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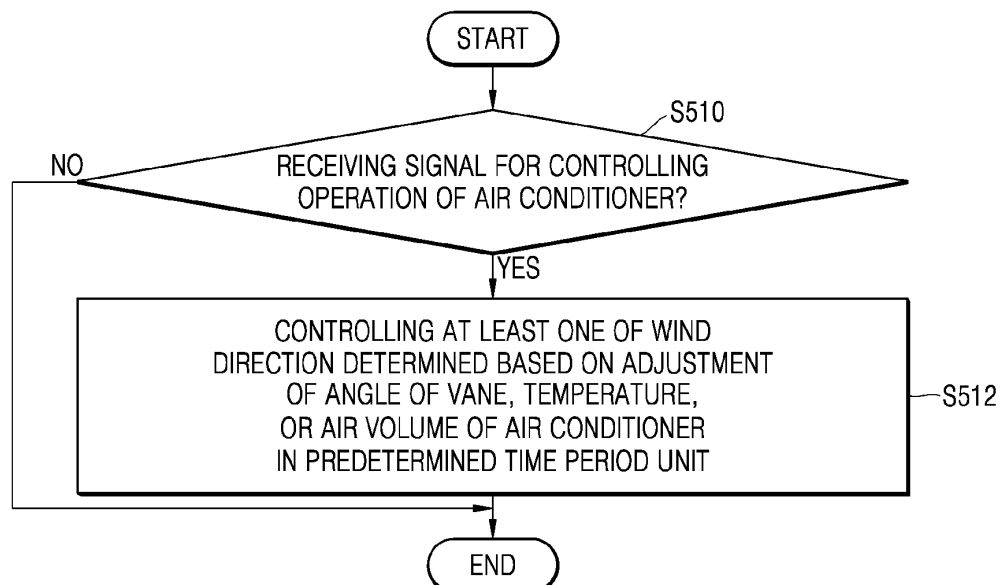
(54) **AIR CONDITIONER AND METHOD FOR CONTROLLING THE SAME**

(57) Provided are an air conditioner and a method for controlling the air conditioner.

According to an embodiment of the present disclosure, the air conditioner may include a communicator, an air volume controller, a wind direction controller, and at least one processor. The at least one processor is electrically connected to the communicator, the air volume

controller, and the wind direction controller and may control at least one of a wind direction determined based on adjustment of an angle of at least one vane, a temperature, and air volume of the air conditioner in a predetermined time period unit based on receiving a signal for controlling the operation of the air conditioner.

FIG. 5



Description

BACKGROUND

1. Field of the Disclosure

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

2. Description of Related Art

[0002] Examples of air conditioner may include a stand-type air conditioner, a wall-mounted air conditioner, and a ceiling-type air conditioner. The air conditioner may include a vane to control a wind direction and a refrigeration cycle device to perform cooling/heating. In addition, the air conditioner may supply air to an indoor space based on a temperature set by a user and automatic rotation of vane.

[0003] A first related art document (e.g., JP Patent Publication No. 2011-284705) relates to an air conditioner configured to discharge air toward a space without occupants and repeatedly perform a swing operation temporarily toward a space with occupants by swinging a vertical wind direction plate. The air conditioner does not consider changing a temperature, air volume, and a wind direction.

[0004] In addition, a second related art document (e.g., JP Patent Publication No. 2016-517789) relates to an air conditioning ventilation system to detect a number of occupants in the room and be optimally operated based on the detected number of occupants. The air conditioning ventilation system does not consider changing a temperature, air volume, and a wind direction according to occupant's conditions.

[0005] In addition, a third related art document (e.g., JP Patent Publication No. 2014-084828) relates to an air conditioner to change an airflow based on a position of the indoor wall and a person's position. The air conditioner does not consider changing a temperature, air volume, and a wind direction according to the occupant's conditions.

[0006] Therefore, the temperature, the air volume, and the wind direction of the air conditioner may be automatically adjusted in accordance with the user's current situation to provide user comfort.

[Related Art Document]

[Patent Document]

[0007]

(Patent Document 1) JP Patent Publication No. 2011-284705

(Patent Document 2) JP Patent Publication No. 2016-517789

(Patent Document 3) JP Patent Publication No. 2014-084828

SUMMARY OF THE DISCLOSURE

[0008] The present disclosure is to automatically control at least one of a set temperature, air volume, or a wind direction of an air conditioner.

[0009] The present disclosure is also to determine a user's current state and variously adjust at least one of the set temperature, the air volume, or the wind direction of the air conditioner to provide user comfort.

[0010] The present disclosure further provides an air conditioner to automatically adjust at least one of the set temperature, the air volume, or the wind direction of the air conditioner when at least one processor identifies that the user is drowsing while learning.

[0011] The objects of the present disclosure are not limited to the above-mentioned objects, and other objects and advantages of the present disclosure which are not mentioned may be understood by the following description and more clearly understood based on the embodiments of the present disclosure. It will also be readily understood that the objects and the advantages of the present disclosure may be implemented by features determined in claims and a combination thereof.

[0012] According to the present disclosure, the air conditioner may identify a user's position using a motion sensing sensor and adjust an angle of at least one vane of the air conditioner based on the user's position to control a direction of wind discharged from the air conditioner.

[0013] In addition, according to the present disclosure, the air conditioner may divide a total operation time period preset by the user into a plurality of time periods and may control the air conditioner to differ the at least one of the set temperature, the air volume, or the wind direction of the air conditioner in one time period among the plurality of time

periods from the at least one of the set temperature, the air volume, or the wind direction of the air conditioner in another time among the plurality of time periods.

[0014] In addition, according to the present disclosure, the air conditioner may be operated in a plurality of modes in which the air conditioner is operated with at least one of different set temperatures, air volume, or wind directions of the air conditioner for a plurality of time periods.

[0015] According to an embodiment of the present disclosure, the air conditioner may include a communicator, an air volume controller, a wind direction controller, and at least one processor. The at least one processor may be electrically connected to the communicator, the air volume controller, and the wind direction controller. In addition, the at least one processor may control at least one of the wind direction adjusted by changing an angle of at least one vane, the temperature, or the air volume of the air conditioner in a predetermined time period unit based on receiving a signal for controlling the operation of the air conditioner.

[0016] In addition, according to an embodiment of the present disclosure, a control device of the air conditioner may include a communicator, an air volume controller, a wind direction controller, at least one processor, and a memory. The memory may be electrically connected to the communicator, the air volume controller, the wind direction controller, and the at least one processor. In addition, the memory may store instructions that, when executed by the at least one processor, cause the apparatus to perform operations including: controlling at least one of an angle of at least one vane, a temperature, or wind volume of the air conditioner in a predetermined time period unit based on receiving a signal for controlling the operation of the air conditioner.

[0017] In addition, according to an embodiment of the present disclosure, a method for controlling an air conditioner may include receiving a signal for controlling operations of the air conditioner and controlling at least one of an angle of at least one vane, a temperature, or air volume of the air conditioner based on the received signal in a predetermined time period unit.

[0018] According to the present disclosure, the air conditioner may provide comfort to a user by automatically controlling at least one of the set temperature, the air volume, or the wind direction of the air conditioner.

[0019] In addition, according to the present disclosure, when the at least one processor identifies that the user is drowsing while learning, the at least one processor automatically adjusts the at least one of the set temperature, the air volume, or the wind direction of the air conditioner to facilitate awakening and improve user's learning ability.

[0020] In addition, according to the present disclosure, the at least one processor is configured to divide the total operation time period preset by the user into a plurality of time periods and control at least one of the set temperature, the air volume, or the wind direction of the air conditioner in one time period among the plurality of time periods to differ from at least one of the set temperature, the air volume, or the wind direction of the air conditioner in another time among the plurality of time periods, thereby providing a user-comfortable environment.

[0021] Hereinafter, further effects of the present disclosure, in addition to the above-mentioned effect, are described together while describing specific matters for implementing the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a configuration diagram showing an example cooling cycle device.

FIG. 2 is an exemplary view showing example air conditioner and remote control device controlling the air conditioner.

FIG. 3 is a block diagram showing an example control device of an air conditioner.

FIG. 4 is an exemplary view showing an example indoor space divided into a plurality of virtual sub-areas.

FIG. 5 is a flowchart showing an example process of controlling an air conditioner.

FIG. 6 is a flowchart showing an example process of controlling an air conditioner.

FIG. 7 is a flowchart showing a process of controlling an air conditioner.

FIG. 8 is a flowchart showing an example operation process of an air conditioner in a first mode.

FIG. 9 is an exemplary view showing example direct wind and indirect wind discharged based on a user's position.

FIG. 10 is an exemplary view showing an example of an angle of at least one vane, a set temperature, or air volume.

FIG. 11A is an exemplary view showing opening/closing of at least one vane.

FIG. 11B is an exemplary view showing examples of adjusted angle of a vane.

FIG. 12A is an exemplary view showing an example vane angle in each mode and an operation time period in each angle of different values.

FIG. 12B is an exemplary view showing an example result of adjusting a vane angle in each mode and an operation time period at each angle to have different values.

FIG. 13 is an exemplary view showing an example result of measuring brainwave before and after executing a concentration enhancing mode.

DETAILED DESCRIPTION OF EXEMPLARY IMPLEMENTATIONS

[0023] Some embodiments of the present disclosure will be described in detail with reference to the accompanying drawings, such that those skilled in the art to which the present disclosure pertains may easily implement the technical idea of the present disclosure. In the description of the present disclosure, a detailed description of the known technology relating to the present disclosure may be omitted if it unnecessarily obscures the gist of the present disclosure. Hereinafter, one or more embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. Same reference numerals may be used to refer to same or similar component in the figures.

[0024] In some examples, terms such as first, second, and the like may be used herein when describing elements of the present disclosure, but the elements are not limited to those terms. These terms are intended to distinguish one element from other elements, and the first element may be a second element unless otherwise stated.

[0025] In this document, the terms "upper," "lower," "on," "under," or the like are used such that, where a first component is arranged at "an upper portion" or "a lower portion" of a second component, the first component may be arranged in contact with the upper surface (or the lower surface) of the second component, or another component may be disposed between the first component and the second component. Similarly, where a first component is arranged on or under a second component, the first component may be arranged directly on or under (in contact with) the second component, or one or more other components may be disposed between the first component and the second component.

[0026] Further, the terms "connected," "coupled," or the like are used such that, where a first component is connected or coupled to a second component, the first component may be directly connected or able to be connected to the second component, or one or more additional components may be disposed between the first and second components, or the first and second components may be connected or coupled through one or more additional components.

[0027] Unless otherwise stated, each component may be singular or plural throughout the disclosure.

[0028] As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. In the present disclosure, it should not be construed that terms such as "including" or "comprising" necessarily include various types of components or various steps described in the present disclosure, and it should be construed terms such as "including" or "comprising" do not include some components or some steps or may include additional components or steps.

[0029] In the present disclosure, unless otherwise stated, "A and/or B" means A, B or A and B. Unless otherwise stated, "C to D" means "C or more and D or less".

[0030] Hereinafter, an air conditioner and a method for controlling the air conditioner according to some embodiments of the present disclosure are described.

[0031] FIG. 1 is a configuration diagram showing an example cooling cycle device.

[0032] Referring to FIG. 1, according to an embodiment of the present disclosure, a cooling cycle device 100 may include a compressor 110 to compress a refrigerant and convert the refrigerant into high-temperature and high-pressure gas and a condenser 120 to convert, into a liquid, the high-temperature and high-pressure refrigerant that is compressed by the compressor 110 and discharge an internal latent heat to outside. In addition, the cooling cycle apparatus 100 may include an expansion mechanism 130 and an evaporator 140. The expansion mechanism 130 reduces pressure of the refrigerant having converted into the liquid phase by the condenser 20 and the evaporator 140 evaporates, into gas, the liquid refrigerant that is expanded by the expansion mechanism 130, and absorbs an external heat.

[0033] As the condenser 120 and the evaporator 140 each exchange heat with the outside, the condenser 120 and the evaporator 140 may also be referred to as "a heat exchanger". The cooling cycle device 100 may be used for an air conditioner to maintain a comfortable indoor space using the heat emitted by the condenser 120 and cold air formed by the evaporator 140.

[0034] FIG. 2 is an exemplary view showing an example air conditioner and remote control device controlling the air conditioner.

[0035] Referring to FIG. 2, according to an embodiment of the present disclosure, an air conditioner 200 includes four vanes 210, 220, 230 and 240 and may be operated under the control of a remote control device 270. As shown in FIG. 2, the air conditioner 200 may be attached to the wall or the ceiling. It is apparent to those skilled in the art that the air conditioner 200 of the present disclosure is not limited to an attached air conditioner 200 that may be attached to the wall or the ceiling, but may include a stand-type air conditioner that may be placed on the floor.

