SPECIFICATION

Floor Installation Type Air Conditioner

TECHNICAL FIELD

The present invention relates to a floor installation type air conditioner. More specifically, the present invention relates to a floor installation type air conditioner configured to suck pre-air-conditioned air via a filter and discharge air-conditioned air.

BACKGROUND ART

A conventional floor installation type air conditioner sucks indoor air by a blower fan, reduces dust and the like via a filter, and discharges air-conditioned air, which is adjusted to a predetermined temperature via heat exchange and the like, into the room. Here, since a filter gradually becomes dirty and clogged as the air conditioner is operated, each user usually regularly cleans and changes the filter. In order to simplify a regular cleaning and the like of this type of filter, conventionally, there is provided an air conditioner which includes a panel having a structure which enables a filter to be freely attached and removed. With this type of air conditioner, the filter can be removed from the main body to be cleaned and changed. For example, as shown in Patent Document 1 below and Figures 11 and 12, in some cases, a suction panel capable of housing a filter is disposed at a position where the suction panel sucks room air of a the floor installation type air conditioner 100, 200. This suction panel 191, 291 is attached to the main body by using a hinge at a lower end portion thereof, so that it can be opened by being rotated outwardly from the main body. In this way, in a state in which the suction panel 191, 291 is opened, a filter 111, 211 housed inside is removed to be cleaned and changed by each user.

Incidentally, with this type of floor installation type air conditioner, a blower fan is provided in the vicinity of the filter. Consequently, without any safety measures, it will possibly provide the user an access to the rotating blower fan in a state in which the suction panel is opened. In other words, in a state in which the suction panel is opened, it will possibly provide the user an access to the blower fan disposed in the main body, thus the user and the like who has poor knowledge of the structure and the like of the air conditioner compared to a person in the air conditioning field may accidentally touch the rotating blower fan with the finger, the hand or the like. In order to improve this point, as shown in Figure 11 of the present invention, the floor installation type air conditioner 100 shown in patent document 1 below employs the structure in which a contact prevention net 197 is attached to a blower fan 103 itself and thus attachment, removal and the like of the filter 111, 211 by the user can be safely performed. In addition, as shown in Figure 12, the floor installation type

air conditioner 200 employs the structure in which a limit switch capable of sensing the opening of the suction panel 291 is provided and thus safely is ensured. For example, as shown in Figure 12, a limit switch 297 is provided to the main body side of the floor installation type air conditioner 200, and is configured to be capable of sensing a state in which the suction panel 291 is opened. Accordingly, a control unit (not shown) in the main body can be programmed to control and stop the rotation of a blower fan 203 as the limit switch 297 senses a state in which the suction panel 291 is opened, and thus safety is ensured.

In this way, with the conventional floor installation type air conditioner 100,200, the contact prevention net 197, the limit switch 297 or the like is provided from the viewpoint of ensuring safety in a state in which the suction panel 191, 291 is opened with respect to the main body of the air conditioner.

<Patent Document 1>

Japanese Patent Application Publication No. 2001-137326

DISCLOSURE OF THE INVENTION

<Problem to be Solved by the Invention>

However, with the above described conventional floor installation type air conditioner 100, 200, the contact prevention net 197, the limit switch 297 or the like is provided separately from the suction panel 191, 291. Consequently, in manufacturing the floor installation type air conditioner 100,200, it is necessary to provide separate components to the suction panel 191, 291 in order to ensure security. Consequently, this involves the component manufacturing cost required to manufacture each component to ensure safety, time required to manufacture the components, manufacturing equipment cost required to assemble the components, assemble cost required to implement manufacturing process, and tune required to assemble the components.

The present invention is provided in view of the above circumstances. Therefore, example embodiments of the present invention seek to provide a floor installation type air conditioner in which a reduction in the number of components is achieved while safety is ensured when filter maintenance is performed.

<Means to Solve the Problem>

A floor installation type air conditioner according to a first embodiment of the present invention is a floor installation type air conditioner configured to suck pre-air-conditioned air via a filter and discharge air-conditioned air, comprising a blower fan, a casing, and a panel. The casing houses the blower fan therein. The panel is attached such that the panel can freely open and close with respect to the casing, and the panel opens outwardly with respect to the

casing. In addition, the panel includes a filter housing configured to house the filter, and a safety portion. Among these components, the filter housing enables attachment and removal of the filter as the panel opens. The safety portion is integrally formed with the filter housing. When the panel opens and therefore a space is created between the casing and the filter housing, the safety portion prevents access to the blower fan from the outside of the casing through the space. Note that the opening and closing of the panel described herein includes, for example, a case where a lateral end portion of the panel is hinged to allow opening and closing, a case where the entire panel is slid outwardly with respect to the casing to allow opening and closing, and the like.

With the conventional floor installation type air conditioner, in order to ensure safety in a state in which the panel is opened when filter maintenance is performed, components separate from the panel are required, such as providing the contact prevention net to the blower fan, providing the limit switch for stopping the operation of the blower fan in a state in which the panel is opened, and the like. At the same time, measures to ensure safety by providing the contact prevention net, the limit switch, and the like are imperative.

In view of the above, even when the panel is opened with respect to the casing for the purpose of maintenance of the filter and the like, the floor installation type air conditioner according to the first embodiment of the present invention is capable of preventing access to the blower fan from the outside of the casing through the space between the filter housing and the casing, by means of the safety portion. Accordingly, even when filter maintenance is performed in a state in which the panel is opened, it is possible to suppress the risk of contact between a hand or the like of a maintenance person and the rotating blower fan, thus ensuring safety. In addition, the safety portion to ensure safety is integrally formed with the panel. Accordingly, it is not necessary to provide separate components to ensure safety, and thus the number of components can be reduced. Therefore, with the floor installation type air conditioner of the first embodiment of the present invention, the safety portion to ensure safety is integrally formed with the panel, and it is consequently possible to reduce the number of components while ensuring safety.

A floor installation type air conditioner according to a second embodiment of the present invention is the floor installation type air conditioner according to the first embodiment of the present invention, wherein the safety portion is formed such that its width in the direction generally parallel to an end portion of the filter housing is longer than its width in an opening direction, which is a direction in which the panel opens.

