

INDOOR AIR-CONDITIONING UNIT WITH IMPROVED AIR BLOW PERFORMANCE

FIELD OF INVENTION

- 5 The present invention relates generally to indoor air conditioners. More specifically, it relates to indoor air-conditioning units having improved air blow performance.

BACKGROUND

10 Air conditioners have become an essential requirement in houses and buildings not only in hot humid weather countries but also in cold weather countries to supply conditioned air into an interior space. Different types of air conditioners are available in the market, which include single unit air conditioners that house all their components in one unit, and split-system air conditioners that consist of an indoor and an outdoor unit. The air conditioner units typically includes a compressor for compressing an evaporated
15 refrigerant, a condenser for absorbing a heat from a compressed refrigerant and discharging the heat to an atmosphere so that the refrigerant can be liquefied, an expansion valve for reducing a pressure of the liquefied refrigerant and expanding the refrigerant, and an evaporator for absorbing a heat from an air of a room and evaporating the refrigerant. The devices are connected to each other by means of tubes which create a refrigerant
20 pathway. The refrigerant undergoes phase changes while being repeatedly circulated through the pipes connecting the devices of the air conditioner to each other, thereby absorbing the heat from the air in the room and discharging the heat to the atmosphere.

However, in the existing indoor air conditioning systems, the cold air discharge louvers are
25 placed on a front bottom portion of the casing of the indoor air conditioning unit. The cold air discharge louvers of the indoor units available in the market, guides the cool air in upwards and downward directions of the room. This may cause the cold air from the louvers to be directly falling on the persons sitting or standing in front of the indoor unit installed on the wall of the room. The direct blowing of cold air may sometimes be
30 uncomfortable to the persons inside the room. The present indoor units only allow the users to adjust the angle of the louvers or reduce the rate of delivery of cold air into the interior of the room through the louvers.

For conventional air conditioner designs, due to the limitation of the design and proper positioning of the adjustable vanes, which may be located at the bottom of the indoor unit, it is difficult to prevent direct blowing of cold air to the persons sitting or standing inside the building structure where the air conditioner is installed. The direct blowing of cold air through the adjustable vanes may cause discomfort to the persons inside the building structure.

SUMMARY

The present invention is an indoor air-conditioning unit having a discharge outlet at a front top position of a chassis body of the indoor air-conditioning unit. The front portion of the chassis body is provided with a slanting surface. The chassis body of the top discharge indoor air-conditioning unit further houses a first air guider and a second air guider to form a continuous curved air guider to guide the air blowing out of the top discharge outlet. The chassis body of the indoor air-conditioning unit further houses a stabilizer near the second air guider. The stabilizer is conveniently positioned near a cross flow fan arranged above the heat exchanger unit, to direct the cold airflow towards a discharge outlet. An adjustable vane is provided at the discharge outlet of the chassis body for controlling the cold airflow. The adjustable vane for guiding cold air from the heat exchange unit is positioned near the stabilizer to effectively deliver the cold air from the heat exchange unit to the top area of the interior of the building structure. The downstream of the second air guider is positioned in front of the downstream of the stabilizer to improve the cold air blowing performance of the indoor air-conditioning unit to the interior of the building structure. The downstream of the second air guider projecting out from the vertical plane of the discharge outlet improves the cold air blowing performance by a diffuser effect. The adjustable vane can be adjusted to horizontal direction or other angles to direct and control the cold air flow. The adjustable vane aligned with the stabilizer provides effective blowing performance by increasing the cold air throw distance to reach the far interior of the building structure.

These and other objects, features and advantages of the invention will be fully understood from the following detailed description of the invention and in view of the accompanying drawings.

BRIEF DESCRIPTIONS OF THE DRAWINGS

FIG. 1 is a cross sectional illustrative view of an indoor air-conditioning unit, according to a preferred embodiment of the present invention;

5 **FIG. 2** illustrates a cross sectional illustrative view of the indoor air-conditioning unit showing a position of the adjustable vane for maximum airflow, according to a preferred embodiment of the present invention; and

FIG. 3 shows a cold air pathway of the indoor air-conditioning unit, according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION

In the following detailed description, a reference is made to the accompanying drawings that form a part hereof, and in which the specific embodiments that may be practiced is shown by way of illustration. These embodiments are described in sufficient detail to enable those skilled in the art to practice the embodiments and it is to be understood that the logical, mechanical and other changes may be made without departing from the scope of the embodiments. The following detailed description is therefore not to be taken in a limiting sense.

