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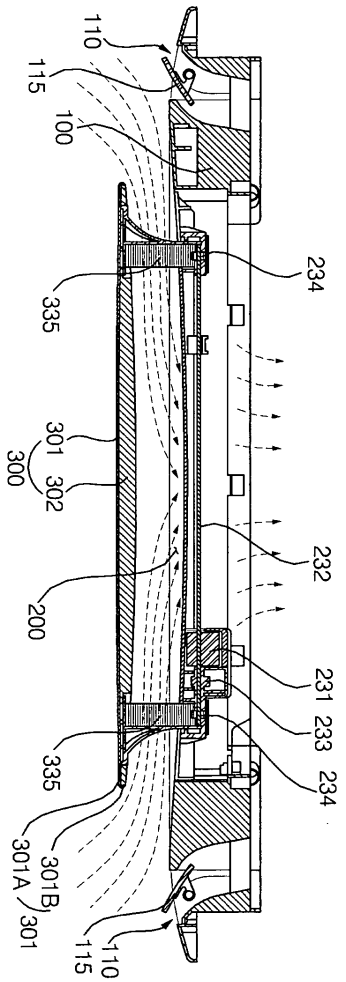
(54) Ceiling air conditioner

(57) A ceiling air conditioner provided. The ceiling air conditioner includes a main body (10) which is fixed onto a ceiling (1) and has an open bottom; an outlet panel (100) which is coupled to the bottom of the main body (10) and includes an air outlet (110); an inlet panel (200) which is coupled to the outlet panel (100) and includes an air inlet (205); and a door panel (300) which is coupled to the inlet panel (200) so as to be able to be lifted up toward the inlet panel (200), wherein the door panel (300) shuts the air inlet (205) and forms the exterior of the bottom of the inlet panel (200) when lifted up, and opens the air inlet (205) and guides air into the air inlet (205) when lowered down. Thus, since the door panel (300) has a curved top surface, it is possible to form a stable path for the flow of air. In addition, since the door panel (300) is formed of a light-weight material, it is possible to stably lift up or down the door panel (300).

FIG. 7a



EP 2 199 694 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a ceiling air conditioner, and more particularly, to a ceiling air conditioner which includes a door panel that can be lifted up and down from below an inlet panel having an air inlet, and can thus efficiently open or shut the air inlet and stably form a path for the flow of indoor air drawn thereinto through the air inlet.

2. Description of the Related Art

[0002] Ceiling air conditioners include an indoor unit which is installed at the ceiling of a room and performs a cooling function, an outdoor unit which performs a heat dissipation function and a compression function, and a coolant tube which connects the indoor unit and the outdoor unit.

[0003] Conventionally, an air inlet of a ceiling air conditioner through which indoor air can be drawn into the main body of the ceiling air conditioner, may always be open, and may thus injure the appearance of the ceiling air conditioner.

SUMMARY OF THE INVENTION

[0004] It would be desirable to provide a ceiling air conditioner which includes a door panel that can be lifted up and down from below an inlet panel having an air inlet, and can thus efficiently open or shut the air inlet and simplify the exterior of the bottom of the ceiling air conditioner. The ceiling air conditioner can stably guide the flow of air drawn thereinto via the air inlet with the aid of the door panel, and can thus prevent the generation of abnormal noise.

[0005] It is further desirable to provide a ceiling air conditioner including a main body which is fixed onto a ceiling and has an open bottom; an outlet panel which is coupled to the bottom of the main body and includes an air outlet; an inlet panel which is coupled to the outlet panel and includes an air inlet; and a door panel which is coupled to the inlet panel so as to be able to be lifted up toward the inlet panel, wherein the door panel shuts the air inlet and forms the exterior of the bottom of the inlet panel when lifted up, and opens the air inlet and guides air into the air inlet when lowered down.

[0006] The door panel may include an exterior element which is disposed below the inlet panel and forms the bottom and sides of the door panel, and an interior element, which is disposed between the inlet panel and the exterior element and forms the top of the door panel.

[0007] The door panel may also include at least one moving element which connects the exterior element and the inlet panel so as for the door panel to be able to be lifted up toward the inlet panel, and the interior element may include at least one through hole which can be passed through by the moving element.

[0008] The door panel may also include at least one moving element installation unit which is formed at the top of the exterior element, and in which the moving element can be installed.

[0009] The door panel may also include an engaging portion extending from a lower side of the moving element, and the moving element installation unit may protrude beyond the top surface of the exterior element so as to surround the engaging portion.

[0010] The engaging portion may be formed in one body with the moving element, and may be curved from one side to the other side thereof.

[0011] The interior element may have an outwardly-curved surface.

[0012] The exterior element may include a lower plate portion and a lateral plate portion which is formed along the edges of the lower plate portion so as to protrude upwardly from the lower plate portion.

[0013] The ceiling air conditioner may also include a pyroelectric infrared ray sensor module(Hereafter, "pyroelectric infrared ray sensor module" may be referred as "PIR sensor module") which is installed in the door panel and senses the movement of a user, wherein the door panel further includes a sensor installation hole which is formed through the exterior element and the interior element and can be passed through by the PIR sensor module when the PIR sensor module is installed in the door panel.

[0014] The door panel may also include a decorative unit which is disposed between the exterior element and the interior element, and the exterior element may be formed of a transparent material so that the decorative unit can be seen through the exterior element.

[0015] The door panel further may include a decorative unit which is disposed at the bottom of the exterior element.

[0016] The exterior element may be formed of at least one of a metal, toughened glass and synthetic resin.

[0017] The interior element may be formed of a foamed plastic resin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The above and other features and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 illustrates a perspective view of a ceiling air conditioner according to an exemplary embodiment of the present invention;

FIG. 2 illustrates an exploded perspective view of an outlet panel, a door panel and an inlet panel shown in FIG. 1;

FIG. 3 illustrates an exploded perspective view of

the inlet panel and the door panel;

FIG. 4 illustrates a cross-sectional view, taken along line A-A of FIG. 2;

FIG. 5 illustrates an exploded perspective view of the door panel;

FIG. 6 illustrates a cross-sectional view, taken along line B-B of FIG. 1; and

FIGS. 7A and 7B illustrate diagrams for explaining how to detach the door panel from the inlet panel.