Here, the safety portion is formed such that its width in the direction generally

parallel to the end portion of filter housing is longer than its width in the opening direction of the panel. Accordingly, it is possible to more effectively cover the open space created between the filter housing and the casing, when the width of the open space of the filter housing with respect to the casing is nearly equal to the width of the safety portion in the opening direction. Accordingly, when the width of the open space of the filter housing with respect to the casing is nearly equal to the width of the safety portion in the opening direction, it is possible to more effectively prevent access to the blower fan. Note that by forming the width of the safety portion in the opening direction to be nearly equal to the width of the open space of the filter housing required for attaching and removing the filter, it is possible to achieve both objects of enabling attachment and removal of the filter and ensuring safety. For example, as for the width of the safety portion in the opening direction, it suffices if it is nearly equal to the width of the open space of the filter housing required for attaching and removing the filter. By preventing the safety portion from becoming larger than necessary, it is possible to downsize the safety portion.

A floor installation type air conditioner according to a third embodiment of the present invention is the floor installation type air conditioner according to the first embodiment or the second embodiment of the present invention, wherein, in a state in which the panel is closed, the safety portion is disposed at a position outside the casing, where the safety portion does not overlap with the blower fan when viewed from a direction in which the panel opens, and where the safety portion at least partially overlaps with the blower fan when viewed from a direction perpendicular to the trajectory plane of the safety portion during opening, which is obtained when the panel opens.

Here, in a state hi which the panel is closed, the safety portion is disposed at a position outside the casing, where the safety portion does not overlap with the blower fan when viewed from the direction in which the panel opens. Consequently, it is possible to introduce the safety portion to the gap between the blower fan and the casing exterior, in the open space created when the panel is in an open state, and therefore it is possible for the safety portion to at least partially cover the vicinity of the blower fan. In addition, in a state in which the panel is closed, the safety portion is disposed at a position where the safety portion overlaps with the blower fan when viewed from a direction perpendicular to the trajectory plane of the safety portion during opening, which is obtained when the panel opens. Consequently, it is possible to introduce the safety portion to the gap between the filter housing and the casing, in the open space created when the panel is in an open state, and therefore it is possible to more reliably prevent access to the blower fan. Accordingly, it is

possible to more reliably ensure safety in a state in which the panel is opened.

A floor installation type air conditioner according to a fourth embodiment of the present invention is the floor installation type air conditioner according to any one of the first embodiment to the third embodiment of the present invention, wherein the safety portion is provided so as to extend from the filter housing toward a direction generally opposite the opening direction of the panel, and in a state in which the panel is opened and a space is created between the casing and panel, the safety portion is located in the space.

Here, the safety portion is provided so as to extend from the filter housing toward a direction generally opposite the opening direction of the panel and is located in the space created when the panel is in an open state. Accordingly, the safety portion can be placed at a position where it is possible to more effectively prevent access to the blower fan, in the open space created when the panel opens. Consequently, safety in a state in which the panel is opened can be more effectively ensured.

A floor installation type air conditioner according to a fifth embodiment of the present invention is the floor installation type air conditioner according to any one of the first embodiment to the fourth embodiment of the present invention, wherein the casing includes locking unit. The safety portion includes lock receiving unit into which the locking unit locks, in order to regulate the opening angle of the panel with respect to the casing. Here, as the locking unit and the lock receiving unit, there are cases, for example, where the casing is formed in a projecting shape and the safety portion is formed in a recessed shape corresponding to the projecting shape so as to lock into each other, or where the casing is formed in a recessed shape and the safety portion is formed in a projecting shape corresponding to the recessed shape so as to lock into each other.

Here, the locking unit of the casing and the lock receiving unit of the safety portion lock into each other, consequently regulating the opening angle of the panel with respect to the casing. Accordingly, besides the viewpoint of preventing access to the blower fan by means of the safety portion, the panel can be prevented from excessively opening with respect to the casing, therefore ensuring safety more reliably.

A floor installation type air conditioner according to a sixth embodiment of the present invention is the floor installation type air conditioner according to the fifth embodiment of the present invention, wherein the lock receiving unit of the safety portion is an elongated hole provided penetrating the safety portion in the thickness direction so as to at least correspond to the trajectory of the safety portion, which is obtained when the panel opens. In addition, the locking unit of the casing is a penetrating member which penetrates the safety portion in

the thickness direction through the elongated hole and is fixed to the casing.

Here, the lock receiving unit of the safety portion is the elongated hole provided penetrating the safety portion in the thickness direction. The penetrating member fixed to the casing is provided penetrating this elongated hole, and this elongated hole is provided so as to be capable of at least corresponding to the trajectory of the safety portion, which is obtained when the panel opens and closes. Therefore, when the panel opens, the lock receiving unit of the safety portion and the locking unit of the casing lock into each other in a state in which the panel is fully opened by the penetrating member. Accordingly, it is possible to improve the opening and closing operability of the panel while ensuring safety. In addition, for example, when the elongated hole is provided so as to correspond to the trajectory of the safety portion obtained when the panel opens and closes, it is not only that the lock receiving unit of the safety portion and the locking unit of the casing lock into each other in a state in which the panel is fully opened but the panel can also be opened by being guided by the penetrating member when the panel opens.

A floor installation type air conditioner according to a seventh embodiment of the present invention is the floor installation type air conditioner according to the sixth embodiment of the present invention, wherein the penetrating member is a washer head screw having a washer. In addition, the diameter of the washer is longer than the width of the elongated hole in a direction generally perpendicular to the movement direction of the safety portion, on the trajectory plane of the safety portion during opening, which is obtained when the panel opens. The washer head screw here may be one in which the washer portion and the screw portion are integrally formed, or, it may be one in which the washer and the screw are separate components.

Here, as a washer head screw, a washer head screw with a washer having a diameter longer than the width of the above described elongated hole is used. Accordingly, a portion around the elongated hole of the safety portion can be located between a portion around where the screw is fixed on the casing and the washer, and therefore it is possible to improve stability of opening and closing of the panel.

