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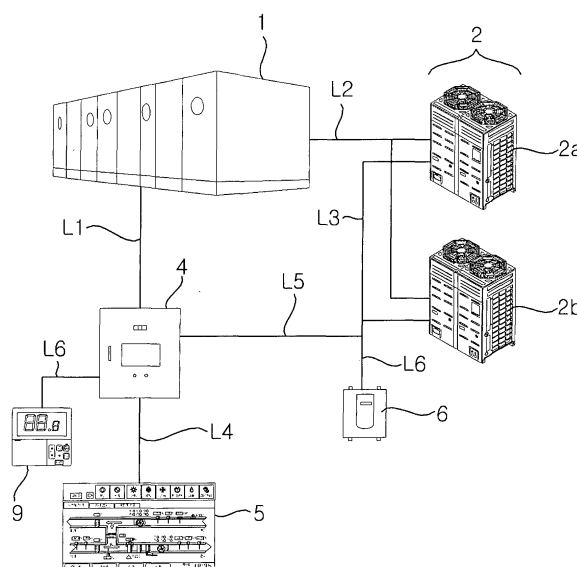
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(54) **AIR CONDITIONING SYSTEM**

(57) The present invention relates to an air conditioning system, comprising an air handling unit (1) to handle indoor air, an interface unit (5) which provides an interface to control the air handling unit (1), and a central controller (4). The controller comprises an input/output unit (120a, b) which provides an input/output port through which an electric signal is input and output between devices configuring the air handling unit and a control unit (110) which is configured to interwork with the interface unit (5) to control the devices configuring the air handling unit (1). The interface unit (5) is configured to configure the interface based on configuration of the devices configuring the air handling unit (1) recognized through the input/output unit (120a, b), the interface being reconfigured in accordance with change of the devices configuring the air handling unit (1). (Fig. 1)

Fig. 1



Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority under ----- to Korean Patent Application No. 10-2014-0094995, filed on July 25, 2014 in the Korean Intellectual Property Office, whose entire disclosure is incorporated herein by reference.

BACKGROUND

1. Field

[0002] The present invention relates to an air conditioning system.

2. Background

[0003] An air conditioning system is a device which controls indoor air and cools, heats, dehumidifies, humidifies, or ventilates indoor air. Generally, the air conditioning system includes a heat pump which increases the heat from a low temperature to a high temperature. The heat pump is widely known to cool or heat indoor air by circulating a refrigerant between indoor and outdoor using a compressor, and passing the refrigerant through a condenser, an expansion valve, and an evaporator during the refrigerant circulating process to exchange heat with surrounding air.

[0004] In a building having a plurality of rooms, individual air conditioning systems may be provided for the rooms or air for conditioning may be supplied to the plurality of rooms from a common air handling unit through at least one duct. When the common air handling unit is used like the latter, a plurality of outdoor units including a driving source (for example, a compressor) of the heat pump may be provided in accordance with the number of rooms which are air handling targets.

[0005] The air handling unit is configured by several devices such as a blower fan which blows air into the duct, a motor which drives the blower fan, a heat exchanger which serves as a condenser or an evaporator, an expansion valve, and a damper which adjusts an opening degree of the duct and the air conditioning system includes a controller which controls the above described devices and an interface unit which functions as an input unit or an output unit of the controller and displays operation states of the devices to a user, and provides an interface for receiving a control command for the devices.

[0006] The air handling unit may have different configurations of the devices depending on a handling load or an installation condition such as an air handling function to be provided. For example, when the number of rooms which are handling targets is large, that is, the air handling load is large, more blower fans and motors may be provided as compared with a small air handling load. Further,

when a function which supplies mixed air in which return air discharged from the indoor and outdoor air flowing from the outdoor are mixed at a target ratio to the indoor is provided in addition to a function which simply supplies outdoor air to the indoor, dampers which adjust inflow rates of the outdoor air and the return air and a discharging rate of the mixed air may be further provided. When the configurations of the devices vary depending on the installation condition, a configuration of the controller or the interface needs to be changed. However, in the air conditioning system of the related art, it is difficult to change the configuration of the controller or the interface. Further, when the configurations of the devices are changed, it is difficult to reflect the changed configurations so that commonality of the controller or the interface unit is lowered.

SUMMARY OF THE INVENTION

[0007] The present invention has been made in an effort to provide an air conditioning system which easily reconfigures an interface that is provided through an interface unit even when a configuration of an air handling unit varies depending on an installation condition, so that generality for various requirements such as extension, modification, or simplification of the system is improved.

[0008] An exemplary embodiment of the present invention provides an air conditioning system, including: an air handling unit which handles indoor air; an interface unit which provides an interface to control the air handling unit; and a central controller which includes an input/output unit that provides an input/output port through which an electric signal is input and output between devices configuring the air handling unit and a control unit which interworks with the interface unit to control the devices configuring the air handling unit, in which the interface unit may configure the interface based on configuration of the devices configuring the air handling unit recognized through the input/output unit and the interface may be reconfigured in accordance with change of the devices configuring the air handling unit.

[0009] Another exemplary embodiment of the present invention provides an air conditioning system, including: an air handling unit which handles indoor air; an interface unit which provides an interface to control the air handling unit; and a central controller which includes an input/output unit that provides an input/output port through which an electric signal is input and output between devices configuring the air handling unit and a control unit which interworks with the interface unit to control the devices configuring the air handling unit, in which the interface unit may configure the interface based on configuration of the devices configuring the air handling unit recognized through the input/output unit and the interface may be reconfigured in accordance with change of the devices configuring the air handling unit.

[0010] The interface unit may generate a control menu for an added device when a device is added to the air

handling unit.

[0011] The interface unit may inactivate or remove a control menu for a removed device when a device is removed from the air handling unit.

[0012] The interface unit may display a driving state of the air handling module in accordance with a signal value which is input through the input/output unit.

[0013] A plurality of input/output units may be provided and the plurality of input/output units may communicate with the control unit through serial communication.

[0014] An analog signal may be input/output through the input/output terminal.

[0015] A digital signal may be input/output through the input/output terminal.

[0016] The air handling module may include a fan motor and further include a driver which drives the fan motor in accordance with a control signal which is applied from the control unit.

[0017] The interface unit may be provided in a location spaced apart from the air handling unit.

[0018] The interface unit may be movable.

[0019] The control unit may include a recording unit which records information on devices configuring the air handling unit and when a new device is added to the air handling unit, the interface unit may obtain information on the added device from the recording unit and reconfigure the interface in accordance with the obtained information.

[0020] The air handling unit may include at least one of a temperature sensor, a humidity sensor, a fan motor, a low rate sensing sensor, a pressure sensor, a differential pressure sensor, a different pressure switch, a valve, a damper, a smoke sensing sensor, and a heater.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

FIG. 1 illustrates a configuration of an air conditioning system according to an exemplary embodiment of the present invention;

FIG. 2 is an applied example of the air conditioning system illustrated in FIG. 1;

FIG. 3 illustrates a configuration of an air handling unit according to an exemplary embodiment of the present invention;

FIG. 4 is a block diagram illustrating a control relationship between main components of an air conditioning system according to an exemplary embodiment of the present invention;

FIG. 5 is a view illustrating a connection relationship between main components of an air conditioning system according to an exemplary embodiment of the present invention;

FIG. 6A illustrates a configuration of a central controller according to an exemplary embodiment of the

present invention and component devices of an air handling unit which communicate with the central controller and FIG. 6B illustrates a configuration of a blower fan;

FIG. 7 illustrates a structure of menus of an interface which is provided through an interface unit according to an exemplary embodiment of the present invention;

FIG. 8 is an exemplary view to explain a login method of an interface;

FIGS. 9 to 12 are exemplary views illustrating an exemplary embodiment of a monitoring screen of an interface unit 5 of an air conditioning system according to the present invention;

FIG. 13 is an exemplary view illustrating an idle screen of an interface unit according to an exemplary embodiment of the present invention;

FIGS. 14 to 16 are exemplary views to explain a manager setting menu of an interface unit according to an exemplary embodiment of the present invention;

FIG. 17 is an exemplary view illustrating a product information screen of an interface unit according to an exemplary embodiment of the present invention;

FIGS. 18 to 22 are exemplary views to explain a system setting menu of an interface unit according to an exemplary embodiment of the present invention;

FIGS. 23 and 24 are exemplary views to explain a schedule setting menu of an interface unit according to an exemplary embodiment of the present invention;

FIG. 25 is an exemplary view illustrating an exemplary embodiment of a screen on which history information of an interface unit of an air conditioning system according to the present invention is displayed; and

FIG. 26 is an exemplary view illustrating an exemplary embodiment of a screen on which a warning is output when an error of an interface unit of an air conditioning system according to the present invention is incurred.

DETAILED DESCRIPTION

[0022] Advantages, features and methods for achieving those of embodiments may become apparent upon referring to embodiments described later in detail together with attached drawings. However, embodiments are not limited to the embodiments disclosed hereinafter, but may be embodied in different modes. The embodiments are provided for perfection of disclosure and informing a scope to persons skilled in this field of art. The same reference numbers may refer to the same elements throughout the specification.

[0023] FIGS. 1 to 3 are views illustrating a configuration of an air conditioning system according to an exemplary embodiment of the present invention. FIG. 4 is a block diagram illustrating a control relationship between main components of an air conditioning system according to

an exemplary embodiment of the present invention. FIG. 5 is a view illustrating a connection relationship between main components of an air conditioning system according to an exemplary embodiment of the present invention.

[0024] Referring to FIGs. 1 to 5, the air conditioning system includes an air handling unit 1, an outdoor unit 2, a central controller 4, and an interface unit 5.

[0025] The air handling unit 1 supplies air to the indoor to condition the indoor air. The air handling unit 1 may be configured by devices such as a blower fan which blows air through at least one duct 3a, 3b and 3c (see FIG. 2) which communicates with the indoor, a motor which drives the blower fan, a heat exchanger which adjusts a temperature of air which is supplied to the indoor, and a supply air damper which adjusts an inflow rate of the supply air which is supplied to the indoor through the duct.

[0026] The air handling unit 1 supplies not only the outdoor air OA but also return air RA, which circulates in the indoor and returns, to the indoor and discharges the outdoor air and/or the return air, which flow in the indoor, to the outdoor. The air handling unit 1 may include a return air damper which adjusts an inflow rate of the return air and an exhaust air damper which adjusts a flow rate of the exhaust air EA which is discharged to the outdoor and/or a mixture damper which adjusts a mixture ratio of the return air RA and the exhaust air EA which are mixed indoor to be supplied.

[0027] The air handling unit 1 may include a plurality of devices which are involved to handle the indoor air. These devices may include a temperature sensor, a humidity sensor, a fan motor, a flow sensing sensor, a pressure sensor, a differential pressure sensor, a differential pressure switch, a valve, a damper, a smoke sensing sensor, and a heater and these configurations interwork with each other under control of the central controller 4 to condition the indoor air. These configurations will be described in more detail below.

[0028] The outdoor unit 2 supplies a heat source of the heat pump to the air handling unit 1. Hereinafter, as an example of the heat source, a refrigerant which passes through a heat exchanger in accordance with a temperature of surrounding air to change a phase is used. However, the outdoor unit 2 is not limited thereto but may be configured by air cooling type or water cooling type electric heat pump (EHP) or gas heat pump (GHP).

[0029] The outdoor unit 2 may include a compressor which compresses the refrigerant to discharge a high pressure gaseous refrigerant, an accumulator which divides a gaseous refrigerant and a liquid refrigerant from the refrigerant to prevent the liquid refrigerant which is not vaporized from flowing into the compressor, an oil separator which collects oil from the refrigerant discharged from the compressor, an outdoor heat exchanger which condenses or evaporates the refrigerant by heat exchange with the outdoor air, an outdoor unit fan which flows the air into the outdoor heat exchanger or discharges the heat-exchanged air to the outdoor in order to

smoothly perform the heat exchange of the outdoor heat exchanger, a four way valve which changes a flow channel of the refrigerant in accordance with a driving mode of the outdoor unit, a pressure sensor which measures a pressure, a temperature sensor which measures a temperature, and a control configuration which controls an operation of the outdoor unit and communicates with the other unit. The outdoor unit 2 may further include a plurality of sensors, valves, and super-cooling devices.

[0030] The central controller 4 controls an entire operation of the air conditioning system, and specifically, controls devices which configure the air handling unit 1. The central controller 4 controls not only driving of the air handling unit 1 but also a flow rate of the air which circulates in order to handle indoor air. The central controller 4 includes input/output units 120a and 120b which provide input/output ports to input/output electric signals between the devices which configure the air handling unit 1 and a control unit 110 which controls the devices which configure the air handling unit 1. The control unit 110 interworks with the interface unit 5 which will be described below to control the devices (hereinafter, referred to as air handling unit configuring devices) which configure the air handling unit 1. The input/output units 120a and 120b may include analog input/output (AI/AO) ports or digital input/output (DI/DO) ports as the input/output ports. The control unit 110 may include a recording unit such as a RAM or a magnetic recording device which records information on the devices which configure the air handling unit. In the recording unit, information not only on the devices which are currently installed in the air handling unit 1 but also devices which will be installed therein may be recorded.

[0031] Devices interwork with each other under the control of the control unit 110 to condition the indoor air. For example, the air handling unit 1 may include a supply air temperature sensor which senses a temperature of supply air and a supply air damper which controls a flow rate of the supply air. In this case, the control unit 110 adjusts an opening degree of the damper based on the temperature which is sensed through the supply air temperature sensor.

[0032] The central controller 4 controls the outdoor unit 2. The central controller 4 includes communication units 130a and 130b which communicate with the outdoor unit 2 and a plurality of communication units 130a and 130b may be provided in accordance with the number of outdoor units 2. The communication units 130a and 130b are modularized and when the outdoor unit 2 is added or moved, the communication units may be added or removed. The communication units 130a and 130b transmit signals which reflect a driving state of the outdoor unit 2 to the control unit 110 and the control unit 110 controls the outdoor unit 2 and/or the air handling unit 1 based on the signals. Further, the control unit 110 may directly control the outdoor unit 2 without using the communication units 130a and 130b and in this case, the control unit 110 directly communicates with the outdoor

unit 2 to control an air handling amount. For example, the control unit 110 may control the outdoor unit to be additionally driven or some of the outdoor units which are being driven to be stopped in accordance with the air handling load.

[0033] Communication between the outdoor unit 2 and the communication units 130a and 130b and/or communication between the outdoor unit 2 and the control unit 110 may be wired or wireless communication. For example, the communication units 130a and 130b may provide a wired/wireless RS485 adaptor which employs a serial communication method and is remotely controlled.

[0034] Units which configure the central controller 4 may communicate with each other. For example, these units may perform RS485 communication based on Modbus protocol. Further, the communication may be performed not only between the units which configure the central controller 4, but also devices which configure the central controller 4 and the air handling unit 1 or between the devices which configure the air handling unit 1. Reference symbols L1, L2, L3, L4, L5, L6 and L7 represented in FIG. 1 denote channels through which communication between the devices is performed and the communication method may be wired communication or wireless communication. In the exemplary embodiment, the communication is performed by the RS485 method, but the present invention is not limited thereto.

[0035] The interface unit 5 provides an interface (user interface) to control the air handling unit 1. The control unit 110 may control the devices which configure the air handling unit 1 in accordance with a setting input through the interface.

[0036] The interface unit 5 may be provided in a location spaced apart from the air handling unit 1. The interface unit 5 may be provided to be movable and the movability of the interface unit 5 may be implemented not only by wirelessly communicating with the air handling unit 1 but also by sufficiently securing a length of a communication line even when the interface unit is connected to the air handling unit 1 through wired communication.

[0037] The devices which configure the air handling unit 1 communicate with the interface unit 5 and/or the central controller 4 through the input/output ports of the input/output units 120 and thus when the devices which configure the air handling unit 1 are changed, the interface unit 5 and/or the central controller 4 may recognize which devices configure the air handling unit 1. The interface unit 5 may reconfigure the interface in accordance with the configurations of the devices which are recognized through the input/output unit 120.

[0038] The interface unit 5 may display a driving state of the air handling unit 1 and the outdoor unit 2 through an interface and provide a control menu. The information which is input through the control menu is transmitted to the control unit 110 through the communication line between units, and the control unit 110 controls the devices which configure the air handling unit 1 based on the transmitted information. The interface unit 5 may provide a

graphical user interface (GUI).

[0039] In some exemplary embodiments, the air conditioning system may further include an outdoor unit controller 6 which controls the outdoor unit 2 and a local controller 9 which is provided in each room where the air conditioning is performed to display an air handling state and receives an air handling setting for each room from the user.

[0040] The outdoor unit controller 6 totally controls the outdoor units 2a, 2b and 2c. The outdoor unit controller 6 is connected to communicate with the central controller 4, and controls the driving of the outdoor units in accordance with the setting transmitted from the central controller 4 and transmits information on the driving state of the outdoor units to the central controller 4. Separately from the central controller 4, a command for driving control of the outdoor units may be directly input through the outdoor unit controller 6.

[0041] A remote controller 7 is provided in a location spaced apart from the air handling unit 1 to control the entire operation of the air conditioning system. Specifically, the remote controller 7 is connected to communicate with the outdoor unit controller 6 to transmit a command for controlling the outdoor units.

[0042] As illustrated in FIG. 2, the air conditioning system may include several air handling units 1 (1a to 1c) in accordance with the air handling load such as a size or a scale of the building and also include a plurality of outdoor units 2a, 2b, and 2c.

[0043] The air handling unit 1 supplies air to the indoor through the duct. The indoor temperature of each room is measured by the temperature sensor which is provided in the room and the indoor temperature measured as described above may be displayed through the local controller 9. An adjusting unit which adjusts a direction of discharged air and an amount of discharged air may be provided at an end of the duct 3, that is, a discharging port which discharges the air to the indoor.

[0044] The central controller 4 is connected to communicate with the outdoor unit controller 6 and the remote controller 7 to interwork with each other based on the information which is exchanged therebetween. The central controller 4 exchanges information with the outdoor unit controller 6, the remote controller 7 and/or local controller 9, controls to output the information through the interface unit 5, and transmits an appropriate control command to the outdoor unit controller 6, the remote controller 7 and/or local controller 9 in accordance with the setting which is input through the interface unit 5.