DETAILED DESCRIPTION OF THE INVENTION

[0019] The present invention will hereinafter be described in detail with reference to the accompanying drawings in which exemplary embodiments of the invention are shown.

[0020] FIG. 1 illustrates a perspective view of a ceiling air conditioner according to an exemplary embodiment of the present invention, FIG. 2 illustrates an exploded perspective view of an outlet panel 100, an inlet panel 200, and a door panel 300 shown in FIG. 1, FIG. 3 illustrates an exploded perspective view of the inlet panel 200 and the door panel 300, FIG. 4 illustrates a cross-sectional view, taken along line A-A of FIG. 2, FIG. 5 illustrates an exploded perspective view of the door panel 300, FIG. 6 illustrates a cross-sectional view, taken along line B-B of FIG. 1, and FIGS. 7A and 7B illustrate diagrams for explaining how to detach the door panel 300 from the inlet panel 200.

[0021] Referring to FIG. 1, the ceiling air conditioner may include a main body 10 which is disposed between a ceiling 1 and a ceiling finishing material 2 below the ceiling 1. The bottom of the main body 10 may be open. Various heat exchange elements such as an air-blowing fan (not shown) and a heat exchanger (not shown) may be installed in the main body 10.

[0022] In short, the main body 10 may be formed as a box with an open bottom, and the various heat exchange elements may be installed in the main body 10.

[0023] The ceiling air conditioner may include the outlet panel 100. The outlet panel 100 may be installed at the bottom of the main body 10. The outlet panel 100 may be on a level with the ceiling finishing material 2. The outlet panel 100 may cover the bottom of the main body 10, and may have an opening 105 in the middle. The outlet panel 100 may include a plurality of air outlets 110. The air outlets 110 may be formed along the edges of the outlet panel 100 so that heat-exchanged air can be ejected from the main body therethrough. The outlet panel 100 may conform to the shape of the bottom of the main body 10 so as to properly cover the bottom of the main body 10. For example, the outlet panel 100 may be formed as a rectangle or square.

[0024] The outlet panel 100 may also include a plurality of wind direction control vanes 115. The wind direction control vanes 115 can rotate by a predetermined angle. Thus, the wind direction control vanes 115 may open or shut the air outlets 110 and may thus control the direction of wind ejected from the air outlets 110.

[0025] Referring to FIGS. 2 and 3, the ceiling air conditioner may also include the inlet panel 200. The inlet panel 200 may be installed on the outlet panel 100 so as to cover the opening 105 of the outlet panel 100.

[0026] The inlet panel 200 may include an air inlet 205 in the middle through which indoor air can be drawn into the main body 100. A purification filter 210 may be disposed above the air inlet 205. The purification filter 210 may filter out foreign substances from air drawn into the main body 10. A purification filter installation unit 215 may be installed at the top of the inlet panel 200 so as to properly mount the purification filter 210 on the inlet panel 200.

[0027] The air inlet 205 may be formed in the middle of the inlet panel 200 as a circle so that indoor air can be properly drawn into the main body 10 therethrough. Thus, the inlet panel 200 may be able not only to provide room for installing the purification filter 210, and but also to serve as an orifice for controlling the amount and speed of the flow of indoor air drawn into the main body 10.

[0028] The air inlet 205 may be formed in various shapes (such as a rectangular shape), other than a circular shape, as long as it can properly allow a considerable amount of air to be drawn into the main body 10 at the same time.

[0029] Referring to FIGS. 1 through 3, the ceiling air conditioner may also include the door panel 300. The door panel 300 may be installed below the inlet panel 200 so as to be able to be lifted up or down from below the inlet panel 200. The door panel 300 may open or shut the air inlet 205 by being lifted up or down.

[0030] The size of the door panel 300 may be determined based on the size of the inlet panel 200. More specifically, the door panel 300 may be slightly larger than the inlet panel 200 in size such that the inlet panel 200 can be hidden from view when shut by the door panel 300.

[0031] Since the opening 105 is formed as a rectangle or square, the inlet panel 200 may be formed as a rectangle or square so as to be able to properly cover the opening 105.

[0032] Referring to FIG. 4, the door panel 300 may include an exterior element 301, which is disposed below the inlet panel 200 and forms the bottom and sides of the door panel 300, and an interior element 302, which is disposed between the inlet panel 200 and the exterior element 301 and forms the top of the door panel 300.

[0033] The exterior element 301, which forms the exterior of the bottom of the main body 10, is a part of the ceiling air conditioner that can be viewed by a user. The exterior element 301 may be formed of a glossy metallic material in order to enhance the exterior of the ceiling air conditioner. Alternatively, the exterior element 301 may be formed of a transparent material such as toughened glass in order to facilitate the installation of a decorative unit. Still alternatively, the exterior element 301 may be formed of a light-weight material such as synthetic resin.

[0034] When the exterior element 301 is lifted up toward the inlet panel 200, the interior element 302 may be detached from the inlet panel 200 and may guide indoor air the air inlet 205.

[0035] In order to properly guide air into the main body 10, the interior element 302 may be designed to have an outwardly-curved surface, and thus, the thickness of the interior element 302 may gradually increase from the edges to the center of the interior element 302.

[0036] When the air-blowing fan in the main body 10 is driven, indoor air may be drawn into the main body 10 through the air inlet 205, as shown in FIG. 7A. Since the interior element 302, which forms the top of the door panel 300, protrudes toward the air inlet 205 and has an outwardly-curved surface, the interior element 302 may be able to form a stable path for the flow of indoor air toward the air inlet 205.

[0037] The interior element 302 may be disposed on the exterior element 301, and may form the exterior of the top of the door panel 300.

[0038] Since the door panel 300 should be able to be lifted up toward the inlet panel 200 against the force of gravity, the door panel 300 may be formed of a light-weight material. More specifically, since the interior element 302 of the door panel 300 is hidden from view by the exterior element 301, the interior element 302 may be formed of a lighter-weight material than the exterior element 301 in order to reduce the weight of the door panel 300. For example, the interior element 302 may be formed of a foamed plastic resin, and particularly, expanded polystyrene (EPS). In this case, the interior element 302 may be fabricated by applying liquid foamed plastic resin onto the top of the exterior element 301 and solidifying the liquid foamed plastic resin. Alternatively, the interior element 302 may be fabricated separately from the exterior element 301, and may then be coupled to the exterior element 301.