A floor installation type air conditioner according to an eighth embodiment of the present invention is the floor installation type air conditioner according to any one of the fifth embodiment to the seventh embodiment of the present invention, wherein the lock receiving unit of the safety portion is integrally formed with the filter housing and the safety portion.

Here, as for the panel, not only the safety portion is integrally formed with the filter housing but the lock receiving unit of the safety portion is also integrally formed.

Accordingly, it is possible to further reduce the number of components.

A floor installation type air conditioner according to a ninth embodiment of the present invention is the floor installation type air conditioner according to any one of the first embodiment to the eighth embodiment of the present invention, wherein the safety portion is located outside the blower fan and inside the casing in a state in which the panel is closed.

Here, the safety portion is located outside the blower fan and inside the casing in a state in which the panel is closed. Accordingly, when the panel is closed, the safety portion can be located between a lateral side of the casing and the blower fan. Consequently, it is possible to house the safety portion inside the casing when the panel is closed.

A floor installation type air conditioner according to a tenth embodiment of the present invention is the floor installation type air conditioner according to any one of the first embodiment to the ninth embodiment of the present invention, wherein one end of the panel is formed as a hinge and attached to the casing.

Here, one end of the filter housing is formed as a hinge and attached to the casing, and therefore it is possible to rotate the panel with respect to the casing so that the panel can freely open and close.

A floor installation type air conditioner according to an eleventh embodiment of the present invention is the floor installation type air conditioner according to the tenth embodiment of the present invention, wherein, in a state in which the panel is opened, the safety portion is provided such that the safety portion and the casing are at least partially continuous with each other in the opening direction of the panel, when viewed in a direction generally perpendicular to the trajectory plane of the safety portion during opening.

Here, even in a state in which the panel is opened, the panel and the casing at least partially overlap with each other in a direction generally perpendicular to the trajectory plane of the safety portion during opening, and the safety portion is disposed at a position where the safety portion and casing are seemingly partially continuous with each other in the opening direction of the panel when viewed in a direction generally perpendicular to the trajectory plane of the safety portion during opening. Consequently, even in a state in which the panel is opened, it is possible to reliably prevent access to the blower fan through the portion that is seemingly continuous in the open space created between the filter housing and the casing. Accordingly, it is possible to more reliably ensure safety in a state in which the panel is opened.

In accordance with one aspect of the present invention, there is provided a floor installation type air conditioner configured to suck pre-air-conditioned air via a filter and discharge air-conditioned air, comprising: a blower fan; a casing configured to house the blower fan therein; and a panel attached to the casing so as to freely open and close and configured to open outwardly with respect to the casing; wherein the panel includes a filter housing configured to house the filter, a safety portion, and a lateral side panel configured to cover a lateral side in a closed state, the filter housing enables attachment and removal of the filter as the panel opens, and when the panel opens and a space is created between the casing and the lateral side panel, the safety portion prevents access to the blower fan from the outside of the casing through the space.

<Advantageous Effect of the Invention>

With the floor installation type air conditioner according to the first embodiment of the

present invention, the safety portion to ensure safety is integrally formed with the panel, and therefore it is possible to reduce the number of components while ensuring safety.

With the floor installation type air conditioner according to the second embodiment of the present invention, when the opening width of the panel with respect to the casing is nearly equal to the width of the safety portion in the opening direction of the panel, it is possible to more effectively prevent access to the blower fan.

With the floor installation type air conditioner according to the third embodiment of the present invention, it is possible to more reliably ensure safety in a state in which the panel is opened.

With the floor installation type air conditioner according to the fourth embodiment of the present invention, it is possible to more effectively ensure safety in a state hi which the panel is opened.

With the floor installation type air conditioner according to the fifth embodiment of the present invention, besides the viewpoint of preventing access to the blower fan by means of the safety portion, the panel can be prevented from excessively opening with respect to the casing, therefore ensuring safety more reliably.

With the floor installation type air conditioner according to the sixth embodiment of the present invention, it is possible to improve the opening and closing operability of the panel while ensuring safety.

With the floor installation type air conditioner according to the seventh embodiment of the present invention, a portion around the elongated hole of the safety portion can be located between a portion around where the screw is fixed on the casing and the washer, and therefore it is possible to improve stability of opening and closing of the panel.

With the floor installation type air conditioner according to the eighth embodiment of the present invention, it is possible to further reduce the number of components.

With the floor installation type air conditioner according to the ninth embodiment of the present invention, it is possible to house the safety portion inside the casing when the panel is closed.

With the floor installation type air conditioner according to the tenth embodiment of the present invention, it is possible to freely open and close the panel by rotating the same with respect to the casing.

With the floor installation type air conditioner according to an eleventh embodiment of the present invention, it is possible to more reliably ensure safety in a state in which the panel is opened.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an external elevation view of a floor installation type air conditioner.

Figure 2 is a view showing a schematic structure of the vicinity of a fan 3.

Figure 3 is an external top view of the floor installation type air conditioner.

Figure 4 is a cross sectional view showing an internal structure of a lower portion of the floor installation type air conditioner.

Figure 5 is an external side view of the floor installation type air conditioner.

Figure 6 is a cross sectional side view showing the internal structure in a state in which a front side lower panel is closed.

Figure 7 is a side view showing the structure in a state in which the front side lower panel is opened.

Figure 8 is a view showing how an air filter is attached to and removed from the front side lower panel.

Figure 9 is a side view of a locking mechanism in an open position, provided to the front side lower panel

Figure 10 is a cross sectional view of the locking mechanism in an open position, provided to the front side lower panel.

Figure 11 is a view of a conventional floor installation type air conditioner with a contact prevention net.

Figure 12 is a view of a conventional floor installation type air conditioner with a limit switch.

DESCRIPTION OF THE REFERENCE SYMBOLS

1	floor installation type air conditioner
3	fan (sirocco fan, turbofan, cross flow fan)
4	casing
9	panel (front side lower panel)
11	filter
91	filter housing
97	safety portion
46	locking unit, washer head screw
46a	washer, washer portion
47	locking unit, penetrating material, penetrating member
98h, 99h	lock receiving unit, elongated hole
OS	space (open space)

BEST MODE FOR CARRYING OUT THE INVENTION

A floor installation type air conditioner 1 according to a first embodiment of the present invention is now described with reference to Figures 1 to 10.