[0045] Referring to FIG. 3, the air handling unit 1 includes a supply air unit 11 which supplies air to the indoor through the duct 3 (e.g. 3a, 3b, 3c of FIG. 2), a return air unit 12 into which the return air discharged from the indoor is flowed, an exhaust air unit 13 which discharges the return air which is flowed into the return air unit 12 to the outdoor, an outdoor air unit 14 into which the outdoor air is flowed, a heat exchanging unit 16 which exchanges heat between the return air which is flowed through the

return air unit 14 and/or the outdoor air which is flowed through the outdoor air unit 14 and the heat source (hereinafter, referred to as a refrigerant). An air mixing unit 15 is configured by the exhaust air unit 13 and the outdoor air unit 14 and adjusts a mixing ratio of the return air and the outdoor air which are supplied to the heat exchanging unit 16. Hereinafter, air which is transferred from the air mixing unit 15 to the heat exchanging unit 16 is referred to as mixed air.

[0046] A return air damper 54 which adjusts a flow rate of the return air which is flowed into the return air unit 12, an exhaust air damper 52 which adjusts a flow rate of the exhaust air discharged from the exhaust air unit 13, an outdoor air damper 51 which adjusts a flow rate of the outdoor air which is flowed into the outdoor air unit 14, a mixture damper 53 which adjusts a flow rate transferred from the exhaust air unit 13 to the outdoor air unit 14, and a supply air damper 55 which adjusts a flow rate of the supply air which is supplied to the duct may be provided. These dampers include a vane which adjusts an opening degree of a flow channel through which the air flows in accordance with a rotation angle and a damper actuator which operates the vane.

[0047] The control unit 110 controls the opening degree of the dampers to adjust a mixing ratio of the outdoor air and the return air. The damper actuator operates under the control of the control unit 110 to control the rotation angle of the vane. For example, when the supply air which is formed of mixed air with the return air and the outdoor air at a ratio of 7:3 is configured, the control unit 10 adjusts the opening degree of the exhaust air damper 52 to discharge 30% of the return air which is flowed into the return air unit 12 to the outside and adjusts the opening degree of the outside air damper 51 to flow the outdoor air into the outdoor air unit 14 as much as the discharged flow rate. In this case, the mixture damper 53 is completely open.

[0048] When the return air which is flowed into the return air unit 12 is completely discharged to the outdoor in accordance with the opening degree of the dampers and the supply air is formed only by the outdoor air flowed into the outdoor air unit 14, it is said that all outdoor air is supplied. In some of the exemplary embodiments, the air handling unit 1 may be configured without having the return air unit 12 and the exhaust air unit 13 and in this case, a 100% outdoor air is supplied indoors.

[0049] The return air unit 12, the exhaust air unit 13, the outdoor air unit 14, the heat exchanging unit 16, and the supply air unit 11 may be modularized and in this case, diversity may be applied to the configuration of the devices by adding and removing each unit. For example, when the indoor air handling is performed only using 100% outdoor air, as described above, the air handling unit 1 may be configured without having the return air unit 12 and the exhaust air unit 13 and the units may be added or removed in accordance with a required air handling quantity. Further, according to a structure in which each unit is modularized, units may be delivered in a

dissembled state to a field where the air handling unit 1 is provided and an assembling process of the units may be also promptly and simply performed at the field.

[0050] The air handling unit 1 includes a blower which forms a flow of air from the return air unit 12 to the supply air unit 11. The blower includes fans 56 and 58 and fan motors 57 and 59 which rotate the fans 56 and 58, respectively. The blowers may be specifically provided in the supply air unit 11 and the return air unit 12, respectively. As a driver 140 of the fan motors 57 and 59, an inverter drive which controls the rotation speed of the motors 57 and 59 may be provided. One unit which configures the air handling unit 1, for example, the supply air unit 11 may include a plurality of blowers. The blowers may be modularized and in this case, the blowers may be added or removed in accordance with a required air blowing amount. The heat exchanging unit 16 may include a heat exchanger 60 which changes a phase of the refrigerant by exchanging heat with mixed air supplied from the air mixing unit 15 or the 100% outdoor air. The heat exchanger 60 serves as an evaporator in the case of a cooling operation and serves as a condenser in the case of a heating operation. Further, the heat exchanging unit 16 may include an expansion valve 61 which expands the refrigerant. During the cooling operation, the high temperature and high pressure compressed refrigerant which is transferred from the outdoor unit 2 is transferred to the heat exchanger 60 through the expansion valve 61. A plurality of expansion valves 61 may be provided in accordance with the configuration of the outdoor unit 2.

[0051] The devices (hereinafter, referred to as air handling unit configuring devices) which configure the air handling unit 1, such as the damper, the fan motor, and the expansion valve described above are controlled by the central controller 4.

[0052] When the heat exchanging unit 15 includes a chiller which uses water as a heat source, the air handling unit 1 may include a valve which adjusts a flow rate of hot water which is supplied to the chiller, a valve which adjusts a flow rate of hot water which is discharged from the chiller, a valve which adjusts a flow rate of cold water which is supplied to the chiller, and a valve which adjusts a flow rate of cold water which is discharged from the chiller. Further, the air handling unit 1 may include a filter which filtrates the air, a pre heater which heats the supply air to pre-heat the indoor in advance until the air conditioning system is stabilized, a humidifier which humidifies the supply air, and a humidifier valve which adjusts a humidifying amount of the humidifier.

[0053] The air handling unit configuring devices may include at least one sensor 150. The sensor may be configured by a supply air flow rate sensing sensor which senses a flow rate of the supply air, a return air flow rate sensing sensor which senses a flow rate of the return air, a CO₂ sensor which senses a concentration of carbon dioxide (CO₂) in the air, a smog sensing sensor which detects smog in the air, a positive pressure sensor which

senses a positive pressure of air current which becomes a base to control an air volume, and a differential pressure sensor which senses a differential pressure of the air before and after passing the filter.

[0054] The central controller 4 may include input/output units 120a and 120b to which the air handling unit configuring devices are connected. Electric signals are input and output between the input/output units 120a and 120b and the air handling unit configuring devices. The input/output units 120a and 120b may include a plurality of input/output ports which is allocated to the air handling unit configuring devices to input/output the signal. The plurality of input/output ports may be configured by an analog port (AI/AO port) through which the analog signal is input/output, a digital port (DI/DO port) which inputs and outputs the digital signal, or a combination thereof.

[0055] A plurality of input/output units may be provided in accordance with the number of devices which configure the air handling unit and the input/output units 120a and 120b are provided to be modularized to be added or removed.

[0056] In the meantime, the input/output ports may be provided by the control unit 110 and in this case, the control unit 110 may receive information from the air handling unit configuring devices through the input/output port provided therein without using the input/output unit.

[0057] The interface unit 5 configures the interface based on the air handling unit configuring devices which are allocated to the input/output ports. For example, when the exhaust air damper 13 is provided in the air handling unit 1, so that any of the input/output ports is allocated to the exhaust air damper 13, the interface unit 5 may provide an interface including a menu which adjusts the opening degree of the exhaust air damper 13.

[0058] The interface unit 5 may reconfigure an interface in accordance with change of the configuration of the air handling unit configuring devices. For example, when the fan motor is added or changed, a menu for controlling the fan motor may be changed on the interface. The reconfiguration of the interface may include not only the change of the control menu which has been previously provided but also addition of a control menu for an added air handling unit configuring device or inactivation or removal of the control menu of a removed air handling unit configuring device.

[0059] The interface may be reconfigured based on the information of the air handling unit configuring devices which is recorded in the recording unit of the control unit 110. When a new device is added to the air handling unit 1, the interface unit 5 obtains information on the added device from the recording unit and reconfigures the interface based on the information obtained as described above. For example, when a function of mixing the outdoor air and the return air and devices related therewith are added to the air handling unit 1 which originally includes only an air supplying function, so that a mixture damper 53 is additionally provided, the interface unit 5 obtains information on the mixture damper 53 from the

recording device and generates a control menu for controlling the mixture damper 53 based thereon.

[0060] The interface unit 5 may display a driving state of the air handling unit 1 in accordance with a signal input through the input/output port. The interface unit 5 may include a predetermined input unit such as an interface button, a switch, or a touch pad and a displaying unit which provides a screen on which numbers, characters, special characters, or images are output. Specifically, the interface unit 5 may be provided as a touch screen in which an input unit and an output unit form a layered structure.

[0061] As illustrated in FIG. 6A, the control unit 110 receives information which is measured by the sensor 150 of the air handling unit 1 through the input/output port provided therein, for example, information for activating or stopping of the fan motor, a current driving mode (cooling/heating/humidifying/ventilating mode) of the air handling unit 1, smoke sensing, a measurement value of the differential pressure sensor, or emergency stop, information for checking a driving state of the air handling unit 1, and a signal for a level (alarm level 1, alarm level 2, and alarm level 3) of an alarm when an abnormal situation occurs. Such information may be received through a digital input/output port.

[0062] The control unit 110 may receive a return air temperature, a return air humidity, a supply air temperature, a supply air humidity, an outdoor air temperature, or an outdoor air humidity which are sensed by the sensors and receive a signal which is output from fan motors of blowing devices which are provided for return air and supply air (a return air fan signal, a supply air fan signal), respectively.

[0063] The control unit 110 may receive information through the input/output unit 120. According to the exemplary embodiment, the first input/output unit 120a receives a temperature (Mix temperature) of the mixed air, a flow rate of the supply air, a flow rate of the return air, operation information (a cold water valve (in)) of a valve which adjusts the inflow of the cold water, operation information (a hot water valve (in)) of a valve which adjusts the inflow of the hot water, operation information (a cold water valve (out)) of a valve which adjusts a flow rate of the discharged cold water, operation information (a hot water valve (out)) of a valve which adjusts a flow rate of the discharged hot water, whether to set a freezing protection function, and operation information of a humidifier valve. Further, the second input/output unit 120b may receive information from the CO₂ sensor, the differential pressure sensor, the outdoor air damper, the exhaust air damper, the mixture damper, the positive pressure sensor, and the pre-heaters.

[0064] Reference symbols L11, L12 and L13 represented in FIG. 6 denote channels through which communication between the device is performed.

[0065] FIG. 6B illustrates configurations of a return air blower module 140a which blows the return air and a supply air blower module 140b which blows the supply

air. Each blower module is configured by a plurality of blowers and each blower is configured by fan motors 143a, 143b, 143c, and 143d and drivers 142a, 142b, 142c, and 142d which control a speed of the fan motors, respectively. Further, each blower module may include noise filters 141a and 141b which remove noise from power supplied from the fan motors which configure the module.

[0066] FIG. 7 is a view illustrating a menu structure of an interface unit according to an exemplary embodiment of the present invention. Referring to FIG. 7, the interface unit 5 displays information received from the central controller 4 and a control menu for controlling the air handling unit 1 and/or the outdoor unit 2 on the screen and transmits information input through the control menu to the central controller 4.

[0067] The interface unit 5 may provide a login menu 201 and in this case, a user, a manger, or an installer may log in. Displayed screen configurations and provided menus are different for every user, manager, and installer. Therefore, control authority for the air handling unit 1 and the outdoor unit 2 may also be differently set in accordance with a login party.

[0068] A driving menu 202 which controls the driving of the air handling unit 1 may be provided through the interface. The driving menu 202 relates to driving (start driving), stop (stop driving), heating, cooling, blowing, outdoor air cooling, dehumidifying, and optional driving and is configured to immediately set a driving mode when a corresponding key is selected. Further, the logged-in screen includes menu items such as main, home, schedule, history, and setting.

[0069] The home menu is configured by a monitoring menu for the air handling unit 1 and the outdoor unit 2. The home menu includes sub menus for a system view, a detail view, and a state for the outdoor unit. The system view provides a monitoring menu for the air handling unit 1, the detail view displays detail information on an operating state of the air handling unit 1, and the outdoor unit 2 may be monitored through the state of the outdoor unit.

[0070] The schedule menu is a menu item for setting a driving schedule of the air handling unit 1. The schedule menu may include a weekly schedule menu as a sub menu and when the weekly schedule menu is selected, a weekly schedule editing screen is separately provided.

[0071] When the history menu is selected, a control history or an error incurring history for another controller or unit which is connected to the air handling unit 1, the outdoor unit 2 and/or the central controller 4 is displayed.

[0072] The setting menu provides a menu for inputting and testing information on the air handling unit configuring device in order to control the driving of the air handling unit 1. As a submenu of the setting menu, manager setting, product information, service setting are provided. The manager setting includes submenus of manager settings 1, 2, and 3 as setting menus for controlling the air handling unit 1 by the manager and model information or version information for the air handling unit 1 and the

interface unit 5 are displayed as the product information. Further, the service setting menu provides a submenu which inputs a reference value or a reference control value for the device which is actually provided in the air handling unit 1 under the authority of the installer as service settings 1 to 5.

[0073] In this case, in the interface unit 5, when the user logs-in in accordance with the login authority, only the home menu is displayed among the main menus (A) to display monitoring information for the air handling unit 1 and/or the outdoor unit 2.

[0074] When the manager logs in, the interface unit 5 displays four main menus of home, schedule, history, and setting on the screen (B). However, all the sub menus for home, schedule, and history are displayed, but only the manager setting and the product information are displayed among the setting menus and the service setting is not displayed. Therefore, when the manager logs in, not only basic monitoring, but also setting input, history, and schedule for control may be managed.

[0075] When the installer logs in, all menus including the service setting of the setting menu are displayed (C) and may be set. When the air handling unit 1 is initially installed, a setting value of a device (air handling unit configuring device) which is installed in the air handling unit 1, for example, a sensor, a valve, or a damper may be input and more particularly, a sensing range or sensitivity of the installed sensor is input and the function may be turned on/off in accordance with whether to install the carbon dioxide sensing sensor. The setting is not changed after the initial setting, so that the setting is displayed only when the installer logs in. When the configuration of the air handling unit is changed or a module is added, the setting may be newly generated for the changed configuration through the installer log-in.

[0076] The menu screens will be described below with reference to the drawings.

[0077] FIG. 8 is an exemplary view to explain a login method of an interface unit according to the exemplary embodiment of the present invention. Referring to FIG. 8, the interface unit 5 may display a login menu 204 on the screen.

[0078] In the login menu 204, as illustrated in FIG. 8A, a manager key 205 and a user key 206 are displayed in accordance with login authorities. When any one of them is selected, as illustrated in FIG. 8B, a password input window 208 is displayed on the screen as a popup menu. In the password input window 208, a plurality of keys and an input section in which a selected key is displayed are displayed. When a confirm key is selected after inputting the password, the password is compared with previously stored authentication information. When the authentication is succeeded, the monitoring menu of FIG. 9 which will be described below is displayed on the screen. In the meantime, when the authentication fails, for example, the password is not correct or a user has an authority which is different from the selected authority, a guiding message is output to re-input the password together with

a guide in accordance with the incorrect password. Further, a separate warning message may be output.

[0079] In this case, in FIG. 8A, when login keys for the manager or the user are displayed or a specific area of the login screen 204 is selected (207) or when the specific area is touched for a predetermined time or longer, a password input window for installer login may be displayed.

[0080] As described above, a menu to be displayed is differently output in accordance with an authority of any one of the installer, the manager, and the user which is used to log in and a setting authority is also different.

[0081] FIGS. 9 to 12 are exemplary views illustrating an exemplary embodiment of a monitoring screen of an interface unit 5 of an air conditioning system according to the present invention. Hereinafter, monitoring screens will be described in detail with reference to the drawings. The interface unit 5 of the present invention may reconfigure the interface in accordance with the air handling unit configuring devices which are recognized through the input/output unit 120.

[0082] The interface may be reconfigured by generating a control menu for an added device when a device is added to the air handling unit 1 or inactivating or removing a control menu for a removed device when a device is removed from the air handling unit 1. Hereinafter, embodied aspects of the implementable interface in accordance with the configuration of the devices provided in the air handling unit 1 will be described in detail with reference to the drawings.

[0083] FIG. 9 illustrates a monitoring screen 210 which represents a state of the air conditioning system. Referring to FIG. 9, information which is received to the central controller 4 is stored in a memory (not illustrated) in the control unit 110 of the central controller 4. The control unit 110 transmits the stored information to the interface unit 5 and the interface unit 5 analyzes information received from the central controller 4 to display a monitoring screen 210 for the air handling unit 1 on the screen as illustrated in FIG. 9.

[0084] The interface unit 5 analyzes the information received from the central controller 4 to display a graphic based monitoring screen 210. An actually measured information value may be displayed on the screen in accordance with information measured by the air handling unit configuring devices, temperature, humidity, a state of the valve, and information on an activating state. For example, a supply air temperature and an intake temperature may be represented by numerical values. The information value may be represented by at least one of a character, a number, and a special symbol or a combination thereof. Further, an image and/or an icon which represents the air handling unit configuring devices may be displayed through the screen.

[0085] An operating state of the air handling unit configuring device may be displayed on the screen as an icon or an image. For example, a supply air fan and/or a return air fan is normally driven, a dynamic image of a

rotating fan is displayed and when the fan is abnormally driven, an image of a stopped fan is displayed with a different color from that of the fan which is normally driven. For example, the fan may be displayed with a red color or displayed with a separate warning notice.

[0086] In the meantime, in the monitoring screen 210, an upper driving menu 220 and a lower main menu 290 are displayed and a main screen is displayed at the center of the screen. In the monitoring state, the monitoring menu 230 is displayed on the main screen. In this case, any one of the upper driving menu 220 and the lower main menu 290 is selected and thus information corresponding thereto is displayed on the main screen. In this case, the selected key from the driving menu 220 and the main menu 290 is displayed to be different from the other key. For example, when a home key 291 is selected and driving 222 and heating 224 are selected, the main screen according to the selection is displayed and the home key and the heating key are displayed to have different colors and letter sizes from other keys, so that it is noticed that the keys are currently selected.

[0087] In the driving menu 220, user information 211 which is currently connected, a power key 221, a drive key 222, a stop key 223, a heating key 224, a cooling key 225, a blowing key 226, an outdoor air cooling key 227, a dehumidifying key 228, and an additional function key 229 are displayed.

