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(54) AIR CONDITIONER AND METHOD FOR CONTROLLING THE SAME

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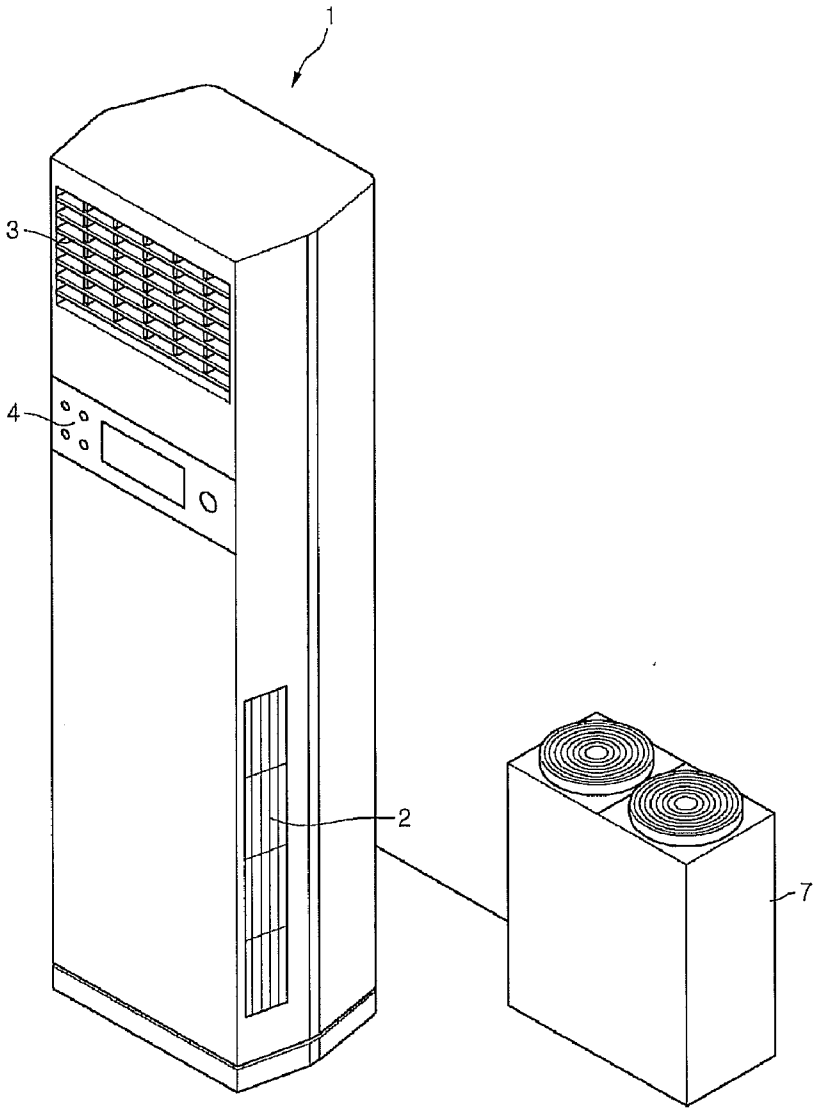
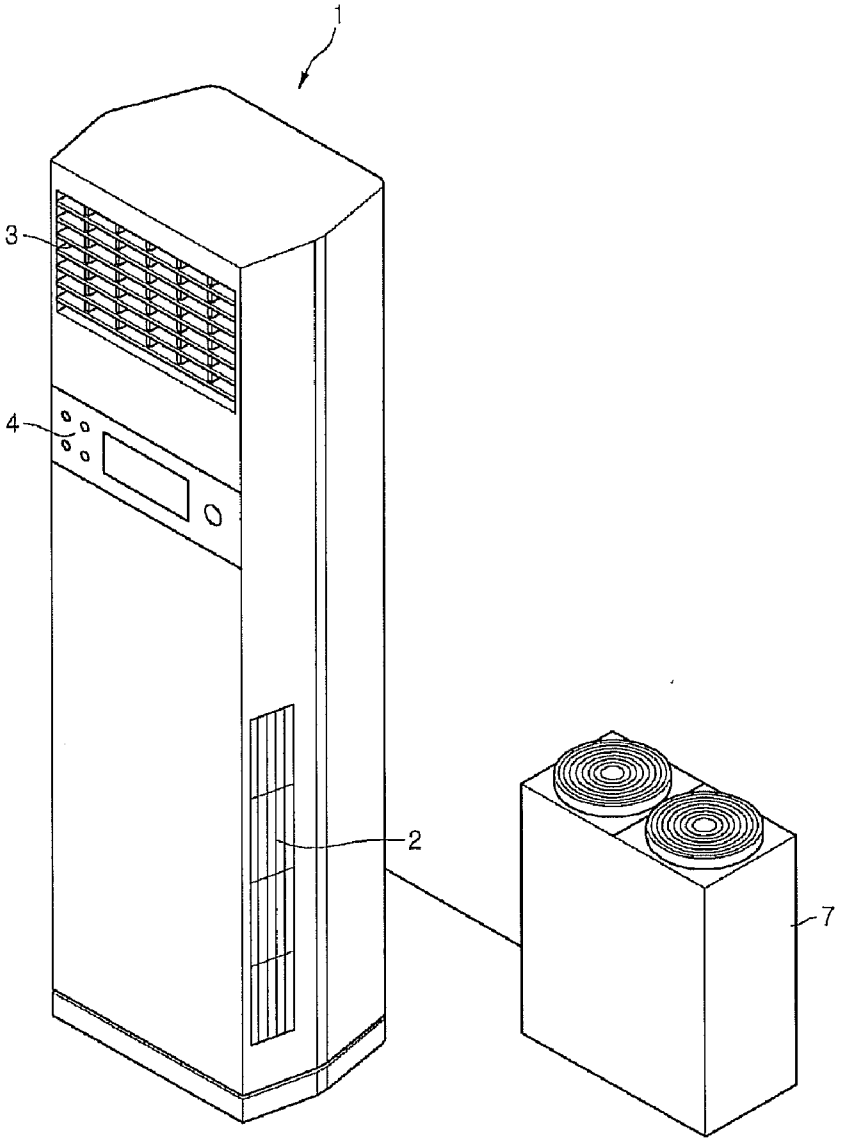
(57) **ABSTRACT**