[0036] According to one embodiment, the air conditioner 200 may include a stepping motor 251, a gear train 252, and a universal joint 253 configured to control an operation (e.g., an opening/closing) of at least one of the first vane to the fourth vane 210, 220, 230, and 240. The air conditioner 200 may control the operation (e.g., the opening/closing) of the at least one of the first vane to the fourth vane 210, 220, 230, and 240 using the stepping motor 251, the gear train 252, and the universal joint 253. In addition, the air conditioner 200 may include a motion sensing sensor 260 to detect an object (e.g., a person). The motion sensing sensor 260 may identify the object and detect the movement of the identified object. The motion sensing sensor 260 may include a vision camera.

[0037] According to an embodiment, the remote control device 270 remotely controls the air conditioner 200. The

remote control device 270 may transmit, to the air conditioner 200, an instruction (or a signal) for controlling at least one of temperature setting and control, controlling of at least one of the first vane to the fourth vane 210, 220, 230, and 240, and time setting for the air conditioner 200. The remote control device may receive an instruction through a button 271 from the user. The instruction includes an instruction for operating the air conditioner 200 in various environments (e.g., a concentration enhancing mode, a sleep mode, a refresh mode, and the like). When the remote control device 270 transmits, to the air conditioner 200, at least one instruction based on the received input, the air conditioner 200 may be operated based on the received at least one instruction.

[0038] According to one embodiment, each of the first vane to the fourth vane 210, 220, 230, and 240 of the air conditioner 200 may be opened/closed for cooling or heating the indoor space. In addition, each of the first vane to the fourth vane 210, 220, 230, and 240 is opened/closed at a predetermined angle to adjust the wind direction of the indoor space.

[0039] According to one embodiment, the air conditioner 200 may control at least one of the angle of at least one vane, an indoor temperature, or air volume in a predetermined time period unit based on the instruction for operating the air conditioner in the concentration enhancing mode, which is received through the input using the button 271 of the remote control device 270. The air conditioner 200 may detect the movement of the object using a motion sensing sensor 260. In addition, the air conditioner 200 may adjust at least one of an angle of each vane, a preset temperature, a wind direction toward the object, and air volume of the air conditioner 200 based on the detected movement of the object.

[0040] FIG. 3 is a block diagram showing an example control device of an air conditioner.

[0041] Referring to FIG. 3, according to an embodiment of the present disclosure, a control device 300 of an air conditioner 200 may include a sensor unit 320, an air volume controller 330, a wind direction controller 340, and a communicator 350, an input unit 360, a storage unit 370, and a processor 310 including a timer 311. The configuration of the control device 300 shown in FIG. 3 is according to an embodiment, and the components thereof are not limited to the example in FIG. 3, and some components thereof may be added, changed, or deleted as necessary. In addition, the air conditioner 100 may include the control device 300.

[0042] According to an embodiment, the input unit 360 receives, from a user, data on operation of the air conditioner 200, for example, operation setting, an operation mode, a temperature, air volume, a wind direction, and the like, and provides the processor 310 with the received data. In this configuration, the input unit 360 may include a physical manipulation member such as a switch or button, or an electrical manipulation member such as a touch key, a touch pad, or a touch screen.

[0043] For example, the input unit 360 may receive data on the operating mode (e.g., a rapid mode, a comfortable mode, a human body adaptation mode, and the like, described below) from a user and provide the processor 310 with the received data. In addition, the processor 310 may drive the air conditioner 200 in the operation mode based on the user input data.

[0044] According to an embodiment, the communicator 350 may perform a wired or wireless data communication. For example, the communicator 350 may perform data communication with an outdoor unit or data communication with another air conditioner (e.g., an indoor unit). In addition, the communicator 350 may communicate with various data-communicable devices (e.g., TVs, ventilation systems, fans, refrigerators, and the like). In addition, the communicator 350 may receive a signal for controlling the air conditioner 200 from the remote control device 270.

[0045] According to an embodiment, the storage unit 370 may store information, data, programs, and the like used to operate the air conditioner 200. For example, the storage unit 370 may previously store information on a human body adaptation time, an activity amount, a virtual area, and the like, which are described below. In this example, the processor 310 may perform a control operation described below based on the information stored in the storage unit 370. The storage unit 370 may store signal processing and controlling programs in the processor 310 and may store signal-processed video, audio, or data signals. The storage unit 370 may store various platforms. The storage unit 370 may include, for example, at least one storage medium of a flash memory type storage medium, a hard disk type storage medium, a multimedia card micro type storage medium, or a card type storage medium (e.g., secure digital (SD) or eXtreme Digital (XD) memory, and the like), random-access memory (RAM) storage medium, or read-only memory (ROM) storage medium (e.g., electrically erasable and programmable read only memory (EEPROM) storage medium).

[0046] According to an embodiment, the air volume controller 330 may control a discharger to control an amount of air discharged. For example, the air volume controller 330 may control the amount of air discharged through the discharger by adjusting a number of rotations of the blower fan based on the control signal provided by the processor 310.

[0047] According to one embodiment, the wind direction controller 340 may control the direction of air discharged by the discharger by adjusting an angle of at least one of the first vane to the fourth vane 210, 220, 230, and 240. For example, the wind direction controller 340 adjusts the rotation angle of the at least one of the first vane to the fourth vane 210, 220, 230, and 240 based on the control signal provided by the processor 310 to control the direction of the discharged air. For example, when the occupant is detected by a motion sensing sensor 260 described below, the wind direction controller 340 may adjust the angle of the at least one of the first vane to the fourth vane 210, 220, 230, and 240 to face the user (e.g., the occupant) under the control of the processor 310.

[0048] According to one embodiment, the sensor unit 320 may include a temperature measurement sensor 321 and a motion sensing sensor 260. The temperature measurement sensor 321 includes at least one temperature measurement sensor to measure a temperature and the motion sensing sensor 260 includes at least one motion sensing sensor to detect movement of the object.

[0049] According to an embodiment, the temperature measurement sensor 321 may include a plurality of temperature measurement sensors. In addition, the temperature measurement sensor 321 may detect a temperature of the air discharged by the air conditioner 200, a temperature of the air suctioned into the air conditioner 200, an indoor space temperature, a temperature of a refrigerant-suctioning pipe, and a temperature of refrigerant-discharging pipe, and the like, using the temperature measurement sensors, and may provide the processor 310 with the detected result. The temperature measurement sensor 321 may include an infrared camera to measure a temperature.

[0050] According to an embodiment, the motion sensing sensor 260 may detect a user (e.g., an occupant) in an indoor space where the air conditioner 200 is disposed. The motion sensing sensor 260 may be disposed on an outer surface of the air conditioner 200 and may be rotatable. The motion sensing sensor 260 may detect a user's movement in the indoor space where the air conditioner 200 is disposed and transmit, to the processor 310, a signal related to the detection degree. Subsequently, the processor 310 may identify whether the user is currently drowsing.

[0051] The motion sensing sensor 260 may scan the indoor space by being rotated under the control of the processor 310 and may detect the user (e.g., the occupant) in the indoor space. The motion sensing sensor 260 may detect the user with various methods. For example, the motion sensing sensor 260 may detect the user with infrared rays. In addition, the motion sensing sensor 260 may detect the user using a radiant heat emitted from the user and may detect the user using a camera. The motion sensing sensor 260 may include a vision sensor. In addition, the motion sensing sensor 260 may detect the user using various methods for identifying the user.

[0052] The detection operation of the motion sensing sensor 260 may be performed every preset detection period (e.g., 10 seconds) and the motion sensing sensor 260 may provide the processor 310 with the user (e.g., occupant) detection information.

[0053] According to an embodiment, the processor 310 may obtain an activity amount of the occupant based on the position of the occupant detected by the motion sensing sensor 260. In addition, the processor 310 may include at least one circuit (or a processor) to control a temperature of the air conditioner 100 using a timer 311 for a preset time period based on the obtained result. The activity amount is a parameter indicating movement degree of an occupant and may be understood as a movement distance of the occupant. Alternatively, the activity amount may be understood as a parameter proportional to the moving distance of the occupant. The processor 310 may identify changes in occupant's position based on the occupant's positions detected every detection time period and may obtain the activity amount of the occupant based on the change in the occupant's positions. For example, the processor 310 may identify the position of the occupant detected by the motion sensing sensor 260 and obtain the activity amount of the occupant based on the change in the occupant's position during a reference period. The processor 310 may identify whether the occupant is currently drowsing based on the obtained result. The processor 310 may control the at least one sensor of the motion sensing sensor 260 to periodically detect the movement of a user's body part (e.g., the head). In addition, the processor 310 may identify whether the user is currently drowsing based on the detection of the movement of the user's body part (e.g., the head).

[0054] The processor 310 may detect the indoor environment and operate the air conditioner 200 in a concentration enhancing mode according to a method described below, or only when an instruction regarding the concentration enhancing mode is received from the user, the processor 310 may operate the air conditioner 200 in the concentration enhancing mode. In addition, the processor 310 may operate the air conditioner 200 in a mode (e.g., concentration enhancing mode) selected from various modes (e.g., a concentration enhancing mode, a sleep mode, a refresh mode, and the like).

[0055] The processor 310 may measure a temperature change rate for each space based on the temperature change of each space measured by the temperature measurement sensor unit 321. The processor 310 may measure the temperature change rate in a constant time period unit, for example, an hour unit. The processor 310 may identify space information based on the temperature change rate measured by the temperature measurement sensor unit 321. In this case, the processor 310 may control the storage unit 370 to store the space information based on the temperature change rate in advance and detect space information identical to the identified space information of the stored space information. In this case, the space information may include information on an open window, a closed wall, the living room having a large space, and the like.

[0056] According to an embodiment, the processor 310 may control the communicator 350 to receive the signal from the remote control device 270. The received signal may include information on a total operation time period during which the air conditioner operates. The processor 310 may divide the total operation time period into a plurality of time periods. In addition, the processor 310 may control at least one of the angle of each vane, the temperature set on the air conditioner 200, and the volume of air flowing toward the object in each period of the divided time periods to differ from at least one of the angle of each vane, the temperature set on the air conditioner 200, and the volume of air flowing toward the object

in a previous time period of the each time period.

[0057] According to an embodiment, the at least one processor 310 may control the air conditioner 200 to be operated at a first temperature and control the wind direction controller 340 to automatically swing the at least one vane during a first time period among the divided plurality of time periods. According to one embodiment, the at least one processor 310 may control the wind direction controller 340 to automatically swing the at least one vane for a predetermined first sub-time period (e.g., 20 minutes) among the first time period.

[0058] The at least one processor 310 may control at least one of an angle of at least one vane 210, 220, 230, and 240, the temperature, and the air volume of the air conditioner 200 based on the received signal in the predetermined hour unit. The air conditioner 200 may further include a sensor unit 320. The sensor unit 320 includes a motion sensing sensor 260 to detect movement of an object and a temperature measurement sensor 321 to measure a temperature of a space where the air conditioner is disposed.

[0059] According to one embodiment, the at least one processor 310 may control the at least one of the angle of each vane of the at least one vane 210, 220, 230, and 240 adjusted by the wind direction controller 330, the temperature set on the air conditioner, the air volume controlled by the air volume controller 330 in the predetermined time period unit. The at least one processor 310 may adjust the angle of each vane, the temperature, and the air volume based on the movement of the object.

[0060] According to one embodiment, the at least one processor 310 may control the motion sensing sensor 260 to identify the object's position based on the received signal. In addition, the at least one processor 310 may detect the movement of the identified object and identify whether the object is drowsing based on the detected movement of the object.

[0061] According to an embodiment, the at least one processor 310 may operate the air conditioner 200 in a first mode after the predetermined first sub-time period (e.g., 20 minutes). In the first mode, at least one processor 310 controls the air volume controller 330 to adjust the air volume to first air volume (e.g., high air volume), and the at least one processor 310 controls the wind direction controller 330 to adjust an angle of the at least one vane to a first angle for a predetermined second sub-time period (e.g., 3 seconds), and after the predetermined second sub-time period, to adjust the angle of the at least one vane to a second angle that is greater than the first angle for a predetermined time period (e.g., 5 seconds) for automatically swinging the at least one vane. In addition, the first mode is a mode in which at least one processor 310 controls the wind direction controller 330 to automatically swing the at least one vane for a predetermined fourth sub-time period (e.g., 7 seconds) after the predetermined third sub-time period.

[0062] According to an embodiment, the at least one processor 310 may operate the air conditioner in the first mode during the first time period, and subsequently, operate the air conditioner sequentially and repeatedly in the second mode and the third mode during the second time period subsequent to the first time period. The second mode is a mode in which the air conditioner is operated by adjusting the first temperature in the first mode to a second temperature that is higher than the first temperature by a predetermined temperature (e.g., 1 Celsius degree) and the at least one processor 310 controls the air volume controller 330 to adjust the wind volume to second air volume (e.g., low air volume) that is less than the first air volume (e.g., high air volume). The third mode is a mode in which the at least one processor 310 controls the air volume controller 330 to adjust the second air volume to the first air volume.

