

WALL MOUNTED TYPE AIR CONDITIONER

HAVING ION GENERATING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a wall mounted type air conditioner having an air blow-out direction changing plate in an air blow-out port of the main body of the air conditioner, and particularly to a wall mounted type air conditioner having an ion generating device in the air blow-out port.

2. Description of the Related Art

There is known a wall mounted type air conditioner having an air blow-out direction changing plate at an air blow-out port surrounded by a scroll portion and a tongue portion of the main body of the air conditioner. Such a wall mounted type air conditioner is designed so that the direction of air stream blown out from an air blow-out port can be controlled by changing the aspect of an air blow-out direction changing plate.

It may be considered for such a type of air conditioner that an ion generating device is equipped in an air blow-out port to contaminate minus ions into air stream from the air blow-out port, and the air contaminated with the minus ions is supplied to the room under air-conditioning. In this case, it is a problem which place the ion generating device is disposed at because the air blow-out direction changing plate is disposed in the air blow-out port. Further, even when the ion generating device is actually equipped in the air blow-out port, it is difficult for users to specify the flow direction and amount (level) of ions blown out from the air blow-out port.

SUMMARY OF THE INVENTION

Therefore, the present invention has been implemented in view of the above situation, and has an object to provide a wall mounted type air conditioner which can surely supply minus ions to a room under air-conditioning while contaminating the minus ions into air stream from an air blow-out port without disturbing the location and operation of an air blow-out direction changing plate even when the air blow-out direction changing plate is controlled to any direction, and also enable users to easily specify the flow direction and amount (level) of ions blown out from the air blow-out port to the room.

In order to attain the above object, according to the present invention, there is provided a wall mounted type air conditioner having an air blow-out port surrounded by a scroll portion and a tongue portion of the main body of the air conditioner, heat-exchanged air being supplied through the air blow-out port into a room, characterized by comprising: an air blow-out direction changing plate located in the air blow-out port; and an ion generating device for emitting ions, wherein the ion generating device is disposed at a narrowed upstream side of the air blow-out port so as to project into the air blow-out port.

In the above wall mounted type air conditioner, the air blow-out port has a tapered shape in cross-sectional view, and the narrowed upstream side of the air blow-out port corresponds to the tip portion of the tapered shape.

In the above wall mounted type air conditioner, the ion generating device is further disposed on a wall surface constituting one end portion in the longitudinal direction of the air blow-out port so as to project into the air

blow-out port.

In the above wall mounted type air conditioner, the ion generating device comprises an ion generator having an ion generating needle connected to a lead wire, a holder for holding the ion generator and a fixing member for fixing the ion generating device at the narrowed upstream side of the air blow-out port, the ion generating needle emitting the ions by applying a predetermined voltage to the ion generating needle through the lead wire.

The above wall mounted type air conditioner further comprises an earth member disposed in the neighborhood of said ion generating needle.

The above wall mounted type air conditioner further comprises an intermediate insulator interposed between the ion generating needle and said earth member to increase the creepage distance of insulation.

In the above wall mounted type air conditioner, the ion generating needle is projected into an open space surrounded by an insulator, and the earth member is formed on the back surface of the insulator surrounding the open space.

The above wall mounted type air conditioner further comprises a display device for displaying the flow direction and flow amount of the ions that are blown out from the air blow-out port while contaminated in air stream.

In the above wall mounted type air conditioner, the display device comprises plural LED arrays.

In the above wall mounted type air conditioner, the display device is disposed on the front face of the main body of the air conditioner.

In the above wall mounted type air conditioner, the air blow-out

direction changing plate comprises a lower horizontal plate extending in the longitudinal direction of the lower side of the air blow-out port, an upper horizontal plate extending in the longitudinal direction of the upper side of the air blow-out port, and plural vertical plates extending in the short-side direction of the air blow-out port.