[0088] Information on a user who logs into the interface unit 5 is displayed as the user information 211 and for example, is divided by an installer, a manager, and a user and a name to be displayed is changeable and the name may be displayed by a separate ID or an icon. When the power key 223 is a login key and when the power key is selected in a logged in state, information on a user which is currently connected is logged out. When the power key 223 is selected in the logged out state, a login menu is displayed on the main screen at the center or a new window is created to display the login menu.

[0089] The drive key 222 and the stop key 223 are key buttons for a driving state and when the drive key 222 is selected, the air handling unit 1 starts driving and when the stop key 223 is selected, the driving air handling unit 1 stops driving. When the air handling unit 1 is stopped, the drive key 222 is activated and only when the air handling unit 1 is driven, the stop key 223 is activated. When the drive key 222 is selected, the interface unit 5 transmits a control signal in accordance with the key to the central controller 4, and the central controller 4 controls the air handling unit corresponding to the control signal.

[0090] The heating key 224, the cooling key 225, the blowing key 226, the outdoor air cooling key 227, and the dehumidifying key 228 are keys for driving modes and set the air handling unit 1 to be driven in a heating mode, a cooling mode, a blowing mode, an outdoor air cooling mode, and a dehumidifying mode.

[0091] For example, when the cooling key 225 is selected, the air handling unit 1 is driven in a cooling mode. When the cooling key 225 is selected, a signal indicating

that the cooling mode is set is transmitted to the central controller 4, and the central controller 4 controls the air handling unit 1 to be driven in the cooling mode. The interface unit 5 may display that the cooling operation is performed through the screen. For example, when the cooling key 225 is selected while being driven in the heating mode, the interface unit 5 may reconfigure the screen on which the cooling mode is previously displayed to display the heating mode. Further, the interface unit 5 may activate or inactivate a specific key in accordance with provided air handling unit devices to be displayed. For example, when a humidifier is not provided in the air handling unit 1, the humidifier 228 may be inactivated.

[0092] The additional function key 229 is a menu for setting additional functions of the air handling unit 1 such as humidification or automatic ventilation and provides selectable menus in accordance with a device which is provided in the air handling unit 1 in order to implement the additional function. For example, when humidifying, automatic ventilating, and humidifying and automatic ventilating functions are provided by the provided air handling unit configuring devices, the menu may be changed in the order of humidification, automatic ventilation, humidification and automatic ventilation, and not-used in accordance with the number of times of selecting the additional function key 229.

[0093] When the humidifying function is not provided in the air handling unit 1, that is, the humidifier is not provided in the air handling unit 1, the humidification menu may not be selected. Further, when the carbon dioxide sensor is not provided in the air handling unit 1, the automatic ventilation menu is inactivated, so that the automatic ventilation menu is not selected. The activation/inactivation of the menu may be automatically performed when the air handling unit configuring device is connected or disconnected to or from the input/output port provided in the input/output unit 120 and/or the control unit 110.

[0094] In the meantime, in the lower main menu 290, the home key 291, the schedule key 292, the history key 293, and the setting key 294 are displayed and date, a day of the week 295 and time 296 are displayed at a right side.

[0095] The home key 291 displays the home screen on the main screen and the monitoring menu 230 for the driving state of the air handling unit 1 and the outdoor unit 2 is displayed as the home screen.

[0096] The schedule key 292 sets a driving schedule for the air handling unit 1 and the history key 292 displays a driving history and an error history of the air handling unit 1. The setting key 294 displays a setting menu for controlling the air handling unit 1 on the main screen. Further, the setting key 294 displays a menu for setting an operation of the interface unit 5 on the main screen. For example, a setting such as screen brightness may be changed.

[0097] When the date and the day of the week 295 or the time 296 is selected, a menu for changing a time of

the system is displayed.

[0098] A plurality of tabs 231, 232, and 233 is displayed on the main screen in accordance with the displayed information, so that the information is changed and displayed corresponding to the selected tab. The monitoring menu 230 is displayed to be divided into three tabs of a system view tab 231, a detail view tab 232, and an outdoor unit state tab 233.

[0099] The system view tab 231 is basically selected when the home key 291 is selected, to be displayed on the main screen and displays the operating state of the air handling unit 1 of the monitoring menu 230 in real time.

[0100] A flow of air is displayed on the monitoring menu 230 by arrows and return air 237, exhaust air 235, outdoor air 236, and supply air 238 are displayed in accordance with intake and discharge of air in accordance with the flow of the air. Further, devices which are individually provided, a damper, a valve, a sensor, and a filter are displayed by images or icons and information values thereof is displayed on the screen.

[0101] In this case, the image or the icon for each device is displayed to correspond to the device which is actually provided and disposed on the screen so as to correspond to the actual position. Further, in the case of a moving device, an image or an icon is displayed to vary corresponding to the moving device to indicate a movement of the device and when an error is incurred, a separate alarm is output and an image or an icon in accordance with the incurred error is additionally displayed on the screen or displayed with a changed color.

[0102] A smoke sensing sensor is provided at a side into which the return air 237 is flowed, so that a smoke sensing icon 247 corresponding thereto is displayed, images for a concentrate sensor 248, a humidity sensor 249, and a temperature sensor 250 are displayed, and 1000 ppm, 80%, and 25.5 degrees (a rotation angle of a vane which configures a damper) are displayed as information values. In this case, the smoke sensing is displayed when smoke which is generated due to fire is sensed by the smoke sensing sensor or displayed with different colors to indicate whether to sense the smoke. The concentration sensor may determine whether to automatically ventilate the indoor in accordance with a concentration of carbon dioxide of the return air which circulates the indoor and returns by measuring the concentration of carbon dioxide and a degree of the outdoor air and the exhaust air may be correspondingly determined.

[0103] The return air fan 246 is displayed and an operation state 251 for every return air fan is displayed above the return air fan 246. When the return air fan 246 is configured by a plurality of fans, for example, six fans, the fans are divided to be denoted by F1 to F6, and the state of the fan is displayed as the drive, stop, and error by different colors of green, white, or red in accordance with the operation state.

[0104] An exhaust air damper 52 (239) is displayed at a side of the exhaust air 235 and when a part of the return air is discharged, an opening degree amount 252 of the

damper is displayed at the side of the return air 235. Further, an outdoor air damper 51 (240) is displayed at the side of the outdoor air 236 and an opening degree amount 255 of the outdoor air damper which adjusts an inflow outdoor air is displayed. A temperature 253 and a humidity 254 for flowed outdoor air are displayed at the side of the outdoor air 236. The temperature sensor and the humidity sensor at the side of outdoor air are provided outside the outdoor air damper to measure an outside temperature and an outside humidity. Therefore, even in a state where the outdoor air damper is closed, the outside temperature and the outside humidity may be measured.

[0105] When the opening degree amount of the exhaust air damper 52 (239) is zero, it means that the exhaust air damper is closed and 100% of return air is supplied as a supply air. In this case, the opening degree of the exhaust air damper interworks with the outdoor air damper 51 (240), so that the opening degree of the outdoor air damper 51 (240) is also zero.

[0106] The mixture damper 53 (241) is displayed between the exhaust air and the outdoor air and an opening degree amount 256 thereof is displayed. In this case, the opening degree amount of the damper is represented by a rotation angle of the vane and when the rotation angle is zero degree, the damper is closed. Further, when the rotation angle is 90 degrees, the damper is open at maximum. Since the exhaust air is 0%, the outdoor air is 0%, and the return air is 100%, the damper is open at maximum to 90 degrees.

[0107] A temperature sensor 258 which measures a temperature of the mixed air in which the return air and the outdoor air are mixed is displayed between the mixture damper 241 and the outdoor air damper 240.

[0108] In this case, the heat exchangers 243 and 244 which are provided between an outdoor air or mixed air side and the supply air side are displayed, and a filter 242 which removes a foreign substance of an air which is flowed in the heat exchanger is displayed. In this case, pressure sensors are provided at both sides of the filter and a pressure 257 of the air which flow into the heat exchanger through the filter is displayed.

[0109] It is determined whether filter cleaning is required in accordance with a filter cleaning cycle or an information value of a filter differential pressure sensor which is installed in the filter, and a filter icon 259 which represents a cleaning timing is displayed.

[0110] A pressure sensor 263, a humidity sensor 262, and a temperature sensor 261 are displayed at the side of the supply air 238 and the supply air fan 245 is displayed. The supply air fans 245 are denoted by F1 to F6 in accordance with the number of provided fans and an operating state of each fan is represented.

[0111] The fan and the damper which are displayed on the monitoring menu 230 may be displayed by an image which moves in accordance with a driving state and each sensor represents whether to normally operate in accordance with the color or a displayed information value. Fur-

ther, a warning icon may be displayed.

[0112] FIG. 10 is an exemplary view that detail information among the monitoring menus displayed on the interface unit is displayed. As illustrated in FIG. 10, when a detail view tab 232 is selected, detail information on the temperature and humidity 271, a locked state 272, a damper opening degree 273, and a fan driving state 274 are displayed in the monitoring menu 30. That is, the detail information is detail information on the operating state of the air handling unit of the system view tab 231 described above.

[0113] Temperatures and humidities for the return air, the supply air, the outdoor air, and the mixed air are displayed by numerical values and the locked state in accordance with the control mode is represented by an icon. Further, damper opening degree amounts of the outdoor air, the exhaust air, and the mixed air are displayed. The damper opening degree amount is zero degree in a closed state and 90 degrees in the maximum opening state. Further, fan driving states 274 of the return air fan and the supply air fan are displayed. In this case, it is displayed whether to turn on/off the fan or whether an error is incurred.

[0114] FIG. 11 is an exemplary view illustrating an outdoor unit state among the monitoring menus displayed on the interface unit. As illustrated in FIG. 11, state information on a heat source, specifically, the outdoor unit 2 which is connected to the air handling unit 1 is displayed in the monitoring menu 230.

[0115] The state information of the outdoor unit which is connected to the air handling unit 1 is displayed for every outdoor unit (281 to 286), and an address for communication with the outdoor unit, any one operation state of drive, stop, and error, and whether to perform a defrosting operation are displayed.

[0116] In accordance with the number of connected outdoor units 2, a plurality of pages is divided to be displayed. When the heat source is not the outdoor unit, for example, when the heat source is a boiler or a cooling tower, information thereon is displayed.

[0117] FIG. 12 is an exemplary view of a menu screen which is differently displayed in accordance with a login authority of the interface unit and illustrates a monitoring menu screen which is differently configured when an installer logs in, in the monitoring menu screen which is displayed when the detail view tab of FIG. 10 described above is selected.

[0118] As illustrated in FIG. 12, when the installer logs in and the detail view tab 232 is selected, in the monitoring menu 230, a detail view menu having a screen configuration which is different from the detail view tab may be displayed when the manager logs in, as described above.

[0119] When the installer logs in, the temperature/humidity 271, the lock state 272, and the damper opening degree 273 are displayed to be the same as the monitoring menu when the manager logs in but the fan driving state 275 may be displayed to be different from the case when the manager logs in.

[0120] Not only the fan on/off state but also a driving frequency 276 of the fan is displayed on the menu screen of the detail view tab in accordance with the login of the installer. In this case, the return air fan and the supply air fan each are configured by a plurality of fans and operate at different frequencies.

[0121] FIG. 13 is an exemplary view illustrating an idle screen of an interface unit according to an exemplary embodiment of the present invention. Referring to FIG. 13, when there is no input for a predetermine time or longer, the interface unit 5 may display an idle screen 212.

[0122] When there is no separate input in a state where the monitoring screen 210 is output, the interface unit 5 switches the screen into the idle screen 212 to display the idle screen, and in this case, brief information on the air handling unit 1 is displayed on the idle screen 212.

[0123] On the idle screen 212, information on the driving state 213, a driving mode 214, an additional driving 215, and a current temperature 216 may be displayed as brief information. Each information is displayed by an image, an icon, a number, or a character, or a combination thereof. The driving state indicates whether to be driven, and as a driving mode, information on the driving mode which is currently set, among the driving modes such as heating, cooling, blowing, dehumidifying, and outdoor air cooling is displayed and a set additional driving is displayed, and the return air temperature is displayed as a current temperature. In this case, when the reference for the indoor temperature is a return air temperature, the return air temperature is displayed, and when the supply air temperature is a room temperature, the supply air temperature is displayed.

[0124] FIGS. 14 to 16 are exemplary views to explain a manager setting menu of an interface unit according to an exemplary embodiment of the present invention.

[0125] FIG. 14A is an example of a menu screen of a first manager setting tab and FIG. 14B is an example of a menu screen when a control reference of the first manager setting tab is set to be a supply air.

[0126] When a setting key 294 is selected from the main menu, as illustrated in FIG. 14A, the setting menu 310 is displayed. The setting menu 310 includes sub-menus of manager setting 311, product information 312, and system setting 313. In this case, the manager setting 311 is a menu for controlling an operation of the air handling unit 1, and the product information 312 is model information on the air handling unit 1 or the interface unit 5 or version information of a control program, and the system setting 313 is to set installation information for the air handling unit 1.

[0127] In the manager setting 311, a menu for the manager setting is divided into a plurality of tabs to be displayed as first to third manager setting tabs 314 to 316. As each tab is selected, a menu screen corresponding thereto is displayed to input the setting, thereby controlling the air handling unit 1 for every function. A basic operation for the air handling unit 1 is set through the

operating menu 220 in an upper portion.

[0128] When the first manager setting tab 314 is selected, a menu screen, which is configured by menu items such as a control reference 321 for a room temperature for controlling the air handling unit 1, a cooling temperature and humidity 322, a heating temperature and humidity 323, an air volume setting 324, a damper opening degree 325, a cooling damper opening degree 326, a heating damper opening degree 327, and a blowing damper opening degree 328 to input information, is displayed.

[0129] As the control reference 321, the return air or the supply air is selected and as the room temperature which becomes a reference for temperature control, one of the return air temperature and the supply air temperature is selected. When the return air temperature is selected, a temperature of the return air which circulates the indoor and returns is measured to control the temperature, and when the supply air temperature is selected, a temperature of the supply air which is supplied indoor is maintained to be a set temperature. When the control reference is set, a reference for the temperature is changed from the monitoring menu of the detail view described above to be displayed.

[0130] The cooling temperature and humidity 322 and the heating temperature and humidity 323 are target temperature and humidity when it is driven in the cooling mode and the heating mode. The temperature is input in the unit of 0.1°C and an input temperature may be limited. For example, the cooling temperature which is lower than 18°C may not be input and the heating temperature which exceeds 30°C may not be input. This may vary depending on the setting. The air volume is set for an air volume of the air handling unit 1 and may be set to be any one of strong, medium, and weak.

[0131] The damper opening degree 325 may be selected from automatic setting and manual setting to control the damper opening degree and when the automatic setting is set, the damper opening degree is automatically changed. The cooling damper opening degree 326, the heating damper opening degree 327, and the blowing damper opening degree 328 may set opening degrees of an outdoor air damper, an exhaust air damper, and the mixture damper when it is driven in a cooling mode, a heating mode, and a blowing mode. When the damper opening degree 325 is manual setting, the damper opening degree is determined in accordance with the set opening degree, and when the damper opening degree is automatic setting, the damper opening degree may vary depending on the driving state or indoor environment change based on the set opening degree. In this case, when the opening angle is zero degree, the damper is a closed state and when the opening angle is 90 degrees, the damper is open to the maximum. The outdoor air damper, the exhaust damper, and the mixture damper interwork with each other to determine the opening angle. Since the air is flowed from the outside as much as the amount discharged from the air handling unit 1, so that

the amount of the exhaust air is the same as an amount of the outdoor air, opening angles of the outdoor air damper and the exhaust air damper are set to be same and a sum of the mixed air and the outdoor air are 100, so that a sum of the opening angles of the outdoor air damper and the mixture damper is also 90 degrees.

[0132] As described above, when a setting value for the menu item of the first manager setting tab 314 is input, the interface unit 5 stores the set information and transmits the set information to the control unit 110 of the central controller 4. The control unit 110 of the central controller 4 which receives the information changes the setting in accordance with the received information and controls the air handling unit to be driven based on the changed information.

[0133] When the return air temperature sensor or the temperature and humidity sensor is not provided, the supply air temperature is an initial value as a temperature reference and when a setting value for an item in which the sensor is not provided is input, the interface unit 5 may output a warning through the screen.

[0134] In the meantime, as illustrated in FIG. 14B, when the control reference 321 is set to the supply air in the menu screen of the first manager setting tab 314, the central controller 4 controls the temperature of the air handling unit based on the supply air temperature.

[0135] When the control reference is set to a supply air, the control reference 321, a cooling temperature and humidity 331, a heating temperature and humidity 332, an air volume setting 324, a damper opening degree 325, a cooling damper opening degree 326, a heating damper opening degree 327, and a blowing damper opening degree 328 are displayed on the menu screen which is displayed when the first manager setting tab 314 is selected, and the cooling temperature and humidity 322 and the heating temperature and humidity 323 are displayed differently from the case when the control reference is a return air.

[0136] The cooling temperature and humidity 331 and the heating temperature and humidity 332 may additionally set a control range for a temperature to input a target temperature and humidity when it is driven in the cooling mode and the heating mode. When the target temperature in the cooling mode is 18 degrees and an allowable range when the installer logs in is set to be 2 degrees, 16 degrees to 20 degrees obtained by adding or subtracting 2 degrees to or from 18 degrees becomes control ranges for the target temperature. The control range may be set in the unit of 1 degree.

[0137] FIG. 15 is a view illustrating an example of a menu screen of a second manager setting tab. As illustrated in FIG. 15, when a second manager setting tab 315 is selected from the manager setting menu 311, a menu screen, which is configured by menu items of a type 335 of an air handling unit (AHU), a heat exchanging method 336 of the air handling unit, and an applied sensor 337, is displayed.

[0138] Any one of a 100% outdoor air unit and an air

handling unit is selected as the type 335 of the air handling unit. The type of air handling unit is an air handling unit when the air handling unit 1 supplies the supply air to the indoor with the mixed air of the outdoor air and the return air and is a 100% outdoor air unit when only the supply air is supplied only by the outdoor air without having the return air. That is, when the air handling unit is configured by the supply air unit, the heat exchanging unit, the outdoor air unit, and the exhaust air unit without having the return air unit, the air handling unit is the 100% outdoor air unit. Further, even though the return air unit is provided, when the supply air is supplied only by the outdoor air by opening the outdoor air damper by 100% at maximum, the air handling unit may be set to be the 100% outdoor air unit.