[0063] According to an embodiment, the at least one processor 310 may control the air conditioner 200 to be repeatedly operated in the second mode and the third mode for the second time period. The at least one processor 310 may operate the air conditioner 200 in the first mode for a third time period subsequent to the second time period. According to an embodiment, the at least one processor 310 may repeatedly and sequentially operate the air conditioner 20 in the first mode to the fourth mode during the total operation time period.

[0064] FIG. 4 is an exemplary view showing an indoor space divided into a plurality of virtual sub-areas.

[0065] Referring to FIG. 4, the processor 310 may map a position of an occupant detected by a motion sensing sensor 260 to a virtual area 400 divided into the sub-areas and detect movement of the occupant based on a distance between the mapped virtual areas. The virtual area 400 may include identifiers VA1 to VA24 preset according to positions thereof and the occupant may be located in one or two areas. In addition, information on the virtual area 400 and the identifiers thereof may be stored in advance in the storage unit 370. The processor 310 may identify a position 410 of the occupant detected by the motion sensing sensor 260 and map the identified position of the occupant to the virtual area 400. For example, the processor 310 may map the position of the occupant detected during the detection period to the virtual area 400 for each detection time period.

[0066] FIG. 5 is a flowchart showing an example process of controlling an air conditioner.

[0067] Hereinafter, a process of controlling the air conditioner according to an embodiment of the present disclosure is described in detail with reference to FIG. 5.

[0068] According to an embodiment, at least one processor 310 may determine whether a signal for controlling an operation of the air conditioner is received (S510). The received signal may include information on a total operation time period during which the air conditioner 200 operates. The total operation time period (e.g., 5 hours) may be set by the user. The at least one processor 310 may control the motion sensing sensor 260 to identify the position of an object

(e.g., a person) based on receiving the signal and determine whether a body portion (e.g., the head) of the identified object is periodically moving. In addition, the at least one processor 310 may identify that the object (e.g., the person) is drowsing based on the above determination.

[0069] According to an embodiment, the at least one processor 310 may control at least one of a wind direction determined based on adjustment of a vane angle, a temperature, and air volume of the air conditioner in a predetermined time period unit based on the received signal. (S512). The at least one processor 310 may control at least one of the angle of the at least one vane 210, 220, 230, and 240 adjusted by the wind direction controller 340, the temperature set on the air conditioner 200, and the air volume controlled by the air volume controller 330 in the predetermined time period unit. The at least one processor 310 may adjust the angle of each of the vanes, the temperature, and the air volume based on the movement of the object. According to an embodiment, the at least one processor 310 may analyze the total operation time period information included in the received signal and divide the total operation time period (e.g., 5 hours) to a plurality of time periods. In addition, the at least one processor 310 may control at least one of the angle of each vane, the temperature set on the air conditioner, and the volume of air flowing toward the object in each time period (e.g., 1 hour) of the divided time periods to differ from at least one of the angle of each vane, the temperature set on the air conditioner, and the volume of air flowing toward the object in a previous time period of the each time period. The at least one processor 310 may control the air conditioner 200 to be operated at a first temperature and control the wind direction controller 340 to automatically swing the at least one vane for a first time period (e.g., 0 to 60 minutes of 5 hours) among the divided plurality of time periods. The at least one processor 310 may control the wind direction controller 340 to automatically swing the at least one vane for a predetermined first sub-time period (e.g., 20 minutes) of the first time period (e.g., between 0 minutes and 60 minutes of 5 hours).

[0070] FIG. 6 is a flowchart showing an example process of controlling an air conditioner.

[0071] Hereinafter, a process of controlling the air conditioner according to another embodiment of the present disclosure is described in detail with reference to FIG. 6.

[0072] According to an embodiment, at least one processor 310 may determine whether an instruction for activating a concentration enhancing mode is input from a user based on a signal received from a remote control device 270 (S610). For example, when the user operates the air conditioner 200 in the concentration enhancing mode, the user may input an operation in the concentration enhancing mode using a button 271 of the remote control device 270. The remote control device 270 transmits, to the air conditioner 200, a signal including an instruction input by pressing the button 271 and the air conditioner 200 may receive the signal including the instruction using the communicator 350. The air conditioner 200 may determine that the user has selected the concentration enhancing mode based on the received signal. The signal may include information on total operation time period for which the air conditioner 200 is operated and the total operation time period may be set by the user.

[0073] According to an embodiment, the at least one processor 310 may activate a concentration enhancing mode and activate a vision camera (S612). The at least one processor 310 may operate the air conditioner 200 in the concentration enhancing mode based on the received signal and activate the vision camera of the motion sensing sensor 260.

[0074] According to an embodiment, the at least one processor 310 may identify a user (S614). The at least one processor 310 may control at least one of an infrared sensor of the temperature measurement sensor 321 and at least one motion sensing sensor of the motion sensing sensor 260 to identify a user's current position.

[0075] According to an embodiment, the at least one processor 310 may identify whether the user is currently drowsing (S616). The at least one processor 310 may control the motion sensing sensor 260 to determine whether the user's body portion (e.g., the head) periodically nods. For example, if the motion sensing sensor 260 determines that the user's body portion (e.g., the head) periodically nods, the at least one processor 310 may identify that the user is currently drowsing. For example, if the motion sensing sensor 260 determines that the user's body portion (e.g., the head) is not periodically nodding, the at least one processor 310 may identify that the user is not drowsing currently.

[0076] According to an embodiment, the at least one processor 310 may control at least one of a wind direction determined based on the adjustment of the vane angle, a temperature, or air volume of the air conditioner in a predetermined time period unit (S618). If the user is not identified by the at least one processor 310 at S614 or the at least one processor identifies that the user is not drowsing at S616, the at least one processor 310 may control at least one of an angle of each of at least one among the vane 210, 220, 230, and 240 adjusted by the wind direction controller 240, the temperature set on the air conditioner 200, and the air volume controlled by the air volume controller 330 in the predetermined time period unit. The at least one processor 310 may analyze information on the total operation time period included in the received signal and divide the total operation time period (e.g., 5 hours) into a plurality of time periods (e.g., a first time period of 0 minutes to 60 minutes, a second time period of 60 minutes to 120 minutes, a third time period of 120 minutes to 180 minutes, a fourth time period of 180 minutes to 240 minutes, and a fifth time period of 240 minutes to 300 minutes). In addition, the at least one processor 310 may control the at least one of the vane angle, the temperature set on the air conditioner, and the volume of air flowing toward the object in each time period (e.g., 1 hour) among the divided time periods to differ from the at least one of the vane angle, the temperature set on the air conditioner, and the volume of air flowing toward the object in the previous time period of the each time period.

[0077] According to an embodiment, the at least one processor 310 may control at least one of the wind direction determined through the adjustment of the vane angle, the temperature, or the air volume of the air conditioner in a predetermined time period unit based on the user's current position. (S620). When the processor 310 identifies that the user is drowsing at S616, the at least one processor 310 may control the wind direction controller 340 to adjust angles of the at least one vane 210, 220, 230, and 240 and face the at least one vane 21, 220, 230, and 240 toward the user. In addition, the at least one processor 310 may adjust the temperature set on the air conditioner 200 and control the air volume controller 330 to adjust the air volume. The at least one processor 310 may perform the adjustment in the predetermined time period unit. The at least one processor 310 may divide the total operation time period (e.g., 5 hours) into a plurality of time periods (e.g., the first time period of 0 minutes to 60 minutes, the second time period of 60 minutes to 120 minutes, the third time period of 120 minutes to 180 minutes, the fourth time period of 180 minutes to 240 minutes, and the fifth time period of 240 minutes to 300 minutes). In addition, the at least one processor 310 may control the at least one of the angle of each vane, the temperature set on the air conditioner, and the volume of air flowing toward the object in each period (e.g., 1 hour) among the divided time periods to differ from the at least one of the angle of each vane, the temperature set on the air conditioner, and the volume of air flowing toward the object in the previous time period of the each time period. The at least one processor 310 may adjust the angle of each vane, the temperature set on the air conditioner, and the air volume based on the current position of the object.

[0078] FIG. 7 is a flowchart showing an example process of controlling an air conditioner.

[0079] Hereinafter, the process of controlling the air conditioner according to another embodiment of the present disclosure is described in detail with reference to FIG. 7.

[0080] According to an embodiment, at least one processor 310 may activate a concentration enhancing mode (S710). The at least one processor 310 may receive, from a remote control device 270, a signal including an instruction for the concentration enhancing mode based on the concentration enhancing mode input using the button 271 of the remote control device 270. The signal may include information on the total operation time period for which the air conditioner 200 operates, and the total operation time may be set by a user. For example, when the user wants to operate the air conditioner 200 in the concentration enhancing mode for a certain time period (e.g., 5 hours), the signal may include information on the total operation time period (e.g., 5 hours) set by the user.

[0081] According to an embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner corresponds to a first period or a fifth period (S712). The at least one processor 310 may determine whether a time period during which the air conditioner 200 is operating in the concentration enhancing mode corresponds to the first period (e.g., 0 to 60 minutes) or the fifth period (e.g., 240 to 300 minutes) of the total operation time period (e.g., 5 hours).

[0082] According to one embodiment, the at least one processor 310 may set the temperature of the air conditioner to the first temperature (S714). When the at least one processor 310 determines that the operation time period of the air conditioner 200 corresponds to the first period or the fifth period, the at least one processor 310 sets the temperature of the air conditioner 200 to a first temperature (e.g., 27 Celsius degrees). The first temperature may include an initial set temperature. The at least one processor 310 may periodically check the current temperature and determine that the checked current temperature is the same as the first temperature.

[0083] According to an embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner corresponds to the first period (S716). The at least one processor 310 may determine that the operation time period corresponds to the first period (e.g., 0 to 60 minutes) of the total operation time period (e.g., 5 hours) while the air conditioner 200 is operated to reach the first temperature.

[0084] According to an embodiment, the at least one processor 310 may automatically swing at least one vane for a predetermined time period (S718). When the at least one processor 310 determines that the operation time period of the air conditioner corresponds to the first period (e.g., 0 minutes to 60 minutes) of the total operation time period (e.g., 5 hours) at S716, the at least one processor 310 may automatically swing at least one vane 210, 220, 230 and 240 of the air conditioner 200 for a predetermined time period (e.g., 20 minutes) to adjust the wind direction of the at least one vane 210, 220, 230, and 240. The automatic swing refers to swinging at least one vane 210, 220, 230, and 240 of the air conditioner 200 from 0° to 90°.

[0085] According to one embodiment, the at least one processor 310 may operate the air conditioner in a first mode (S720). The at least one processor 310 automatically swings at least one vane 210, 220, 230, and 240 of the air conditioner 200 for the predetermined time period (e.g., 20 minutes) and control the air conditioner 200 to be operated in the first mode. The first mode is a mode in which the at least one processor 310 controls the air volume controller 330 to adjust the volume of air discharged through the at least one vane 210, 220, 230, and 240 to first air volume (e.g., high air volume). The first mode is a mode in which the at least one processor 310 controls the wind direction controller 340 to move the at least one vane within a first angular range (e.g., within 0° to 30°) for a predetermined second sub-time period (e.g., 60 seconds), and after the predetermined second sub-time period, move the at least one vane within a second angular range (e.g., within 30° to 80°) that is greater than the first angular range for a predetermined third sub-time period (e.g., 60 seconds). In addition, the first mode is a mode in which the at least one processor 310 controls the wind

direction controller 340 to automatically swing the at least one vane for a predetermined fourth sub-time period (e.g., 90 seconds) after the predetermined third sub-time period. The at least one processor 310 may repeatedly perform the above operation for a rest time period (e.g., 40 minutes) of the first period (e.g., 0 to 60 minutes) after the predetermined time period (e.g., 20 minutes) in the first mode.

[0086] According to an embodiment, the at least one processor 310 may determine whether an operation time period of the air conditioner corresponds to the first period (S722). The at least one processor 310 periodically checks the operation time period of the air conditioner 200 while the air conditioner 200 is operating in the first mode to determine whether the operation time period of the air conditioner 200 corresponds to the first period (e.g., 0 minutes to 60 minutes).

[0087] According to one embodiment, the at least one processor 310 may determine whether the operation time period thereof corresponds to the fifth period (S724). The at least one processor 310 may periodically check the operation time period of the air conditioner 200 while the air conditioner 200 is operating in the first mode. In addition, when the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the first period, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 corresponds to the fifth period (e.g., 240 to 300 minutes).

[0088] According to one embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 corresponds to the third period (S726). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the fifth period, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 exceeds a predetermined total operation time period (e.g., 5 hours) (S736). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not exceed the total operation time period, the process returns back to S712, and the at least one processor 310 may determine that the operation time period of the air conditioner corresponds to the fifth period (e.g., 240 to 300 minutes) (S712). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the fifth period, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 corresponds to the third period (e.g., 120 to 180 minutes) (S726).