20 **FIG. 1** is a cross sectional illustrative view of an indoor air-conditioning unit (100), according to a preferred embodiment of the present invention. The indoor air-conditioning unit (100) for delivering cool air from a top of a front portion when installed on a wall structure of an interior of a building structure has a chassis body (102), a discharge outlet (118), a first air guider (104), a second air guider (106), an air filter (120), a cross flow fan (122) and an adjustable vane (110). The chassis body (102) has a front portion (124), which is provided with a slanting surface. The chassis body (102) of the indoor air-conditioning unit (100) includes a number of air suction inlets and the discharge outlet (118). The discharge outlet (118) is positioned on the top of the front portion (124) to blow cold air out of the indoor air-conditioning unit (100). The discharge outlet (118) further includes a stabilizer (108) at the bottom for direction the cold airflow to the surroundings. In other words, the discharge outlet (118) is an opening formed at the downstream of the second air guider (106) and at the downstream of the stabilizer (108).

The first air guider (104) and the second air guider (106) are arranged in form of a continuous air guider within the chassis body (102) of the indoor air-conditioning unit (100) such that the downstream of the second air guider (106) lies at the top of the discharge outlet (118). The first air guider (104) and the second air guider (106) are arranged within the chassis body (102) in a curved shape to guide the air entering the chassis body (102) through the number of air suction inlets provided on the chassis body (102) and to guide the air blowing out of the discharge outlet (118). An air flow circuit within the chassis body (102) of the indoor air-conditioning unit (100) leads to a heat exchange unit (112) through the air filter (120). The air filter (120) removes any dirt particles present in the air sucked in through the air suction inlets of the chassis body (102). In a preferred embodiment of the present invention, the downstream of the second air guider (106) is projecting out from a vertical plane of the downstream of the stabilizer (108) for improving the cold air blowing performance by a diffuser effect.

The cross flow fan (122) is arranged within the chassis body (102) for blowing out the cold air. The chassis body (102) of the indoor air-conditioning unit (100) further houses the stabilizer (108) near the discharge outlet (118) and the cross flow fan (122). The stabilizer (108) is conveniently positioned near the cross flow fan (122) arranged above the heat exchanger unit (112), which is formed by a front heat exchanger (114) and a rear heat exchanger (116) arranged in form of V-shape, to direct the cold air flow towards a cold air outlet. The adjustable vane (110) for guiding cold air from the heat exchange unit (112) is positioned at the discharge outlet (118). The adjustable vane (110) provided at the discharge outlet (118) of the chassis body (102) controls the cold airflow from the indoor air-conditioning unit (100) to the interior of the building structure.

The adjustable vane (110) is horizontal in direction and is hinged to the chassis body (102) such that it opens at the downstream of the stabilizer (108) to direct and control the cold air flow from the discharge outlet (118). The adjustable vane (110) is attached to an electric motor and a controller and the position of the adjustable vane (110) can be adjusted using a remote controller provided with the indoor air-conditioning unit (100). The controller associated with the adjustable vane (110) can also perform automatic control of the position of the adjustable vane (110) based on the settings on the indoor air-conditioning unit (100).

FIG. 2 illustrates a cross sectional illustrative view of the indoor air-conditioning unit (100) showing a position of the adjustable vane (110) for maximum airflow, according to a preferred embodiment of the present invention. The position of the adjustable vane (110) can be controlled between a fully open position and a fully closed position using the controller controlling the electric motor associated with the adjustable vane (110). The position of the adjustable vane (110) determines the direction in which the cold air is released into the interior of the building structure. The adjustable vane (110) for guiding cold air from the heat exchange unit (112) is positioned near the stabilizer (108) to effectively deliver the cold air from the heat exchanger unit (112) to the top area of the interior of the building structure.

The downstream of the second air guider (106) arranged inside the chassis body (102) is positioned in front of the downstream of the stabilizer (108) to improve the cold air blowing performance of the indoor air-conditioning unit (100) to the interior of the building structure. The downstream of the second air guider (106) projecting out from the vertical plane of the stabilizer (108) improve the cold air blowing performance by a diffuser effect. Diffuser effect is imparted, mostly by way of design, to control the characteristics of a fluid at the entrance to a thermodynamic open system. Diffusers are used to slow the fluid's velocity and to enhance its mixing into the surrounding fluid.

