of each of the axis lines is in parallel with the left and right direction A of the casing.

**[0067]** In the above described configuration, the cover panel body 8 forms a smooth S-shaped curve by being connected to the upper side wall surface 25 of the blow out port 4. Thus, it is possible to efficiently deliver the conditioned air downward almost without causing pressure loss.

**[0068]** Next, there will be described a case where the air from the blow out port 4 is blown out forward from the casing 2. Figure 5 is a sectional view showing a state where the cover panel body 8 and the extending panel body 9 are integrally rotated as the wind guide panel 7 around the axis line 10a of the lower shaft to open the blow out port 4, so as to make conditioned air blown out slightly upward. Figure 6 is a perspective view of the state.

**[0069]** As shown in Figure 5, arms 16 are attached at two left and right positions of the extending panel body 9 configuring the wind guide panel 7, and a rack section 16a which is circularly curved around the lower shaft 10 as a center is formed in the arm 16.

**[0070]** The rack section 16a is meshed with a pinion (not shown) installed in the casing 2, and the wind guide panel 7 is rotated around the axis line 10a of the lower shaft by the drive of the pinion. It is configured such that when the wind guide panel 7 opens the blow out port 4, the cover panel body 8 is rotated around the axis line 10a of the lower shaft integrally with the extending panel body 9 while maintaining the attitude for closing the ventilating section 9a.

**[0071]** In the extending panel body 9, there is arranged

a sealing material 17 for sealing the gap between the sealing section 802 and the extending panel body 9. Further, in the casing 2, there is arranged a sealing material 18 for sealing a gap between the wind guide panel 7 and the casing 2.

**[0072]** Thereby, when the wind guide panel 7 is integrally rotated to make the conditioned air forwardly blown out forward from the blow out port 4, it is possible to deliver the conditioned air along the wind guide panel 7 to a further distance without the conditioned air leaking from the gap between the wind guide panel 7 and the casing 2 and from the gap between the sealing section 802 and the extending panel body 9. Note that as a material of the above described sealing materials 14, 17 and 18, it is preferred to use a material having elasticity. For example, natural rubber, synthetic rubber, synthetic resin, or a foaming body made of these materials can be suitably used.

**[0073]** The rear surfaces of the cover panel body 8 and the extending panel body 9 which configure the wind guide panel 7 are respectively used as the wind guide surfaces 22 and 23 for changing the direction of the flow of the air blown out from the blow out port 4. Specifically, when the wind guide panel 7 is rotated around the axis line 10a of the lower shaft 10 so as to face forward, the proximal end section of the wind guide panel 7 is connected to the lower end edge of the blow out port 4.

**[0074]** The wind guide surface 22 of the cover panel body 8 is formed in a recessed curved surface in order to guide the flow of the air, which is blown out forward and slightly downward from the blow out port 4, to the forward and slightly upward direction of the casing 2. Thereby, a continuous smooth curved surface is formed by the lower side wall surface 21 formed in the recessed curved surface, and the wind guide surface 22.

**[0075]** The wind guide surface 23 of the extending panel body 9 is formed in a convex curved surface in order to generally guide the flow of the air, which is to be blown forward and slightly upward along the wind guide surface 22 of the cover panel body 8, to the direction nearer to the front side. Thereby, the shape of the wind guide surfaces 22 and 23, as the wind guide panel as a whole, is formed so that the cross section in the length direction is in an S-shape having the recessed surface connected to the convex surface. Thereby, the air is made to flow along the wind guide surfaces without causing turbulence.

**[0076]** In this way, the air flow B blown out from the indoor unit of the air conditioning apparatus can be efficiently delivered forward from the casing 2 to a distance as shown in Figure 5. Thereby, it is possible to effectively suppress the short-circuits.

**[0077]** A projecting section 24 is formed on the front surface of the casing 2 in the width direction A of the casing. The projecting section 24 is configured to close the gap between the extending panel body 9 and the casing 2 as shown in Figure 1 at the time when the wind guide panel 7 takes the attitude for closing the blow out port 4. Thereby, it is possible to prevent dust from being deposited in the gap between the extending panel body 9 and the casing 2, and possible to avoid the case where the dust is blown out at the time of the operation start of the air conditioning apparatus.

**[0078]** In this way, in any of the cases where the air is blown out in the downward direction of the air conditioning apparatus, and where the air is blown out in the forward and slightly upward direction of the air conditioning apparatus, it is possible to realize smooth and efficient blowing of the conditioned air without causing the pressure loss and turbulence.

**[0079]** There will be described in detail a configuration of the cover panel body 8 and the extending panel body 9. Figure 7 is a sectional view of the cover panel body 8. Figure 8 is a sectional view of the wind guide section, and Figure 9 is an exploded perspective view of the extending panel body.

**[0080]** As shown in Figure 7, the cover panel body 8 is formed in such a manner that a polyurethane foam as a foamed layer 812 is laminated on an exterior material 811, and that the surface of the foamed layer 812 is curved in a wind guide shape. The surface of the foamed layer 812 is protected by a decorative sheet 813.

**[0081]** The wind guide shape of the foamed layer 812 of the cover panel body 8 is formed so as to be warped in the direction opposite to the wind guide section 9c which is warped to the outside. That is, the wind guide shape of the foamed layer 812 is formed in a circular arc shape so that a recessed surface is formed on the inside. That is, the cross sectional shape of the wind guide section 9c and the cover panel body 8 is formed in a substantially S-shape.

**[0082]** The exterior material 811 is made of synthetic resin and is formed in a curved plate shape. Note that in practice, the exterior material 811 is formed to have a U-shaped cross section on the periphery of which side walls are formed. A foaming raw material is injected into the exterior material 811, so that the foamed layer 812 is formed by foam molding.