[0089] According to one embodiment, the at least one processor 310 may operate the air conditioner at a second temperature (S728). When the at least one processor 310 determines that the operation time period of the air conditioner 200 corresponds to the third period, the at least one processor 310 sets the temperature of the air conditioner 200 to the second temperature (e.g., 28 Celsius degrees). The second temperature (e.g., 28 Celsius degrees) may be a temperature higher than the first temperature (e.g., 27 Celsius degrees) by a preset temperature (e.g., 1 Celsius degree). The at least one processor 310 may periodically check the current temperature and determine that the checked current temperature is the same as the second temperature.

[0090] According to one embodiment, the at least one processor 310 may operate the air conditioner in a second mode and a third mode (S730). The at least one processor 310 may control the air conditioner 200 to sequentially and repeatedly operate the air conditioner 200 in the second mode and the third mode. The second mode is a mode in which the at least one processor 310 operates the air conditioner to adjust the first temperature (e.g., 27 Celsius degrees) in the first mode to a second temperature (e.g., 28 Celsius degrees) that is greater than the first temperature by the predetermined temperature (e.g., 1 Celsius degree) and the at least one processor 310 controls the air volume controller 330 to adjust the air volume to the second air volume (e.g., low air volume) that is less than the first air volume (e.g., high air volume). The third mode is a mode in which the at least one processor 310 controls the air volume controller 330 to adjust the second air volume in the second mode to the first air volume.

[0091] For example, the second mode is a mode in which the at least one processor 310 controls the air volume controller 330 to adjust the volume of air discharged through the at least one vane 210, 220, 230, and 240 to the second air volume (e.g., low air volume). The second mode is a mode in which the at least one processor 310 controls the wind direction controller 340 to move the at least one vane within a first angular range (e.g., within 0° to 30°) for a predetermined second sub-time period (e.g., 60 seconds), and after the predetermined second sub-time period, to move the at least one vane within a second angular range (e.g., within 30° to 80°) that is greater than the first angular range for the predetermined third sub-time period (e.g., 60 minutes). The second mode is a mode in which, after the predetermined third sub-time period, the at least one processor 310 controls the wind direction controller 340 to automatically swing the at least one vane for a predetermined fourth sub-time period (e.g., 90 seconds).

[0092] In addition, the third mode is a mode in which the at least one processor 310 controls the air volume controller 330 to adjust the air volume discharged through the at least one vane 210, 220, 230, and 240 to the first air volume (e.g., high air volume). In addition, the third mode is a mode in which the at least one processor 310 controls the wind direction controller 340 to move the at least one vane within the first angular range (e.g., within 0°~30°) for the predetermined second sub-time period (e.g., 60 seconds), and after the predetermined second sub-time period, the at least one vane moves within a second angular range (e.g., within 30°~80°) that is greater than the first angular range for a predetermined third sub-time period (e.g., 60 seconds). In addition, after the predetermined third sub-time period, the third mode is a mode in which the at least one processor 310 controls the wind direction controller 340 to automatically swing the at least one vane for the predetermined fourth sub-time period (e.g., 90 seconds).

[0093] The at least one processor 310 may control the air conditioner 200 to be operated repeatedly and alternately in the second mode and the third mode in the second period (e.g., 60 to 120 minutes).

[0094] According to an embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner corresponds to the second period (S732). The at least one processor 310 periodically checks the operation time period of the air conditioner 200 while the air conditioner 200 is repeatedly operated in the second mode and the third mode to determine whether the operation time period of the air conditioner 200 corresponds to the second period (e.g., 60 to 120 minutes).

[0095] According to one embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner corresponds to the fourth period (S734). The at least one processor 310 may periodically check the operation time period of the air conditioner 200 while the air conditioner 200 is repeatedly operated in the second mode and the third mode. In addition, when the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the second period (e.g., 60 minutes to 120 minutes), the at least one processor 310 may determine that the operation time period of the air conditioner 200 corresponds to the fourth period (e.g., 180 to 240 minutes).

[0096] According to one embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner is greater than the total operation time period (S736). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the fourth period, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 exceeds the predetermined total operation time period (e.g., 5 hours) (S736). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not exceed the total operation time period, the process returns back to S712, and the at least one processor 310 may determine whether the operation time period of the air conditioner corresponds to the fifth period (e.g., 240 to 300 minutes) (S712). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the fifth period, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 corresponds to the third period (e.g., 120 to 180 minutes) (S726).

[0097] According to one embodiment, the at least one processor 310 may operate the air conditioner at a third temperature (S738). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the third period, the at least one processor 310 sets the temperature of the air conditioner 200 to the third temperature (e.g., 29 Celsius degrees). The third temperature (e.g., 29 Celsius degrees) may be a temperature higher than the second temperature (e.g., 28 Celsius degrees) by a preset temperature (e.g., 1 Celsius degree). The at least one processor 310 may periodically check the current temperature and determine that the checked current temperature is the same as the third temperature.

[0098] According to one embodiment, the at least one processor 310 may operate the air conditioner in the first mode (S740). The first mode at S740 may have the same set time and angular range of each vane as the first mode at S720. Alternatively, the first mode at S740 may have different set time or angular range of at least one vane from the set time or the angular range of the at least one vane in the first mode at S720.

[0099] According to an embodiment, the at least one processor 310 may determine whether the operation time period of the air conditioner 200 corresponds to the third period (S742). The at least one processor 310 periodically checks the operation time period of the air conditioner 200 while the air conditioner 200 is operated in the first mode to determine whether the operation time period of the air conditioner 200 corresponds to the third period (e.g., 120 minutes to 180 minutes).

[0100] According to an embodiment, the at least one processor 310 may deactivate a concentration enhancing mode (S744). When the at least one processor 310 determines that the operation time period of the air conditioner 200 does not correspond to the third period, at least one processor 310 may determine that the operation time period of the air conditioner 200 exceeds the total operation time period (e.g., 5 hours) of the air conditioner 200. When the at least one processor 310 determines that the operation time period of the air conditioner 200 exceeds the total operation time period (e.g., 5 hours), the at least one processor 310 may deactivate the concentration enhancing mode. The at least one processor 310 may deactivate the concentration enhancing mode that is activated according to user's requests. After the concentration enhancing mode is deactivated, the at least one processor 310 may terminate the operation of the air conditioner 200 or control the air conditioner through cooling and heating.

[0101] At least one of the time period or the angular ranges described above is only an example, and may be variably changed or adjusted to other times or other angular ranges.

[0102] FIG. 8 is a flowchart showing an example operation process of an air conditioner in a first mode.

[0103] Hereinafter, an operation process of the air conditioner in the first mode according to an embodiment of the present disclosure is described in detail with reference to FIG. 8 as follows. The processes of FIG. 8 may be performed in at least one of the processes (e.g., S720, S730, and S740) of FIG. 7.

[0104] According to an embodiment, the at least one processor 310 may operate the at least one vane within a first angular range for a first time period (S810). The at least one processor 310 may control the at least one vane 210, 220,

230, and 240 of the air conditioner 200 to move within a first angular range (e.g., within 0° to 30°) for a predetermined first sub-time period (e.g., 60 seconds) to discharge indirect wind. The first angular range (e.g., within 0° to 30°) may be an angular range in which the wind does not directly flows toward an occupant (or a user), but flows toward a periphery of the occupant (e.g., above the head or in a direction not toward the occupant). The at least one processor 310 may control the at least one sensor (e.g., the motion sensing sensor) disposed at an outer portion of the air conditioner 200 to determine presence or absence of an occupant and the position of the occupant. The at least one processor 310 may control the wind direction controller 340 to gradually increase the angle of the at least one vane from 0° to 30° during the predetermined sub-time period (e.g., 60 seconds) and control the wind direction controller 340 to gradually decrease the angle of the at least one vane from 30° to 0°. The at least one processor 310 may control the wind direction controller 340 to move at least one vane within the first angular range during the predetermined time period (e.g., 60 seconds) and control the air volume controller 330 to adjust the air volume to low air volume, medium air volume, or high air volume.

[0105] According to one embodiment, the at least one processor 310 may operate the at least one vane within a second angular range for a second time period (S810). The at least one processor 310 may control the at least one vane 210, 220, 230, and 240 of the air conditioner 200 to move within the second angular range (e.g., within 30° to 90°) for the predetermined second sub-time period (e.g., 60 seconds) to discharge direct wind. The first angular range (e.g., within 30° to 90°) may be an angular range in which the wind directly flows toward the occupant (or the user). The at least one processor 310 may control the wind direction controller 340 to gradually increase the angle of the at least one vane from 30° to 90° during the predetermined time period (e.g., 60 seconds) and control the wind direction controller 340 to gradually decrease the angle of the at least one vane from 90° to 30°. The at least one processor 310 may control the wind direction controller 340 to move the at least one vane within the second angular range for the predetermined time period (e.g., 60 seconds) and control the air volume controller 330 to adjust the air volume to low air volume, mediate air volume, or high air volume.

[0106] According to one embodiment, the at least one processor 310 may automatically swing the at least one vane to operate for a third time period (S814). The at least one processor 310 may automatically swing the at least one vane 210, 220, 230, and 240 of the air conditioner 200 during the third time period (e.g., 90 seconds) to adjust the angle of the at least one vane 210, 220, 230, and 240. The automatic swing refers to swinging of at least one vane 210, 220, 230, and 240 of the air conditioner 200 from 0° to 90°. According to an embodiment, the at least one processor 310 may repeatedly perform the steps (e.g., S810, S812, and S814) in a predetermined time period unit (e.g., 1 hour unit).

[0107] FIG. 9 is an exemplary view showing example direct wind and indirect wind discharged based on a user's position.

[0108] Referring to FIG. 9, according to an embodiment of the present disclosure, when a user is located at a first position 910, direct winds 911 and 912 are discharged from a first vane 20 among at least one vane 210, 220, 230, and 240 of the air conditioner 200 and directly flow toward the user. Indirect wind 913 is discharged from the first vane 210 among the at least one vane 210, 220, 230, and 240 of the air conditioner 200 and directly flows toward the user.

[0109] According to an embodiment, when the user is located at a second position 920, direct wind 913 is discharged from the first vane 210 among the at least one vane 210, 220, 230, and 240 of the air conditioner 200 and directly flows toward the user. The indirect winds 911 and 912 are discharged from the first vane 210 among the at least one vane 210, 220, 230, and 240 of the air conditioner 200 and directly flow toward the user.

[0110] The at least one processor 310 controls the wind direction controller 340 to face the at least one vane 210, 220, 230, and 240 of the air conditioner 200 toward the user. Based on the above operations, the wind direction controller 340 may directly face the wind discharged from the at least one vane toward the user (e.g., discharge the direct wind) or indirectly face the wind discharged from the at least one vane toward the user (e.g., discharge the indirect wind).

[0111] At least one processor 310 may control a least one motion sensing sensor disposed at the outer portion of the air conditioner 200 to identify a position of the user and determine whether a body portion (e.g., the head) of the identified user is periodically moving. For example, when the user's body portion (e.g., the head) is periodically moving, the at least one processor 310 may identify that the user is currently drowsing. When the at least one processor 310 identifies that the user is currently drowsing, the at least one processor 310 may automatically activate a concentration enhancing mode. According to an embodiment, at least one of the angle of each of vanes, a temperature set on the air conditioner, and volume of air flowing toward the subject may be changed compared to a predetermined value based on the position of the user, a distance between the user and the air conditioner, a direction of the vane of the air conditioner.

[0112] FIG. 10 is an exemplary view showing an example of at least one vane angle, a set temperature, and air volume. FIG. 11A is an exemplary view showing example opening/closing of at least one vane. FIG. 11B is an exemplary view showing an example adjusted angle of a vane.

[0113] Referring to FIGS. 10, 11A, and 11B, at least one processor 310 may control a communicator 350 to receive a signal from a remote control device 270 and identify total operation time period information included in the received signal. The total operation time period is a user set time period for which the air conditioner 200 is operated in a concentration enhancing mode. The at least one processor 310 may divide the total operation time period (e.g., 5 hours) into a plurality of time periods 1010, 1020, 1030, 1040, and 1050 and control at least one of the angle of each vane, the temperature set on the air conditioner 200, and volume of air flowing toward the user in each time period unit (e.g., 1

hour unit) among the divided time periods. The at least one processor 310 may control the at least one of the angle of each of vanes, the temperature, and the air volume in each time period to differ from the at least one of the angle of each of vanes, the temperature, and the air volume in a previous time period of the each time period and operate the air conditioner 200 based on the controlled configurations.