[0139] The heat exchanging method 336 of the air handling unit is divided into a case when a fan is provided to heat-exchange the refrigerant and a case when the heat is exchanged by circulating water to set the heat exchanging methods 339a and 339b for cooling and heating to be an air cooling type or water cooling type and set to be "not used". As a heat exchanging method, a heat exchanging method which coincides with a method which is actually provided in the air handling unit 1 needs to be set. The case of "not used" may be the outdoor air cooling which does not perform the heat exchange and performs the cooling only with the outdoor air. The heat exchanging method may be displayed to be selected by a drop-down menu method.

[0140] The applied sensor 337 is set for a sensor which is provided in the air handling unit 1. That is, a type of sensor which is actually provided is set. In this case, the control menu which controls the air handling unit 1 may be changed in accordance with a setting state of the applied sensor 337.

[0141] The applied sensor 337 may be divided into a necessary sensor and an optional sensor. A return air sensor and a supply air sensor are provided as the necessary sensor and types 338a and 338b of the sensors provided may be set. Any one of the temperature and humidity sensor and the temperature sensor may be set as the return air sensor and the supply air sensor and the selection menu may be displayed by a drop-down menu method. The temperature and humidity sensor measures a temperature and a humidity.

[0142] An outdoor air temperature and humidity sensor, a mixed air temperature sensor, a carbon dioxide sensor, a filter differential pressure sensor, a supply air positive pressure sensor, a return air flow sensor, and a supply air flow sensor are set as the optional sensor. In the case of the carbon dioxide sensor, a reference value for determining a contamination degree is input, and in the filter differential pressure sensor, a reference pressure for outputting an error or a warning is input.

[0143] In the applied sensor 337, when a sensor which is not provided in the air handling unit 1 is selected, information corresponding thereto is not input. Further, even though the sensor is provided in the air handling

unit, when the sensor is not set, an error is not incurred but the control related with the sensor may not be used. For example, when the carbon dioxide (CO₂) sensor is not set, an icon for CO₂ is removed from the monitoring screen and a related control menu is inactivated or the corresponding item may not be selected.

[0144] FIG. 16 is a view illustrating an example of a menu screen of a third manager setting tab. As illustrated in FIG. 16, when a third manager setting tab 316 is selected from the manager setting menu 311, a menu screen, which is configured by items of temperature and humidity mode setting 341, language setting 343, touch coordinate correction 345, password change 344, and software (SW) upgrade 346, is displayed.

[0145] In the temperature and humidity mode setting 341, a control mode related with the temperature and the humidity is set, and the control mode may set any one of local and remote schedules and when the remote mode is set, any one of a contact point and a mode bus is set. Each item is displayed by a drop-down menu.

[0146] In the language setting 343, a language which is displayed for entire menu which is displayed in the interface unit 5 may be changed. When a setting key is selected, an available language list is displayed. In the password change 344, a password which is input to login in the interface unit 5 is changed. Only a password having a logged-in authority may be changed. That is, the manager does not change the password of the user or the installer. In the touch coordinate correction 345, when the interface unit 5 is configured by a touch screen or includes an input unit such as a touch pad, information is input in accordance with the touched position, that is, a key which is disposed in the touched position is selected. However, when the key does not coincide with the touched position, that is, an A area is touched, but a B area is selected, the inconsistency may be corrected by the coordinate correction. In the software upgrade 346, a program for monitoring or control, including the menu screen which is displayed in the interface unit 5 is downloaded and updated from an external program providing server. In some cases, the updating program is received through the controller or directly connected to be downloaded.

[0147] FIG. 17 is an exemplary view illustrating a product information screen of an interface unit according to an exemplary embodiment of the present invention. As illustrated in FIG. 17, when the product information 312 is selected, version information 351 of a program which is currently installed in the interface unit 5 and a driving time 352 of the air handling unit are displayed.

[0148] In the manager setting menu described above, when the program is updated by upgrading the software, the version information which is displayed in the product information is also changed to be displayed as a version of an updated program.

[0149] The driving time 352 is information received through the central controller 4 to represent a total time at which the air handling unit 1 is driven. When an initial-

ization key 353 is selected, an accumulated driving time is initialized to be zero and then counted again from zero. In this case, the initialization of the accumulated driving time may be selected only when the log-in is performed as an installer. When there is a need to newly count the time similarly to the case when the configuration of the air handling unit 1 is changed, if the installer logs in, the accumulated driving time may be initialized. When a user logs in as a manager, the version information and the driving time are displayed, but the initialization key is inactivated so as not to be selected or displayed.

[0150] FIGS. 18 to 22 are exemplary views to explain a system setting menu of an interface unit according to an exemplary embodiment of the present invention.

[0151] As illustrated in FIG. 18, when a first system setting tab 361 is selected from the system setting unit 313 of the interface unit, items of an additional function 371 for the air handling unit 1, a warming time 373, and a smoke control mode 374 are displayed on the menu screen.

[0152] The additional function 371 may be selected from damper feedback, a cooling humidifier function, a humidifier, a preheat coil, and outdoor unit sequential control. When the additional function is selected, a driving mode is set for the selected additional function by the additional driving key 229 of the driving menu 220. The damper feedback relates to whether to receive a feedback signal from the damper and a feedback signal for an opening degree of the damper is transmitted to the central controller 4 and displayed on the monitoring screen of the interface unit 5. The cooling and humidifying function is available when a humidifier is available and a dehumidification effect is provided at the time of cooling, so that humidification is additionally performed if necessary. The preheat coil may select any one of an electric heater, hot water, and steam as a type of a heat source. A type of the preheat coil is set to be the same as the device provided in the air handling unit 1.

[0153] The cooling and humidifying and the humidifier among the additional functions may be set when a humidifier is provided in the air handling unit 1 and the preheat coil may be set when a device which supplies a heat source such as a heater or a boiler is provided in the air handling unit 1. When a function which is not provided in the air handling unit 1 is selected, the central controller 4 incurs an error and the interface unit 5 outputs the error on the screen.

[0154] The warming time 373 sets a preparation time because when the air handling unit 1 is driven, the set driving is performed as soon as the driving starts so that the indoor temperature is not controlled, and provided devices including the outdoor unit require a time to prepare the driving. In this case, during the warming time, when the air handling unit 1 controls a damper and controls a heat source to start and prepare driving of the devices in accordance with the set driving mode to be in a maindriving available state, the air handling unit 1 starts the set operation. In this case, even though a condition

to start the main driving is not satisfied, when the warming time has passed, the central controller 4 controls the air handling unit 1 to be operated in accordance with the driving setting. That is, the warming time is a maximum allowed time for warming up and prevents the main driving from being delayed so as not to maintain the warming up driving for a long time.

[0155] In the smoke control mode 374, a smoke control mode setting 375 may be allowed depending on whether to install a smoke sensing sensor. In some cases, when a fire signal is input from a smoke sensing device of a building controller, the smoke control mode may be set. In the smoke control mode 374, damper setting 376 and fan operation setting 377 may be performed.

[0156] In the damper setting 376, opening angles of an outdoor air damper, an exhaust air damper, and a mixture damper may be set and a frequency for rotating operation of the return air fan and the supply air fan may be set in the fan operation setting 377.

[0157] When the smoke control mode is set and a smoke is sensed by the smoke sensing sensor or a fire signal is received, the central controller 4 may set an opening degree of the damper of the air handling unit 1 in accordance with the damper setting 376. In the case of fire, the operation of the outdoor unit stops and the air handling unit 1 also stops a series of operations including the heat exchange but the damper operates with a predetermined opening degree in accordance with the smoke control mode setting. Further, the central controller 4 operates the return air fan and the supply air fan at a predetermined frequency in accordance with the fan operation setting 377.

[0158] As illustrated in FIG. 19, among the system setting menu 313 of the interface unit, when the second system setting tab 362 is selected, a menu screen configured by a sensor range 378 and a heat source securing temperature range 379 is displayed.

[0159] The sensor range 378 sets a sensible range value for a plurality of sensors which is provided in the air handling unit 1 in accordance with the characteristic of the provided sensors. Since the sensible minimum value and maximum value of the sensor are input, even though a specific sensor model is not provided, various models may be selectively provided in the air handling unit 1.

[0160] The sensor range may be set for the return air temperature sensor, the outdoor air temperature sensor, the filter differential pressure sensor, the return air flow sensor, a carbon dioxide sensor, a supply air temperature sensor, a mixed air temperature sensor, a supply air positive pressure sensor, and a supply air flow sensor and the sensor range may not be input for the sensor which is not provided. When the sensor range for the provided sensor is not input and the sensor is set to be provided, an initial value of the sensor is automatically set..

[0161] In the heat source securing temperature range 379, a minimum value and a maximum value of a securable temperature for the cooling heat source and the

heating heat source are set when the temperature of the air handling unit 1 is controlled. The minimum value and the maximum value of the heat source securing temperature may become a reference to determine to additionally drive the outdoor unit and reduce the number of driven outdoor units when the number of outdoor unit is controlled. For example, when the temperature is equal to or higher than the maximum value of the supply air temperature cooling heat source securing temperature during the cooling driving, the outdoor unit is additionally driven and when the temperature is equal to or lower than the minimum value, the number of driven outdoor units is reduced. Further, even though the number of outdoor units is not controlled in accordance with the heat source securing temperature, the room temperature is controlled not to be out of the range of the maximum value and the minimum value of the heat source securing temperature. That is, the heat source securing temperature range 379 is a controllable temperature range when the temperature is controlled.

[0162] As illustrated in FIG. 20, when a third system setting tab 363 is selected, a menu screen, which is configured by setting items for the central control address 381, a number of fans 383, and a fan driving reference 379 at the time of a defrosting operation, is displayed.

[0163] The central control address 381 sets an address of the air handling unit 1 to be controlled. In this case, the address setting method is a method of displaying an address and may be set by any one of a decimal number and a hexadecimal number.

[0164] The number of fans 383 sets a number of installed return air fans and supply air fans and 1, 2, 4, and 6 fans may be set. As the fan driving reference 379 at the time of a defrosting operation, a temperature at which the fan operation stops at the time of a defrosting operation and a temperature value at which the operation starts are input. For example, at the time of a defrosting operation, when the supply air temperature is equal to or higher than 25 degrees, the operation of the fan stops and when a piping temperature is equal to or higher than 30 degrees, the fan operates.

[0165] As illustrated in FIG. 21, when a fourth system setting tab 364 is selected, a menu screen, which is configured by an inverter fan control reference 387, positive pressure control 388, and an inverter frequency 389, is displayed on the screen.

[0166] The inverter fan control reference 387 sets to control an inverter fan based on the air volume or the positive pressure. It is determined whether to control the inverter fan based on a designated frequency in accordance with strong, medium, and weak air volume settings or control the inverter fan based on the positive pressure in accordance with the pressure in the air handling unit 1.

[0167] In the positive pressure control 388, when the inverter fan control reference is set based on a positive pressure, a positive pressure based control cycle and a pressure value which becomes a control reference in accordance with the control cycle are set.

[0168] As the inverter frequency 389, when the inverter fan is controlled based on the air volume, an operating frequency of the inverter fan is set for the supply air and the return air in accordance with strong wind, medium wind, and weak wind. In this case, even though the strong wind is set in accordance with the setting, an actual amount of wind may be different in accordance with the frequency setting. The wind is changed into strong, medium, or weak wind to be set in accordance with an environment in which the air handling unit is provided.

[0169] As illustrated in FIG. 22, when a fifth system setting tab 365 is selected, a menu screen, which configured by an inverter fan control reference 391 in a test driving situation, fan control 392, damper control 393, a humidification valve 394 when the valve is controlled, a heater valve 395, and a freezing protection contact point 396, is displayed.

[0170] When test driving is performed, the inverter fan control reference 391 sets whether to control the inverter fan based on the air volume or the positive pressure when the inverter fan is controlled in order to check the operation of the inverter.

[0171] When the test driving is performed, the fan control 392 inputs driving frequencies to the supply air fan and the return air fan to check the operations of the supply air fan and the return air fan. In this case, when the frequency is input and application keys 397a and 397b are selected, the fan for which the application key is selected operates. When the supply air fan operates, the operation state of the supply fan is displayed in the monitoring menu or the detail view described above and the operation frequency of the supply air fan is displayed when the installer logs in. The installer may check whether the supply air fan operates at the input frequency when the test driving is performed.

[0172] In the damper control 393, when opening angles for the outdoor air damper, the exhaust air damper, and the mixture damper are input and application keys 397d to 397e are selected, the opening degree of the damper of the air handling unit 1 is changed. In this case, the interface unit 5 transmits information to the control unit 110 of the central controller 4 and the control unit 110 transmits the control signal to the input/output unit 120 to control the damper.

[0173] In the valve control, when humidifiers are provided, test driving is performed by selecting a DC signal and a contact point signal for the humidification valve 394 by application keys 397f and 397g and test driving is performed by selecting a DC signal and a contact point signal for the heater valve 395 by application keys 397h and 397i. Further, the contact point signal may be selected by the application key 397i to check whether to perform the operation for the freeze protection.

[0174] In the case of test driving, a plurality of application keys 397a to 397j is provided to perform test driving for individual devices. In this case, test driving is performed for one device whose application key is selected but the test driving may not be simultaneously performed on a

plurality of devices.

[0175] The system setting menu is displayed when the installer logs in so as to be used for test driving to check whether to input information corresponding to a device provided in the air handling unit 1 in an installation step and whether to perform a normal operation after installation. When the manager logs in, basically, the system setting 313 is not displayed. However, if necessary, new information may not be input and previous setting may not be edited, but predetermined setting information may be displayed to be read.

[0176] FIGS. 23 to 24 are exemplary views to explain a schedule setting menu of an interface unit according to an exemplary embodiment of the present invention.

[0177] As illustrated in FIG. 23A, when a schedule key 292 is selected, a schedule setting menu 410 is displayed on a screen. The schedule setting menu 410 inputs, adds, or changes a driving schedule of the air handling unit 1.

[0178] In the schedule setting menu 410, a previously set schedule list 414 is displayed and a schedule key for individual schedules and an editing key 416 for the schedules are provided.

[0179] The schedule setting menu 410 includes a schedule selection 411 to select any one of currently applied schedules, a selected schedule driving setting 412, and an application key 413. In the schedule mode, the driving setting 412 is displayed to be applied to the schedule but when the air handling unit 1 is locally or remotely controlled, the driving setting is displayed to be unused. The application key 413 applies a setting to the changed schedule or a selected schedule in the schedule setting menu 410.

[0180] In this case, when any one schedule is selected in the schedule list 414, for example, when schedule 1 (415) is selected, as illustrated in FIG. 25B, schedule information 417 which is set for schedule 1 is displayed. In the schedule information, schedules in accordance with a time for every day of the week are displayed.

[0181] In the meantime, when an editing key 416 is selected in FIG. 23A, an editing screen for the schedule is displayed. In this case, an editing key 416 for the schedule 1 (415) is selected, a schedule editing menu for the schedule 1 is displayed and when an editing key of schedule 2 is selected, an editing menu for the schedule 2 is displayed.

[0182] As illustrated in FIG. 24A, in the schedule editing menu 418, a schedule pattern in accordance with a time for every day of the week for the schedule 1 selected is displayed and the schedule editing key 419 is displayed.

[0183] When the schedule editing key 419 is selected, new schedule is added to the schedule 1 or the predetermined schedule may be corrected or removed.

[0184] When the schedule editing key 419 is selected, as illustrated in FIG. 26B, the editing menu 420 is displayed. In the editing menu 420, day selection 421 which may select a day of the week to be edited is displayed as the drop down menu and a schedule pattern 422 for

the selected day of the week is displayed. When the day of the week is changed, the schedule pattern 422 correspondingly changed to be displayed.

[0185] When any one of time basis schedule pattern items which are displayed in the schedule pattern 422 is selected, a driving start time 423 and a driving stop time 424 therefor may be input and when the correction key is selected, the time schedule pattern is changed. In this case, when the deletion key is selected, the corresponding time schedule pattern is deleted. Further, when an additional key is selected after inputting the driving start time and driving stop time without selecting the predetermined schedule, new schedule pattern is additionally input. Changed information in accordance with addition, correction, deletion of the pattern item is displayed in the schedule pattern 422.

[0186] When a storing key is selected, the changed schedule pattern is stored, and when the previous menu is selected, the changed schedule pattern moves to the schedule editing menu 418 illustrated in FIG. 26A.

[0187] FIG. 25 is an exemplary view illustrating an exemplary embodiment of a screen on which history information of an interface unit of an air conditioning system according to the present invention is displayed. As illustrated in FIG. 25, among the main menu, when a history key 293 is selected, error information 430 for the air handling unit 1 is displayed.

[0188] The interface unit 5 receives and stores error information incurred in the air handling unit 1 from the central control unit 4 and displays the error information 430 based on the stored error information. In this case, the interface unit 5 may output a warning for incurrence of error of the air handling unit 1.

[0189] A number is assigned to the error information 430 in accordance with the order of error incursion and a date and a time when the error is incurred are displayed, and a code for the incurred error and information on a device in which the error is incurred are displayed. Further, a code number or a message related with the incurred error is displayed.

[0190] When a refresh key 432 is selected, error information 430 which is updated based on the newly received information is displayed. When new error information is received, if the refresh key 432 is selected, new error information is added to the error information 430.

[0191] When all deletion 431 is selected, all information in the error information is deleted and initialized. Errors incurred before performing all deletion 431 are accumulated and stored as a list and held for a predetermined period.

[0192] FIG. 26 is an exemplary view illustrating an exemplary embodiment of a screen through which a warning is output when an error of an interface unit of an air conditioning system according to an exemplary embodiment of the present invention is incurred.

[0193] As illustrated in FIG. 26, when an error is incurred in the air handling unit 1, the interface unit 5 may output a notice message 433 corresponding to the error

information which is received from the central controller 4.

[0194] In the notice message 433, a date and time 435 when the error is incurred, an error code 434, and an error message 436 for an error code are displayed.