<Schematic Structure of the Floor Installation Type Air Conditioner>

Figure 1 shows an external elevation view of the floor installation type air conditioner 1 according to the first embodiment of the present invention. In addition, Figure 2 shows a schematic structure of the vicinity of a fan 3; Figure 3 is a top view; Figure 4 is a cross sectional view showing the internal structure of a lower portion of the floor installation type air conditioner 1; Figure 5 is a side view; and Figure 6 is a cross sectional side view showing the internal structure of the floor installation type air conditioner 1. The term "up-down direction" used hereinbelow refers to an up-down direction in the front view of Figure 1 and Figure 2, that is, a height direction of the room (refer to a solid arrow D2), and the term "left-right direction" or "transverse direction" used hereinbelow refers to a left-right direction in the front view of Figure 1 and Figure 2 (refer to a solid arrow D1). In addition, the term "front-back direction" used hereinafter refers to a direction shown by a solid arrow D3 in Figure 3, Figure 4, and the like.

This floor installation type air conditioner 1 is installed on a floor F in a room, and mainly comprises a heat exchanger 2, the fan 3, a casing 4, a front side lower panel 9, and the like.

<Heat Exchanger>

The heat exchanger 2 is housed in the casing 4, and is configured to exchange heat with the air taken into the casing 4. As shown in Figure 6, the heat exchanger 2 occupies the upper half of the floor installation type air conditioner 1, and is disposed at the same height as an outlet portion 5. In addition, as shown in Figure 6, which is a cross sectional view (cross sectional view taken along line B-B in Figure 1) of the floor installation type air conditioner 1 when viewed from the side, the heat exchanger 2 is provided such that the upper portion thereof is inclined to a rear side 41 of the floor installation type air conditioner 1.

<Fan>

As shown in Figure 2, the fan 3 is housed in the casing 4. As shown in Figure 1, the fan 3 takes indoor air into the casing 4 by causing the indoor air to pass through an the air filter 11 (refers to Figure 7 and Figure 8) from an inlet portion 6. Subsequently, the fan 3 causes the indoor air to pass through the heat exchanger 2 and sends out the same to the outlet portion 5. The fan 3 is a sirocco fan disposed so as to rotate within a plane parallel to the front face of the floor installation type air conditioner 1, and is provided below the heat

exchanger 2 as shown in Figure 6. In addition, as shown in Figure 4, which is a cross sectional view (cross sectional view taken along line A-A in Figure 1) of the floor installation type air conditioner 1 when viewed from the top, the fan 3 is disposed near of the inlet portion 6 (described later) and between rib housing guides 48 and 49 (described later). As shown in Figure 2, the fan 3 is housed in a fan casing 30. The fan casing 30 includes a lateral side 32 in a circular arc shape which surrounds approximately 3/4 of the circumference of the fan 3 along a lateral side of the fan 3, and is disposed so as to face the lateral side of the fan 3. The fan casing 30 surrounds the left half of the lateral side and the lower half of the right side of the fan 3. In addition, the fan casing 30 is provided with an opening 33, and indoor air is taken into the inside of the floor installation type air conditioner 1 as a fan rotor 34 rotates. In addition, the fan casing 30 is provided with a fan casing outlet 31. The fan casing outlet 31 is a portion where air is blown out from the fan 3 toward the heat exchanger 2 disposed above, and is disposed at a position facing the upper half of the right side of the fan 3, where the fan 3 is not surrounded by the fan casing 30. The fan casing outlet 31 is provided offset to the right from the rotation center of the fan 3. Note that in Figure 2, the fan 3 rotates counterclockwise and sends air to the heat exchanger 2 (see open arrow A1 and solid arrow A2 in Figure 2).

<Casing>

The casing 4 is a generally rectangular shaped member elongated in an up-down direction D2, and is configured to house the heat exchanger 2, the fan 3, and the like therein. As shown in Figure 3, the casing 4 mainly comprises a main body casing 40, a front side upper panel 45, and the like.

As shown in Figure 3 and Figure 4, the main body casing 40 integrally comprises the rear side 41, a left lateral side 42, a right lateral side 43, and the rib housing guides 48 and 49. The rear side 41 covers the entire up-down direction of the rear of the floor installation type air conditioner 1. The left lateral side 42 covers the entire up-down direction of the left rear of the floor installation type air conditioner 1 in the front view. The right lateral side 43 covers the entire up-down direction of the right rear of the floor installation type air conditioner 1 in the front view. As shown in Figure 4, the rib housing guide 49 is a plate-like member extending from near a right end portion of the rear side 41 to the front in the front view. The rib housing guide 49 is provided parallel to the right lateral side 43, and consequently a rib housing space S is formed between the rib housing guide 49 and the right lateral side 43. This rib housing guide 49 is provided so as to extend from a lower end side of the main body casing 40 to a height that is equal to the height of the front side lower panel 9. In addition, as

shown in Figure 4 and Figure 7, the rib housing guide 49 is integrally formed with penetrating members 47, into which washer head screws 46 are screwed. As shown in Figure 4 and Figure 7, these penetrating members 47 penetrate through elongated holes 98h, 99h of a safety rib portion 97 on the front side lower panel 9 in a left-right direction D1 (thickness direction), and the washer head screws 46 are screwed thereinto. As shown in Figure 9, each washer head screw 46 comprises a screw portion 46b and a washer portion 46a. Note that as the washer portion 46a, a washer having a diameter longer than the width of the elongated holes 98h, 99h is used. Accordingly, a portion around the elongated hole 98h and a portion around the elongated hole 99h of the safety rib portion 97 can be respectively located between the rib housing guide 48 and the washer portion 46a and between the rib housing guide 49 and the washer portion 46a. Accordingly, the safety rib portion 97 is prevented from moving inwardly beyond the rib housing guides 48 and 49 and is prevented from moving outwardly beyond the washer portion 46a, and therefore it is possible to improve stability of opening and closing of the front side lower panel 9. In addition, the rib housing guide 48 on the left side in the front view is the same as the rib housing guide 49. The rib housing guide 48 is provided near a left end portion of the rear side 41 in the front view, and is provided in the same manner as the rib housing guide 49.