[0114] For example, during a first time period 1010 of the total operation time period (e.g., 5 hours), the at least one processor 310 may control the air conditioner 200 to be operated in the concentration enhancing mode like as a first pattern 1011 in which the at least one processor 310 adjusts the air volume to high wind volume, a temperature to a set temperature (T_0), the angle of the vane from 20° to 80° . For a second time period 1020 of the total operation time period (e.g., 5 hours), the at least one processor 310 may operate the air conditioner 200 like as a second pattern 1021 in which the at least one processor 310 adjusts the air volume of the air conditioner 200 to high air volume and medium air volume, the temperature to a set temperature (T_0+1), and the angle of the vane from 20° to 80° . For a third time period 1030 of the total operation time period (e.g., 5 hours), the at least one processor 310 may operate the air conditioner 200 like as a third pattern 1031 in which the at least one processor 310 adjusts the air volume of the air conditioner 200 to high air volume, the temperature to a set temperature (T_0+2), and the angle of the vane from 20° to 80° . For a fourth time period 1040 of the total operation time period (e.g., 5 hours), the at least one processor 310 may operate the air conditioner 200 like as a fourth pattern 1041 in which the at least one processor 310 adjusts the air volume of the air conditioner 200 to high air volume and medium air volume, the temperature to a set temperature (T_0+1), and the angle of the vane from 20° to 80° . The operation pattern of the air conditioner 200 for the second time period 1020 may be identical to the operation pattern of the air conditioner 200 for the fourth time period 1040. In addition, for a fifth time period 1050 of the total operation time period (e.g., 5 hours), the at least one processor 310 may operate the air conditioner 200 like as a fifth pattern 1051 in which the at least one processor 310 adjusts the air volume of the air conditioner 200 to high air volume, the temperature to a set temperature (T_0), and the angle of the vane from 20° to 80° .

[0115] Referring to FIGS. 11A and 11B, an angle of each of vanes may be variously adjusted. For example, when wind discharged from the air conditioner 200 is indirect wind, the angle of the at least one vane may be gradually adjusted from a first angle 1110 to a second angle 1120. In addition, when the wind discharged from the air conditioner 200 is direct wind, the angle of the at least one vane may be gradually adjusted to a third angle 1130, a fourth angle 1140, a fifth angle 1150, a sixth angle 1160, and a seventh angle 1170. The angle of the at least one vane may be adjusted to the third angle 1130 in a reverse sequence after the seventh angle. At least one of the first angle, the second angle, the third angle, the fourth angle, the fifth angle, the sixth angle, or the seventh angle may be adjusted to have a different angle value.

[0116] FIG. 12A is an exemplary view showing vane angles in each mode and operation time periods at each angle adjusted to have different values. FIG. 12B is an exemplary view showing an example result of adjusting angles in each mode and operation time periods at each angle to have different values.

[0117] Referring to FIGS. 12A and 12B, a first experiment 1210 is an example in which an air conditioner is operated at 20° of angle of at least one vane for 60 seconds, at 45° of angle of at least one vane for 60 seconds, and from 40° to 80° of angle of the at least one vane for 90 seconds. A second experiment 1220 is an example in which the air conditioner is operated at 20° of angle of at least one vane for 60 seconds, at 45° of angle of the at least one vane for 60 seconds, and at 40° to 80° of angle of the at least one vane for 120 seconds.

[0118] A third experiment 1230 is an example in which the air conditioner is operated at 20° of angle of at least one vane for 60 seconds, at 45° of angle of the at least one vane for 60 seconds, and from 40° to 80° of angle of the at least one vane for 90 seconds. A fourth experiment 1240 is an example in which the air conditioner is operated at 20° of angle of at least one vane for 60 seconds, at 40° of angle of the at least one vane for 60 seconds, and from 20° to 80° of angle of the at least one vane for 90 seconds. According to the experiments executed under the above conditions, the higher the stimulus is, the higher the concentration is in the fourth experiment as shown in FIG. 12B.

[0119] FIG. 13 is an exemplary view showing an example result of measuring brainwave before and after executing a concentration enhancing mode.

[0120] Referring to FIG. 13, an alpha level and a beta level are significantly increased after executing the concentration enhancing mode than before executing the concentration enhancing mode. The alpha level refers to a person's comfort and the beta level refers to a person's concentration and awakening. The higher the alpha level is, the higher the comfort index is, and the higher the beta level is, the higher the concentration or awakening is. For example, the alpha wave ratio before executing the concentration enhancing mode was 12.4%, but the alpha wave ratio after executing the concentration enhancing mode was increased to 15%, indicating that the user's comfort was improved. In addition, the beta wave ratio before executing the concentration enhancing mode was 17.6%, but the beta wave ratio after executing the concentration enhancing mode was increased to 24.1%, indicating that the user's concentration and awakening were improved.

[0121] Each step in each of the flowcharts described above may be operated regardless of the illustrated sequence, or may be performed simultaneously. In addition, at least one component of the present disclosure and at least one operation performed by the at least one component may be implemented with hardware and/or software.

[0122] Although the present disclosure has been described as described above with reference to exemplary drawings, the present disclosure is not limited to the embodiments and drawings disclosed herein, and various modifications may be made by those skilled in the art within the scope of the technical idea of the present disclosure. In addition, even if working effects obtained based on configurations of the present disclosure are not explicitly described in the description of embodiments of the present disclosure, effects predictable based on the corresponding configuration have to be recognized.

[Description of Symbols]

[0123]

310:	Processor	311:	Timer
320:	Communicator sensor unit	321:	Temperature measurement
330:	Air volume controller	340:	Wind direction controller
350:	Communicator	360:	Input unit
370:	Storage unit		

Claims

1. An air conditioner (200), comprising:

a communicator (350);
 an air volume controller (330);
 a wind direction controller (340); and
 at least one processor (310) electrically connected to the communicator (350), the air volume controller (330), and the wind direction controller (340),
 wherein the at least one processor (310) is configured to:
 control at least one of an angle of at least one vane (210, 220, 230, 240), a temperature, or air volume of the air conditioner (200) in a predetermined time period unit based on receiving a signal for controlling an operation of the air conditioner (200).

2. The air conditioner of claim 1, further comprising:

a sensor unit (320) configured to comprise a motion sensing sensor (260) to detect a movement of an object, and a temperature measurement sensor (321) to measure a temperature of a space where the air conditioner (200) is placed.

3. The air conditioner of claim 2, wherein the least one processor (310) is configured to control the at least one of the angle of each vane among the at least one vane (210, 220, 230, 240) adjusted by the wind direction controller (340), a temperature set on the air conditioner (200), and the air volume controlled by the air volume controller (330) in the predetermined time period unit.

4. The air conditioner of claim 3, wherein the at least one processor (310) is configured to adjust the angle of the each vane, the temperature set on the air conditioner, and the air volume based on the movement of the object.

5. The air conditioner of any one of claims 2 to 4, wherein the at least one processor (310) is configured to:

control the motion sensing sensor (260) to identify a position of the object based on receiving the signal and detect the movement of the identified object, and
 identify whether the object is drowsing based on the detected movement of the object.

6. The air conditioner of any one of claims 3 to 5,
 wherein the received signal comprises information on a total operation time period for which the air conditioner (200) is operated, and
 wherein the at least one processor (310) is configured to:

divide the total operation time period into a plurality of time periods, and

control at least one of the angle of the each vane, the temperature set on the air conditioner (200), and the volume of air flowing toward the object in each time period among the divided plurality of time periods to differ from at least one of the angle of each vane, the temperature set on the air conditioner (200), and the volume of air flowing toward the object in a previous time period of the each time period.

7. The air conditioner of claim 6, wherein the at least one processor (310) is configured to control the air conditioner (200) to be operated at a first temperature and control the wind direction controller (340) to automatically swing the at least one vane (210, 220, 230, 240) for a first time period among the divided plurality of time periods.

8. The air conditioner of claim 7, wherein the at least one processor (310) is configured to control the wind direction controller (340) to automatically swing the at least one vane (210, 220, 230, 240) for a predetermined first sub-time period among the first time period.

9. The air conditioner of claim 8, wherein the at least one processor (310) is configured to operate the air conditioner (200) in a first mode after the predetermined first sub-time period, and wherein the first mode is a mode in which the at least one processor:

controls the air volume controller (330) to adjust the wind volume to a first air volume, and controls the wind direction controller (340) to:

move the at least one vane (210, 220, 230, 240) within a first angle for a predetermined second sub-time period,

after the predetermined second sub-time period, to move the at least one vane (210, 220, 230, 240) within a second angle that is greater than the first angle for a predetermined third sub-time period, and after the predetermined third sub-time period, automatically swing the at least one vane (210, 220, 230, 240) for a predetermined fourth sub-time period.

10. The air conditioner of claim 9, wherein the at least one processor (310) is configured to control the air conditioner (200) to be operated in the first mode for the first time period, and sequentially and repeatedly operated in a second mode and a third mode for a second time period subsequent to the first time period, wherein the second mode is a mode in which the at least one processor controls the air conditioner (200) to adjust the first temperature in the first mode to a second temperature that is higher than the first temperature by a predetermined temperature, and controls the air volume controller (330) to adjust the air volume to second air volume that is less than the first air volume, and wherein the third mode is a mode in which the at least one processor controls the air volume controller (330) to adjust the second air volume to the first air volume.

11. The air conditioner of claim 10, wherein the at least one processor (310) is configured to control the air conditioner (200) to be repeatedly operated in the second mode and the third mode for the second time period, and then operated in the first mode for the third time period subsequent to the second time period.

12. The air conditioner of claim 11, wherein the at least one processor (310) is configured to control the air conditioner (200) to be sequentially and repeatedly operated in the first mode to the third mode for the total operation time period.

13. An apparatus, comprising
a communicator (350);
an air volume controller (330);
a wind direction controller (340);
at least one processor (310); and
a memory (370) electrically connected to the communicator (350), the air volume controller (330), the wind direction controller (340), and the at least one processor (310),
wherein the memory (370) is configured to store instructions that, when executed by the at least one processor (310), causes the apparatus to perform operations comprising:
controlling at least one of an angle of at least one vane (210, 220, 230, 240), a temperature, and air volume of the air conditioner (200) in a predetermined time period unit based on receiving a signal for controlling the operation of the air conditioner.

14. The apparatus of claim 13, further comprising a sensor unit (320) configured to comprise a motion sensing sensor (260) to detect a movement of an object and a temperature measurement sensor (321) to measure a temperature of a space where the air conditioner (200) is placed.

5 15. A method for controlling an air conditioner (200) comprising a communicator (350), an air volume controller (330), a wind direction controller (340), and at least one processor (310), comprising:

10 receiving a signal for controlling an operation of the air conditioner (200), and
controlling at least one of an angle of each of at least one vane (210, 220, 230, 240), a temperature, and air
volume of the air conditioner (200) based on receiving the signal in a predetermined time period unit.