[0195] Therefore, the air conditioning system of the present invention includes an air handling unit which adjusts the return air, the exhaust air, the outdoor air, and the supply air to circulate the indoor air and adjusts the temperature to control the room temperature to simultaneously control the temperature and ventilation while increasing heat efficiency, and includes a controller which controls the air handling unit to control the driving while monitoring an operation state for the air handling unit through a detachable interface unit which is an input/output device of the controller, thereby performing easy management.

[0196] The air conditioning system of the present invention may easily reconfigure the interface which is provided through the interface unit even though a configuration of the air handling unit varies in accordance with installation conditions, so that generality and expandability for various requirements such as expansion, change, or simplification of the system are improved.

[0197] The interface unit functions as a dedicated controller for the completely installed air handling unit, but is not limited only to controlling the air handling unit configuring devices which are already installed, and has a generality to correspond to the changed device configuration. That is, high degree of freedom for the interface configuration is assigned to the interface unit and no physical structure change is necessary to control the changed configurations, even though the configuration of the air handling unit is changed, so that commonality and generality of component are improved.

Claims

1. An air conditioning system, comprising:

an air handling unit (1) to handle indoor air;
an interface unit (5) which provides an interface to control the air handling unit (1); and
a central controller (4) which includes:

an input/output unit (120a, b) which provides an input/output port through which an electric signal is input and output between devices configuring the air handling unit; and
a control unit (110) which is configured to interwork with the interface unit (5) to control the devices configuring the air handling unit (1),

wherein the interface unit (5) which is configured to configure the interface based on configuration

- of the devices configuring the air handling unit (1) recognized through the input/output unit (120a, b), the interface being reconfigured in accordance with change of the devices configuring the air handling unit (1). 5
2. The air conditioning system of claim 1, wherein the interface unit (5) is configured to generate a control menu for an added device when a device is added to the air handling unit (1). 10
 3. The air conditioning system of claim 1 or 2, wherein the interface unit (5) is configured to inactivate or remove a control menu for a removed device when a device is removed from the air handling unit (1). 15
 4. The air conditioning system according to any of of claims 1 to 3, wherein the interface unit (5) is configured to display a driving state of the air handling unit (1) in accordance with a signal value which is input through the input/output unit (120a, b). 20
 5. The air conditioning system according to any of claims 1 to 4, wherein a plurality of the input/output units (120a, b) is provided and the plurality of input/output units (120a, b) is configured to communicate with the control unit (110) through serial communication. 25
 6. The air conditioning system according to any of claims 1 to 5, wherein an analog signal is input/output through the input/output port. 30
 7. The air conditioning system according to any of claims 1 to 6, wherein a digital signal is input/output through the input/output port. 35
 8. The air conditioning system according to any of claims 1 to 7, wherein the air handling unit (1) includes a fan motor (57, 59) and further includes a driver (140) which is configured to drive the fan motor (57, 59) in accordance with a control signal which is applied from the control unit (110). 40
 9. The air conditioning system according to any of claims 1 to 8, wherein the interface unit (5) is provided in a location spaced apart from the air handling unit (1). 45
 10. The air conditioning system according to any of claims 1 to 9, wherein the interface unit (5) is movable. 50
 11. The air conditioning system according to any of claims 1 to 10, wherein the control unit (110) includes a recording unit which is configured to record information on devices configuring the air handling unit (1) and when a new device is added to the air handling unit (1), the interface unit (5) obtains information on the added device from the recording unit and reconfigures the interface in accordance with the obtained information. 55
 12. The air conditioning system according to any of claims 1 to 11, wherein the air handling unit (1) includes at least one of a temperature sensor (250), a humidity sensor (249), a fan motor (57, 59), a flow rate sensing sensor, a pressure sensor, a differential pressure sensor, a different pressure switch, a valve, a damper, a smoke sensing sensor, and a heater.
 13. Method of operating an air conditioning system according to any of claims 1 to 12.