According to the present invention, there is provided a wall mounted type air conditioner having an air blow-out port surrounded by a scroll portion and a tongue portion of the main body of the air conditioner, heat-exchanged air being supplied through the air blow-out port into a room, characterized by comprising: an air blow-out direction changing plate located in the air blow-out port; and an ion generating device for emitting ions, wherein the ion generating device is disposed on a wall surface constituting one end portion in the longitudinal direction of the air blow-out port so as to project into the air blow-out port.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view showing an embodiment of a wall mounted type air conditioner according to the present invention;

Fig. 2 is a perspective view showing a state that an ion generating device is secured;

Fig. 3 is an exploded perspective view showing the ion generating device;

Fig. 4 is a diagram showing a fabricated state of the ion generating device;

Fig. 5 is an exploded perspective view showing an ion generating device according to another embodiment of the present invention;

Fig. 6 is a fabrication diagram showing the other embodiment of the ion generating device according to the present invention; and

Fig. 7 is a diagram showing a display device;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment according to the present invention will be described hereunder with reference to the accompanying drawings.

Fig. 1 is a cross-sectional view showing a wall mounted type air conditioner according to an embodiment of the present invention.

Reference numeral 1 represents the main body of the air conditioner, and the main body 1 is fixed onto the wall 3. An indoor heat exchanger 5 and a cross-flow fan 7 are disposed in the main body 1. An upper air suction port 9 is formed in the form of a grille at the upper portion 1A of the main body 1, and an air suction grille 11 is secured to the front edge portion 1B of the upper portion 1A so that the lower end 11B of the air suction grille 11 is freely released from the front face of the main body 1 under the state that the upper end 11A of the air suction grille 11 is linked to the main body 1 through a hinge so as to be rotatable around a fulcrum (not shown).

An air suction filter 13 having a filter element (not shown) is secured inside the air suction grille 11 so as to be movable upwardly and downwardly.

An air blow-out port 21 surrounded by a scroll portion 17 and a tongue portion 19 is formed at the lower portion of the main body 1 of the air conditioner, and an air blow-out direction changing plate 23 is disposed in the air blow-out port 21. The air blow-out direction changing plate 23 comprises a small-width lower horizontal plate 23A extending in the longitudinal direction of the lower side of the air blow-out port 21, an upper horizontal

plate 23B extending in the longitudinal direction of the upper side of the air blow-out port 21, and plural vertical plates 23C extending in the short-side direction of the air blow-out port 21. The upper and lower horizontal plates 23B and 23A serve to control the upward and downward directions of air stream blown out from the air blow-out port 21, and the vertical plates 23C serve to control the rightward and leftward directions of the air stream.

According to this embodiment, an ion generating device 25 for generating ions (i.e., minus ions) is disposed at a narrowed upstream side of the air blow-out port 21 surrounded by the scroll portion 17 and the tongue portion 19 so as to project into the air blow-out port 21 as shown in Fig. 2 and particularly it is located on a wall surface 21A constituting one end portion in the longitudinal direction of the air blow-out port 21 as shown in Fig. 2.

In this embodiment, the air blow-out port 21 is designed so as to be substantially elongated in a direction (for example, a rectangular shape) in front view as shown in Fig. 2 and substantially tapered toward the inside of the main body 1 (toward the cross-flow fan) in cross-sectional view as shown in Fig. 1. That is, the width of the air blow-out port 21 is gradually reduced as it approaches to the cross-flow fan 7. Accordingly, in the following description, the narrowed upstream side of the air blow-out port 21 corresponds to the tip portion of the tapered air blow-out port 21 in cross-sectional view (Fig. 1), and one end portion in the longitudinal direction of the air blow-out port 21 means at least one of both the ends of the elongated (rectangular) air blow-out port 21 in the longitudinal direction thereof (Fig. 2).

Fig. 3 is an exploded perspective view showing the ion generating device 25 and Fig. 4 is a diagram showing a fabricated state of the ion

generating device 25.