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FIG. 1

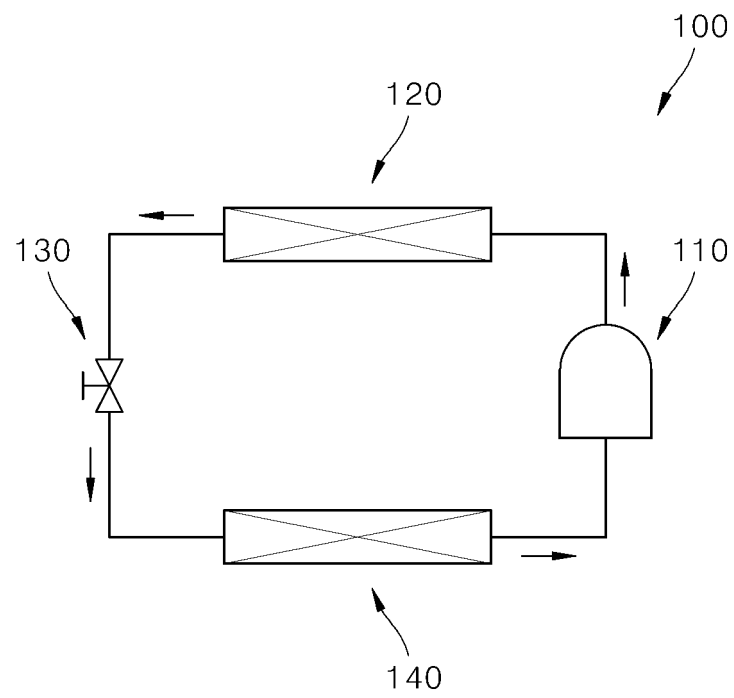


FIG. 2

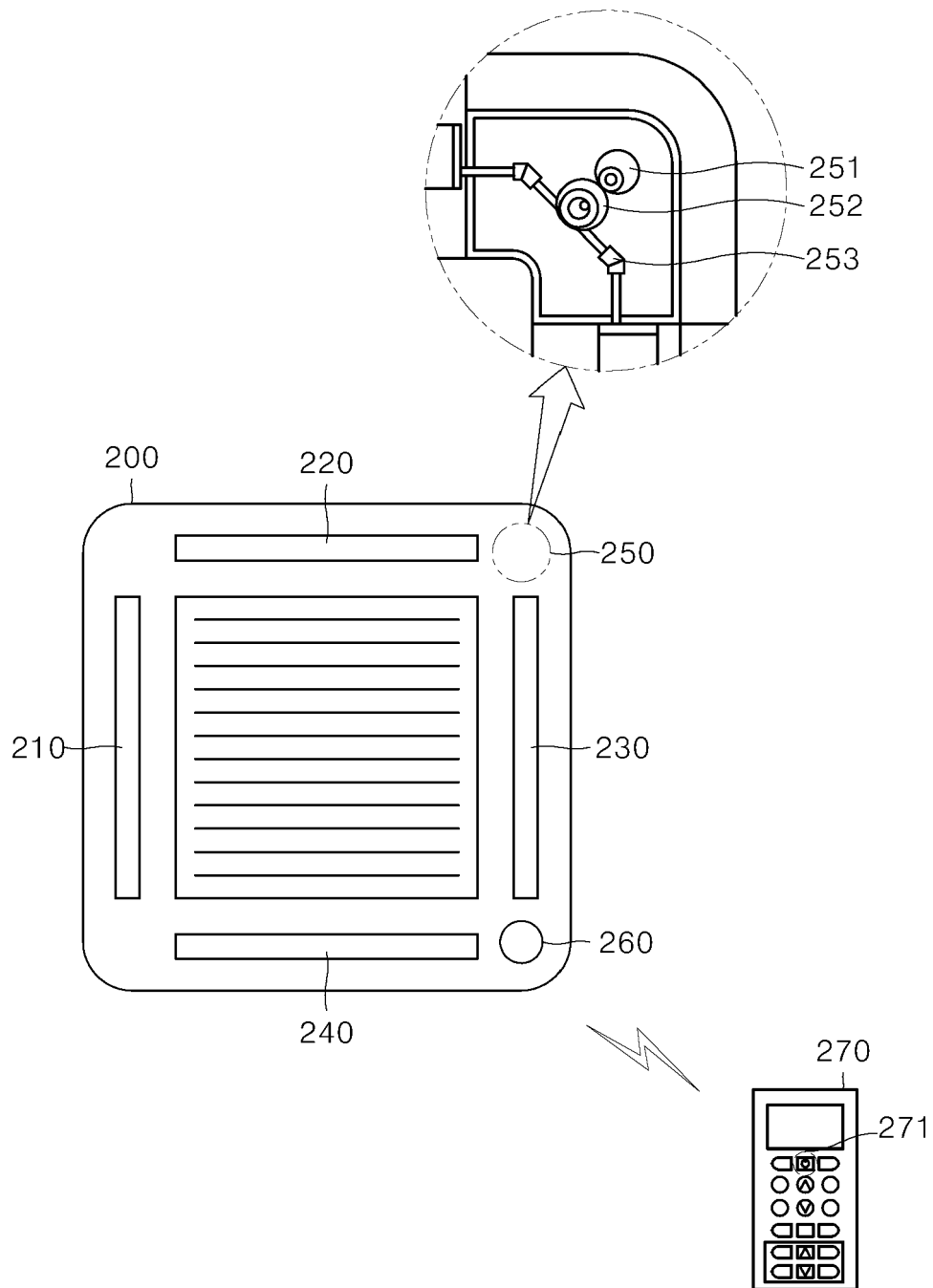


FIG. 3

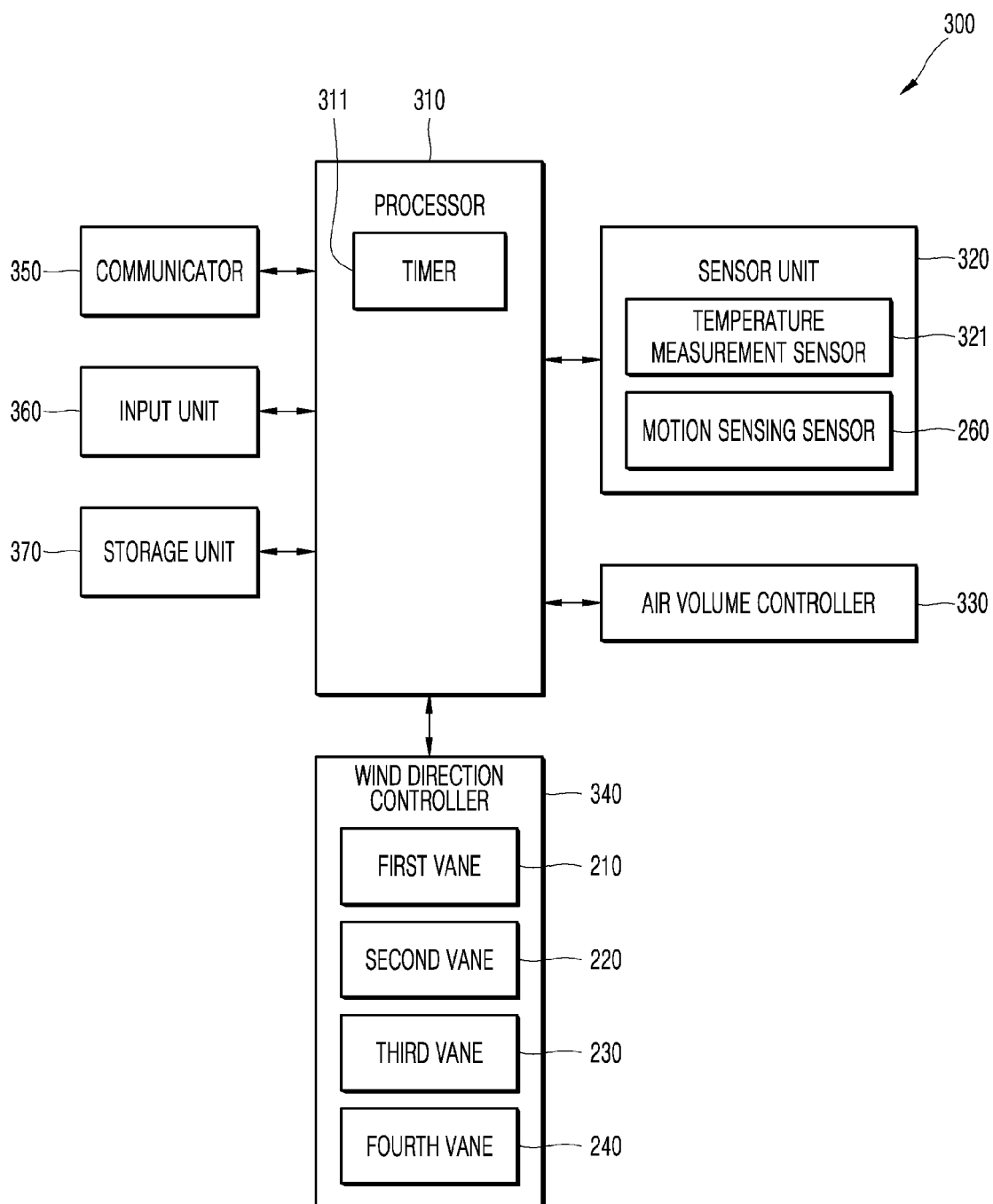


FIG. 4

400

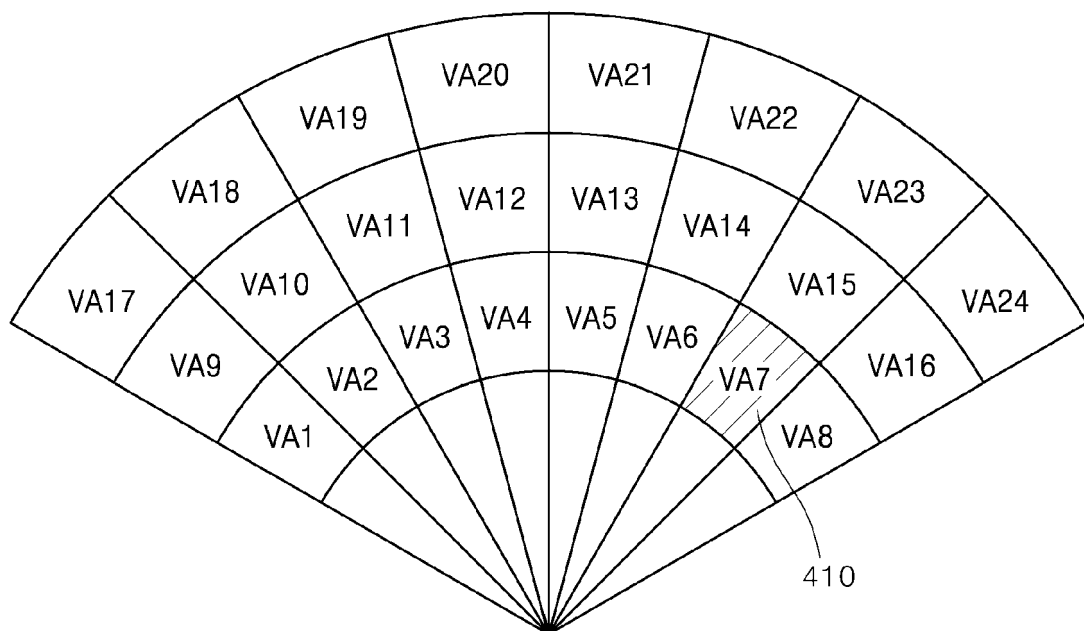


FIG. 5

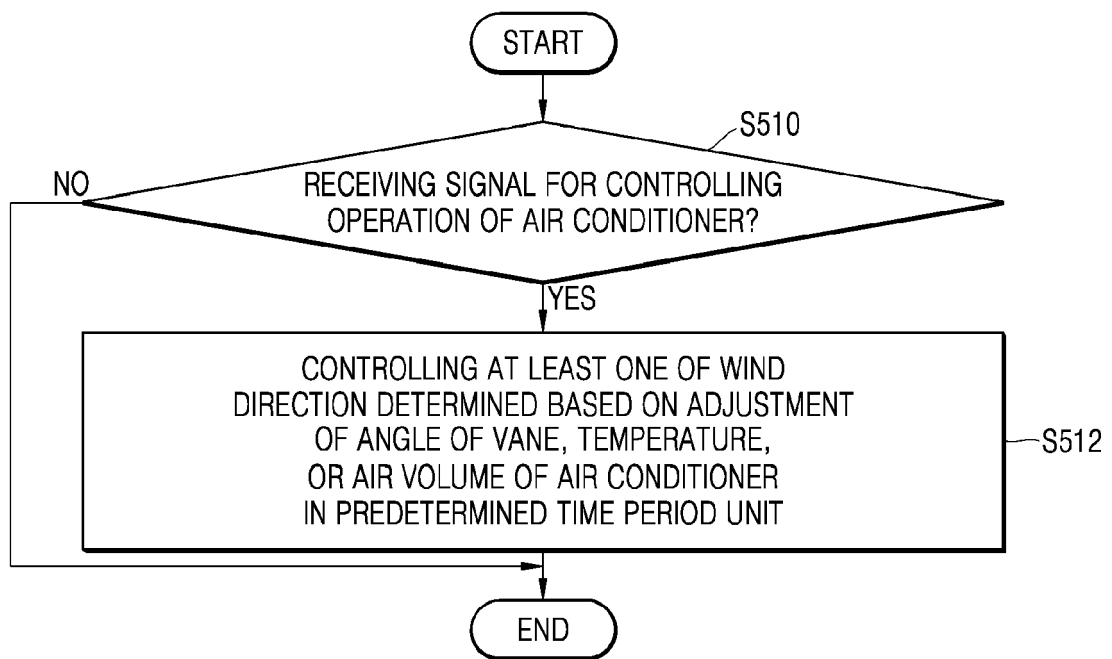


FIG. 6

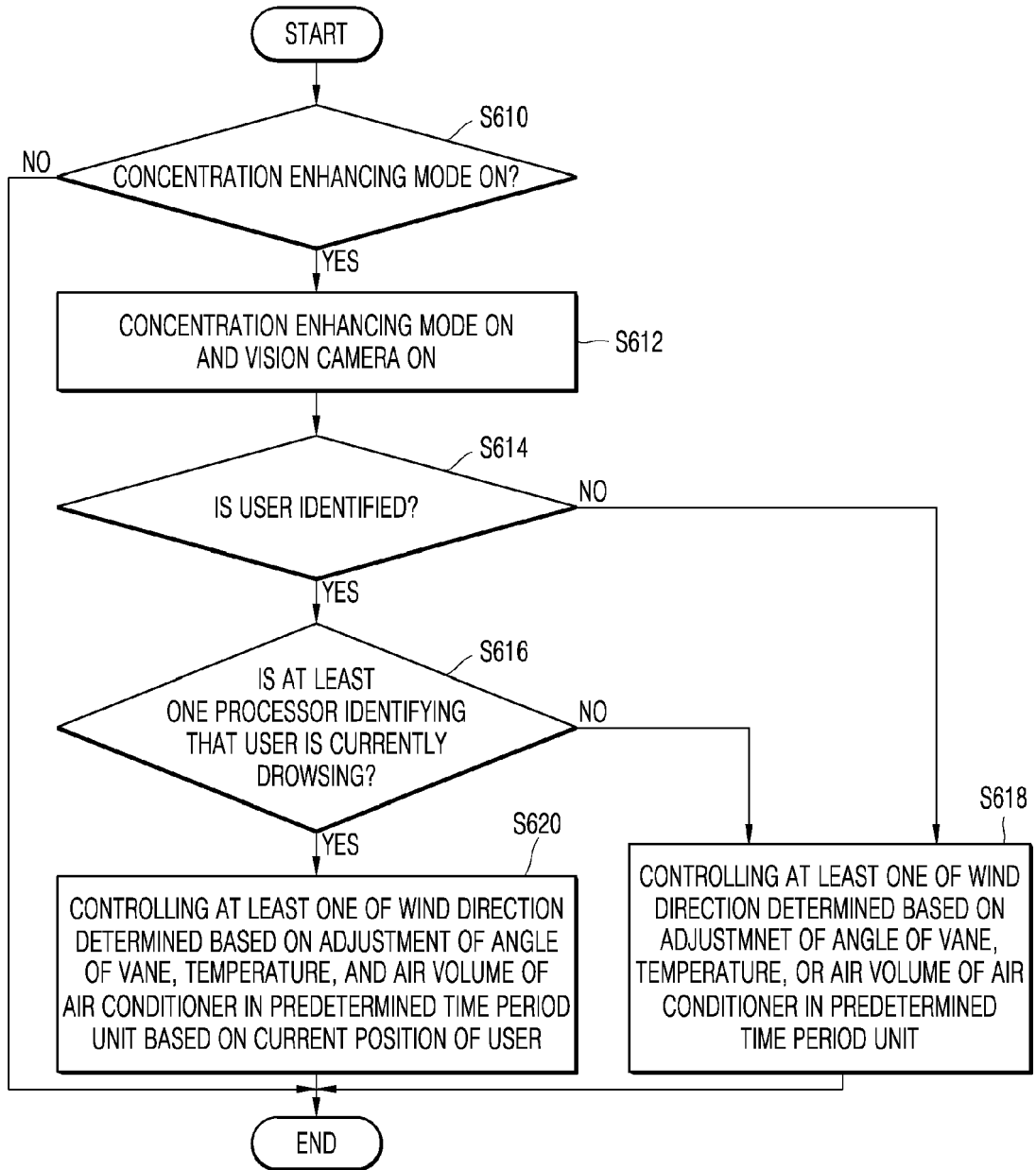


FIG. 7

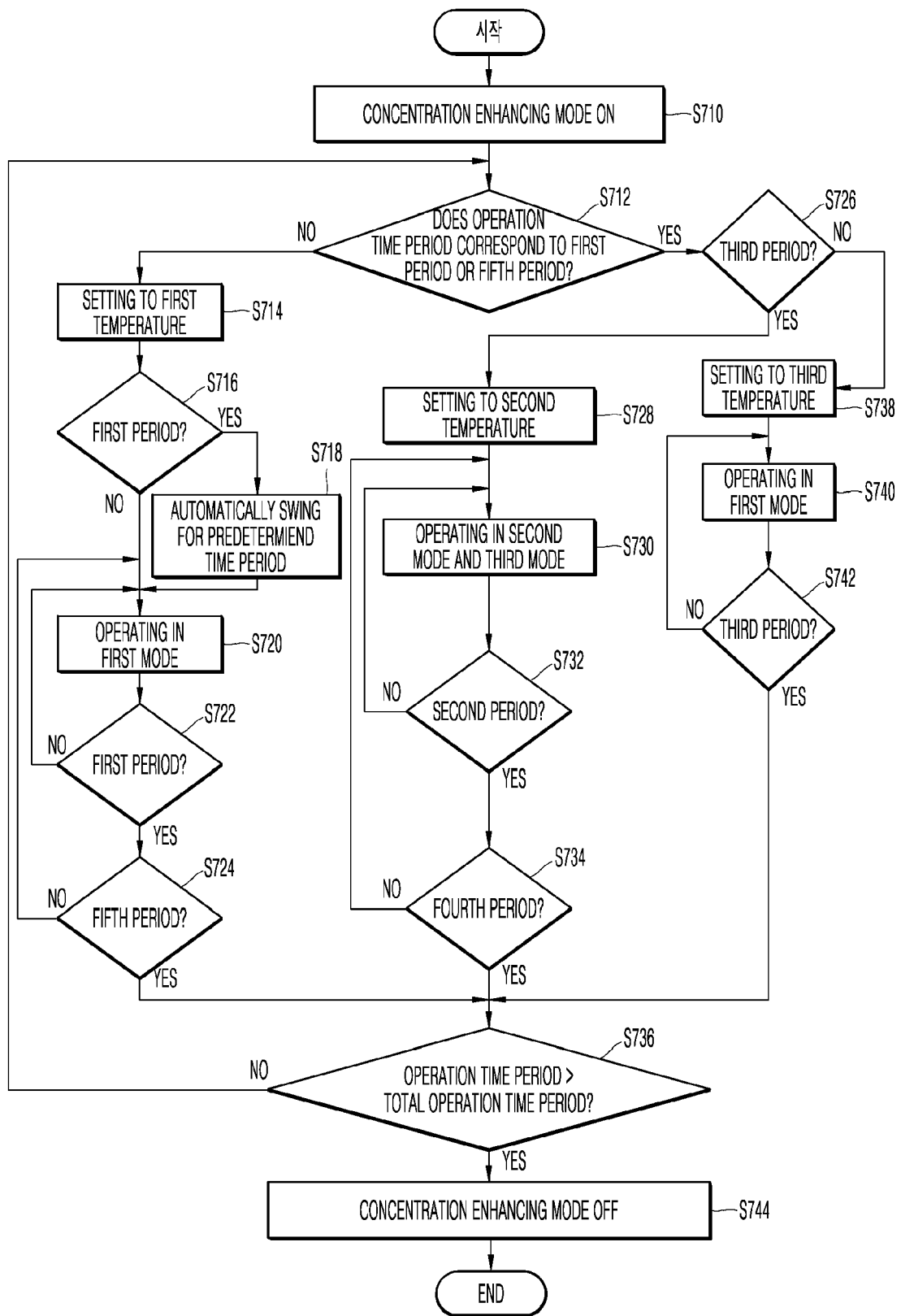