Fig. 1

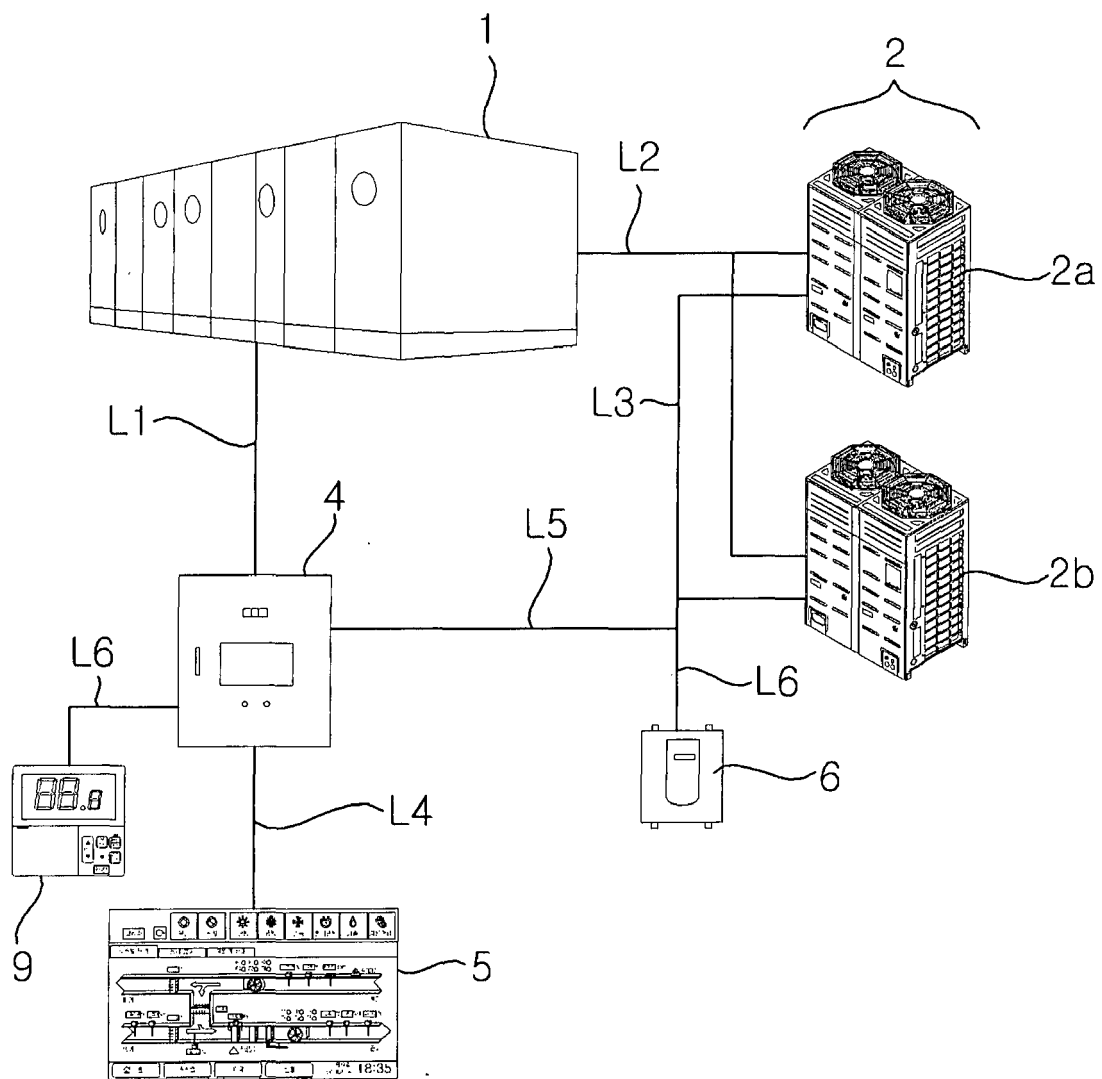


Fig. 2

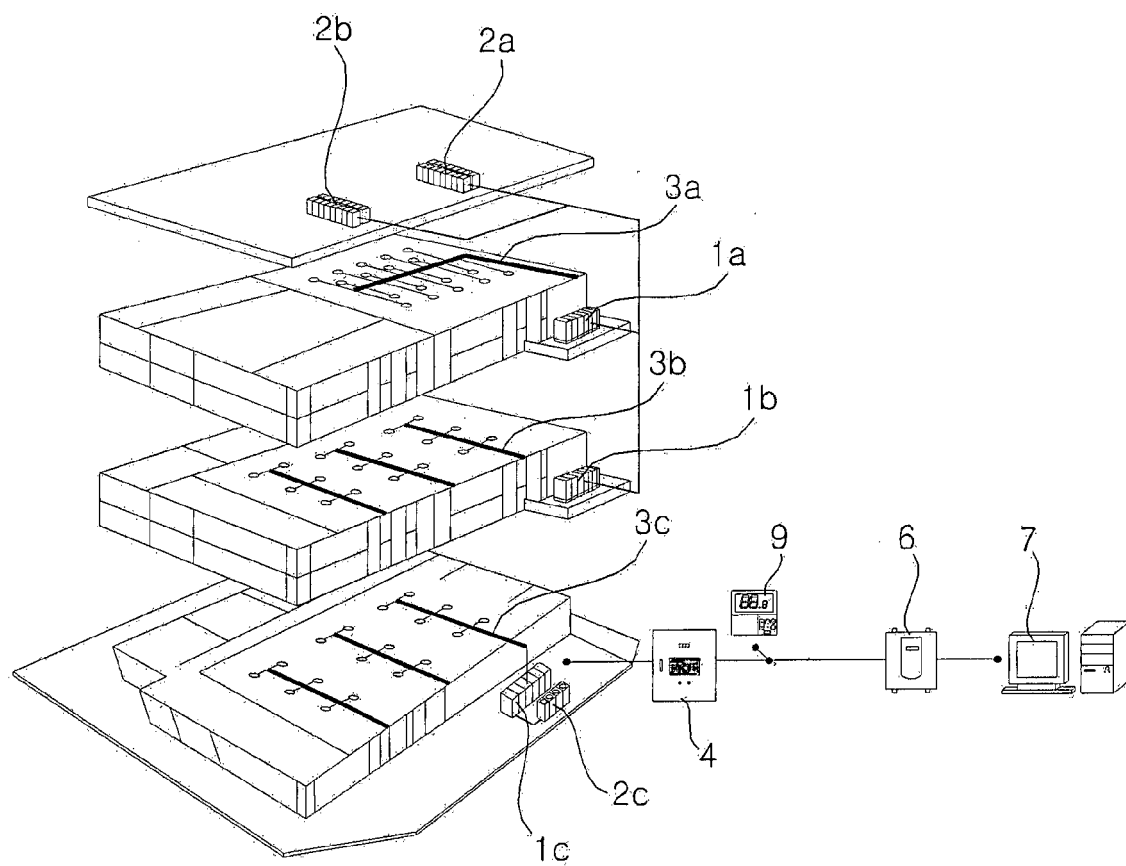


Fig. 3

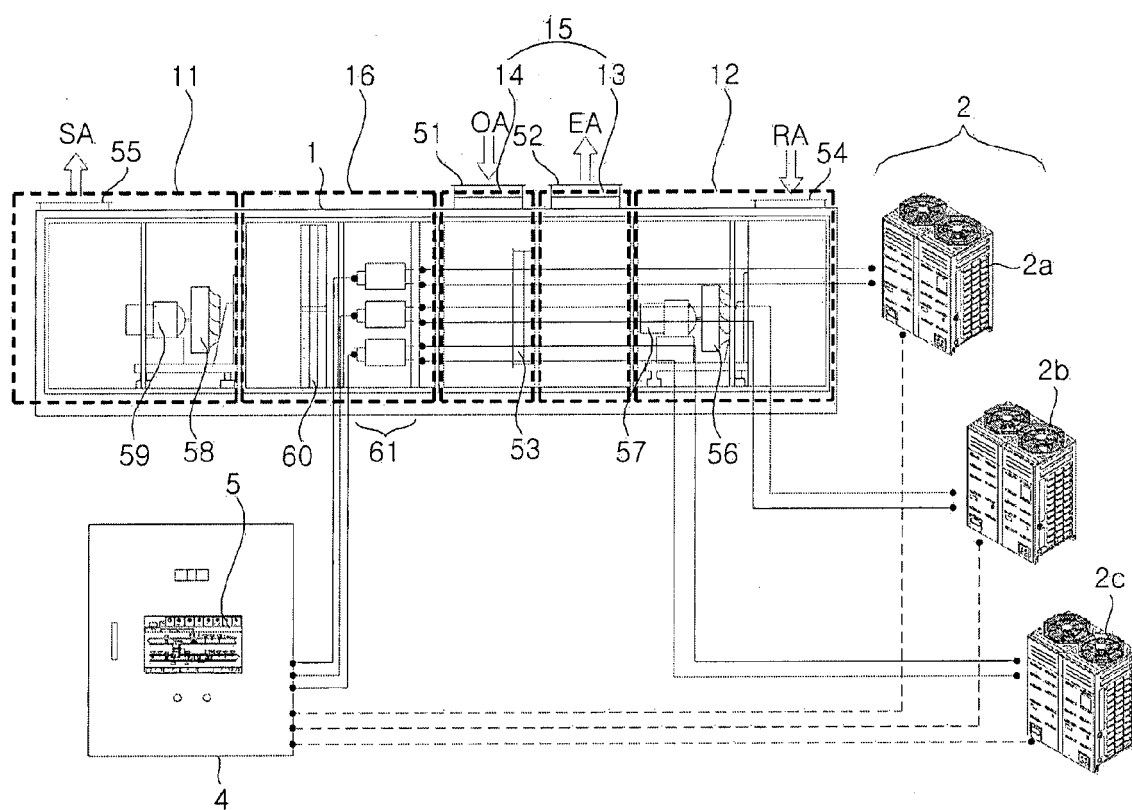


Fig. 4

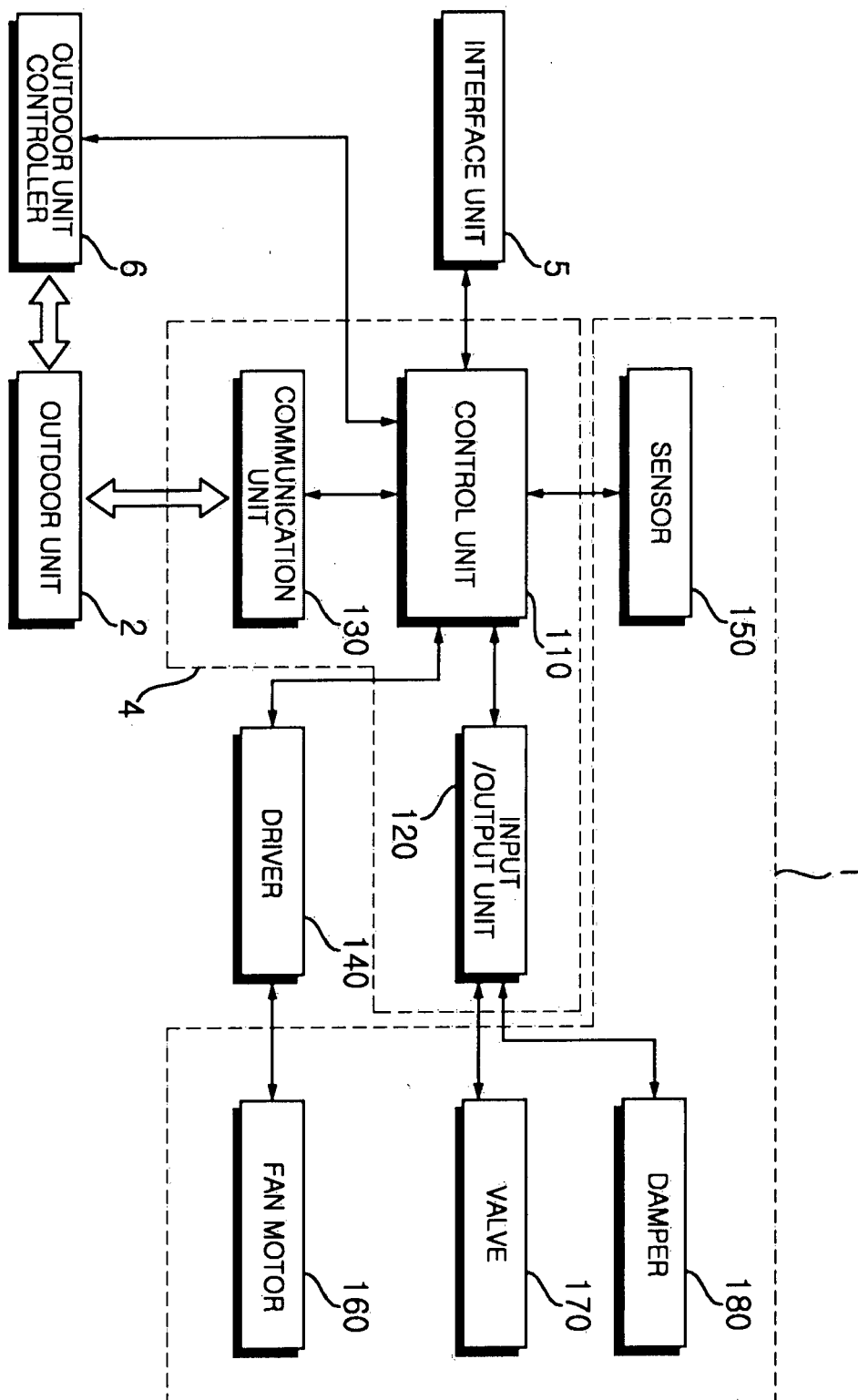


Fig. 5

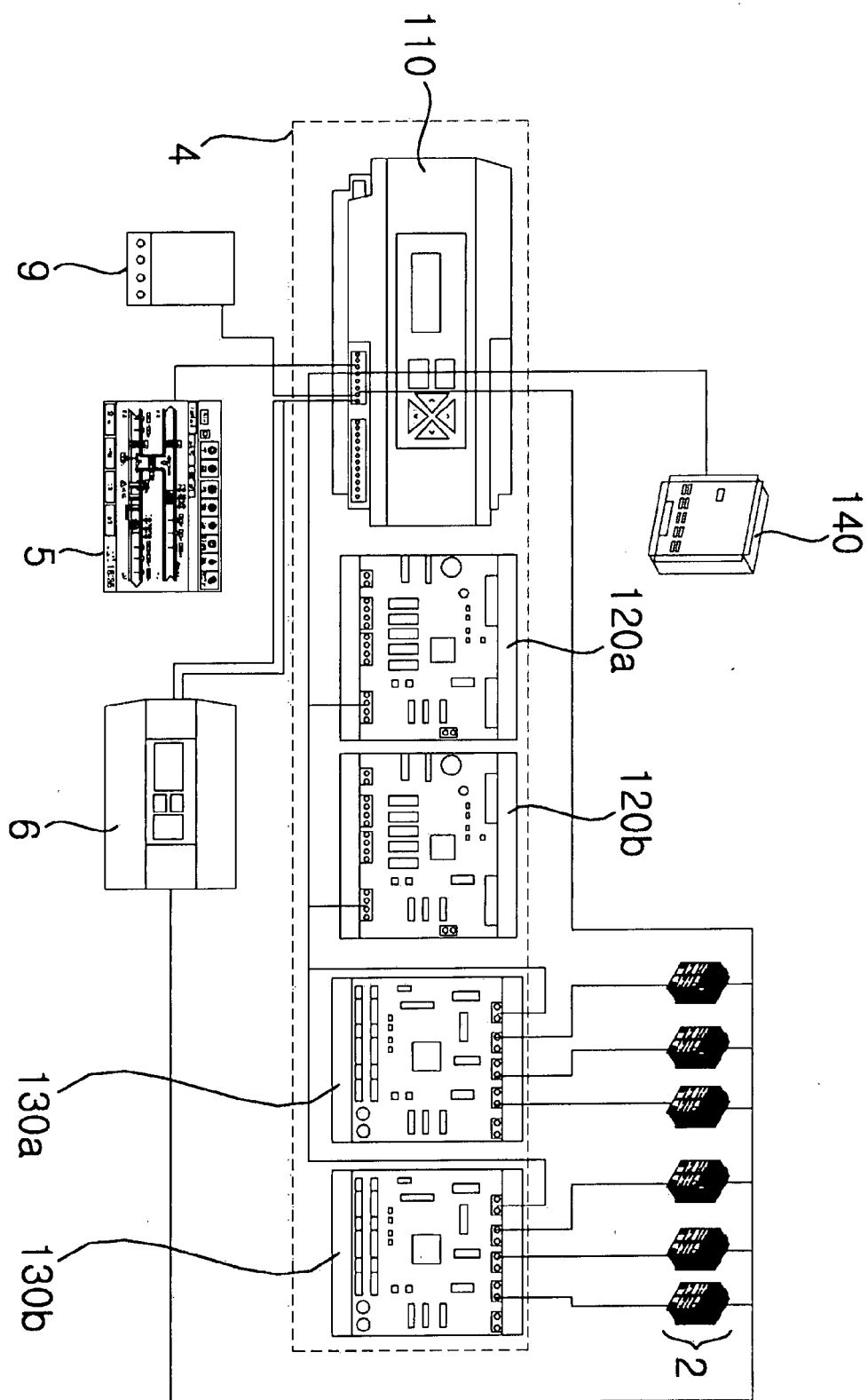


Fig. 6A

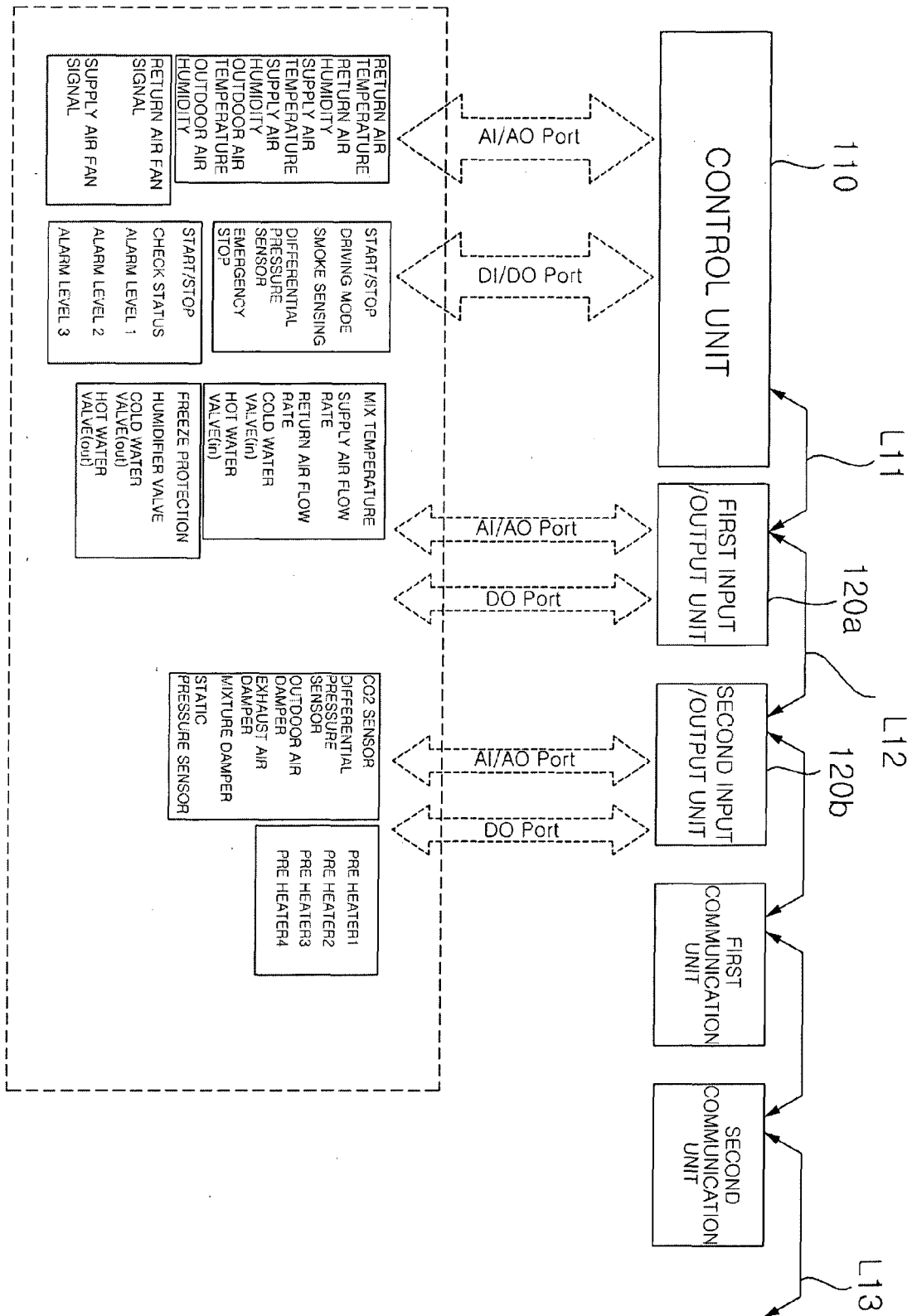


Fig. 6B

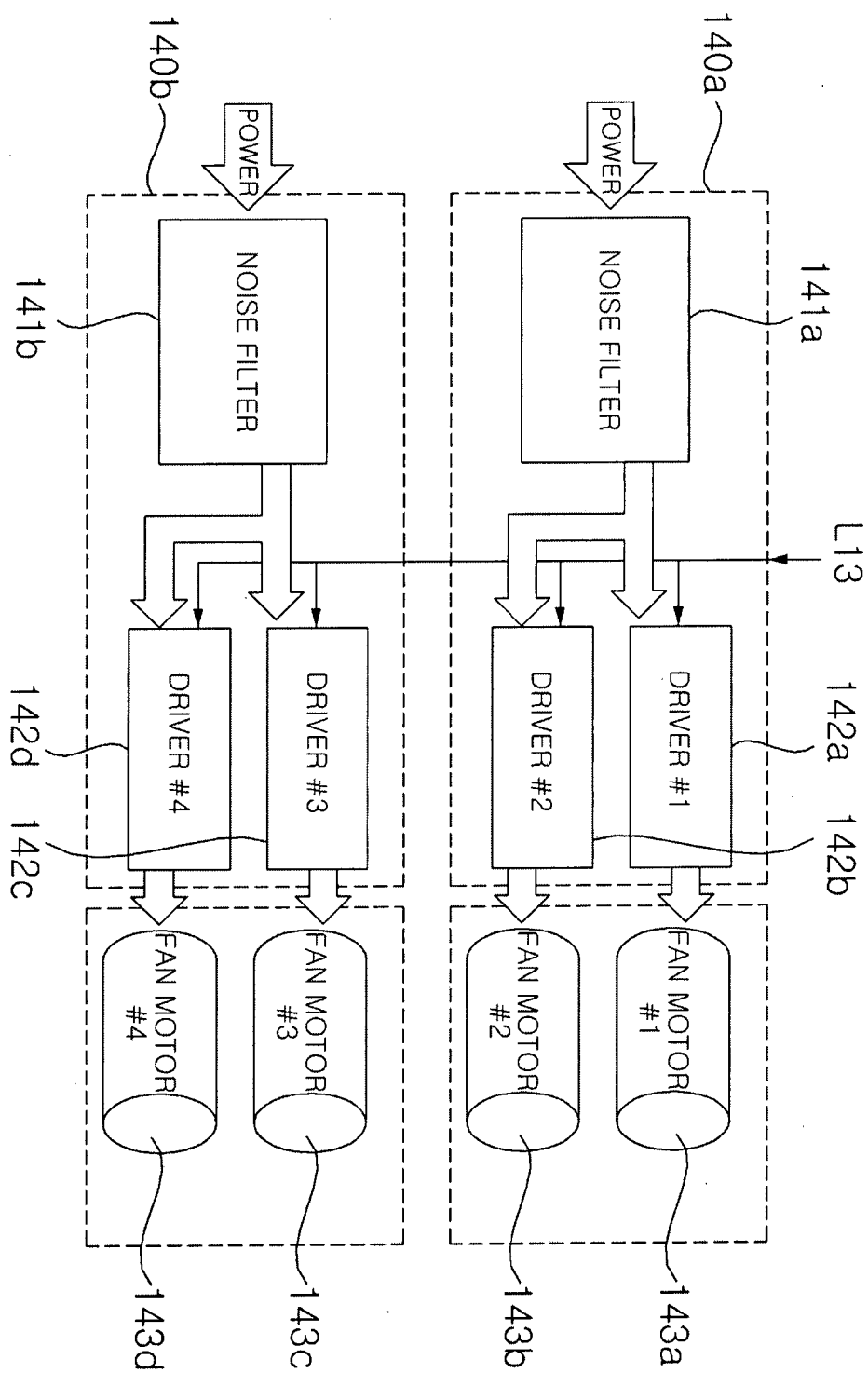


Fig. 7

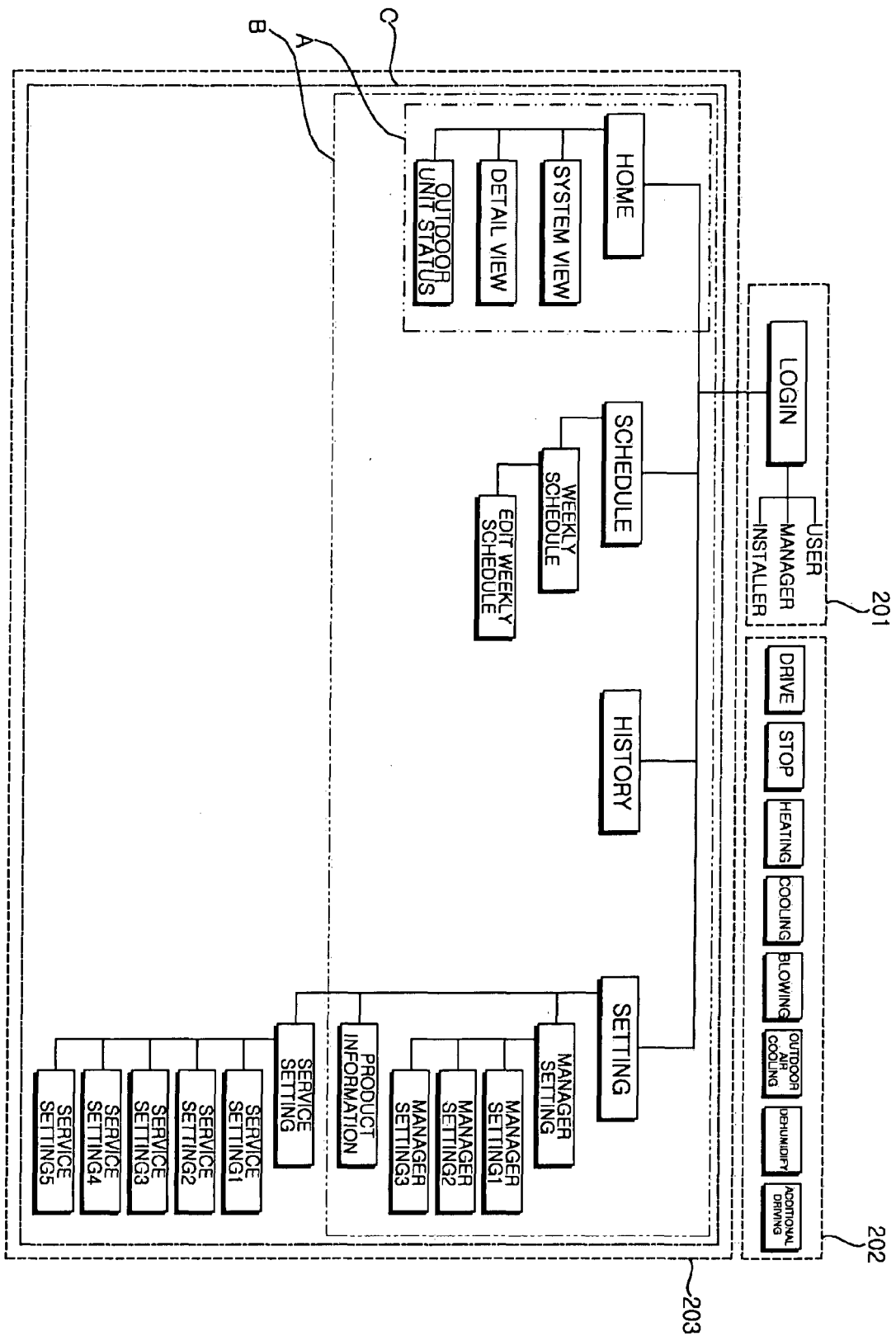


Fig. 8

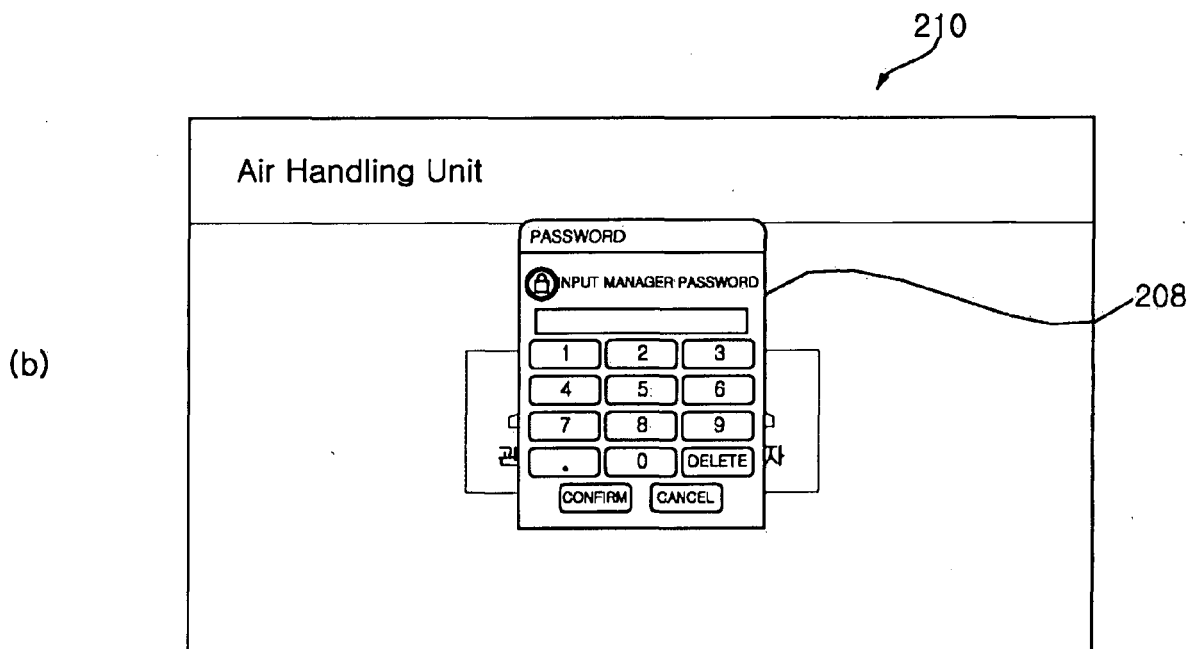
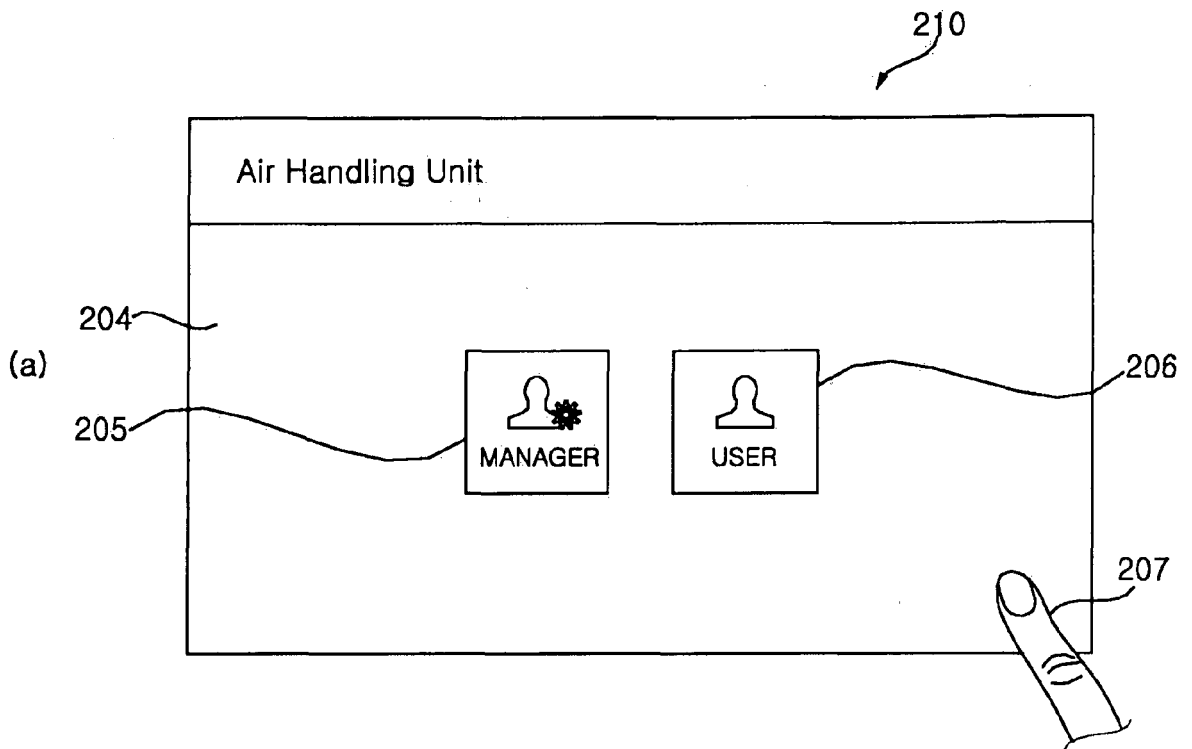