As shown in Fig. 3, the ion generating device 25 comprises the main body 26 of the ion generating device (hereinafter merely referred to as "ion generating main body"), a holder 27 having tip portions 27A inserted in an upper opening 26A of the ion generating main body 26, an ion generator 28 having an upward-faced ion generating needle 28A which is fixed to the lower surface of the holder 27, and a fixing plate 29 for fixing the ion generator 28. When the ion generating device 25 is fabricated, the holder 27, the ion generator 28 and the fixing plate 29 are unified into one body, the tip portions 27A of the holder 27 are inserted into the upper opening 26A and then the unified body is fixed to the ion generating main body 26 by a cover 30.

As shown in Fig. 2, the ion generating device 25 is fixed by fixing the ion generating main body 26 to the wall surface 21A constituting the end portion in the longitudinal direction of the air blow-out port 21 so that the tip portions 27A of the holder 27 project into the air blow-out port 21. The ion generating device 25 has a lead wire 32, and by applying a predetermined voltage to the ion generating needle 28A through the lead wire 32, minus ions are omitted from the tip portion of the ion generating needle 28A as shown in Figs. 3 and 4.

According to this embodiment, the ion generating device 25 is fixedly located at a specific secret position in the air blow-out port 21 as described above. That is, the ion generating device 25 is disposed at an upstream position of a narrower space of the air blow-out port 21 surrounded by the scroll portion 17 and the tongue portion 19 on the wall surface 21A constituting one end portion in the longitudinal direction of the air blow-out

port 21 as shown in Fig. 2. Here, the secret position in the air blow-out port 21 may be any narrowed upstream place in the air blow-out port 21 surrounded by the scroll portion 17 and the tongue portion 19, and it is not limited to the wall surface 21A constituting one end portion in the longitudinal direction of the air blow-out port 21.

In this embodiment, the ion generating device 25 does not disturb the control of the orientation of the air blow-out direction changing plate 23, and even when the air blow-out direction changing plates 23A to 23C are controlled to face in any directions, the minus ions emitted from the tip of the ion generating needle 28A can be surely contaminated into air stream from the air blow-out port 21. Therefore, the minus ions thus emitted can be uniformly supplied to the room under air-conditioning even when the air blow-out direction changing plates 23A to 23C are oriented to any directions.

Figs. 5 and 6 show another embodiment of the ion generating device 25.

In Figs. 5 and 6, the same constituent elements as shown in Figs. 3 and 4 are represented by the same reference numerals, and the description thereon is omitted from the following description.

The ion generating device 25 of this embodiment is equipped with an ion generator 28 having an ion generating needle 28A, and the ion generating needle 28A is projected into an open space 40 surrounded by an insulator.

The insulator surrounded by the open space 40 is constructed by the main body 26 of the ion generating device body, the holder 27 having the tip portions 27A, the fixed plate 29 which is fixed to the lower surface of the holder 27 to fix the ion generator 28, etc.

A pair of tip portions 27A are provided in order to specially protect the ion generating needle 2A from being touched by a hand. As described above, the ion generating device 25 has the lead wire 32, and when a predetermined high voltage is applied to the ion generating device 25 through the lead wire 31, minus ions are emitted from the tip portion of the ion generating needle 28A.

It has been discovered from experimental results that when the ion generating device 25 is used for a long time, the insulator surrounding the open space 40, particularly the pair of tip portions 27A of the holder 27 are charged with minus ions. When the ion generating apparatus 25 is left under this charged state, the amount of minus ions emitted from the tip portion of the ion generating needle 28A is reduced. However, it is preferable that the amount of minus ions is increased.

In order to increase the amount of minus ions, an earth member 41 of metal plate is disposed in the neighborhood of the ion generating needle 28A.

As shown in Fig. 5, the earth member 41 has an earth plate 41A. As shown in Fig. 6, the earth plate 41A is disposed in confrontation with the ion generating needle 28A so as to occupy in the inner space between the pair of tip portions 27A. Further, as shown in Fig. 5, an earth wire 45 is inserted between the earth member 41 and the holder 27, and these elements are joined to one another by a bolt 46 and a nut 47. The earth wire 45 is connected to the main body of the air conditioner and grounded through a refrigerant pipe, an outdoor unit, etc.