As shown in Figure 3, the front side upper panel 45 is formed with depressed portions 44. In addition, as shown in Figure 1, the front side upper panel 45 comprises the outlet portion 5, horizontal flap portions 7, and vertical flap portions 8. The floor installation type air conditioner 1 sets a direction in which air-conditioned air is blown out, by means of the horizontal flap portions 7 and the vertical flap portions 8. The front side upper panel 45 is a flat portion provided generally in the entire up-down direction D2 of the casing 4, on the front top portion of the casing 4. In addition, a display unit 15 is provided at the upper portion of the front side upper panel 45. The display unit 15 displays information such as room temperature, outside temperature, operation setting, etc. In addition, the depressed portions 44 are depressed portions elongated in the up-down direction D2, which are provided along the lateral ends of the front side upper panel 45. Each depressed portion 44 is provided on both sides of the front side upper panel 45.

<Front Side Lower Panel>

The front side lower panel 9 comprises a filter housing 91 and the safety rib portion 97, which are integrally formed.

As shown in Figure 4, the filter housing 91 mainly comprises a front side 92, the depressed portions 93, inclined surfaces 94, a left lateral side 95, a right lateral side 96, and

the like. The front side 92 is a flat portion provided generally in the entire up-down direction D2 on the front side of the filter housing 91. The depressed portions 93 are depressed portions elongated in the up-down direction D2, which are provided along the lateral ends of the front side 92 of the front side lower panel 9. Each depressed portion 93 is provided on both sides of the front side lower panel 9. As shown in Figure 4, each depressed portion 93 comprises a lateral surface 930 and a curved surface 931. Between the lateral surface 930 and the curved surface 931 on one side, there is provided a first inlet port 61, which is described later, and between the lateral surface 930 and the curved surface 931 on the other side, there is provided a second inlet port 62, which is described later. Indoor air can be taken into the floor installation type air conditioner 1 from the first inlet port 61 and the second inlet port 62. The inclined surfaces 94 are inclined surfaces provided adjacent to the lateral sides of the depressed portions 93 and provided over the entire up-down direction D2 of the front side 92. Each inclined surface 94 is provided to both lateral end portions of the front side lower panel 9. As shown in Figure 4, the left lateral side 95 forms the left side of the front side lower panel 9 in the front view and comprises a lateral side inlet port 66, which is described later.

In addition, as shown in Figure 8, the left lateral side 95 is provided with a filter housing guide 95g for guiding the air filter 11 to a housing position. The right lateral side 96 is the same as the left lateral side 95. The right lateral side 96 forms the right side of the front side lower panel 9 in the front view and comprises a lateral side inlet port 67, which is described later. In addition, as shown in Figure 8, the right lateral side 96 is also provided with a filter housing guide 96g for guiding the air filter 11 to a housing position. In other words, when the air filter 11 is attached to or removed from the filter housing 91, the filter housing guide 95g and the filter housing guide 96g of the filter housing 91 move together so that the air filter 11 can be slid with respect to the filter housing 91 and be guided to the housing position. In addition, the front side lower panel 9 forms a hinge at its lower end portion such that the front side lower panel 9 freely opens and closes with respect to the casing 4 when attached to the front lower end of the casing 4. In other words, the front side lower panel 9 is configured to perform an opening movement around the hinge portion as a supporting point and open outwardly. In addition, in a state in which the front side lower panel 9 is opened, as shown in Figure 7, an open space OS is created between the front side lower panel 9 and the casing 4.

As shown in Figure 4, the safety rib portion 97 comprises a left safety rib 98 and a right safety rib 99, which are integrally formed with the filter housing 91 by synthetic resin and the like.

The left safety rib 98 is a plate-like member extending in a rearward direction D3 from the left lateral side 95. This left safety rib 98 is formed such that its thickness in the left-right direction D1 becomes thinner in the rearward direction. This left safety rib 98 is also formed such that the maximum opening width of the front side lower panel 9 in the front-back direction D3 with respect to the casing 4 is nearly equal to the width of the safety rib portion 97 in the front-back direction D3. In addition, as shown in Figure 7 which is a right side view of the floor installation type air conditioner 1 in a state in which the front side lower panel 9 is opened with respect to the casing 4; Figure 8 which is a view showing how the air filter 11 is attached and removed; and Figure 9 which is an enlarged view of the elongated hole of the safety rib portion 97, the left safety rib 98 in the left side view has a generally circular arc shaped elongated hole 98h formed therein which moves around the hinge portion of the front side lower panel 9 as a supporting point. In other words, the elongated hole 98h is provided to the left safety rib 98 so as to lie along the path trajectory of the washer head screw 46 and the penetrating member 47, which is obtained when the front side lower panel 9 opens and closes. This elongated hole 98h is provided so as to penetrate through the left safety rib 98 in the thickness direction thereof. As shown in Figure 9, the above described penetrating member 47 of the casing 4 penetrates through the elongated hole 98h in the thickness direction, and thereby the range of operation of the safety rib portion 97 is regulated and the opening angle of the front side lower panel 9 with respect to the casing 4 is limited. In addition, as shown in Figure 10, which is a cross sectional view of the penetrating member 47 and the washer head screw 46 (cross sectional view taken along line C-C in Figure 7), as the washer head screw 46 is screwed into the penetrating member 47, the left safety rib 98 is located between the washer portion 46a and the rib housing guide 48, and consequently the movement of left safety rib 98 in the left-right direction D1 is regulated, and the opening and closing movement of the front side lower panel 9 is stabilized. In addition, in a state in which the front side lower panel 9 is closed, as shown in Figure 4, the left safety rib 98 is housed in the above described rib housing space S.

The right safety rib 99 is the same as the left safety rib 98, and is a plate-like member extending in the rearward direction D3 from the right lateral side 96. This right safety rib 99 in the right side view also has a generally circular arc shaped elongated hole 99h formed therein, which moves around the hinge portion of the front side lower panel 9 as a supporting point. In addition, the above described penetrating member 47 and the washer head screw 46 are the same as the ones provided to the left safety rib 98. In a state in which the front side lower panel 9 is closed, as shown in Figure 4, the right safety rib 99 is also

housed in the above described rib housing space S.