FIG. 8

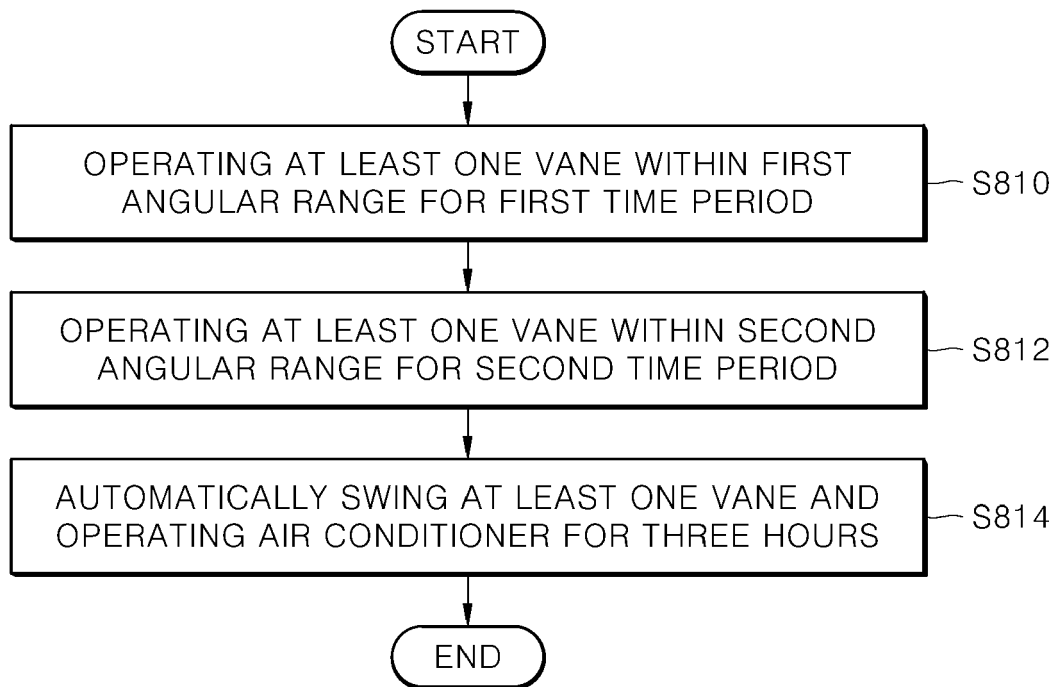


FIG. 9

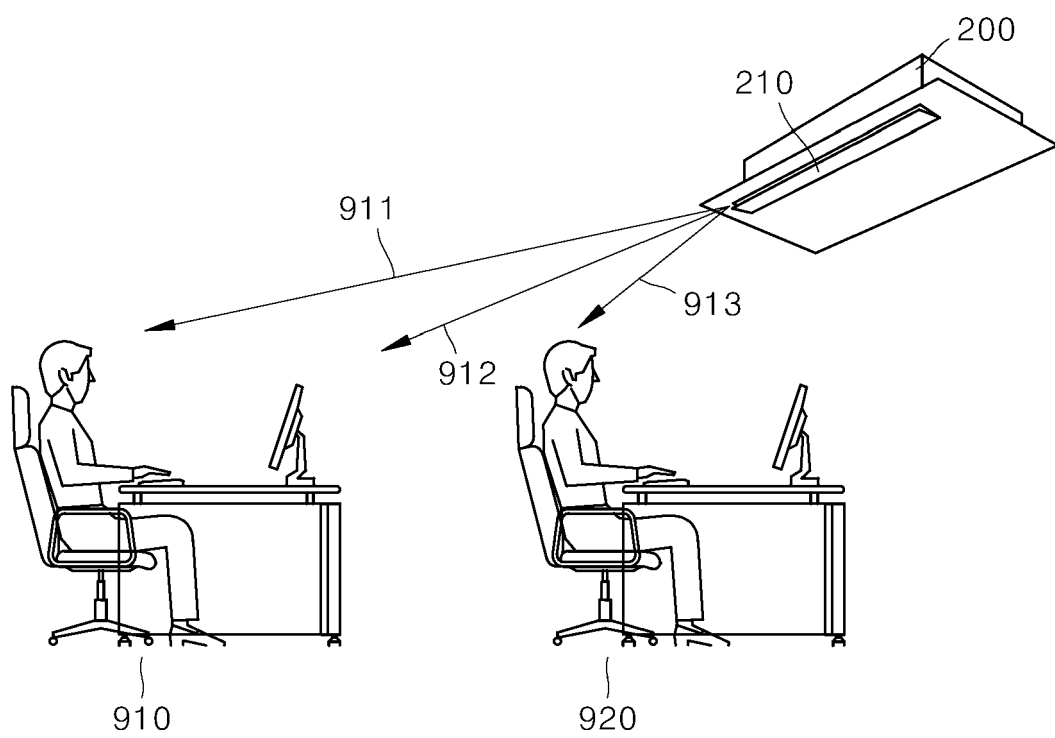


FIG. 10

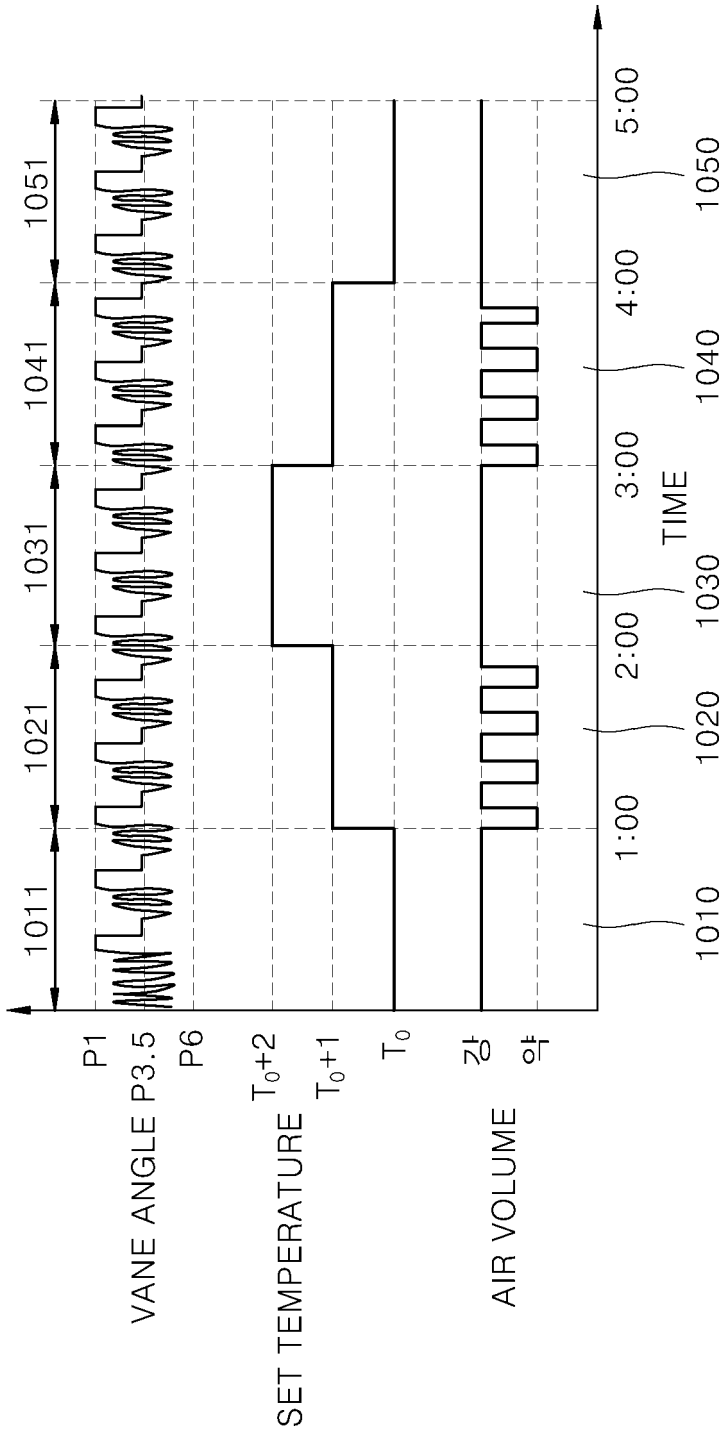


FIG. 11A

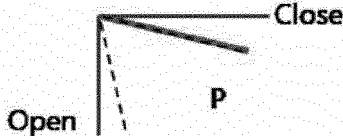
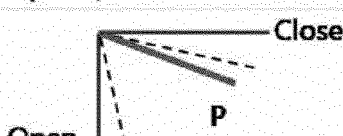
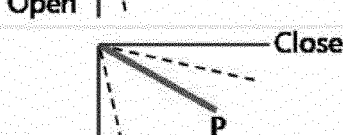
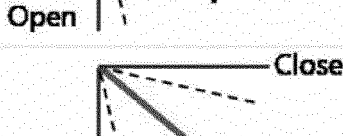
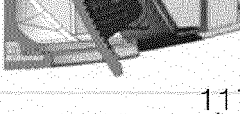
	Vane Mode	Vane Open View		
INDIRECT WIND	P1			20°