According to this embodiment, even when the ion generating apparatus 25 is used for a long time, the minus charges charged on the pair of

tip portions 27A are leaked through the earth wire 45 to the ground. Therefore, the amount of charges on the pair of tip portions 27A is reduced, and the electric field intensity in the neighborhood of the open space 40 is increased, so that the amount of minus ions emitted from the tip portion of the ion generating needle 28A can be increased.

As the earth plate 41A is approached to the ion generating needle 28A, the electric field intensity in the neighborhood of the open space 40 is increased, so that the amount of minus ions emitted from the tip portion of the ion generating needle 28A is increased. On the other hand, when the earth plate 41A is excessively approached to the ion generating needle 28A, corona discharge occurs between the ion generating needle 28A and the earth plate 41A. Accordingly, the earth plate 41A is preferably approached to the ion generating needle 28A at maximum to the extent that no corona discharge occurs.

In this embodiment, an intermediate insulator 27B designed like a projection is formed on the holder 27 as shown in Fig. 5. As shown in Fig. 6, the intermediate insulator 27B is projected into the gap between the ion generating needle 28A and the earth plate 41A so as to extend to the inner space between the pair of tip portions 27A to thereby increase the creepage distance for insulation between the ion generating needle 28A and the earth plate 41A.

When the distance between the ion generating needle 28A and the earth plate 41A is short, current would flow to the earth plate 41A if a high voltage is applied to the ion generating needle 28A. If dust or the like is interposed between the ion generating needle 28A and the earth plate 41A,

current is liable to flow into the earth plate 41A through the dust or the like.

According to this embodiment, the current flow into the earth plate 41A can be prevented by providing the intermediate insulator 27B.

The location of the intermediate insulator 27B is not limited to the intermediate position between the ion generating needle 28A and the earth plate 41A. For example, the earth member may be constructed by electrically conductive coating, electrically conductive plating or the like formed on the back surfaces 27C of the insulators (a pair of tip portions 27A) surrounding the open space.

Fig. 7 shows a display device for displaying the flow direction and flow amount of ions contained in air stream from the air blow-out port 21.

The display device 31 is secured at the substantially center portion in the longitudinal direction of the front face of the main body 1 of the air conditioner (air suction grille 11) (see Fig. 1). The display device 31 comprises a display portion (blow direction monitor) comprising plural LED arrays 31A to 31C for displaying the direction of the air stream blown out from the air blow-out port 21, and a display portion (ion monitor) 31D comprising an LED or the like for displaying occurrence of ions. The display portion 31D also serves as a filter sign. If dirt of filters is detected, the display portion 31D displays the face of the dirty, and then it does not display occurrence of ions unless the dirt of the filters is removed.

The plural LED arrays 31A to 31C indicate the direction of the air stream from the air blow-out port 21, and the ions flow while riding on air stream. Accordingly, each of the LED arrays 31A to 31C indicates the flow direction of the ions.

For example when the LED array 31A on the left-side column is turned on, the air stream containing ions is blow out leftwardly from the air blow-out port 21. When the LED array 31B on the center column is turned on, the air stream containing ions is blow out from the air blow-out port 21 to the center side. When the LED array 31C on the left-side column is turned on, the air stream containing ions is blow out rightwardly from the air blow-out port 21.

Accordingly, by merely viewing the turn-on state of the LED arrays 31A to 31C, a user can specify the flow direction of ions.

When the flow velocity of the air stream from the air blow-out port 21 is varied, the display mode of each of the LED arrays 31A to 31C is varied. If the generation amount of ions from the ion generating device 25 is substantially constant, the blow-out amount of ions is increased if the velocity of the air stream is increased.