Fig. 9

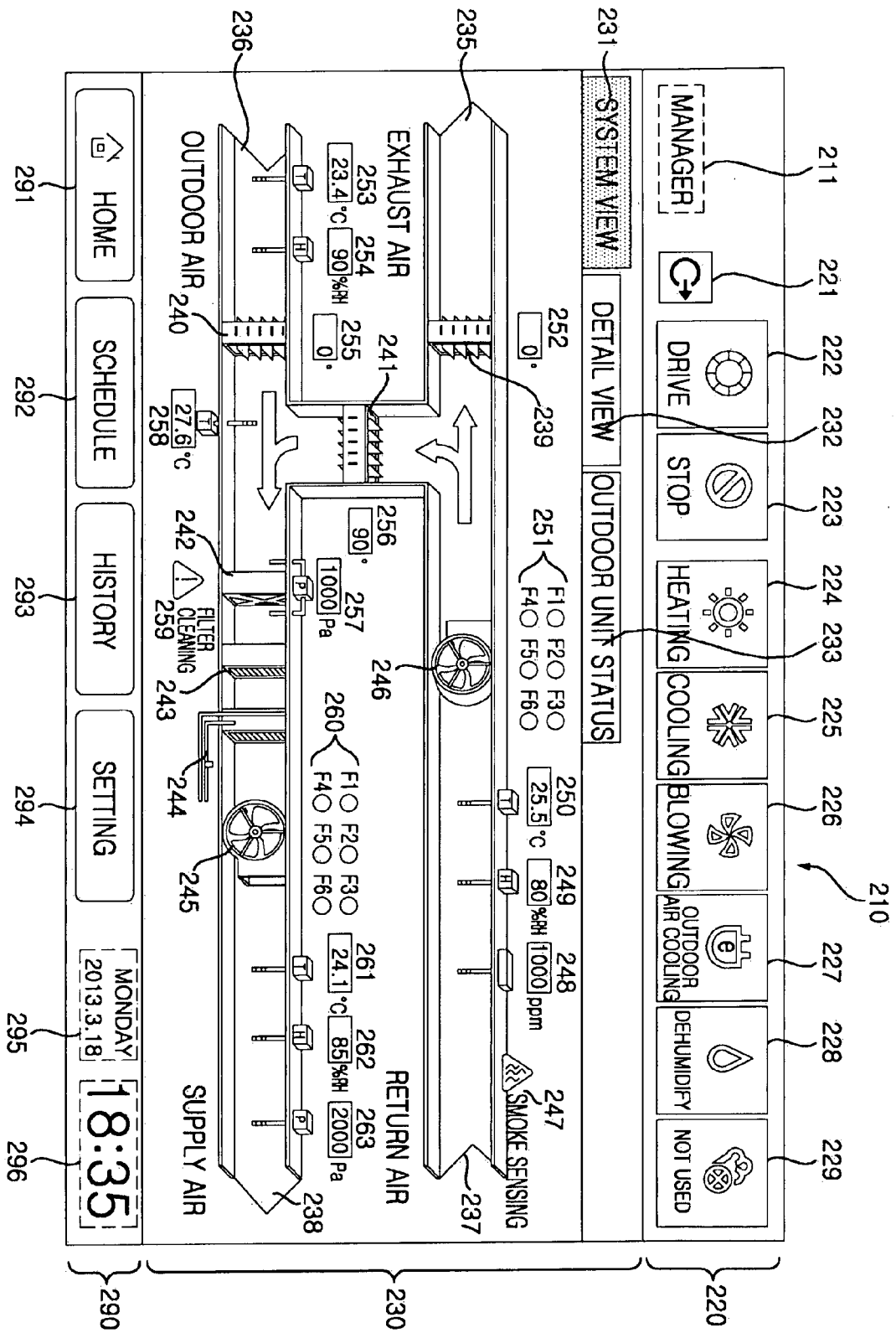


Fig. 10

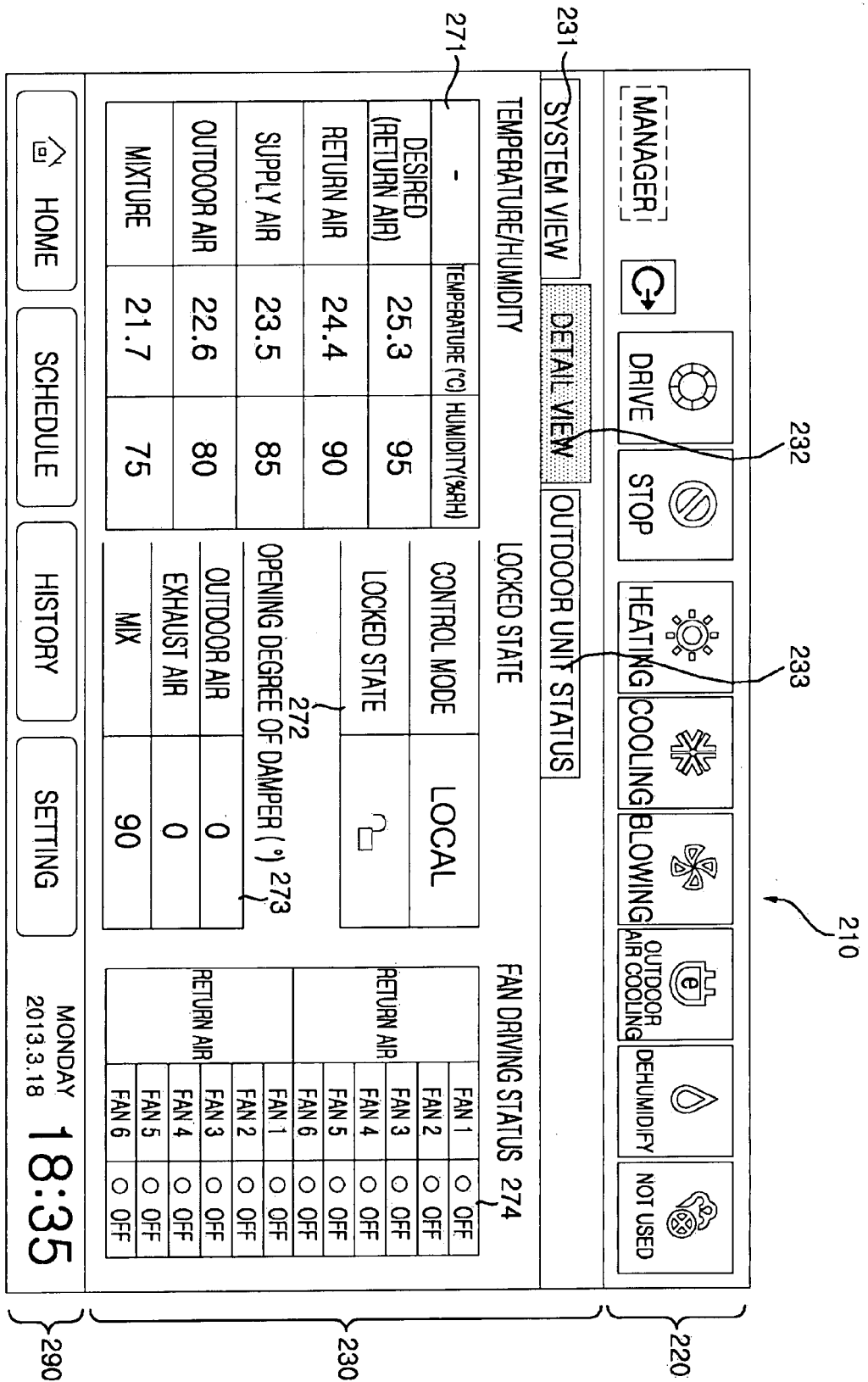


Fig. 11

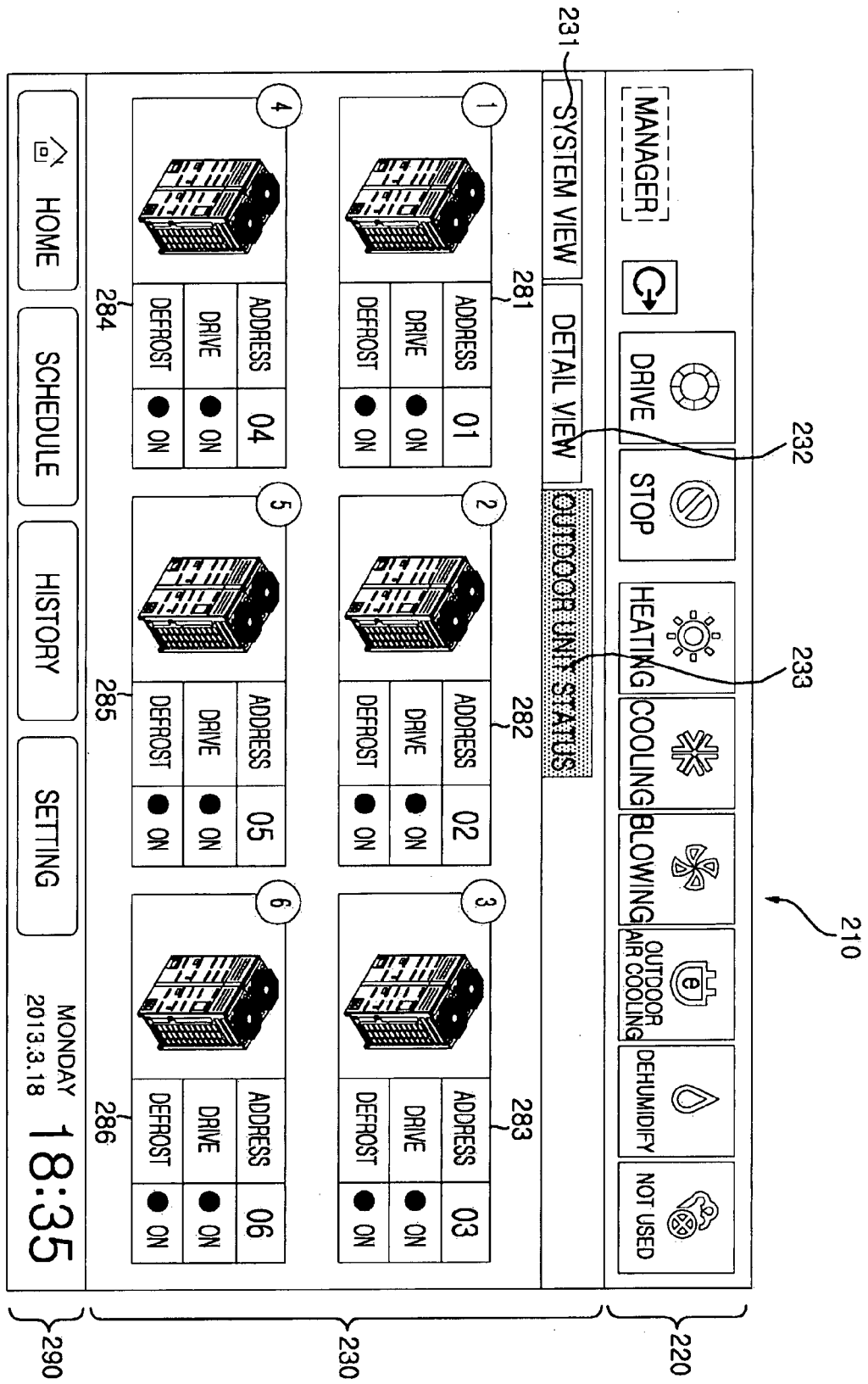


Fig. 12

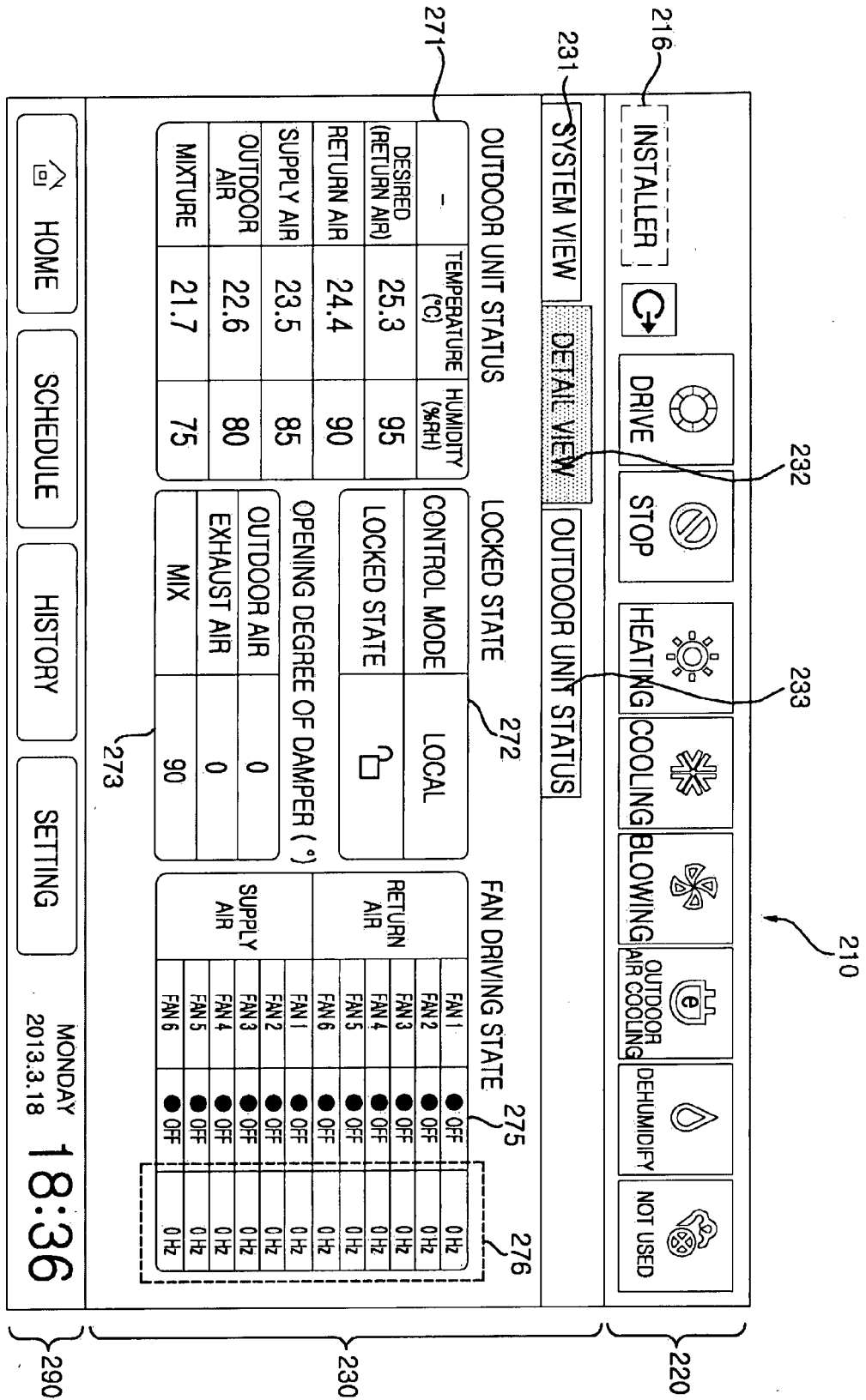


Fig. 13

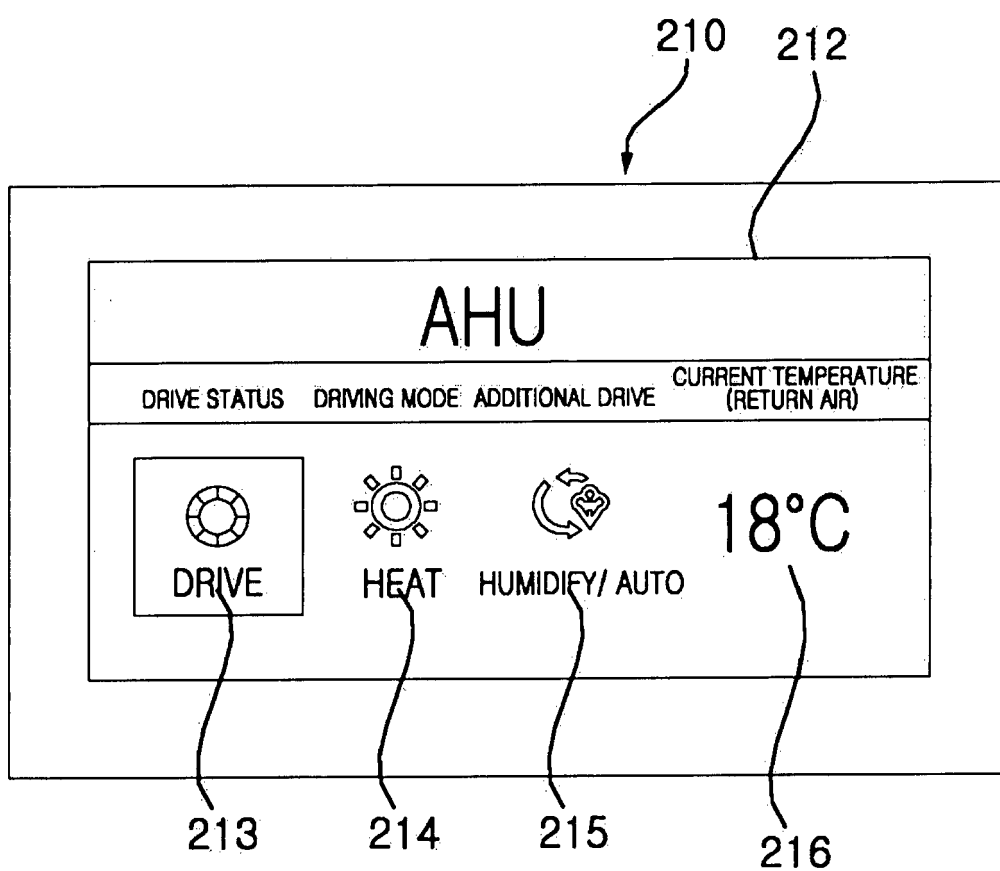


Fig. 14A

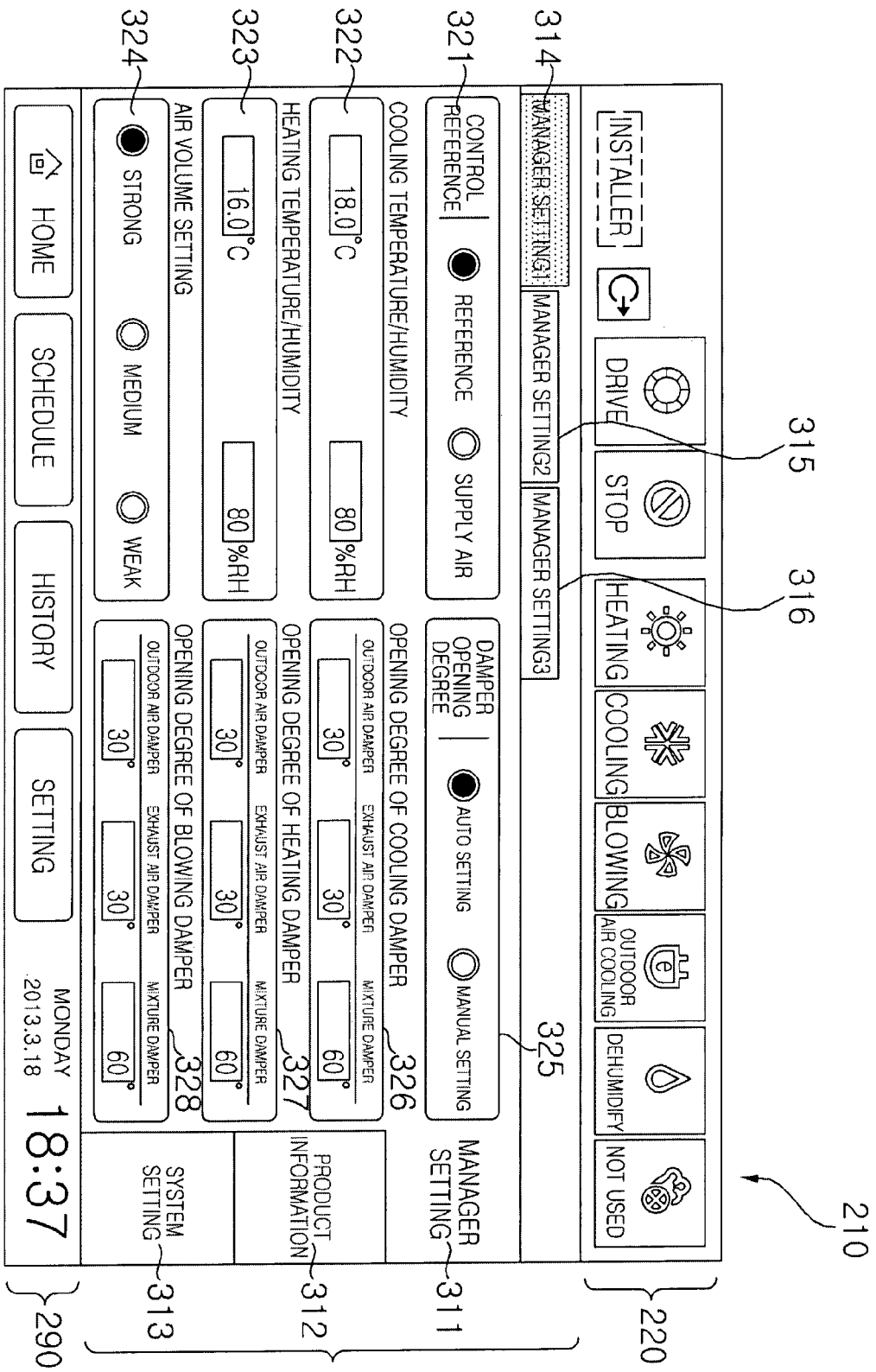


Fig. 14B

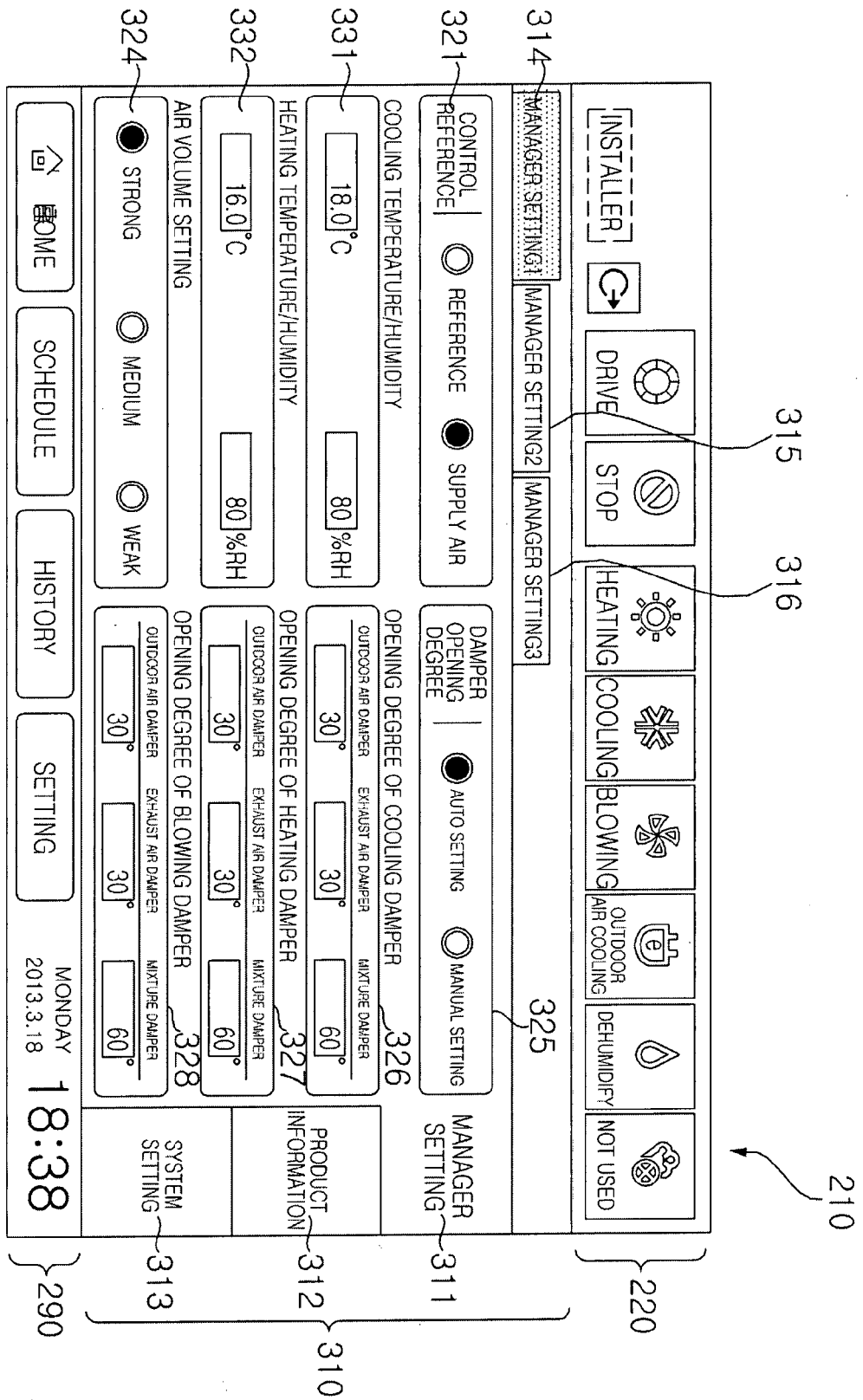


Fig. 15

210

315 316

MANAGER

DRIVE STOP

HEATING COOLING BLOWING

OUTDOOR AIR COOLING

DEHUMIDIFY

NOT USED

314

MANAGER SETTING1

MANAGER SETTING2

MANAGER SETTING3

SET AHU TYPE

100% OUTDOOR AIR UNIT AIR HANDLING UNIT

335

APPLIED SENSOR

NECESSARY SENSOR

RETURN AIR

OPTIONAL SENSOR