**[0083]** A metal shaft is embedded as the upper shaft 11 in the foamed layer 812 at the end section of the cover panel body 8, which end section faces the extending panel body 9, that is, at the upper end section of the cover panel body 8. Thereby, it is possible to suppress the warpage and deflection of the cover panel body 8. The upper shaft 11 is formed so as to be exposed to the outside at the left and right end sections of the cover panel body 8, and each of the exposed portions of the upper shaft 11 is journaled by the bearing section formed at the upper end section of the leg section 9b.

**[0084]** As shown in Figure 8, the wind guide section 9c is formed in such a manner that a polyurethane foam is laminated as a foamed layer 912 on an exterior material 911 in a recessed shape which forms one surface side of the panel, and that the surface of the foamed layer 912 is curved in a wind guide shape. The surface of the foamed layer 912 is protected by a decorative sheet 913.

The wind guide shape of the foamed layer 912 of the wind guide section 9c is formed in a circular arc shape so as to be warped to the outside.

**[0085]** With this configuration, as will be described below, in the case where the wind guide panel 7 is rotated around the axis line 10a of the lower shaft formed at the lower end section of each of both the panel end sections 9b so as to open the blow out port 4 as shown in Figure 5, the air blown out from the blow out port 4 can be guided to the indoor direction, so that it is possible to prevent the short-circuits caused by the air directed upward from the casing 2.

**[0086]** The exterior material 911 is made of synthetic resin and is formed in a curved plate shape. Note that in practice, the exterior material 911 is formed to have a U-shaped cross section on the periphery of which side walls are formed. A foaming raw material is injected into the exterior material 911, so that the foamed layer 912 is formed by foam molding.

**[0087]** A metal square material is embedded as a reinforcing material 26 in the foamed layer 912 at the end section of the extending panel body 9, which end section faces the cover panel body 8, that is, at the lower end section of the extending panel body 9. Further, at the end section of the extending panel body 9, which end section faces the cover panel body 8, a plurality of wall sections 914 for holding the reinforcing material 26 are formed in the exterior material 911 in parallel with the side wall of the exterior material 911.

**[0088]** The wall section 914 for holding the reinforcing material is to prevent the position of the reinforcing material 26 from being shifted at the time when the foaming raw material is injected so as to be foamed and formed. The reinforcing material 26 is eventually fixed by the foamed layer 912, so as to be integrated with the panel. Thereby, it is possible to suppress the warpage and deflection of the extending panel body 9.

**[0089]** In the present embodiment, the above described wall section 914 is mainly used for preventing the positional shift of the reinforcing material, but the present invention is not limited to this. Locking means for locking the reinforcing material 26 may also be used. In this case, regardless of the foamed layer 912, the reinforcing material 26 can be fixed, so that the warpage and deflection of the extending panel body 9 can be suppressed.

**[0090]** As specific locking means, for example, a locking claw 915 may be formed at the distal end and the side wall of the wall section 914 as shown in Figure 10. Also, a locking section 917 having a locking hole 916, into which the reinforcing material 26 is inserted and locked, may also be formed as shown in Figure 11.

**[0091]** With the above configuration, it is possible to reduce the gap between the cover panel body 8 and the extending panel body 9 by suppressing the warpage and deflection of the cover panel body 8 and the extending panel body 9. Thereby, it is possible to improve the sense of unity as the wind guide panel 7 and possible to obtain an air conditioning apparatus having excellent appearance design properties.

**[0092]** There will be described an example of a manufacturing method of the above described wind guide section 9. Figure 12 is a view showing a manufacturing process of the wind guide section. First, there is formed the exterior material 911 in the recessed shape which forms one surface side of the panel. After the exterior material 911 is placed in a first metallic mold 923 having a recessed section 923a corresponding to the external shape of the outer surface of the exterior material 911, the decorative sheet 913 is laid so as to cover the open surface of the exterior material 911.

From above the decorative sheet 913, a second metallic mold 925 having a recessed section 925a corresponding to the wind guide shape is set to sandwich the exterior material 911 with the first metallic mold 923.

**[0093]** Thereafter, a foaming raw material is injected into the space surrounded by the exterior material 911 and the recessed section 925a of the second metallic mold 925, so as to be foamed and formed. Thereby, it is possible to manufacture the wind guide panel 7 in which the foamed layer 912 is laminated on the exterior material 911. Note that the manufacturing method is not limited to this, and the foamed layer 912 may be an expanded foam in which air is mechanically entrained at the time of molding.

**[0094]** As the foaming raw material for forming the polyurethane foam, there may be used a known material which includes, for example, a polyol component, a polyisocyanate component, a foaming agent, and other auxiliary agents. It is possible to effect the foaming by making these materials react with each other.

**[0095]** Figure 13 is a view showing a manufacturing process of the cover panel body. The cover panel body is manufactured similarly to the wind guide section 9c. Specifically, the recessed exterior material 811 forming one surface side of the panel is first formed. After the exterior material 811 is placed in a first metallic mold 823 having a recessed section 823a corresponding to the external shape of the outer surface of the exterior material 811, the decorative sheet 813 is laid so as to cover the opening surface of the exterior material 811. From above the decorative sheet 813, a second metallic mold 825 having a projecting section 825a corresponding to the wind guide shape is set to sandwich the exterior material 811 with the first metallic mold 823.

**[0096]** Thereafter, a foaming raw material is injected into the space surrounded by the exterior material 811 and the projecting section 825a of the second metallic mold 825, so as to be foamed and formed. Thereby, it is possible to manufacture the cover panel body 8 in which the foamed layer 812 is laminated on the exterior material 811.

## Industrial Applicability

**[0097]** The present invention can be effectively used

for an air conditioning apparatus which is capable of blowing out conditioned air in a cooling and heating operation.