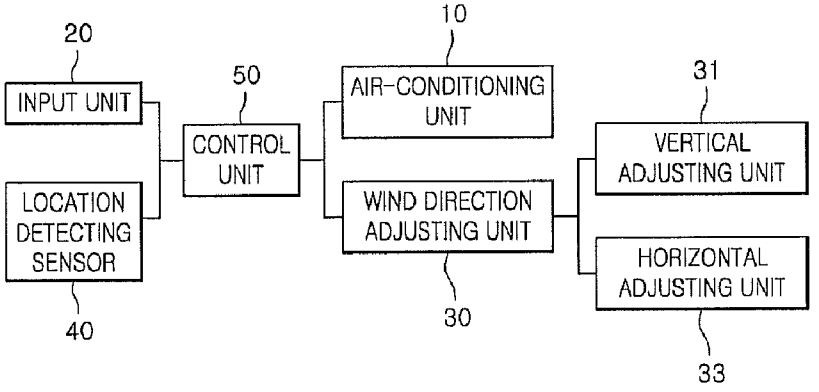
Provided are an air conditioner and a method for controlling the air conditioner. The air conditioner includes an input unit receiving an input air-conditioning temperature for an indoor space, an air-conditioning unit generating a cool or hot wind having the input air-conditioning temperature, and a location detecting unit for detecting a user s location in the indoor space. A direction and temperature of the cool or hot wind generated by the air-conditioning unit are adjusted in accordance with whether a user is detected in the indoor space by the location detecting unit.