[0039] Referring to FIG. 4, the exterior element 301 may include a lower plate portion 301A, on which the interior element 302 can be mounted, and a lateral plate portion 301B which protrudes upwardly from the lower plate portion 301A and surrounds the edges of the lower plate portion 301A.

[0040] The lower plate portion 301A and the lateral plate portion 301B may be formed in one body with each other. Alternatively, the lower plate portion 301A and the lateral plate portion 301B may be formed as separate elements, and then, the lateral plate portion 301B may be coupled to the lower plate portion 301A.

[0041] The lateral plate portion 301B may hide both end sides of the interior element 302 from view and may thus prevent a user from noticing that the exterior and interior elements 301 and 302 are formed of different materials.

[0042] The height of the lateral plate portion 301B may be determined based on the height of either end portion of the interior element 302.

[0043] Given that the door panel 300 actually forms the exterior of the bottom of the ceiling air conditioner, the ceiling air conditioner may also include a decorative unit (not shown) for decorating the exterior of the ceiling air conditioner.

[0044] The decorative unit may include a colorful, decorative film or sheet. The decorative unit may be semi-transparent with colors or patterns.

[0045] If the decorative unit is disposed between the exterior element 301 and the interior element 302, the exterior element 301 may be formed of a transparent material, and thus, the decorative unit can be seen through the exterior element 301.

[0046] On the other hand, if the decorative unit is disposed at the bottom of the exterior element 301, the decorative unit can be readily seen by a user, and thus, there is no need to form the exterior element 301 of a transparent material. In this case, the exterior element 301 may be formed of, for example, an acrylic material, and the decorative unit may be attached onto the bottom of the exterior element 301 by using an adhesive.

[0047] The ceiling air conditioner may be installed at the center of the ceiling 1. In this case, the ceiling air conditioner may also include a lighting unit (not shown). The lighting unit may be disposed in the door panel 300, and may radiate light with wavelengths that can be helpful to the health of a user such as those for helping the user to sleep well.

[0048] Referring to FIG. 3, the ceiling air conditioner may also include a plurality of elevation driving units 230 which can lift up the door panel 300.

[0049] More specifically, the elevation driving units 230 may be installed on the inlet panel 200. The elevation driving units 230 may generate driving force for lifting up the door panel 300. Each of the elevation driving units 230 may include a motor 231, which is disposed on the inlet panel 200, a shaft 232, which is arranged in line with the rotational axis of the motor 231, a plurality of connection elements 233 which connect the motor 231 and the shaft 232 and thus allow the shaft 232 to rotate along with the motor 231, and a plurality of rotation elements 234, which are installed on either end of the shaft 232 and can rotate along with the shaft 232.

[0050] The operation of the elevation driving units 230 will hereinafter be described in detail. When a user operates the main body 10 with the use of a manipulation unit (not shown) such as a remote control, the motor 231 may receive a predetermined operation signal and may thus rotate in a predetermined direction. Since the motor 231 is connected to the shaft 232 by the connection elements 233, the shaft 232 may rotate when the motor 231 rotates. Due to the rotation of the shaft 232, the rotation elements 234 may rotate.

[0051] Referring to FIG. 4, the door panel 300 may also include a plurality of moving elements 335, which are disposed on the door panel 300 and are connected to the rotation elements 234 of each of the elevation driving units 230. The moving elements 335, which are connected to the elevation driving units 230, can help the

elevation driving units 230 to lift up the door panel 300.

[0052] In this exemplary embodiment, four moving elements 335 may be provided, one at each corner of the door panel 300. Thus, the four moving elements 335 may be spaced apart from one another.

[0053] More specifically, the moving elements 335 may be fixed onto the top surface of the exterior element 301 of the door panel 300, and may protrude beyond the interior element 302.

[0054] For this, four moving element installation units 340 may be provided, one at each corner on the top surface of the exterior element 301, as shown in FIGS. 3 through 5. The moving element installation units 340 may protrude beyond the top surface of the exterior element 301. The door panel 300 may also include a plurality of engaging portions 336, which extend from the lower sides of their respective moving elements 335. The engaging portions 336 may be inserted horizontally into the moving element installation units 340.

[0055] The moving element installation units 340 may protrude beyond the top surface of the exterior element 301 to the extent that they can surround the engaging portions 336 when the engaging portions 336 of the moving elements 335 are inserted thereinto.

[0056] The moving elements 335 may be installed in the moving element installation units 340 by inserting the engaging portions 336 into the moving element installation units 340.

[0057] The engaging portions 336 may be formed in one body with their respective moving elements 335. Each of the engaging portions 336 may be curved from one side to the other side thereof.

[0058] Once the moving elements 335 are installed in the moving element installation units 340, the moving elements 335 may be firmly coupled to and fixed onto the top surface of the exterior element 301 by a coupling element (not shown).

[0059] A plurality of through holes 310 may be provided, one at each corner of the interior element 302, so that the moving elements 335 can protrude beyond the interior element 302 therethrough.

[0060] The moving elements 335 may protrude beyond the inlet panel 200 so as to be able to be connected to the elevation driving unit 230, which is disposed on the inlet panel 200. For this, referring to FIG. 3, a plurality of elevation guide holes 240 may be provided, one at each corner of the inlet panel 200. Thus, the moving elements 335 may be able to protrude beyond the inlet panel 200 through the elevation guide holes 240.

[0061] When the door panel 300 is lifted up, the moving elements 335 may also be lifted up and may thus protrude beyond the inlet panel 200 through the elevation guide holes 240.

[0062] Since the moving elements 335 can protrude beyond the inlet panel 200, it is possible to easily detach the door panel 300 from the inlet panel 200 for repair purposes.

[0063] More specifically, a stopper (not shown) may be attached onto each of the moving elements 335 in order to restrict the downward movement of the moving elements 335. Thus, the door panel 300 can be easily detached vertically from the inlet panel 200 simply by detaching the stopper from each of the moving elements 335.

[0064] Referring to FIGS. 5 and 6, the ceiling air conditioner may also include a PIR sensor module 400, which is installed in the door panel 300 and senses the movement of a user.