## Claims

1. An air conditioning apparatus **characterized by** comprising: a casing which includes a suction port in an upper surface thereof and a blow out port in a front lower section thereof, and in which an air flow channel from the suction port to the blow out port is formed; a fan for blowing air; and a wind guide panel which covers the blow out port and is extended upward from the blow out port, wherein the wind guide panel is provided to freely open and close the blow out port by being rotated around an axis line of a lower shaft which is set in the vicinity of the lower end edge of the blow out port in parallel with the left and right direction of the casing, and wherein a wind guide surface formed in a recessed curved surface is formed on the inside surface of the wind guide panel so that when the wind guide panel is rotated to take an attitude for opening the blow out port, the wind guide surface is connected to a lower side wall surface in a recessed curved surface, which wall surface configures an air flow channel from the fan to the blow out port.

2. The air conditioning apparatus according to claim 1, wherein that the wind guide panel is configured by a cover panel body which covers the blow out port, and an extending panel body which extends the cover panel body, and wherein the cover panel body and the extending panel body are integrally freely rotated around the axis line of the lower shaft.

3. The air conditioning apparatus according to claim 2, wherein the cover panel body is provided to freely open and close the blow out port by being rotated around an axis line of an upper shaft set at the upper end section of the cover panel body in parallel with the right and left direction of the casing, and wherein an upper side wall surface configuring the air flow channel from the fan to the blow out port is formed so that when the cover panel body is rotated to take an attitude for opening the blow out port, the upper side wall surface is connected to a wind guide surface in a recessed curved surface of the cover panel body.

4. The air conditioning apparatus according to claim 3, wherein the upper side wall surface is inclined upward from the inside of the air flow channel toward the blow out port.

5. The air conditioning apparatus according to claim 2, wherein the wind guide surface of the cover panel body is formed in a recessed curved surface, and wherein the wind guide surface of the extending panel body is formed in a convex curved surface reversely to the cover panel body.

6. The air conditioning apparatus according to claim 5, wherein the casing is formed in a shape in which when the cover panel body and the extending panel body of the wind guide panel are integrated to each other to take an attitude for covering the blow out port, a gap is prevented from being formed between the extending panel body and the casing.

7. The air conditioning apparatus according to claim 6, wherein there is formed in the casing a projecting section which is configured, when the cover panel body and the extending panel body of the wind guide panel are integrated to take the attitude for closing the blow out port, to close the gap between the extending panel body and the casing.

8. The air conditioning apparatus according to claim 3, wherein there is provided sealing means which closes a gap between the cover panel body and the casing at the time when the cover panel body is rotated around the axis line of the upper shaft to take the attitude for opening the blow out port.

9. The air conditioning apparatus according to claim 8, wherein the cover panel body includes a main body section which closes the blow out port, and a sealing section which extends the main body section, wherein the sealing section is provided so as to be positioned on the side opposite to the main body section across the upper shaft, wherein a contact section is provided in the casing, which contact section closes a gap between the sealing section and the casing by being in contact with the sealing section at the time when the cover panel body is rotated around the upper shaft to take the attitude for opening the blow out port, and wherein the sealing means is configured by the sealing section and the contact section.

10. The air conditioning apparatus according to claim 9, wherein a groove section which does not hinder the rotation of the sealing section is formed in the casing above the blow out port in the left and right direction of the casing, and wherein the lower wall section of the groove section is set to intervene in the rotation track of the sealing section so as to function as the contact section.

11. The air conditioning apparatus according to claim 9, wherein the upper shaft is set at a position above the blow out port.

12. The air conditioning apparatus according to one of claim 9, claim 10 and claim 11, wherein a sealing

material is arranged on at least one of the sealing section and the contact section at a portion at which the sealing section and the contact section are brought into contact with each other.

**13.** The air conditioning apparatus according to claim 1, wherein a sealing material is arranged on at least one of the wind guide panel and the casing, which material seals a gap between the wind guide panel and the casing at the time when the wind guide panel is rotated around the axis line of the lower shaft to take the attitude for opening the blow out port.

**14.** The air conditioning apparatus according to claim 2, wherein a sealing material for sealing a gap between the cover panel body and the extending panel body is arranged on at least one of the cover panel body and the extending panel body.

**15.** The air conditioning apparatus according to claim 1, wherein the wind guide panel is formed in a plate shape, one surface of which forms the wind guide surface, and wherein a reinforcing material is provided on the side of the wind guide surface.

**16.** The air conditioning apparatus according to claim 15, wherein the wind guide panel is configured such that a foamed layer is laminated on the rear surface of a plate-shaped exterior material, and that the reinforcing material is embedded in the foamed layer.

**17.** The air conditioning apparatus according to claim 3, wherein a reinforcing material is embedded in the end section of the cover panel body, which end section faces the extending panel body.

**18.** The air conditioning apparatus according to claim 17, wherein a reinforcing material is embedded in the end section of the extending panel body, which end section faces the cover panel body.

**19.** The air conditioning apparatus according to any of claim 15 to claim 18, wherein the reinforcing material of the cover panel body is a shaft and functions as the upper shaft and/or the lower shaft.