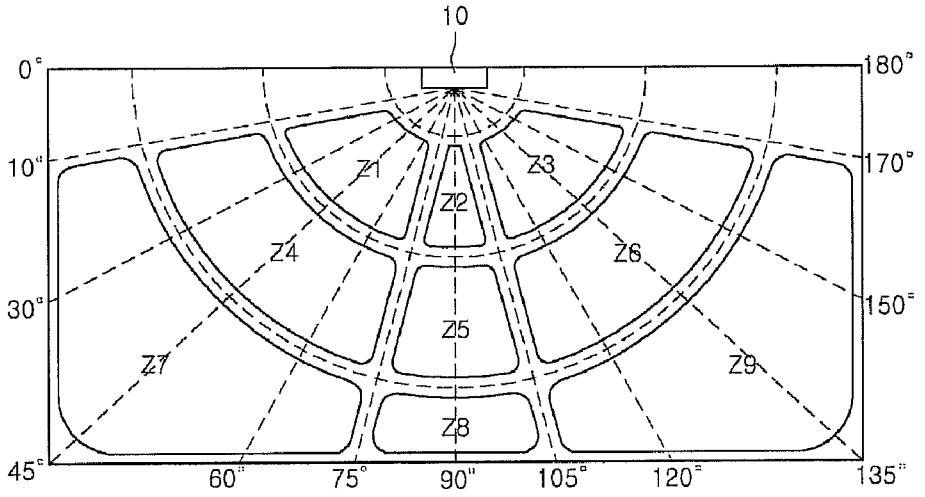
[Fig. 1]


1
3
4
2
7

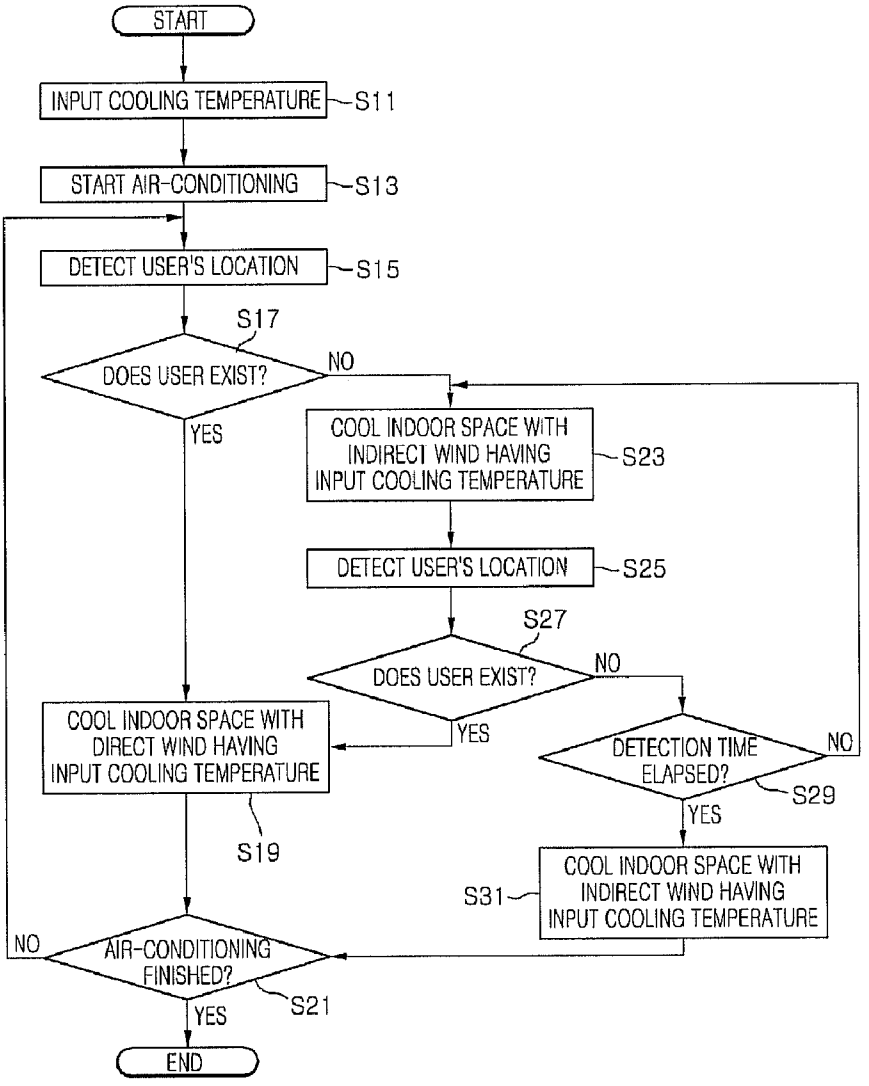
[Fig. 2]