[0065] The PIR sensor module 400 may include a human body sensor (not shown), and may thus be able to determine the location of a user in a room where the ceiling air conditioner is installed by detecting infrared rays or wavelengths radiated by the user. The PIR sensor module 400 may transmit the result of the determination to a control unit (not shown) of the ceiling air conditioner as an electric signal. The control unit may precisely determine the location and movement of the user and the temperature in the room based on the electric signal provided by the PIR sensor module 400. Then, the control unit may control the operating rate of the heat exchanger of the ceiling air conditioner or the rotation of the wind direction adjustment vane 115. Thus, it is possible to provide an appropriate indoor temperature for the user and direct ambient cool air to the user.

[0066] Referring to FIG. 6, the PIR sensor module 400 may be installed in a sensor installation hole 310, which is formed through the door panel 300. More specifically, when installed in the door panel 300, the PIR sensor module 400 may protrude from both the top and bottom of the door panel 300 through the sensor installation hole 310, as indicated by reference characters A and B.

[0067] Since the door panel 300 is thin enough to be effectively lifted up toward the ceiling 1 against the force of gravity, the sensor installation hole 310 may be formed through the door panel 300, and the PIR sensor module 400 can protrude from both the top and bottom of the door panel 300 through the sensor installation hole 310.

[0068] Since the bottom of the door panel 300 can be directly seen by a user, the amount by which the PIR sensor module 400 protrudes beyond the bottom of the door panel 300 may be smaller than the amount by which the PIR sensor module 400 protrudes beyond the top of the door panel 300.

[0069] From an aesthetic point of view, it may be preferable that the bottom of the PIR sensor module 400 is on a level with the bottom of the door panel 300 when the PIR sensor module 400 is installed in the door panel 300. However, in this exemplary embodiment, the PIR sensor module 400 may be designed to protrude, but as little as possible, beyond the bottom of the door panel 300 in order to cover a wider range of the room.

[0070] The door panel 300 may be lifted up toward the inlet panel 200 and may thus be firmly attached onto the inlet panel 200. As a result, the air inlet 205 of the inlet panel 200 may be shut by the door panel 300. As described above, the PIR sensor module 400 is designed

to protrude beyond the door panel 300. Thus, when the door panel 300 is lifted up toward the inlet panel 200, the PIR sensor module 400 may be distorted, or the door panel 300 may not be able to be properly attached onto the inlet panel 200. In order to address this problem, a human body sensor cover unit 260 may be provided on the inlet panel 200. The human body sensor cover unit 260 may conform to the shape of an upper portion of the PIR sensor module 400.

[0071] The human body sensor cover unit 260 may not necessarily have to conform to the shape of the upper portion of the PIR sensor module 400. That is, the human body sensor cover unit 260 may be formed in various shapes as long as it can accommodate the PIR sensor module 400 therein when the door panel 300 is firmly attached onto the inlet panel 200. The human body sensor cover unit 260 may be formed at the bottom of the inlet panel 200 as a recess. The human body sensor cover unit 260 may be formed in one body with the inlet panel 200.

[0072] The depth of the human body sensor cover unit 260 may be greater than the amount by which the PIR sensor module 400 protrudes beyond the top surface of the door panel 300.

[0073] The operation of the ceiling air conditioner will hereinafter be described in detail.

[0074] When a user operates the main body 10 with the use of the manipulation unit such as a remote control, the control unit may drive the heat exchanger and the air-blowing fan.

[0075] In addition, referring to FIG. 7A, the control unit may drive the motors 231 of the elevation driving units 230 and may thus rotate the shafts 232 of the elevation driving units 230 in a first direction. As a result of the rotation of the shafts 232 of the elevation driving units 230, the rotation elements 234 of each of the elevation driving units 230 may also be rotated in the first direction, and the moving elements 335, which are connected to the rotation elements 234 of each of the elevation driving units 230, may be lowered down.

[0076] When the moving elements 335 are lowered down, the door panel 300 may also be lowered down. Since the door panel 300 has an outwardly-curved surface, it is possible to form a stable path for the flow of air drawn into the main body 10 through the air inlet 205.

[0077] In addition, since the door panel 300 includes the exterior element 301 and the interior element 302, which is coupled onto the exterior element 301 and is lighter in weight than the exterior element 301, it is possible to provide the sense of unity in the design of the door panel 300 and reduce the weight of the door panel 300. Therefore, it is possible to stably lift up or down the door panel 300 from below the ceiling 1, and prevent the coupling between the exterior element 301 and the interior element 302 from weakening even after a long use.

[0078] Thereafter, referring to FIG. 7B, if the user stops the operation of the main body 10 with the use of the manipulation unit, the control unit may stop the heat exchanger and the air-flowing fan from operating further, and may rotate the motors 231 of the elevation driving units 230 in a second direction.

[0079] As a result, not only the shafts 232 of the elevation driving units 230 but also the rotation elements 234 of each of the elevation driving units 230 may also be rotated in the second direction, and the moving elements 335, which are connected to the rotation elements 234 of each of the elevation driving units 230, may be lifted up.

[0080] As a result, the door panel 300 may also be lifted up, and may thus be firmly attached onto the bottom of the inlet panel 200. Accordingly, the door panel 300 may be able to shut the air inlet 205, hide the inlet panel 200 from view, and simplify the exterior of the ceiling air conditioner.

[0081] Since the door panel 300 has no opening for the flow of air, the door panel 300 may be designed to serve as a decorative unit or a lighting unit in order to improve the appearance of the ceiling air conditioner or the atmosphere of the room where the ceiling air conditioner is installed.

[0082] As described above, according to the present invention, since a door panel that shuts an air inlet of an inlet panel can be detached from the inlet panel, it is possible to facilitate the repair of the door panel and the inlet panel.

[0083] In addition, according to the present invention, since the door panel includes an exterior element and an interior element, it is possible to form a stable path for the flow of air and prevent the generation of abnormal noise.

[0084] Moreover, since the door panel is formed of a light-weight material, it is possible to stably lift up or down the door panel.

[0085] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the scope of the present invention as defined by the following claims.