For example, when a mode in which the LEDs constituting each of the LED arrays 31A to 31C are sequentially turned on/out with time lag in the direction from the uppermost LED to the lowermost LED is used as a display mode to indicate the flow direction of the air stream, the time lag is set to a smaller value as the velocity of the air stream increases.

According to the above embodiment, by merely viewing the display mode of each of the LED arrays 31A to 31C, the user can easily specify the amount (level) of flowing ions.

The present invention is not limited to the above embodiment, and various modifications may be made without departing from the subject matter of the present invention. For example, in the above embodiment, the

air blow-out port 21 is designed so as to be substantially elongated in a direction (for example, a rectangular shape or the like) in front view as shown in Fig. 2 and substantially tapered toward the inside of the main body (i.e., toward the cross-flow fan 7) in cross-sectional view as shown in Fig. 1.

However, the air blow-out port of the present invention is not limited to the above structure, and any shape may be adopted for the air blow-out port insofar as the ion generating device can be disposed at such a position that the location and movement of the air blow-out direction changing plate are not disturbed. That is, the narrowed upstream side of the air blow-out port 21 is not limited to the innermost portion of the air blow-out port 21. For example when the air blow-out port 21 is designed to be necked at some portion between the innermost portion and the outlet thereof, the narrowed upstream side corresponds to the portion concerned.

As described above, according to the present invention, the ion generating device never disturbs the air blow-out direction changing plate, and also even when the air blow-out direction changing plate is controlled to be oriented in any direction, the minus ions can be surely supplied to the room under air-conditioning while riding on the air stream from the air blow-out port.

Further, according to the present invention, the user can easily specify the flow direction and amount (level) of ions blown out from the air blow-out port while riding on the air stream.

WHAT IS CLAIMED IS

1. A wall mounted type air conditioner having an air blow-out port surrounded by a scroll portion and a tongue portion of the main body of the air conditioner, heat-exchanged air being supplied through said air blow-out port into a room, characterized by comprising:

an air blow-out direction changing plate which is located in said air blow-out port, has plural vertical plates extending in the short-side direction of the air blow-out port for freely distributing air stream in rightward and leftward directions and changing the air blow-out direction in accordance with a signal from a remote controller;

an ion generating device disposed in said air blow-out port for generating ions; and

a display device for displaying the flow direction and flow amount of the ions which are generated by said ion generating device and contained in air stream blown out from the air blow-out port.

2. The wall mounted type air conditioner as claimed in claim 1, wherein said air blow-out port has a tapered shape in cross-sectional view, and said narrowed upstream side of said air blow-out port corresponds to the tip portion of the tapered shape.

3. The wall mounted type air conditioner as claimed in claim 1, wherein said ion generating device comprises an ion generator having an ion generating needle connected to a lead wire, a holder for holding said ion generator and a fixing member for fixing said ion generating device at the narrowed upstream side of said air blow-out port, said ion generating needle emitting the ions by applying a predetermined voltage to said ion generating needle through said lead wire.

4. The wall mounted type air conditioner as claimed in claim 3, further comprising an earth member disposed in the neighborhood of said ion generating needle.

5. The wall mounted type air conditioner as claimed in claim 4, further comprising an intermediate insulator interposed between said ion generating needle and said earth member to increase the creepage distance of insulation.

6. The wall mounted type air conditioner as claimed in claim 4, wherein said ion generating needle is projected into an open space surrounded by an insulator, and said earth member is formed on the back surface of said insulator surrounding the open space.

7. The wall mounted type air conditioner as claimed in claim 1, wherein said display device comprises plural LED arrays.

8. The wall mounted type air conditioner as claimed in claim 1, wherein said display device is disposed on the front face of the main body of said air conditioner.

9. The wall mount type air conditioner as claimed in claim 1, wherein said air blow-out direction changing plate further comprises a lower horizontal plate extending in the longitudinal direction of the lower side of said air blow-out port and an upper horizontal plate extending in the longitudinal direction of the upper side of said air blow-out port.