FIG. 1

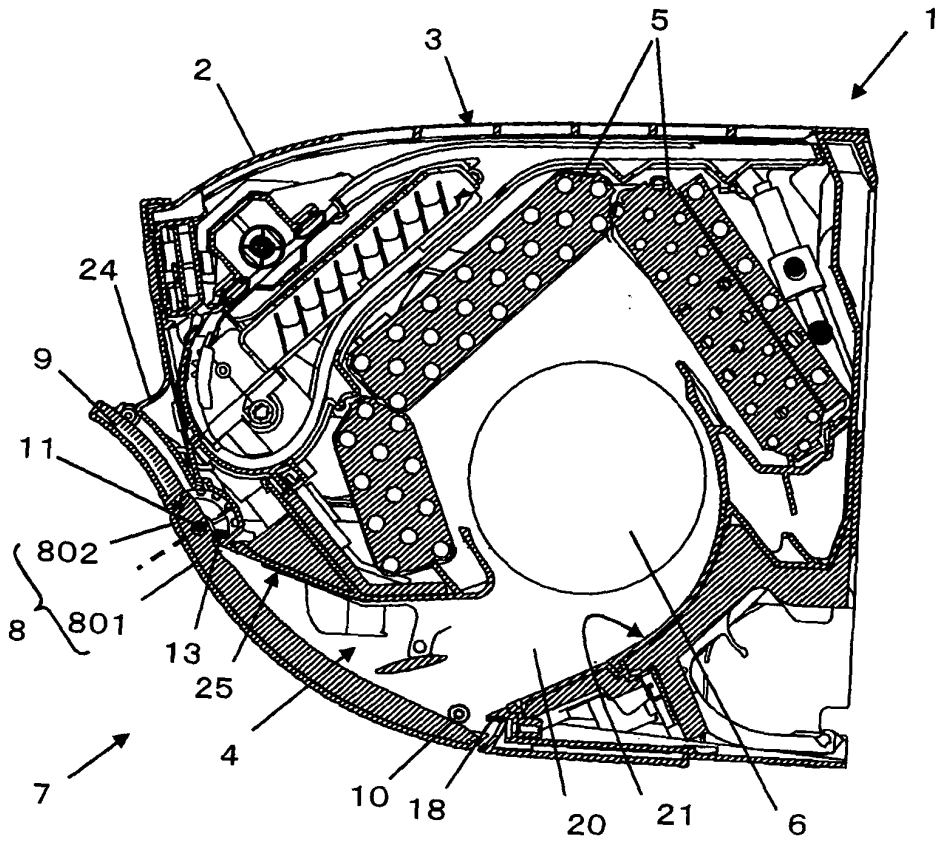



FIG. 2

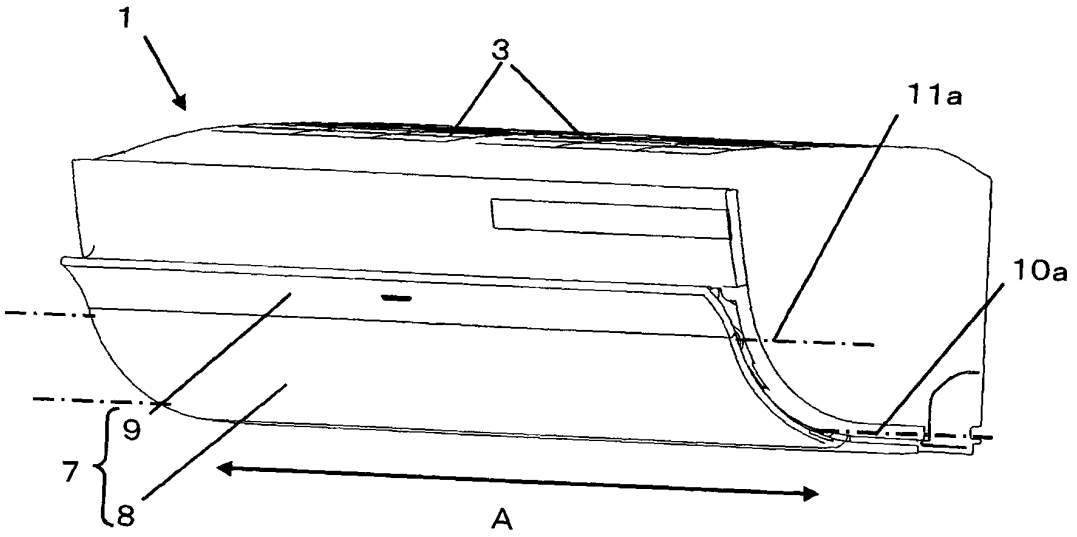


FIG. 3

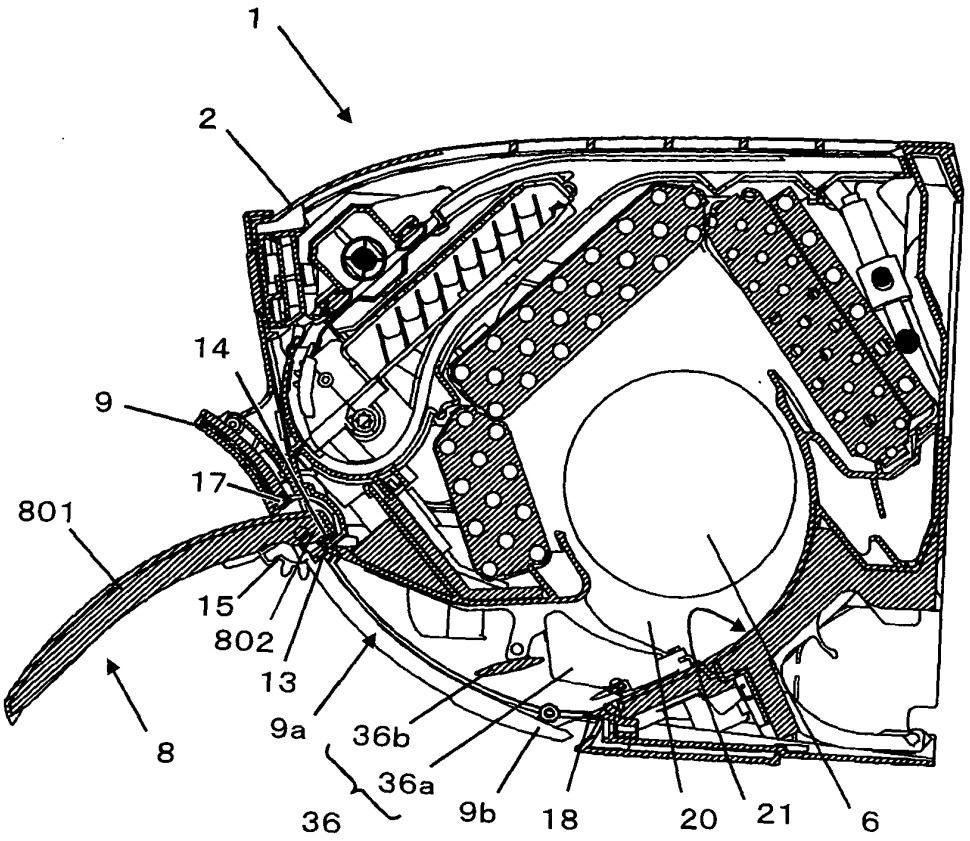

1
2
14
9
17
801
15
802
13
9a
36b
36a
36
9b
18
20
21
6
8

FIG. 4

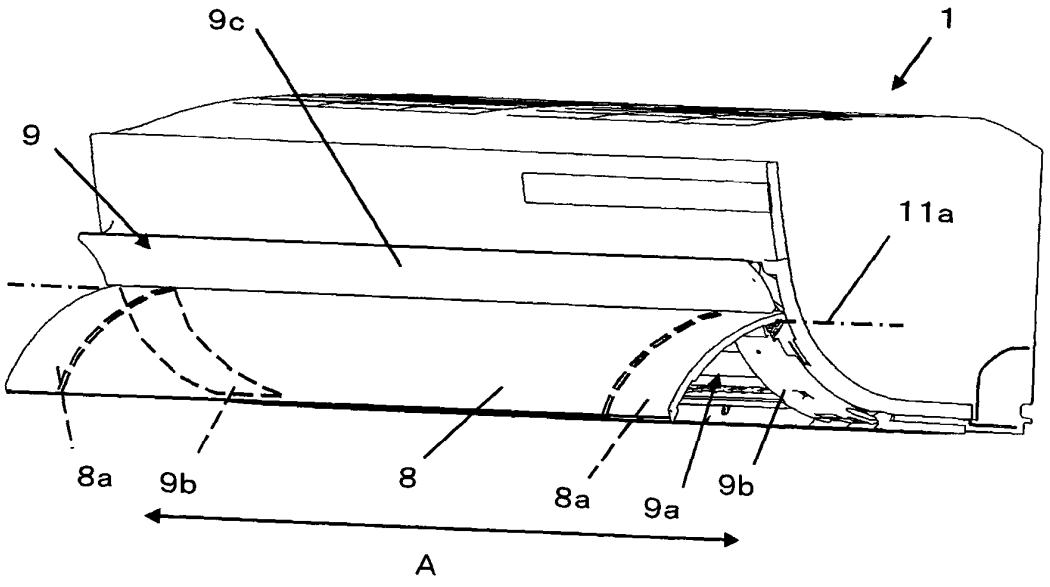

9c
1
9
11a
8a
9b
8
8a
9a
9b
A

FIG. 5

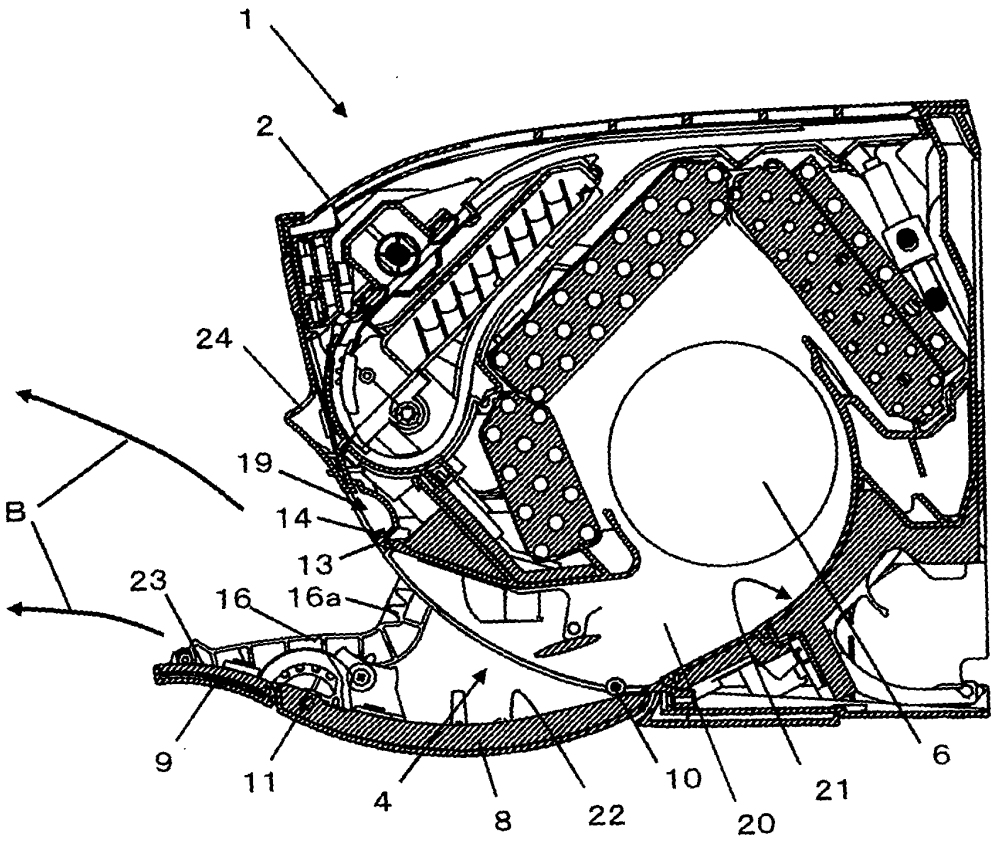



FIG. 6

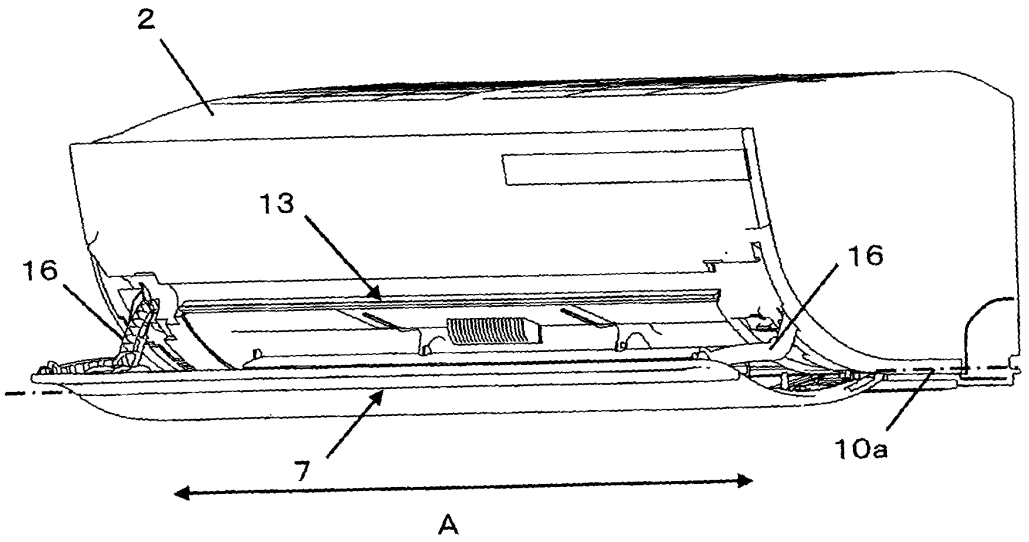


FIG. 7

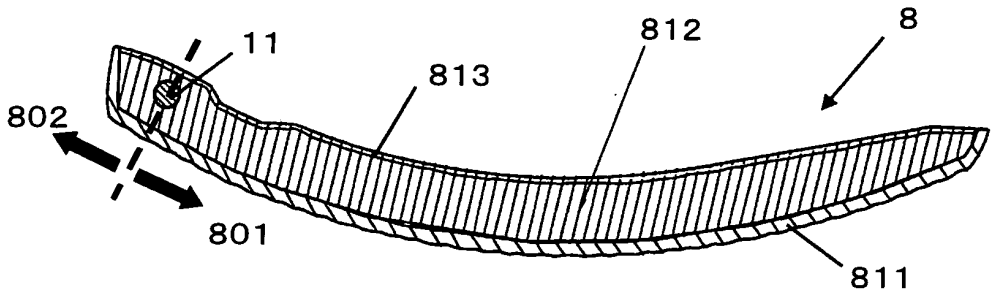



FIG. 8