Claims

1. A ceiling air conditioner comprising:

a main body which is fixed onto a ceiling and has an open bottom;

an outlet panel which is coupled to the bottom of the main body and includes an air outlet;

an inlet panel which is coupled to the outlet panel and includes an air inlet; and

a door panel which is coupled to the inlet panel so as to be able to be lifted up toward the inlet panel,

wherein the door panel shuts the air inlet and forms the exterior of the bottom of the inlet panel when lifted up, and opens the air inlet and guides air into the air inlet when lowered down.

2. The ceiling air conditioner of claim 1, wherein the door panel includes an exterior element which is disposed below the inlet panel and forms the bottom and sides of the door panel, and an interior element, which is disposed between the inlet panel and the exterior element and forms the top of the door panel.

3. The ceiling air conditioner of claim 2, wherein the door panel further includes at least one moving element which connects the exterior element and the inlet panel so as for the door panel to be able to be lifted up toward the inlet panel, and the interior element includes at least one through hole which can be passed through by the moving element.

4. The ceiling air conditioner of claim 3, wherein the door panel further includes at least one moving element installation unit which is formed at the top of the exterior element, and in which the moving element can be installed.

5. The ceiling air conditioner of claim 4, wherein the door panel further includes an engaging portion extending from a lower side of the moving element, and the moving element installation unit protrudes beyond the top surface of the exterior element so as to surround the engaging portion.

6. The ceiling air conditioner of claim 5, wherein the engaging portion is formed in one body with the moving element, and is curved from one side to the other side thereof.

7. The ceiling air conditioner of claim 2, wherein the interior element has an outwardly-curved surface.

8. The ceiling air conditioner of claim 2, wherein the exterior element includes a lower plate portion and a lateral plate portion which is formed along the edges of the lower plate portion so as to protrude upwardly from the lower plate portion.

9. The ceiling air conditioner of claim 2, further comprising a PIR sensor module which is installed in the door panel and senses the movement of a user,
wherein the door panel further includes a sensor installation hole which is formed through the exterior element and the interior element and can be passed through by the PIR sensor module when the PIR sensor module is installed in the door panel.

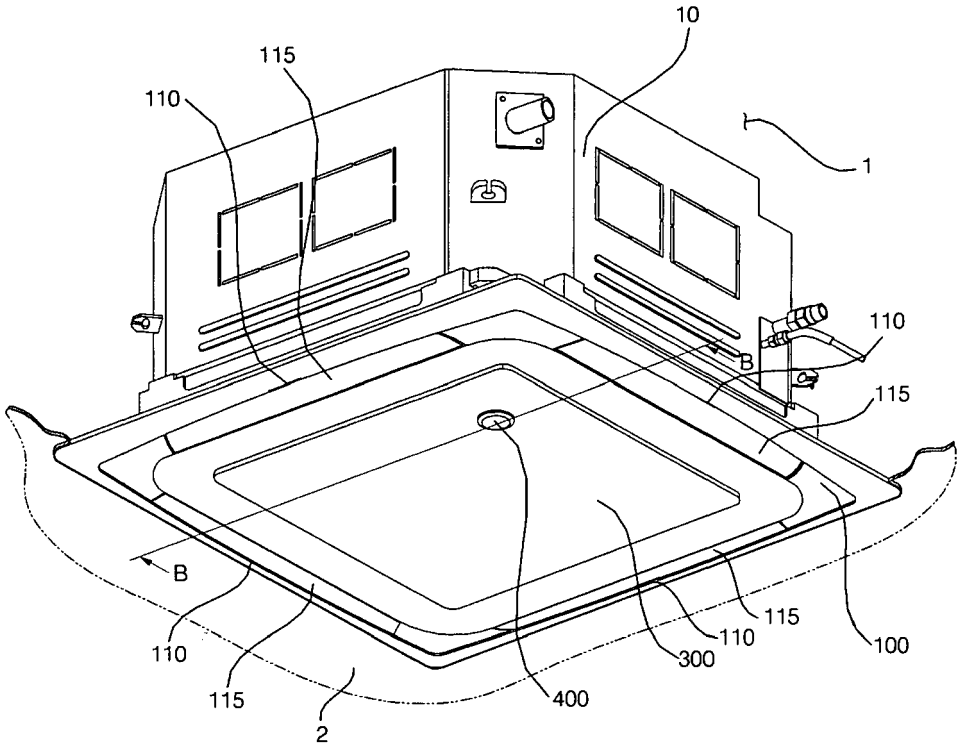
10. The ceiling air conditioner of claim 2, wherein the door panel further includes a decorative unit which is disposed between the exterior element and the interior element, and the exterior element is formed of a transparent material so that the decorative unit can be seen through the exterior element.

11. The ceiling air conditioner of claim 2, wherein the door panel further includes a decorative unit which is disposed at the bottom of the exterior element.

12. The ceiling air conditioner of any of claims 2 to 11, wherein the exterior element is formed of at least one of a metal, toughened glass and synthetic resin.

13. The ceiling air conditioner of any of claims 2 to 11, wherein the interior element is formed of a foamed plastic resin.

FIG. 1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115
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115
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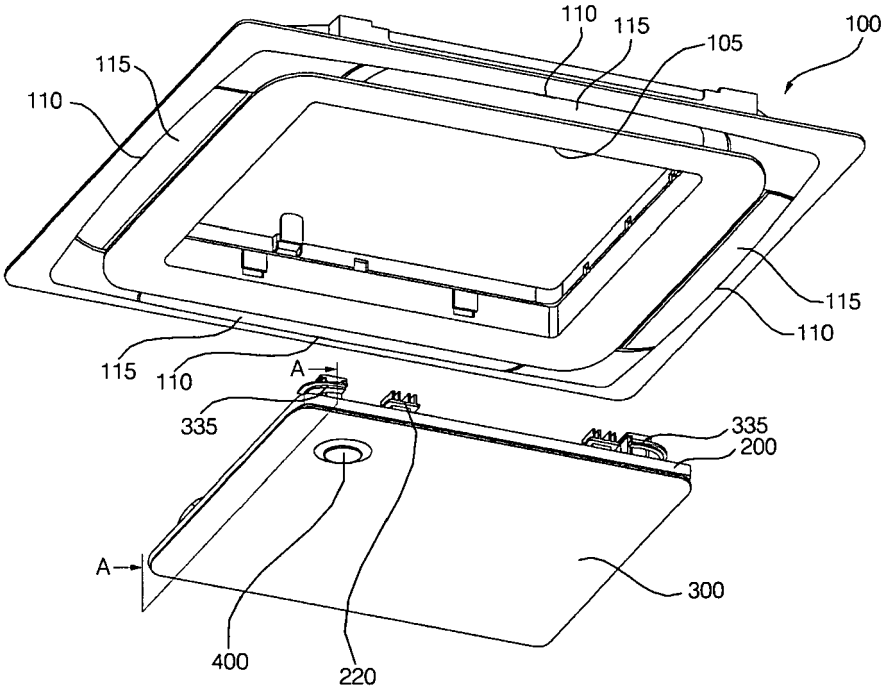
2