Note that a locking mechanism between the front side lower panel 9 and the casing 4 is described later.

<Outlet Portion>

The outlet portion 5 is provided to the front side upper panel 45 of the casing 4, and air heat-exchanged by the heat exchanger 2 is blown out from the outlet portion 5. The outlet portion 5 comprises a first outlet port 51 and a second outlet port 52.

The first outlet port 51 and the second outlet port 52 are rectangular shaped openings elongated in the height direction D2, which are provided along both lateral ends of the front side upper panel 45. The first outlet port 51 and the second outlet port 52 are provided at the upper half of the front side. In addition, as for the first outlet port 51 and the second outlet port 52, as shown in Figure 1 and Figure 3, the first outlet port 51 is provided on the left side and the second outlet port 52 is provided on the right side, with the front side upper panel 45 and the depressed portions 44 interposed therebetween.

Note that outlet ports which constitute the outlet portion 5 are not limited to the first outlet port 51 and the second outlet port 52. At least two outlet ports may be provided spaced apart in the transverse direction D1.

<Inlet Portion>

The inlet portion 6 is a portion configured to take indoor air into the casing 4. As shown in Figure 1, Figure 4 which is a cross sectional view of the internal structure, and Figure 5 which is an external side view, the inlet portion 6 is provided to the front side lower panel 9. The inlet portion 6 comprises the first inlet port 61, the second inlet port 62, and lateral side inlet ports 66, 67.

The first inlet port 61 and the second inlet port 62 are openings provided at the lateral surfaces 930 of the depressed portions 93. The depressed portion 93 on the left side is provided with the first inlet port 61, and the depressed portion 93 on the right side is provided with the second inlet port 62. As shown in Figures 1 and 6, the first inlet port 61 comprises three openings 62a, 62b, 62c, which are juxtaposed in the up-down direction D2.

The lateral side inlet ports 66, 67 are openings elongated in the up-down direction D2 as shown in Figure 5, each of which is provided to the front side lower panel 9 of the floor installation type air conditioner 1. As shown in Figure 4, the lateral side inlet ports 66, 67 are located between the fan 3 and the front side 92 when viewed in the front-back direction D3. Note that Figure 5 shows the lateral side inlet port 67 disposed to the right lateral side 96 on the right side in the front view, and the same applies to the lateral side inlet

port 66 disposed to the left lateral side 95 on the left side.

Note that the air filter 11 which covers the lower portion of the casing 4 is provided facing the first inlet port 61, the second inlet port 62, and the lateral side inlet ports 66, 67.

<Locking Mechanism between the Casing and the Panel>

Although Figure 7, Figure 9, and Figure 10 show the locking mechanism of the casing 4 in the left side view, the locking mechanism on the right side is the same.

As shown in Figure 7, in a state in which the front side lower panel 9 is opened, the open space OS is created between the front side lower panel 9 and the casing 4. In this way, in a state in which the front side lower panel 9 is opened, the locking mechanism between the casing 4 and the front side lower panel 9 enables the above described safety rib portion 97 to be located in the open space OS, and therefore it is possible to prevent access to the fan 3 from the outside of the casing 4.

Specifically, with this locking mechanism between the casing 4 and the front side lower panel 9, as shown in Figure 10, in a state in which the front side lower panel 9 is fully opened, the safety rib portion 97 is located in the open space OS, and outside end portions of the penetrating members 47 and their corresponding end portions of the elongated holes 98h, 99h lock into each other in the opening and closing direction DO of the front side lower panel 9, which consequently limits the opening angle of the front side lower panel 9. As for the elongated holes 98h, 99h provided to the safety rib portion 97, as shown in Figure 7, in a state in which the front side lower panel 9 is fully opened, the length and the shape of the elongated holes 98h, 99h are adjusted and formed such that the safety rib portion 97 and the right lateral side 43 of the casing 4 are located so as to form a portion where the safety rib portion 97 and the right lateral side 43 of the casing 4 are seemingly continuous with each other in the front-back direction D3 in the side view.

Note that the elongated holes 98h, 99h not only regulate the opening angle of the front side lower panel 9, but are also capable of fulfilling a function as an opening and closing guide by causing the penetrating members 47 to move along portions through which the penetrating members 47 penetrate. Note that as for the location of the elongated holes 98h, 99h provided to the safety rib portion 97, it is possible to shorten the length of the elongated holes 98h, 99h in the opening direction by locating the elongated holes 98h, 99h closer to the hinge portion of the safety rib portion 97.

<Characteristics of the Floor Installation Type Air Conditioner in this Embodiment>

(1)

With the conventional floor installation type air conditioner, in order to ensure safety

in a state in which the panel is opened when air filter maintenance is performed, the contact prevention net is provided to the fan or the limit switch is provided which stops the operation of the fan in a state in which the panel is opened. Consequently, components separate from the panel are required. Consequently, this will require the component manufacturing cost required to manufacture each component, time required to manufacture the components, manufacturing equipment cost required to assemble the components, assemble cost required to implement manufacturing process, and time required to assemble the components. This is a cause that prevents the improvement of the productivity. In addition, with the manufacturing process in which the above described contact prevention net, the limit switch, or the like is attached, complicated operation may be required, making it further difficult to improve the productivity or maintain good production efficiency.

On the other hand, with the above described floor installation type air conditioner 1, even in a state in which the front side lower panel 9 is opened for the purpose of maintenance or the like of the air filter 11, it is possible to prevent access to the fan 3 from the outside of the casing 4 through the open space OS between the front side lower panel 9 and the casing 4, by means of the safety rib portion 97. Consequently, even when maintenance of the air filter 11 is performed with the front side lower panel 9 open, it is possible to suppress the risk of contact between a hand and the like of a maintenance person and the rotating fan 3, thus ensuring safety. In addition, the safety rib portion 97 to ensure safety is integrally formed with the filter housing 91 that houses the air filter 11. Accordingly, it is not necessary to provide separate components to ensure safety, and therefore the number of components can be reduced. Consequently, by integrally forming the safety rib portion 97 to ensure safety with the filter housing 91, it is possible to reduce the number of components while ensuring safety.