20
INPUT UNIT
LOCATION DETECTING SENSOR
40
50
CONTROL UNIT
10
AIR-CONDITIONING UNIT
WIND DIRECTION ADJUSTING UNIT
30
31
VERTICAL ADJUSTING UNIT
HORIZONTAL ADJUSTING UNIT
33

[Fig. 3]


10
0°
180°
10°
170°
30°
150°
45°
60°
75°
90°
105°
120°
135°
Z1
Z2
Z3
Z4
Z5
Z6
Z7
Z8
Z9

[Fig. 4]


START
INPUT COOLING TEMPERATURE
S11
START AIR-CONDITIONING
S13
DETECT USER'S LOCATION
S15
S17
DOES USER EXIST?
NO
YES
COOL INDOOR SPACE WITH INDIRECT WIND HAVING INPUT COOLING TEMPERATURE
S23
DETECT USER'S LOCATION
S25
S27
DOES USER EXIST?
NO
YES
COOL INDOOR SPACE WITH DIRECT WIND HAVING INPUT COOLING TEMPERATURE
S19
DETECTION TIME ELAPSED?
NO
S29
YES
S31
COOL INDOOR SPACE WITH INDIRECT WIND HAVING INPUT COOLING TEMPERATURE
NO
AIR-CONDITIONING FINISHED?
S21
YES
END

AIR CONDITIONER AND METHOD FOR CONTROLLING THE SAME

TECHNICAL FIELD

[0001] The present disclosure relates to an air conditioner and, more particularly, to an air conditioner and a method for controlling the air conditioner.

BACKGROUND ART

[0002] An air conditioner is an appliance that cools or heats an indoor space. The air conditioner includes a compressor, an expanding device, an indoor heat exchanger, and an outdoor heat exchanger that constitute a heat-exchange cycle. The indoor space is cooled or heated by the heat exchange between a refrigerant and indoor or outdoor air passing through the indoor and outdoor heat exchangers.

[0003] Referring to FIG. **1**, an indoor heat exchanger for air-conditioning an indoor space is provided in an indoor unit **1**. The indoor unit **1** is provided with an air inlet **2** for introducing indoor air and an air outlet **3** for discharging the air introduced through the air inlet **2** and heat-exchanging with the indoor heat exchanger. An input unit **4** for receiving manipulation signals for the air-conditioning of the indoor space is provided in the indoor unit **1**. Further, the air outlet **2** is provided with vertical and horizontal adjusting units for adjusting a discharging direction of the air discharged to the indoor space.

[0004] Meanwhile, components for air-conditioning the indoor space, such as a compressor and an outdoor heat exchanger, are provided in the outdoor unit **7**.

DISCLOSURE OF INVENTION

Solution to Problem

[0005] Embodiments provide an air conditioner and a method for controlling the air conditioner, which can economically control air in an indoor space in accordance with a location of a user.

[0006] In one embodiment, an air conditioner includes: an input unit receiving an input air-conditioning temperature for an indoor space; an air-conditioning unit generating a cool or hot wind having the input air-conditioning temperature; and a location detecting unit for detecting a user's location in the indoor space, wherein a direction and temperature of the cool or hot wind generated by the air-conditioning unit are adjusted in accordance with whether a user is detected in the indoor space and the user's location by the location detecting unit.

[0007] In another embodiment, an air conditioner includes: an input unit receiving an input cooling or heating temperature for an indoor space; an air-conditioning unit generating a cool wind having the input cooling temperature or a hot wind having the input heating temperature; a wind direction adjusting unit adjusting a direction of the cool or hot wind generated by the air-conditioning unit; a location detecting unit detecting a user located in one of a plurality of air-conditioning sections defined by dividing the indoor space; and a control unit that controls the wind direction adjusting unit such that the cool or hot wind is generated as a direct or indirect wind and corrects the input cooling and heating temperatures in accordance with whether the user exits in one of the air-conditioning sections, which is determined by a user's location detected by the location detecting unit, and a time for which the user exists in one of the air-conditioning sections.