FIG. 2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A
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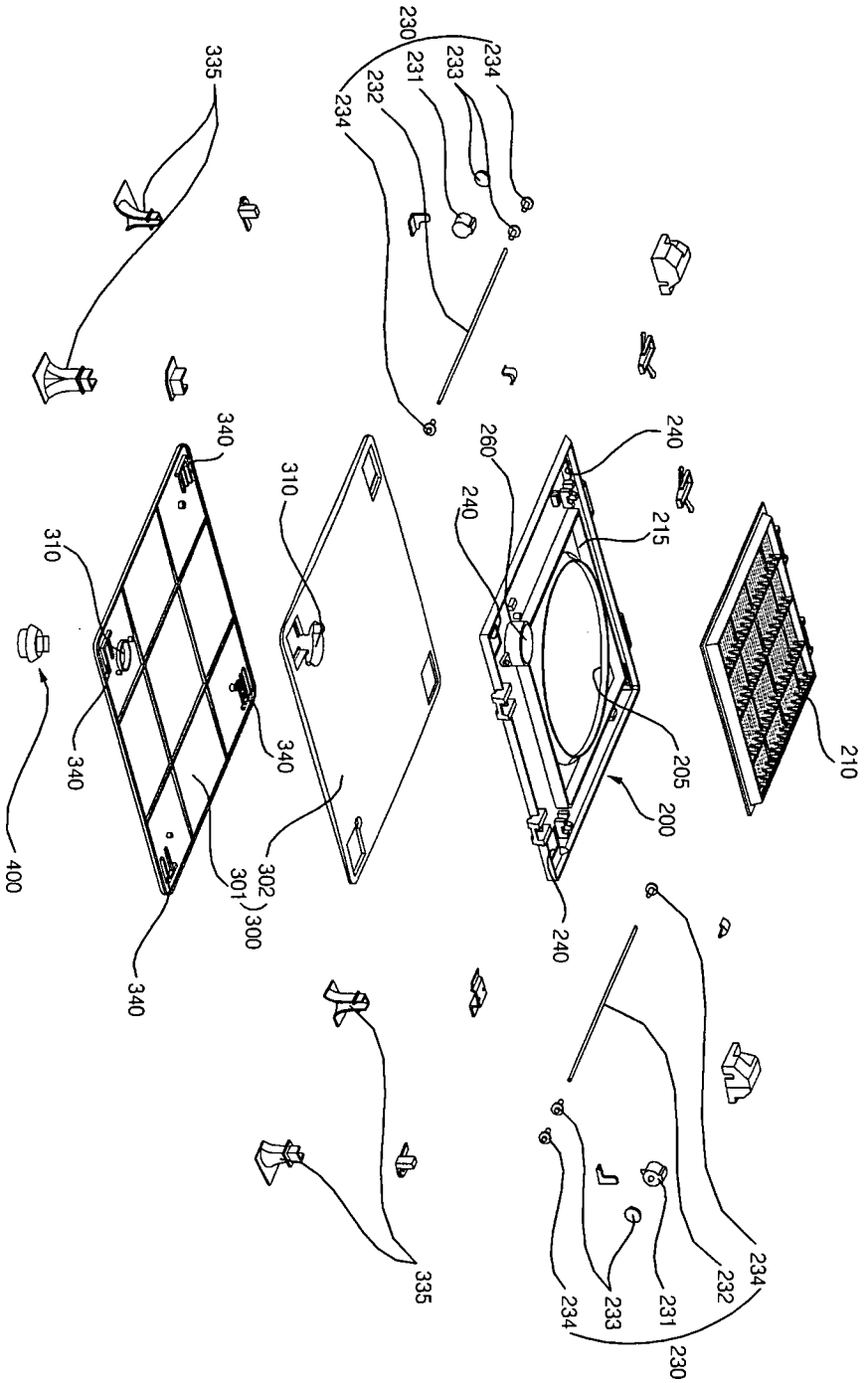
FIG. 3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301
302
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205
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210