(2)

With the above described floor installation type air conditioner 1, the safety rib portion 97 is integrally formed with the filter housing 91 so as to form a shape in which the width in the up-down direction D2 is longer than the width in the front-back direction D3 in a state in which the front side lower panel 9 is closed. Accordingly, it is possible to more reliably cover the open space OS when the opening width of the front side lower panel 9 with respect to the casing 4 is provided nearly equal to the width of the safety rib portion 97 in the front-back direction D3. Therefore, it is possible to more effectively prevent access to the fan 3.

(3)

With the above described floor installation type air conditioner 1, the penetrating members 47 and the washer head screws 46 of the rib housing guides 48 and 49 of the casing 4 lock in the elongated holes 98h, 99h of the safety rib portion 97, respectively, and consequently the opening angle of the front side lower panel 9 with respect to the casing 4 is regulated. Therefore, in a state in which the front side lower panel 9 is opened, besides the viewpoint of preventing access to the fan 3 by means of the safety rib portion 97, the front side lower panel 9 can be prevented from excessively opening with respect to the casing 4. Accordingly, it is possible to more reliably ensure safety.

Note that if the safety rib portion 97 is formed such that its width in the front-back direction D3 is nearly equal to the opening width of the front side lower panel 9 required for attaching and removing the air filter 11, it is possible to achieve both objects of enabling attachment and removal of the filter and ensuring safety. In this case, it suffices if the width of the safety rib portion 97 in the front-back direction D3 is nearly equal to the opening width of the front side lower panel 9 required for attaching and removing the air filter 11, and it is possible to prevent the safety rib portion 97 from becoming larger than necessary.

(4)

In addition, the safety rib portion 97 extends from the vicinity of both lateral end portions of the filter housing 91 of the front side lower panel 9 in the rearward direction D3 in the front view. In a state in which the front side lower panel 9 is closed, the safety rib portion 97 is configured to be housed in the rib housing space S provided to the casing 4. Consequently, enlargement of the width of the casing 4 and the front side lower panel 9 in the transverse direction D1 is prevented, and therefore it is possible to downsize the floor installation type air conditioner 1.

(5)

In addition, the elongated holes 98h, 99h of the safety rib portion 97 are provided such that, in a state in which the front side lower panel 9 is fully opened, the safety rib portion 97 and the right lateral side 43 (the same applies to the left lateral side 42) of the casing 4 at least partially overlap with each other in a direction generally perpendicular to the trajectory plane of the safety rib portion 97, and the safety rib portion 97 is located at a position where the safety rib portion 97 and the casing 4 are seemingly partially continuous with each other in the front-back direction D3 when viewed in a direction generally perpendicular to the trajectory plane of the safety portion 97 during opening. Consequently, even in a state in which the front side lower panel 9 is fully opened, it is possible to reliably prevent access to the fan 3 in the vicinity of the above described overlapping portion, in the

open space S created between the front side lower panel 9 and the casing 4.

<Other Embodiments>

An embodiment of the present invention is described above. However, the specific construction of the present invention is not limited to this embodiment, and can be modified within a range that does not depart from the essence of the invention.

(A)

The floor installation type air conditioner 1 is described with an example of the locking mechanism comprising the washer head screws 46, the penetrating members 47, and the elongated holes 98h, 99h provided to the safety rib portion 97 so as to lie along the trajectory of the washer head screws 46 and the penetrating members 47 which is obtained when the front side lower panel 9 opens and closes, as an example of the locking mechanism that regulates the opening angle of the front side lower panel 9.

However, as the elongated holes 98h, 99h provided to the safety rib portion 97, it is not particularly limited to the above described example. For example, as long as an elongated hole is formed so as to be capable of guiding the opening and closing movement of the front side lower panel 9 according to the outside diameter or the inside diameter of the washer portion 46a and the size (thickness) of the screw portion 46b, such an elongated hole does not specifically need to be provided along the opening and closing trajectory. Even in this case, the opening angle of the front side lower panel 9 can be sufficiently regulated as in the case of the above embodiment.

Note that by integrally forming the safety rib portion 97 with respect to the filter housing 91, it is possible to improve the strength and durability of the front side lower panel 9 itself and reduce the possibility of the occurrence of failure, damage, etc., compared to the conventional air conditioner in which the filter housing 91 and the safety rib portion 97 are separately formed.

(B)

The floor installation type air conditioner 1 is described with an example of the locking mechanism comprising the washer head screws 46 screwed into the penetrating members 47 of the rib housing guides 48 and 49 of the casing 4, and the elongated holes 98h, 99h formed in the safety rib portion 97, as an example of the locking mechanism between the casing 4 and the front side lower panel 9.

However, as for the locking mechanism herein, as long as it is a mechanism that is capable of regulating the opening angle of the front side lower panel 9 with respect to the casing 4 and that does not accompany an increase in the number of components, it is not

specifically limited to the locking mechanism described in the above embodiment.

As a first example, the rib housing guides 48 and 49 of the casing 4 may be provided with a projection formed so as to protrude outwardly in a direction generally perpendicular to the trajectory plane of the safety rib portion 97 during opening, and the safety rib portion 97 may be provided with a generally circular arc shaped depression whose depressed shape corresponding to the projection of the casing 4 is formed so as to extend according to the trajectory of the front side lower panel 9 during opening. In this case, besides the effect in which safety is ensured and the number of components is reduced as described in the above embodiment, it is possible to achieve a structure in which the opening and closing portion is difficult to be viewed from outside when changing the air filter 11, and therefore it is also possible enhance the design.

In addition, as a second example, the safety rib portion 97 may be provided with a projection formed so as to protrude inwardly in a direction generally perpendicular to the trajectory plane of the safety rib portion 97 during opening, and the rib housing guides 48 and 49 of the casing 4 may be provided with a generally circular arc shaped depression whose depressed shape corresponding to the projection of the safety rib portion 97 is formed so as to extend according to the trajectory of the front side lower panel 9 during opening. Also in this case, the same effect as the first example can be achieved.