[0008] In still another embodiment, a method for controlling an air conditioner comprising an air-conditioning unit generating a cool or hot wind having an input air-conditioning temperature for an indoor space; a wind direction adjusting unit for adjusting a direction of the cool or hot wind generated by the air-conditioning unit, a location detecting unit for detecting a user's location in the indoor space, and a control unit controlling the air-conditioning unit is provided, the method including: determining if the location detecting unit detects the user in the indoor space; allowing the control unit to determine if the user exists in the indoor space in accordance with whether the user is detected in the indoor unit by the location detecting unit; and allowing the control unit to control the air-conditioning unit and the wind direction adjusting unit such that a direction of the cool or hot wind is adjusted in accordance with whether the user exits in the indoor space.

Advantageous Effects of Invention

[0009] According to the embodiments, the indoor space can be more pleasantly air-conditioned.

BRIEF DESCRIPTION OF DRAWINGS

[0010] FIG. **1** is a view of a typical air conditioner.

[0011] FIG. **2** is a block diagram of an air conditioner according to an embodiment.

[0012] FIG. **3** is a view illustrating air-conditioning sections according to an embodiment.

[0013] FIG. **4** is a flowchart illustrating an air-conditioning process by an air conditioner controlling method of an embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

[0015] Reference will now be made in detail to the embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings.

[0016] FIG. **2** is a block diagram of an air conditioner according to an embodiment and FIG. **3** is a view illustrating air-conditioning sections according to an embodiment.

[0017] Referring first to FIG. **2**, an air conditioner includes an air-conditioning unit **10**, an input unit **20**, a wind direction adjusting unit **30**, a location detecting unit **40**, and a control unit **50**. The air-conditioning unit functions to control indoor air. The input unit **20** receives manipulation signals of the air-conditioning unit **10** and the wind direction adjusting unit **30** adjusts directions of cool winds and hot winds generated from the air conditioning-unit **10**. The location detecting unit **40** detects a location of a user (i.e., a learner) located in the indoor space. In addition, the control unit **50** controls the air-conditioning unit **10** and the wind adjusting unit **30** according to the signals input to the input unit **20** and the learner's location detected by the location detecting unit **40**.

[0018] In more detail, the air-conditioning unit **10** includes a variety of components for controlling the indoor air, i.e., generating the cool and hot winds. That is, the air-conditioning unit **10** includes components constituting a heat exchange cycle, such as a compressor, a condenser, an expansion unit, and an evaporating unit. The air-conditioning unit **10** includes an indoor unit and an outdoor unit, which may be separately provided or integrated with each other.

[0019] The input unit **20** receives a manipulation signal for setting cooling and heating temperatures and a manipulation signal for an amount of cool and hot winds. Particularly, the input unit **20** receives input air-conditioning temperatures such as an input cooling temperature and an input heating temperature.

[0020] The wind direction adjusting unit **30** includes a vertical adjusting unit **31** and a horizontal adjusting unit **33**. The vertical adjusting unit **31** adjusts a vertical direction of the cool and hot winds generated from the air-conditioning unit **10**. Further, the horizontal adjusting unit **33** adjusts a horizontal direction of the cool and hot winds. For example, veins may be used as the vertical adjusting unit **31** and the louvers may be used as the horizontal adjusting unit **33**.

[0021] The location detecting unit **40** may be installed at, for example, a side of the air-conditioning unit **10**. Accordingly, when the air-conditioning unit **10** includes the indoor and outdoor units, the location detecting unit **40** may be installed in the indoor unit. Needless to say, the location detecting unit **40** may be installed at other places rather than the air-conditioning unit **10**. An infrared sensor may be used as the location detecting unit **40**.

[0022] In this embodiment, the location detecting unit **40** determines if the user is located in one of air-conditioning sections Z**1** to Z**9** that are defined by dividing the indoor space in accordance with a distance from the air-conditioning unit **10** and an angle with respect to the air-conditioning unit **10**. Referring to FIG. **3**, the air-conditioning sections Z**1** to Z**9** are defined by dividing the indoor space along a plurality of imaginary latitude lines that are spaced apart from each other by predetermined radii from a center of the air-conditioning unit **10** and extend in a circumferential direction and longitudinal lines extending in a radial direction and spaced apart from each other by predetermined central angles with respect to the center of the air-conditioning unit **10**. In FIG. **3**, the indoor space is divided into nine air-conditioning sections Z**1** to Z**9**. However, the present invention is not limited to this.