FIG. 4

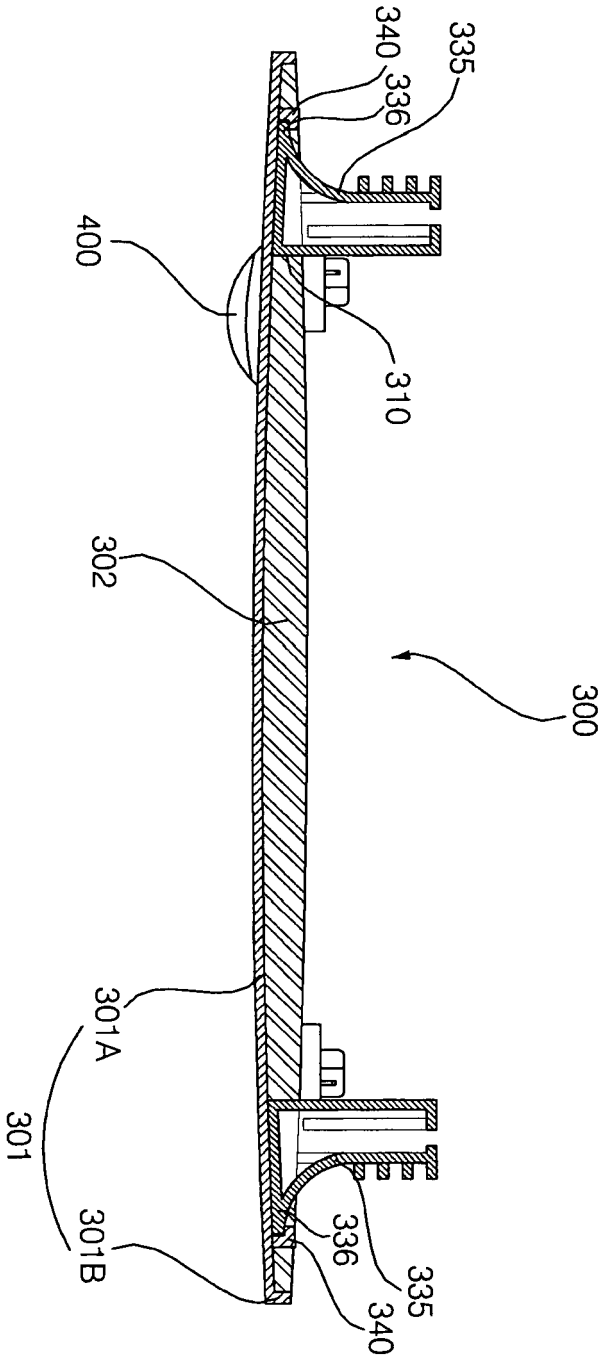

FIG. 5

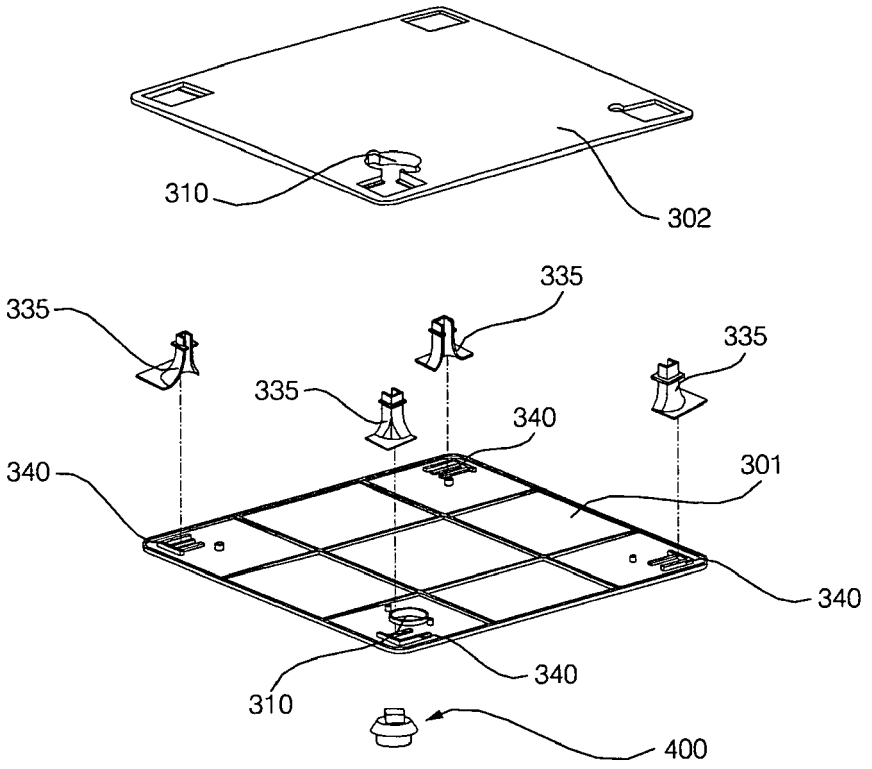

FIG. 6

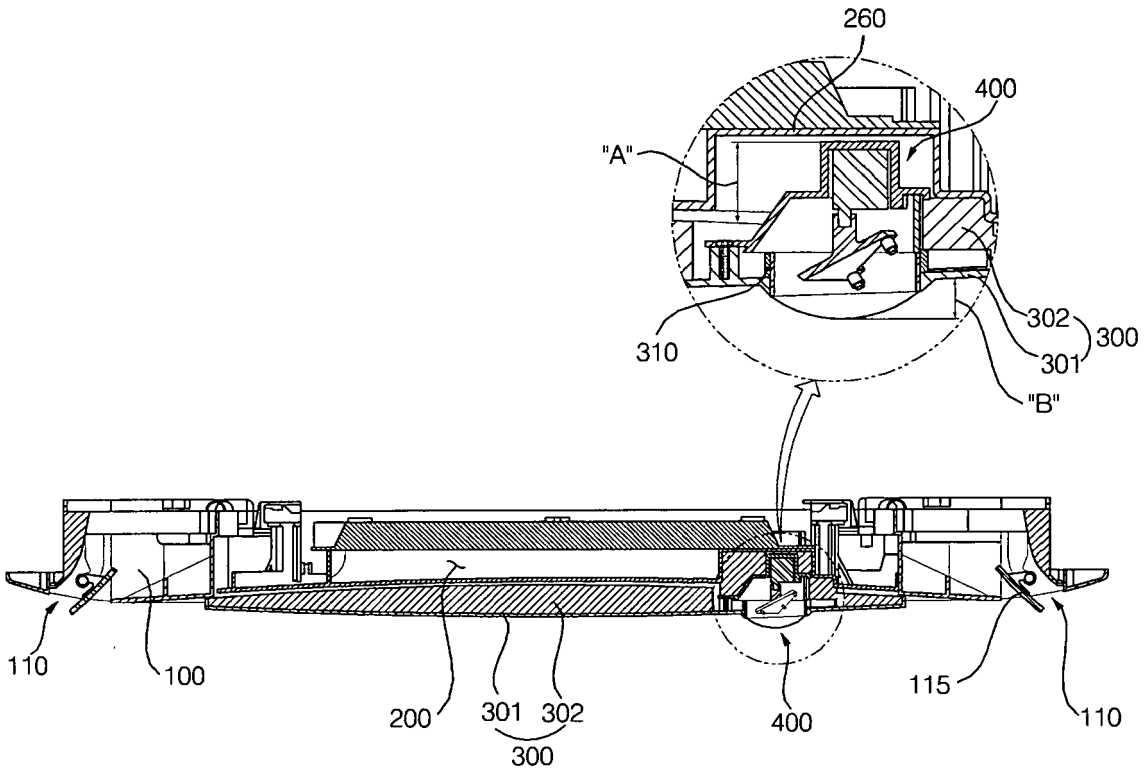

FIG. 7a

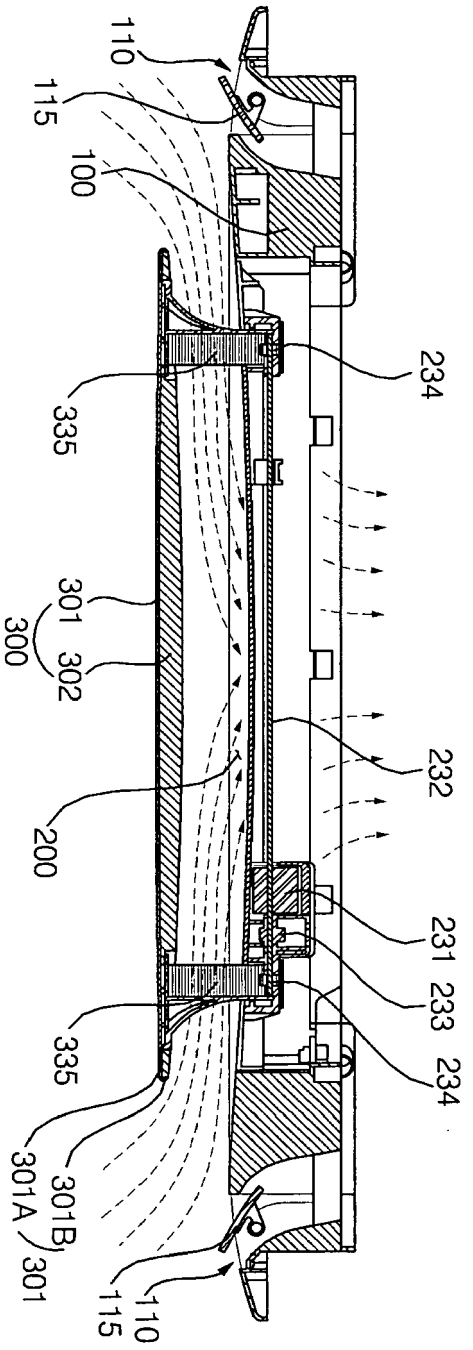
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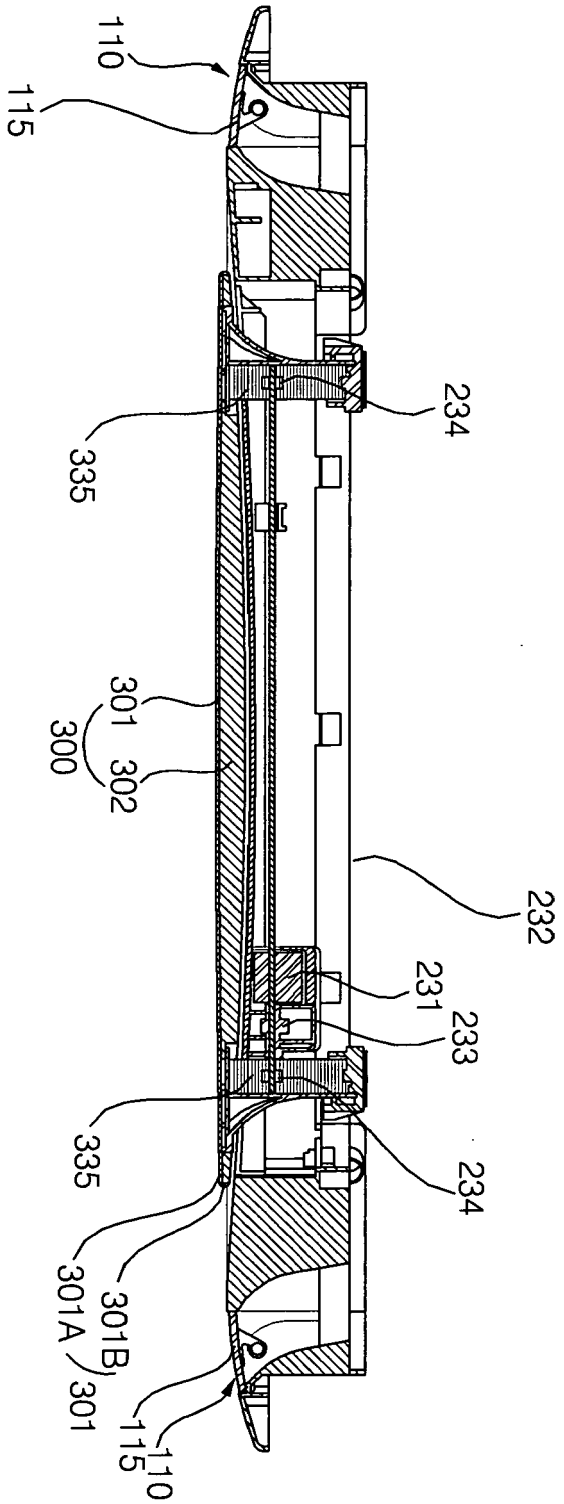
FIG. 7b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EP 09 25 2874

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 1 826 496 A (LG ELECTRONICS INC [KR]) 29 August 2007 (2007-08-29) * paragraph [0004] - paragraph [0010]; claim 1; figures 1-3 *	1-8, 10-13 9	INV. F24F1/00 F24F13/20
Y	EP 1 460 350 A (DAIKIN IND LTD [JP]) 22 September 2004 (2004-09-22) * abstract; figure 1 *	9	
A	JP 2006 071136 A (SANYO ELECTRIC CO) 16 March 2006 (2006-03-16) * abstract; figure 1 *	1-13	
A	JP 60 078242 A (HITACHI LTD) 2 May 1985 (1985-05-02) * abstract; figures 1-5 *	1-13	
A	JP 59 161425 U (XXX) 29 October 1984 (1984-10-29) * abstract; figures 1,3,4 *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC) F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 March 2010	Decking, Oliver

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05-03-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1826496 A	29-08-2007	NONE	
EP 1460350 A	22-09-2004	AU 2002344488 A1	24-07-2003
		CN 1491335 A	21-04-2004
		WO 03058133 A1	17-07-2003
		JP 2003194385 A	09-07-2003
		US 2004050077 A1	18-03-2004
JP 2006071136 A	16-03-2006	NONE	
JP 60078242 A	02-05-1985	NONE	
JP 59161425 U	29-10-1984	NONE	

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