	P2			30°
DIRECT WIND	P3			40°
	P4			50°
	P5			60°
	P6			70°
	P7			80°

FIG. 11B

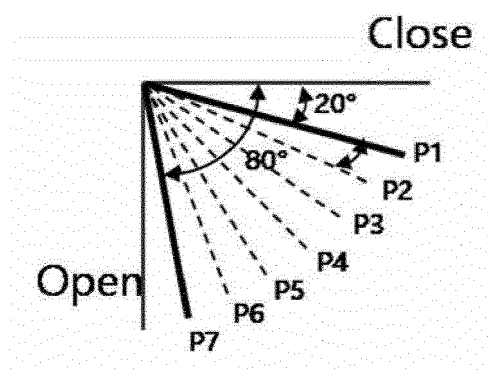


FIG. 12A

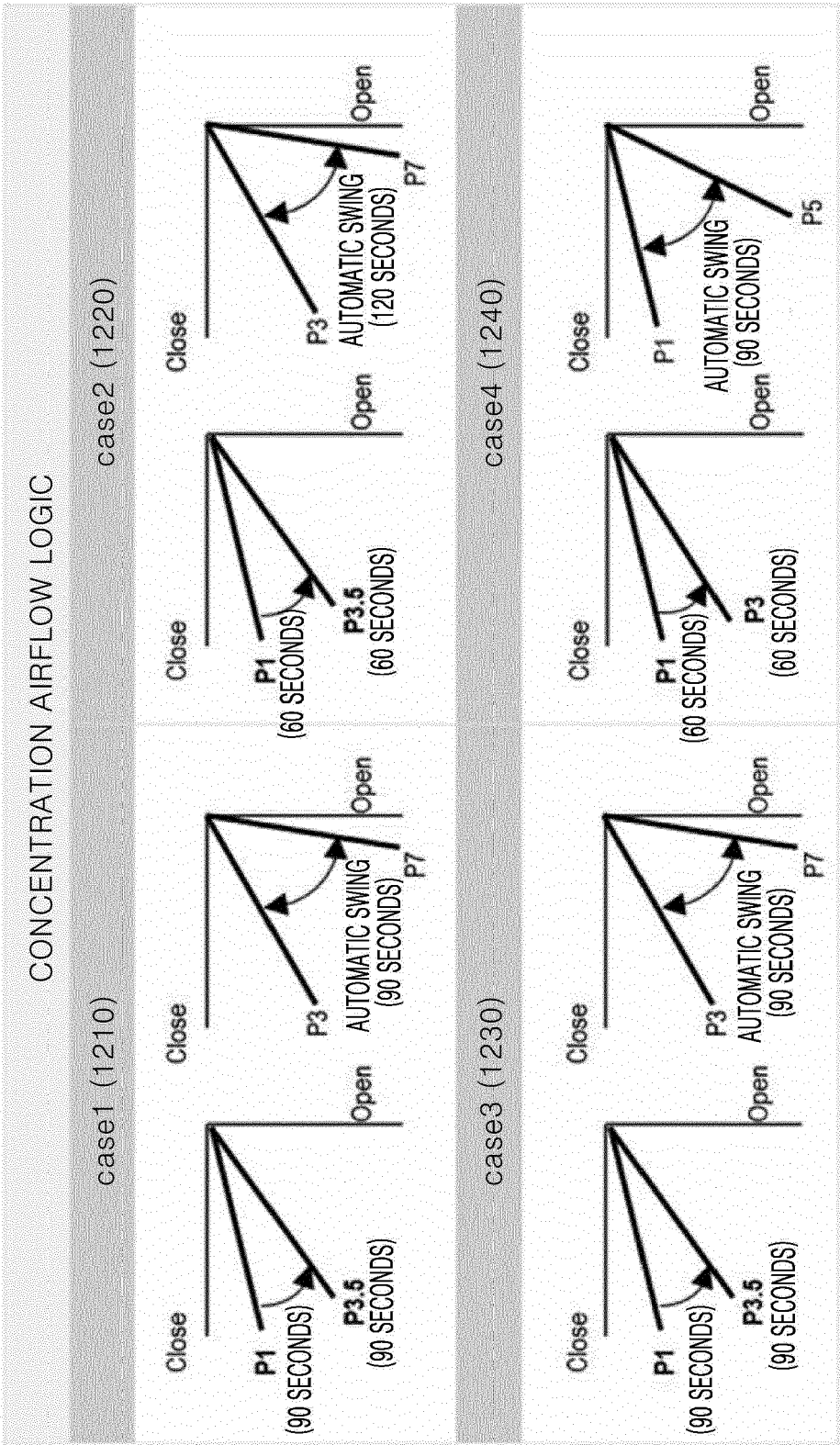


FIG. 12B

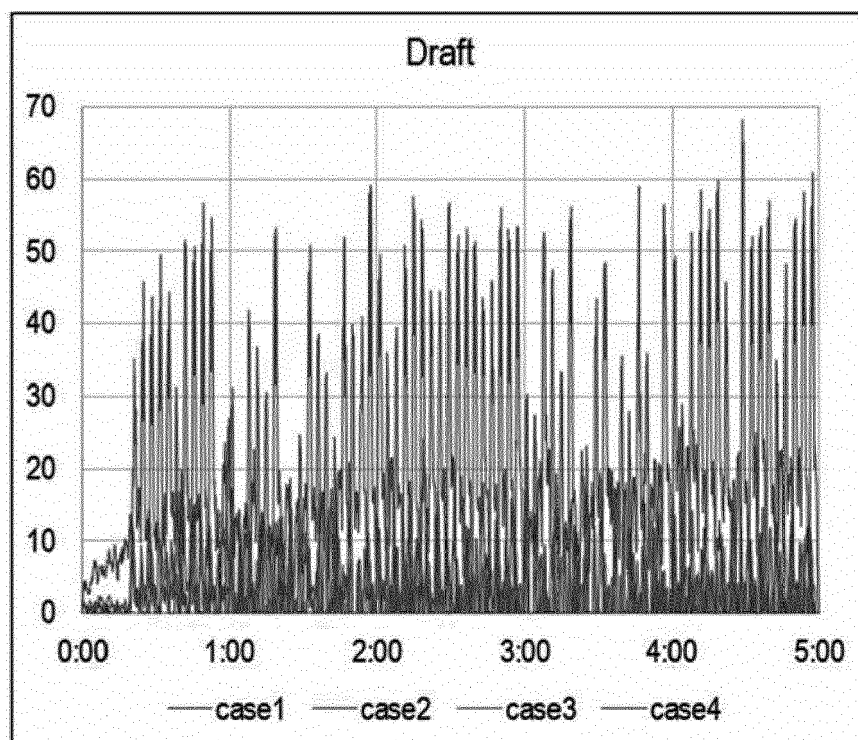
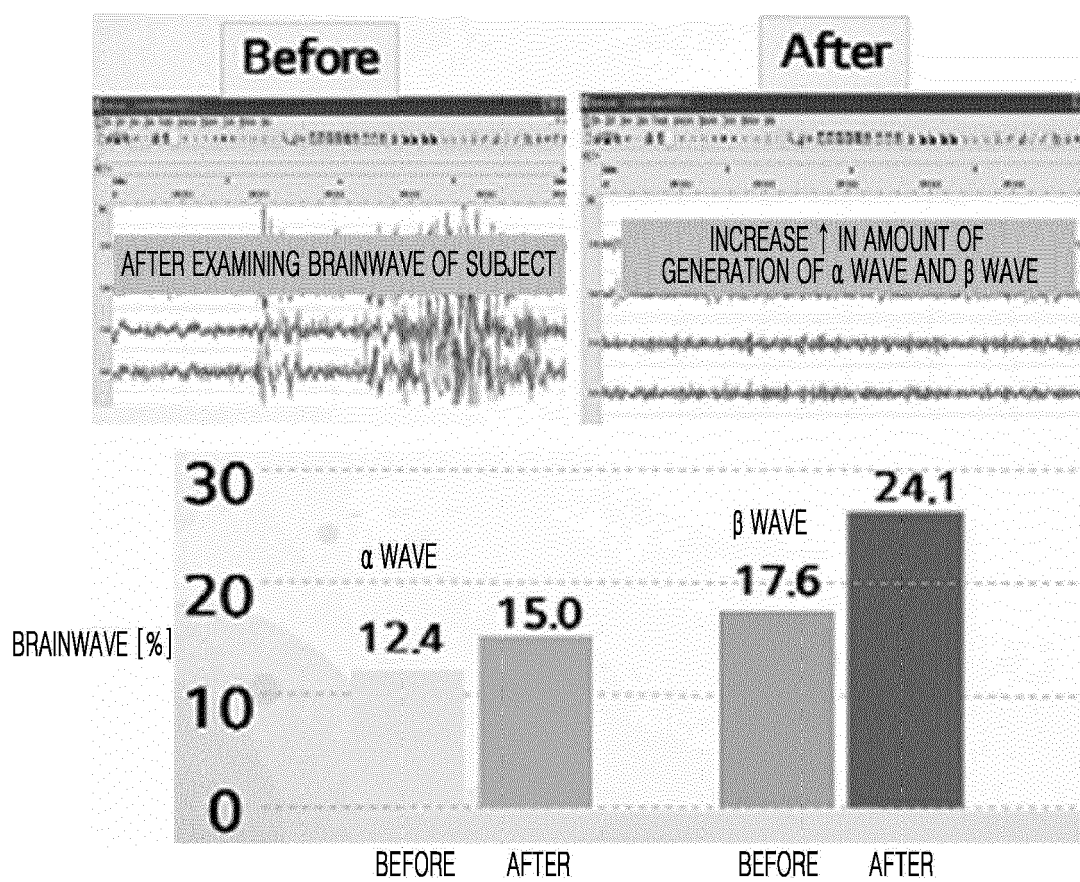


FIG. 13



REFERENCES CITED IN THE DESCRIPTION

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- JP 2014084828 A [0005] [0007]