[0023] Meanwhile, the control unit **50** controls such that the air-conditioning unit **10** cools or heats the indoor space in response to the input cooling and heat temperatures input to the input unit **20**. Especially, the control unit **50** determines if the user exists in the indoor space, i.e., in one of the air-conditioning sections Z**1** to Z**9** in accordance with the user's location detected by the location detecting unit **40**. The control unit **50** adjusts the cooling and hot winds as direct or indirect winds in accordance with whether the user exists in one of the air-conditioning sections Z**1** to Z**9**. In addition, the control unit **50** corrects the input cooling and heating temperatures when the user exists in one of the air-conditioning sections Z**1** to Z**9** for a predetermined time or more.

[0024] That is, when it is determined that the user exists in the indoor space, the control unit **50** controls the wind direction adjusting unit **30** such that the direct wind having the input cooling or heating temperature can be directly directed to one of the air-conditioning sections Z**1** to Z**9** where the user is detected by the location detecting unit **40**. However, when it is determined that the user does not exist in the indoor space, the control unit **40** controls the wind direction adjusting unit **30** such that the indirect wind having the input cooling and heating temperatures can be indirectly directed toward at least three of the air-conditioning sections Z**1** to Z**9**.

[0025] In addition, when it is detected that the user exits in one of the air-conditioning sections Z**1** to Z**9** for the predetermined time or more, the control unit **50** corrects the input cooling and heating temperatures into preset corrected cooling and heating temperatures. Further, the control unit **50** controls the wind direction adjusting unit **30** such that the hot wind having the corrected heating temperature or the cool wind having the corrected heating temperature is directed toward at least three of the air-conditioning sections Z**1** to Z**9** as the indirect wind. At this point, the corrected cooling temperature is set to be higher than the input cooling temperature by 2° C. and the corrected heating temperature is set to be lower than the input heating temperature by 2° C.

[0026] The following will describe a method for controlling the air condition according to an embodiment in more detail.

[0027] FIG. **4** is a flowchart illustrating an air-conditioning process by an air conditioner controlling method of an embodiment. FIG. **4** illustrates a cooling mode case. However, the present invention can be identically applied to a heat mode case.

[0028] Referring to FIG. **4**, the input cooling temperature is first input to the input the unit **20** (S**11**). Needless to say, other manipulation signals such as a wind volume may be further input to the input unit **20**.

[0029] The air-conditioning unit **10** starts the air-conditioning with the input cooling temperature input to the input unit **20** (S**13**). That is, the air-conditioning unit **10** generates a cool wind having the input cooling temperature and sends the cool wind to the indoor space.

[0030] Next, the location detecting unit **40** detects if the user is located in the indoor space (S**15**). In more detail, the location detecting unit **40** detects if the user exists in one of the air-conditioning sections Z**1** to Z**9**.

[0031] Meanwhile, the control unit **50** determines if the user exists in one of the air-conditioning sections Z**1** and Z**9** or not in accordance with the user's location detected by the location detecting unit **40** (S**17**). The control unit controls the cool wind generated by the air-conditioning unit **10** as the direct or indirect wind in accordance with the existence of the user in one of the air-conditioning sections Z**1** to Z**9** or corrects the input cooling temperature into the preset corrected cooling temperature.

[0032] In more detail, when it is determined that the user exists in one of the air-conditioning sections Z**1** to Z**9**, the control unit **50** controls the wind direction adjusting unit **30** such that the cool wind having the input cooling temperature and generated from the air-conditioning unit **10** is directly directed to one of the air-conditioning sections Z**1** to Z**9** where the user exits (S**19**). Therefore, the user existing in one of the air-conditioning sections Z**1** to Z**9** can feel the more comfort.

[0033] Next, the control unit **50** determines if the air-conditioning is finished (S**21**). It can be determined whether the air-conditioning is finished in accordance with the finish of the air-conditioning time that is set by a manipulation signal input to the input unit **20** or whether a manipulation signal for finishing the air-conditioning is put by the user. When it is determined that the air-conditioning is not finished, Step **15** and the followings are performed.