The interior space of the room or the building structure serves as a thermodynamic open system into which the cold air is about to enter. Due to the position of the downstream of the second air guider (106) extending beyond the downstream of the stabilizer (108), the cold air blowing out from the cold-air discharge outlet (118) experiences enhanced diffuser effect and mixes effectively and gradually into the surrounding air.

The adjustable vane (110) is horizontal in direction and is automatically adjustable to direct and control the flow of the cold air. The adjustable vane (110) when aligned with the stabilizer (108) provides effective blowing performance by increasing the cold air throw-distance to reach far areas of the interior of the building structure.

The chassis body (102) of the indoor air-conditioning unit (100) can be installed to a vertical wall structure of the interior of a building structure using one or more attaching

plates and associated mechanical attachment means. When attached on the vertical wall, the adjustable vane (110) of the chassis body (102) faces the front portion of the chassis body (102), towards the top of the interior of the building structure. The downstream of the second air guider (106) projects out from the vertical plane of the discharge outlet (118) such that the downstream of the second air guider (106) extends beyond the downstream of the stabilizer (108), which improves the cold air blowing performance by a diffuser effect. Further a user can manually adjust the position of the adjustable vane (110) for increasing the cold airflow into the interior of the building structure using a remote controller. For obtaining maximum airflow, the adjustable vane (110) is adjusted to align with the position of the stabilizer (108). In some instances, the adjustable vane (110) automatically adjusts its position to align with the position of the stabilizer (108), during operation, in order to improve the air blow performance, which in turn increases the cold air throw distance for reaching farther corners of the interior of the building structure.

FIG. 3 shows a cold air pathway of the indoor air-conditioning unit (100), according to a preferred embodiment of the present invention. The cold air received from the heat exchanger units (112) are directed by the first air guider (104) and the second air guider (106) positioned within the chassis body (102) as a continuous air guider to the cold air outlet on top of the chassis body (102). The cross flow fan (122) arranged above the heat exchanger unit (112), i.e. the front and rear heat exchangers (114, 116), and below the first air guider (104) and the second air guider (106) blows out the cold air through the discharge outlet (118) on the top of the front portion the chassis body (102).

The downstream of the second air guider (106) positioned in front of the downstream of the stabilizer (108) improve the blowing performance of the cold air through the discharge outlet (118) provided on the top of the front portion of the chassis body (102). The angle of the adjustable vane (110) with respect to the position of the stabilizer (108) controls the amount and direction of airflow into the interior of the building structure.

For obtaining optimal airflow into the interior of the building structure, the adjustable vane (110) is aligned with the position of the stabilizer (108) and provides effective cooling of the interior of the building structure. The cold air is blown out of the cold air outlet on top of the chassis body (102) do not cause discomfort to the persons inside the interior of the

building structure as the direction of the cold airflow is towards the top of the interior of the building structure and at the same time ensures optimal cold air flow and cooling of the interior of the building structure.

5 The foregoing description of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the
10 disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the appended claims.

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Although the embodiments herein are described with various specific embodiments, it will be obvious for a person skilled in the art to practice the invention with modifications. However, all such modifications are deemed to be within the scope of the claims.

CLAIMS

1. An indoor air-conditioning unit (100) comprising:
a chassis body (102) having a discharge outlet (118) at top of a front portion of the
5 chassis body (102);
a second air guider (106) positioned at the top of the discharge outlet (118)
receiving air through a first air guider (104) that is positioned within the
chassis body (102), to guide the air blowing out of the discharge outlet
(118); and
10 a stabilizer (108) provided at bottom of the discharge outlet (118);
characterized in that downstream of the second air guider (106) is
positioned in front of downstream of the stabilizer (108).
2. The indoor air-conditioning unit (100) of claim 1 wherein chassis body (102)
15 includes an adjustable vane (110) hinged to the chassis body (102) such that it opens at the
downstream of the stabilizer (108).
3. The indoor air-conditioning unit (100) of claim 1 wherein the first air guider (104)
and the second air guider (106) are arranged in a continuous manner.
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4. The indoor air-conditioning unit (100) of claim 1 wherein an angle of the
adjustable vane (110) with the stabilizer (108) is adjustable during operation.
5. The indoor air-conditioning unit (100) of claim 1 wherein the adjustable vane (110)
25 is positioned to align with the stabilizer (108).
6. The indoor air-conditioning unit (100) of claim 1 wherein the downstream of the
second air guider (106) extends beyond the vertical plane of the discharge outlet (118).