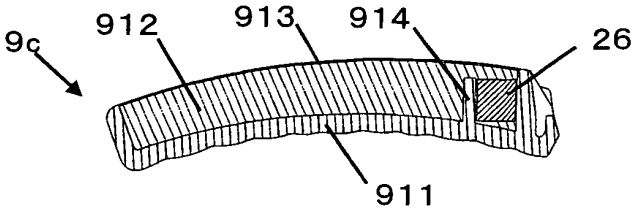



FIG. 9

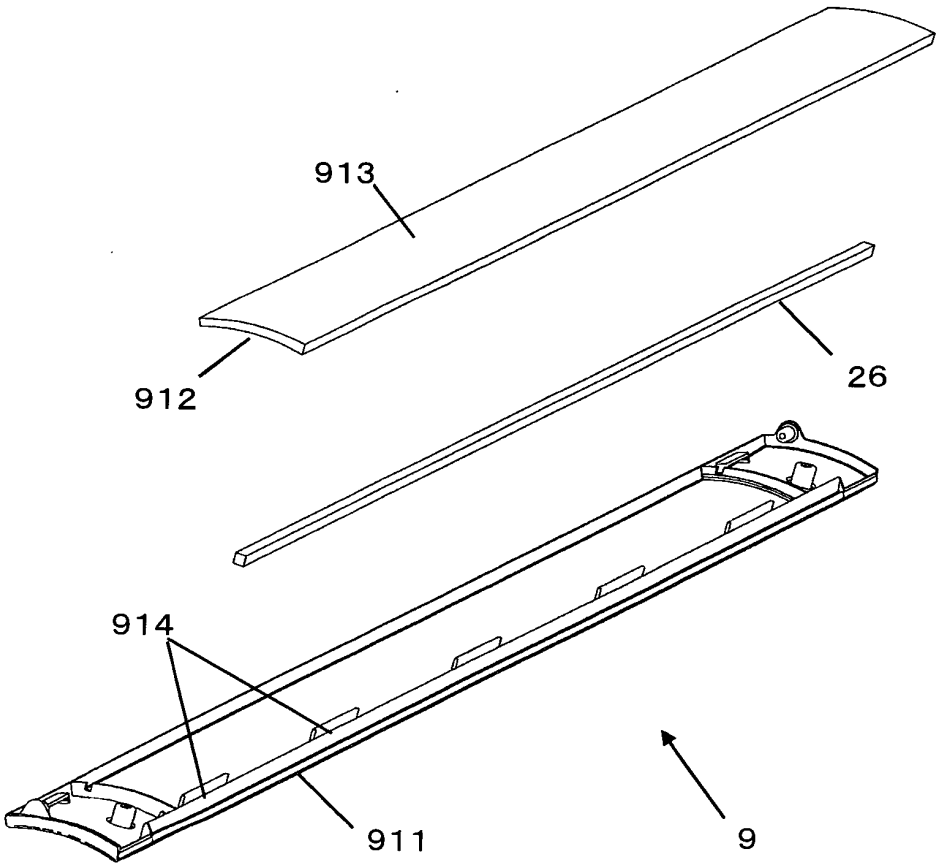


FIG. 10

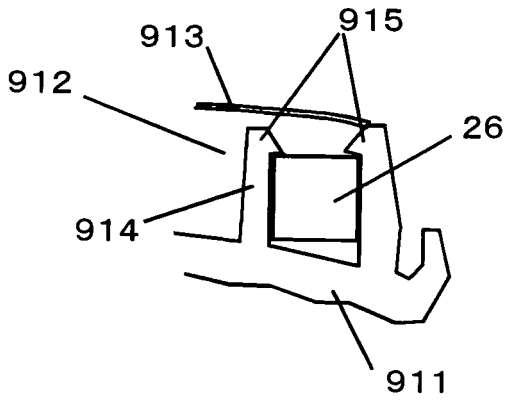



FIG. 11

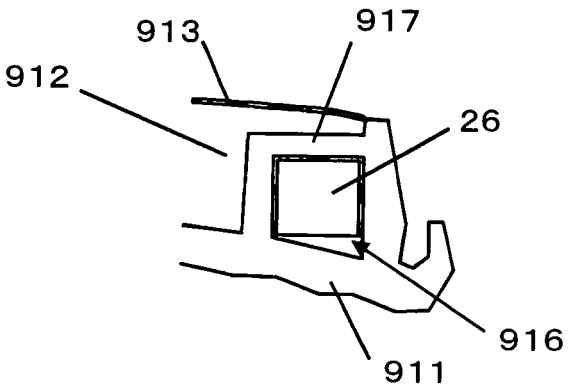


FIG. 12

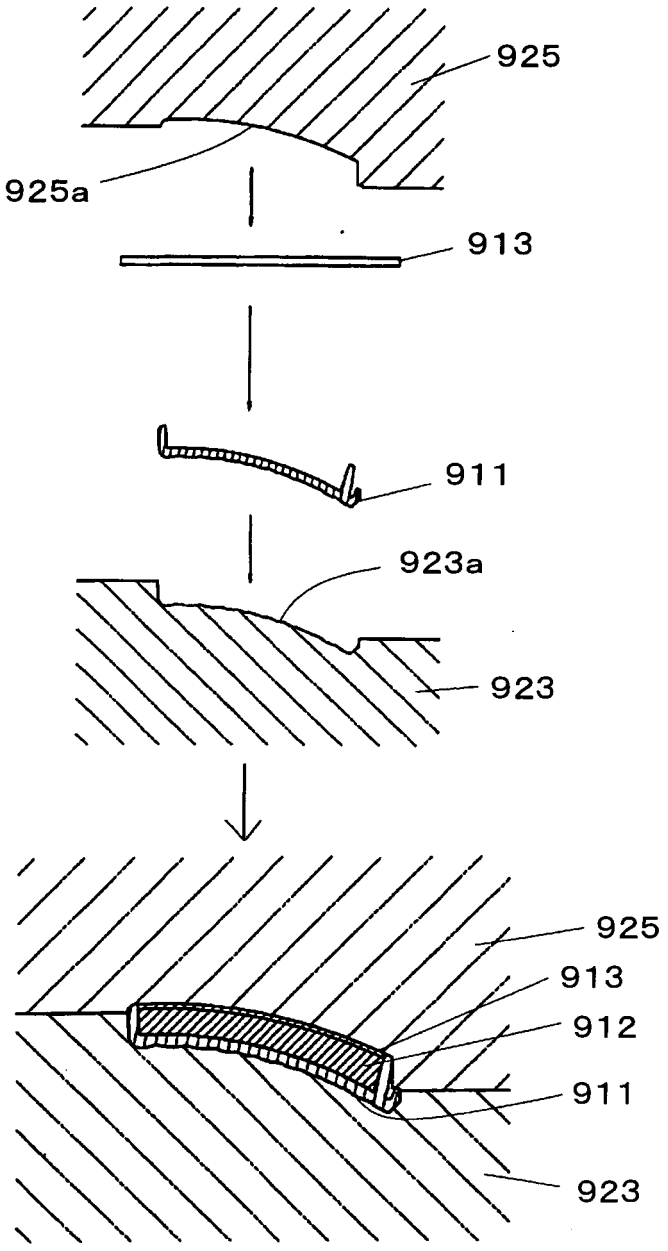


FIG. 13

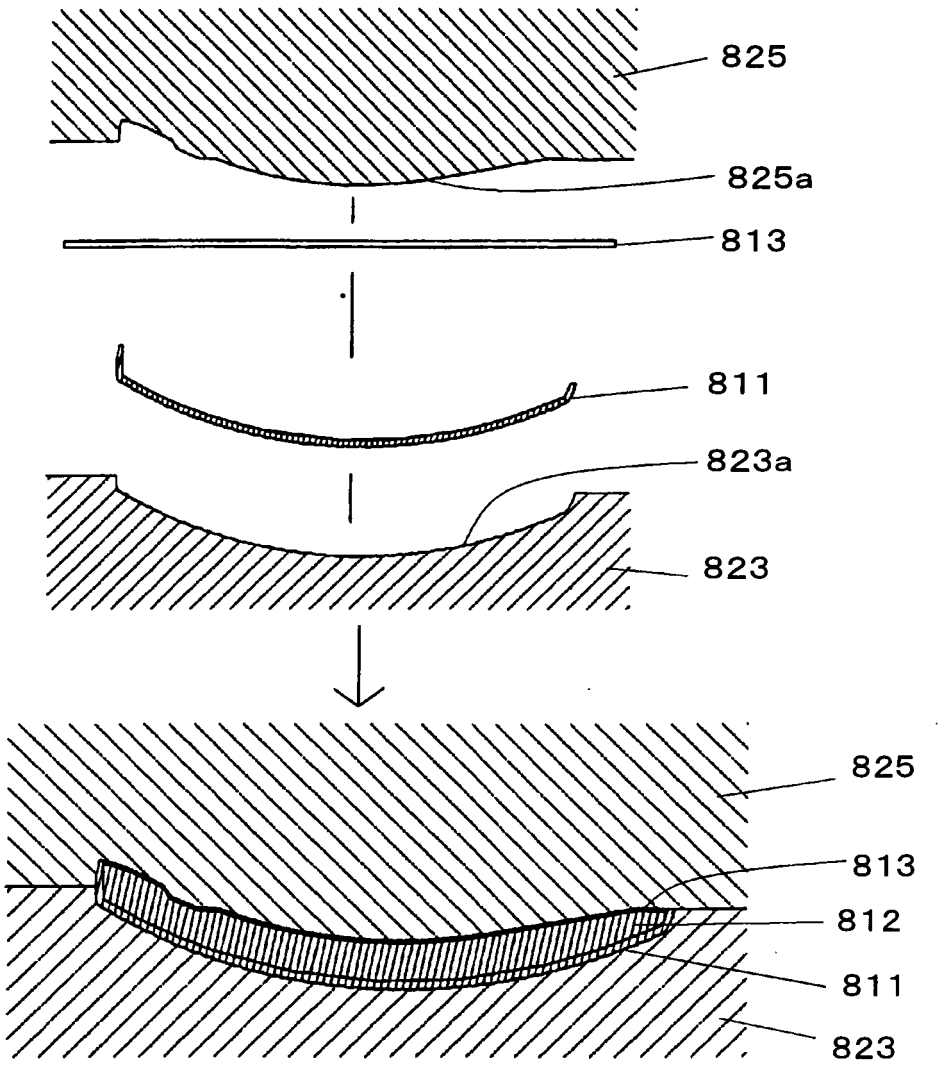


FIG. 14

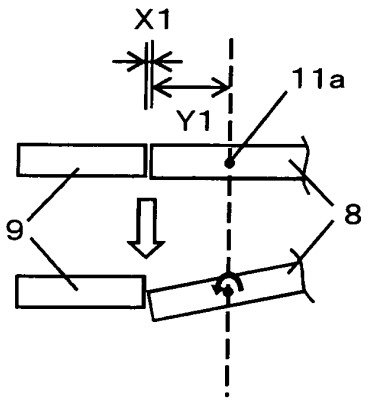



FIG. 15

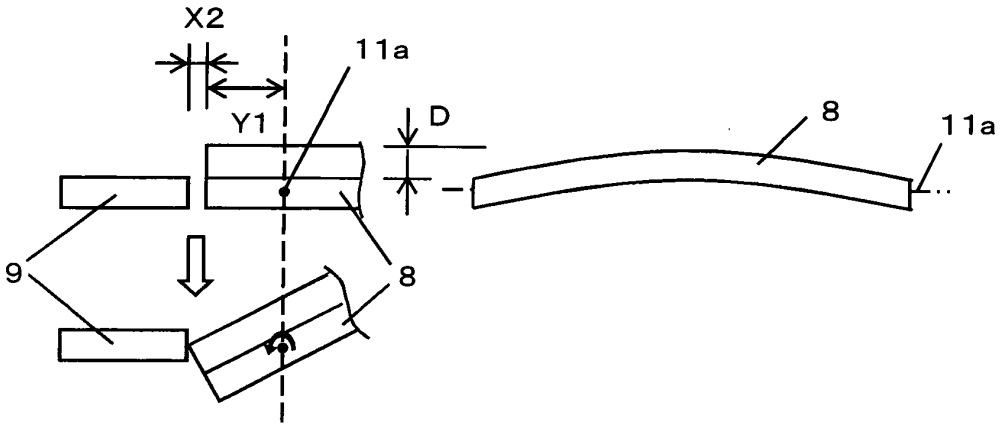
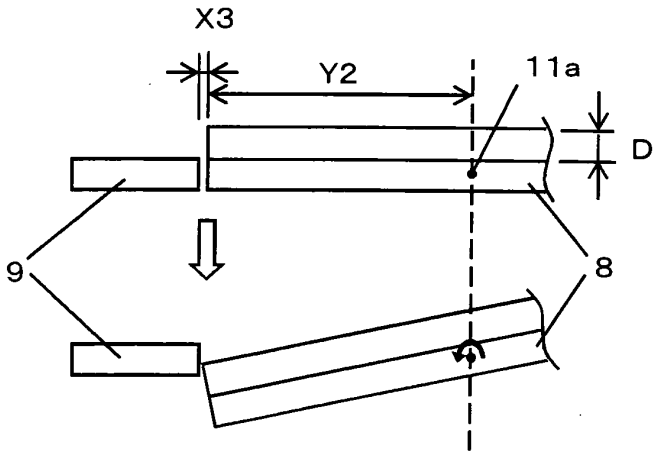



FIG. 16



**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2007/071342

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 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

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. |
|---|---|---|
| A | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 23719/1987(Laid-open No. 132236/1988) (Fujitsu General Ltd.), 30 August, 1988 (30.08.88), Full text; all drawings (Family: none) | 1-19 |
| A | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 22930/1985(Laid-open No. 138946/1986) (Fujitsu General Ltd.), 28 August, 1986 (28.08.86), Full text; all drawings (Family: none) | 1-19 |

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

* Special categories of cited documents:
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 08 January, 2008 (08.01.08) | 22 January, 2008 (22.01.08) |
| Name and mailing address of the ISA/ Japanese Patent Office<br>Facsimile No. | Authorized officer<br>Telephone No. |

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**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2007/071342

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | JP 2006-138629 A (Matsushita Electric Industrial Co., Ltd.), 01 June, 2006 (01.06.06), Full text; all drawings (Family: none) | 1-19 |

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## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- JP 2005315536 A **[0003]**