[0034] Meanwhile, when it is determined in Step **17** that the user does not exist in one of the air-conditioning sections Z**1** to Z**9**, the control unit **50** controls the wind direction adjusting unit **30** such that the cool wind having the input cooling temperature and generated by the air-conditioning unit **10** is formed in the indirect wind directing toward at least three of the air-conditioning sections Z**1** to Z**9** (S**23**). At this point, the control unit **50** may control the wind direction adjusting unit **30** such that the indirect wind is directed to substantially all of the air-conditioning sections Z**1** to Z**9**.

[0035] Further, in a state where the cooling mode is realized by the indirect wind 그리고 in Step **23**, the location detecting unit **40** detects the user's location (S**25**). In addition, the control unit **50** determines if the user exists in the indoor space in accordance with the user's location detected by the location detecting unit **40** S**27**.

[0036] When it is determined that the user exits in the indoor space, the control unit **50**, Step **19** and the following steps are performed. However, when it is determined that the user does not exist in the indoor space, the control unit determines if a preset detection time has elapsed (S**29**). When it is determined that the preset detection time has elapsed, the control unit **50** corrects the input cooling temperature into the preset corrected cooling temperature and controls the wind direction adjusting unit **30** such that the air-conditioning sections Z**1** to Z**9** are cooled according to the preset corrected cooling temperature (S**31**). However, when it is determined that the preset detection time has not elapsed, Step **23** and the following steps are preformed.

[0037] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

INDUSTRIAL APPLICABILITY

[0038] According to the above-described air conditioner and method for controlling the same of the embodiments, the following effects can be expected.

[0039] The cool and hot winds generated by the air-conditioning unit are formed in the direct or indirect wind in accordance with whether the user exists in the indoor space. Therefore, the user's comfort can be enhanced.

[0040] Further, the input cooling or heating temperature is corrected when it is detected that the user does not exist in the indoor space for the preset time. Therefore, when the user does not exist in the indoor space, the cooling or heating load can be substantially reduced and thus the cooling and heating can be more economically realized.

1. An air conditioner comprising:
- an input unit receiving an input air-conditioning temperature for an indoor space;
- an air-conditioning unit generating a cool or hot wind having the input air-conditioning temperature; and
- a location detecting unit for detecting a user's location in the indoor space,
- wherein a direction and temperature of the cool or hot wind generated by the air-conditioning unit are adjusted in accordance with whether a user is detected in the indoor space and the user's location by the location detecting unit.

2. The air conditioner according to claim **1**, wherein the location detecting unit detects whether the user is located in one of a plurality of air-conditioning sections that are defined by dividing the indoor space.

3. The air conditioner according to claim **2**, wherein the air-conditioning sections are defined by dividing the indoor space according to a distance from the air-conditioning unit and an angle with reference to a center of the air-conditioning unit.

4. The air conditioner according to claim **2**, wherein, the air-conditioning unit generates the cool or hot wind as a direct wind and directs the direct wind to one of the air-conditioning sections where the user is located, when the user is detected in one of the air-conditioning sections by the location detecting unit.

5. The air conditioner according to claim **2**, wherein, except for a case where the user is detected in one of the air-conditioning sections, the air-conditioning unit generates the cool or hot wind as an indirect wind and directs the indirect wind to at least three of the air-conditioning sections.

6. The air conditioner according to claim **5**, wherein, in a state where the cool or hot wind having the input air-conditioning temperature is formed as the indirect wind, except for a case where the user is detected in one of the air-conditioning sections before a preset detection time has elapsed, the air-conditioning unit generates the cool wind as the indirect wind having a temperature higher than the input air-conditioning temperature or the hot wind as the indirect wind having a temperature lower than the input air-conditioning temperature.

7. An air conditioner comprising:
- an input unit receiving an input cooling or heating temperature for an indoor space;
- an air-conditioning unit generating a cool wind having the input cooling temperature or a hot wind having the input heating temperature;
- a wind direction adjusting unit adjusting a direction of the cool or hot wind generated by the air-conditioning unit;
- a location detecting unit detecting a user located in one of a plurality of air-conditioning sections defined by dividing the indoor space; and
- a control unit that controls the wind direction adjusting unit such that the cool or hot wind is generated as a direct or indirect wind and corrects the input cooling and heating temperatures in accordance with whether the user exits in one of the air-conditioning sections, which is determined by a user's location detected by the location detecting unit, and a time for which the user exists in one of the air-conditioning sections or does not exit in any of the air-conditioning sections.