Note that in both the first example and the second example as described above, the safety rib portion 97 may be a rib having a generally triangular shape, which is integrally formed with the filter housing 91 and in which a portion around the hinge serves as the apex. Even this type rib having a generally triangular shape is capable of preventing access to the fan 3 from the outside of the casing 4 through the above described open space OS.

In addition, for example, the rib may have a structure that is screwed to the left lateral side 43 and the right lateral side 42 of the casing 4 shown in Figure 4 and is locked in the elongated holes 98h, 99h of the safety rib portion 97.

Further, the opening angle of the front side lower panel 9 may be regulated in the same manner as the above embodiment by directly screwing the washer head screws 46 to the rib housing guides 48 and 49, and the left lateral side 43 and the right lateral side 42 of the casing 4, without providing the penetrating members 47.

(C)

The floor installation type air conditioner 1 is described with an example of the floor installation type air conditioner 1 whose overall shape is generally rectangular, as shown in Figures 1 to 6.

However, the shape of the floor installation type air conditioner 1 is not limited to such a rectangular shape. It may be a floor installation type air conditioner having a cylindrical shape. In this case, for example, such a floor installation type air conditioner may have a structure in which a plurality of lower panels are radially provided at the lower portion. In this case, the floor installation type air conditioner may have a structure in which indoor air is radially taken in from a plurality of portions, and air-conditioned air is emitted from a panel portion disposed at the upper portion of the air conditioner. In this case, each lower panel may be formed such that the lower panel opens radially outwardly when attaching and removing the air filter 11. Note that each lower panel may employ the same structure described in the above embodiment, which includes the safety rib portion 97 and the locking mechanism comprising the penetrating members 47 and the washer head screws 46. Accordingly, the same effect as the above embodiment can be achieved with the lower panels radially provided.

(D)

The floor installation type air conditioner 1 is described with an example of the floor installation type air conditioner 1 provided with the fan 3 (sirocco fan) at the lower portion of the casing 4.

As the fan 3 provided to the floor installation type air conditioner 1 here, the type may not be specifically limited. For example, a turbofan, a cross flow fan, and the like may be used.

(E)

As shown in Figure 9, the floor installation type air conditioner 1 employs the washer head screw 46 in which the screw portion 46b and the washer portion 46a are integrally formed.

Alternatively, a washer head screw in which a washer and a screw portion are separately formed may be employed.

INDUSTRIAL APPLICABILITY

According to the floor installation type air conditioner of the present invention, it is possible to reduce the number of components while safety is ensured when filter maintenance is performed. Therefore, the present invention is specifically useful when it is applied to a floor installation type air conditioner configured to suck pre-air-conditioned air via a filter and discharge air-conditioned air.

CLAIMS

1. A floor installation type air conditioner configured to suck pre-air-conditioned air via a filter and discharge air-conditioned air, comprising:

a blower fan;

a casing configured to house the blower fan therein; and a panel attached to the casing so as to freely open and close and configured to open outwardly with respect to the casing; wherein

the panel includes a filter housing configured to house the filter, a safety portion, and a lateral side panel configured to cover a lateral side in a closed state,

the filter housing enables attachment and removal of the filter as the panel opens, and

when the panel opens and a space is created between the casing and the lateral side panel, the safety portion prevents access to the blower fan from the outside of the casing through the space.

2. The floor installation type air conditioner according to claim 1, wherein

the lateral side panel includes an opening portion at a position where the lateral side panel does not overlap with the casing in a state in which the panel is closed when viewed from a side, and

when the blower fan is operated in the state in which the panel is closed, an airflow is created that passes through the filter housing and the opening portion.

3. The floor installation type air conditioner according to either claim 1 or claim 2, wherein

the safety portion is formed such that its width in a direction generally parallel to an end portion of the filter housing is longer than its width in an opening direction, which is a direction in which the panel opens.

4. The floor installation type air conditioner according to any of claim 1 to claim 3, wherein,

in a state in which the panel is closed, the safety portion is disposed at a position outside the casing, where the safety portion does not overlap with the blower fan when viewed from a direction in which the panel opens, and where the safety portion at least partially overlaps with the blower fan when viewed from a direction perpendicular to a trajectory plane of the safety portion during opening, which is obtained when the panel opens.

5. The floor installation type air conditioner according to any one of claim 1 to claim 4, wherein

the safety portion is provided so as to extend from the filter housing toward a direction generally opposite the opening direction of the panel, and in a state in which the panel is opened and a space is created between the casing and panel, the safety portion is located in the space.

6. The floor installation type air conditioner according to any one of claim 1 to claim 5, wherein

the casing includes a locking unit, and

the safety portion includes a lock receiving unit into which the locking unit locks, in order to regulate the opening angle of the panel with respect to the casing.

7. The floor installation type air conditioner according to claim 6, wherein

the lock receiving unit of the safety portion is an elongated hole provided penetrating through the safety portion in the thickness direction so as to at least correspond to the trajectory of the safety portion, which is obtained when the panel opens, and the locking unit of the casing is a penetrating member which penetrates the safety portion in the thickness direction through the elongated hole and is fixed to the casing.

8. The floor installation type air conditioner according to claim 7, wherein

the penetrating member is a washer head screw having a washer, and

the diameter of the washer is longer than the width of the elongated hole in a direction generally perpendicular to a movement direction of the safety portion, on the trajectory plane of the safety portion during opening, which is obtained when the panel opens.

9. The floor installation type air conditioner according to any one of claim 6 to claim 8, wherein

the lock receiving unit of the safety portion is integrally formed with the filter housing, the lateral side panel, and the safety portion.

10. The floor installation type air conditioner according to any one of claim 1 to claim 9, wherein

the safety portion is located outside the blower fan and inside the casing in a state in which the panel is closed.

11. The floor installation type air conditioner according to any one of claim 1 to claim 10, wherein

one end of the panel is formed as a hinge and attached to the casing.

12. The floor installation type air conditioner according to claim 11, wherein

in a state in which the panel is opened, the safety portion is provided such that the safety portion and the casing are at least partially continuous with each other in the opening direction of the panel, when viewed in a direction generally perpendicular to the trajectory plane of the safety portion during opening.