8. The air conditioner according to claim **7**, wherein the air-conditioning sections are defined by dividing the indoor space along a plurality of imaginary latitude lines that are spaced apart from each other by predetermined radii from a center of the air-conditioning unit and extend in a circumferential direction and longitudinal lines extending in a radial direction and spaced apart from each other by predetermined central angles with respect to the center of the air-conditioning unit.

9. The air conditioner according to claim **7**, wherein the wind direction adjusting unit comprises:
- a vertical adjusting unit that adjusts a direction of the cool or hot wind such that the cool or hot wind is directed to one of the air-conditioning sections in accordance with a distance from the air-conditioning unit; and
- a horizontal adjusting unit that adjusts a direction of the cool or hot wind such that the cool or hot wind is directed to one of the air-conditioning sections in accordance with an angle with the air-conditioning unit.

10. The air conditioner according to claim **7**, wherein the location detecting unit is an infrared sensor installed at the air-conditioning unit.

11. The air conditioner according to claim **7**, wherein, when it is determined that the user does not exist in any one of the air-conditioning sections, the control unit controls the wind direction adjusting unit such that the cool wind having the input cooling temperature or the hot wind having the input heating temperature are generated as an indirect wind directing toward at least three of the air-conditioning sections.

12. The air conditioner according to claim **7**, wherein, when the user does not exist in any one of the air-conditioning unit for a preset detection time or more, the control unit controls the wind direction adjusting unit such that the cool wind having a corrected cooling temperature or the hot wind having a corrected heating temperature is generated as the indirect wind directing at least three of the air-conditioning sections.

13. The air conditioner according to claim **12**, wherein, when the user does not exist in any one of the air-conditioning unit for the detection time or more, the control unit corrects the input cooling or heating temperature.

14. The air conditioner according to claim **13**, wherein the corrected cooling temperature is greater than the input cooling temperature by a temperature that is equal to or greater than 1° C. and less than 5° C.; and the corrected heating temperature is less than the input heating temperature that is equal to or greater than 1° C. and less than 5° C.

15. The air conditioner according to claim **13**, wherein the detection time is 10-30 minutes.

16. A method for controlling an air conditioner comprising an air-conditioning unit generating a cool or hot wind having an input air-conditioning temperature for an indoor space; a wind direction adjusting unit for adjusting a direction of the cool or hot wind generated by the air-conditioning unit, a location detecting unit for detecting a user's location in the indoor space, and a control unit controlling the air-conditioning unit, the method comprising:

determining if the location detecting unit detects the user in the indoor space;

allowing the control unit to determine if the user exists in the indoor space in accordance with whether the user is detected in the indoor unit by the location detecting unit; and

allowing the control unit to control the air-conditioning unit and the wind direction adjusting unit such that a direction of the cool or hot wind is adjusted in accordance with whether the user exits in the indoor space.

17. The method according to claim **16**, wherein the location detecting unit determines if the user is located in one of air-conditioning sections that are defined by dividing the indoor space.

18. The method according to claim **16**, wherein, when it is determined that the user exists in one of the air-conditioning unit, the cool or hot wind is generated as a direct wind having the input air-conditioning temperature and directing toward one of the air-conditioning sections where the user is located and, when it is determined that the user does not exist in any one of the air-conditioning sections, the cool or hot wind is generated as an indirect wind having the input air-conditioning temperature and directing toward at least three of the air-conditioning sections.

19. The method according to claim **18**, wherein, in a state where the cool or hot wind is generated as the indirect wind having the input air-conditioning temperature and directing toward at least three of the air-conditioning sections, when the user does not exist in any one of the air-conditioning sections for a preset detection time or more, the cool or hot wind having a corrected air-conditioning temperature is generated as the indirect wind directing toward at least three of the air-conditioning sections.

20. The method according to claim **19**, wherein the corrected air-conditioning temperature of the cool wind is greater than the input air-conditioning temperature by 2° C. and the corrected air-conditioning temperature of the hot wind is less than the input air-conditioning temperature by 2° C.

* * * * *