OUTDOOR AIR TEMPERATURE/HUMIDITY SENSOR

MIXED AIR TEMPERATURE SENSOR

CO2 SENSOR (REFERENCE CONCENTRATION) 1000 ppm

337

338a

온/습도센서

온/습도센서

온도센서

338b

COOLING

AIR COOLING TYPE

AIR COOLING TYPE

WATER COOLING TYPE

NOT USED

HEATING

AIR COOLING TYPE

AIR COOLING TYPE

WATER COOLING TYPE

NOT USED

339a 336 339b

TEMPERATURE /HUMIDITY SENSOR

TEMPERATURE /HUMIDITY SENSOR

TEMPERATURE /HUMIDITY SENSOR

400 Pa

SUPPLY AIR

338b

339a

336

339b

MANAGER SETTING

PRODUCT INFORMATION

SYSTEM SETTING

HOME SCHEDULE HISTORY SETTING

MONDAY 2013.3.18 18:38

Fig. 16

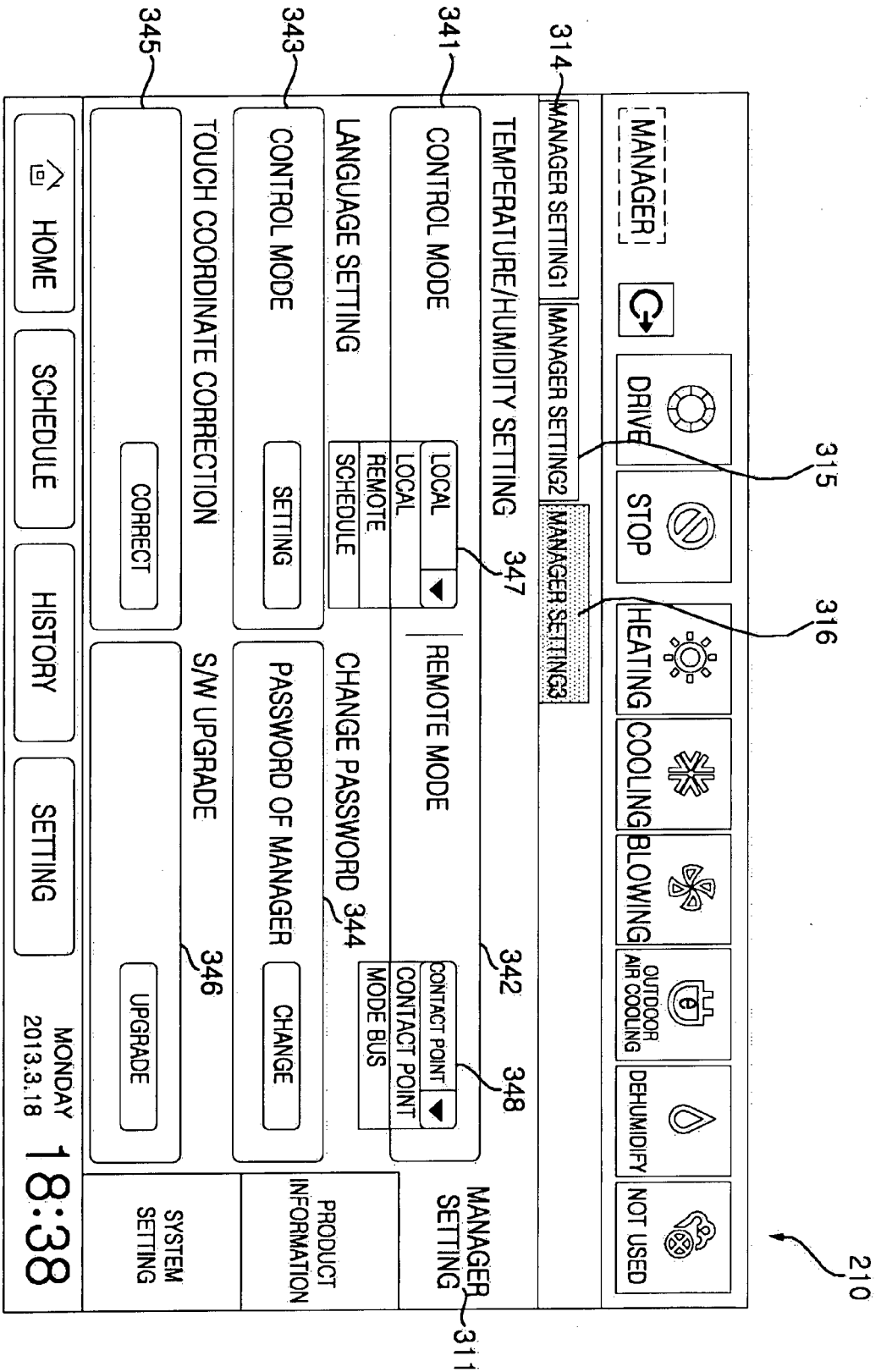


Fig. 17

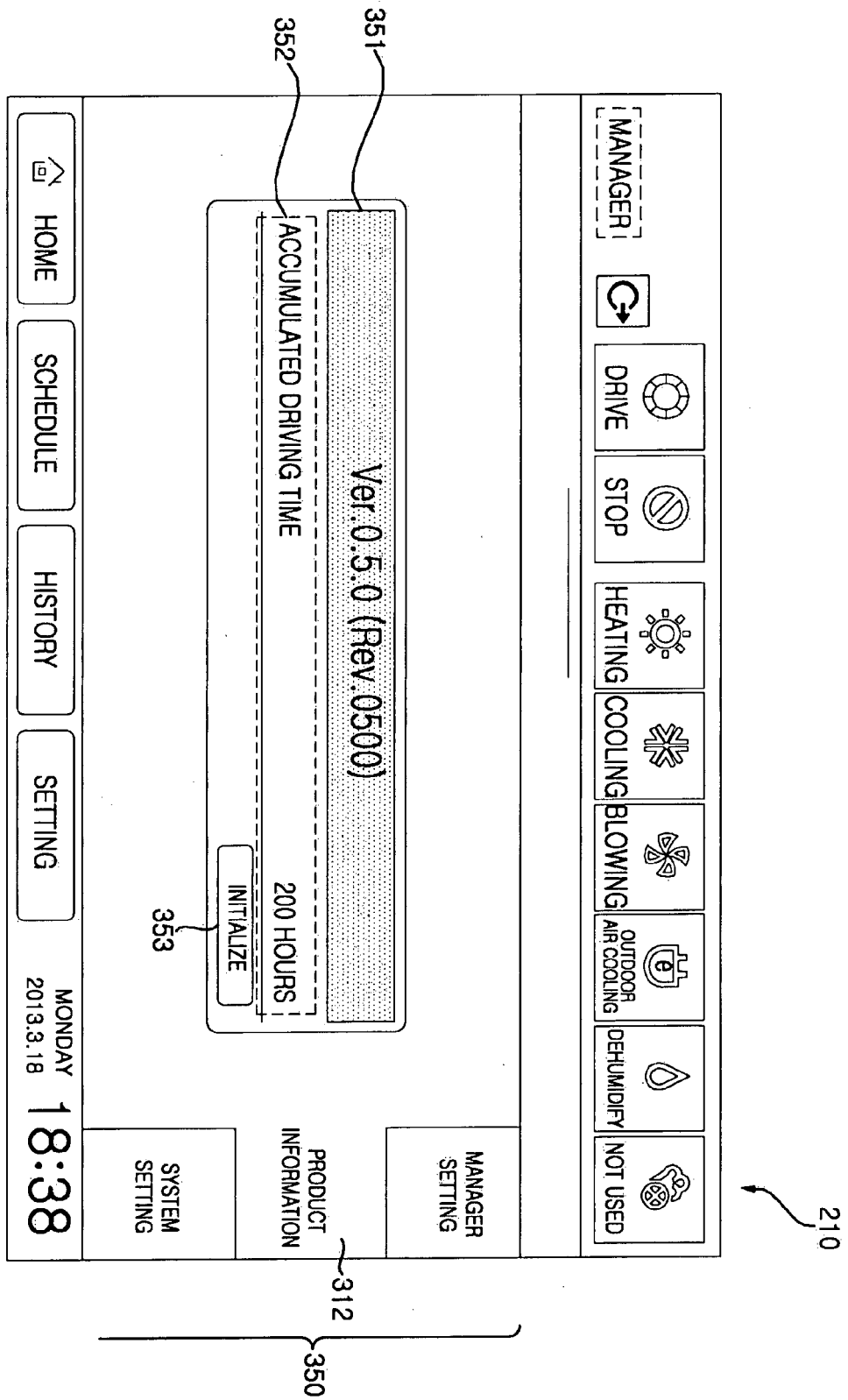


Fig. 18

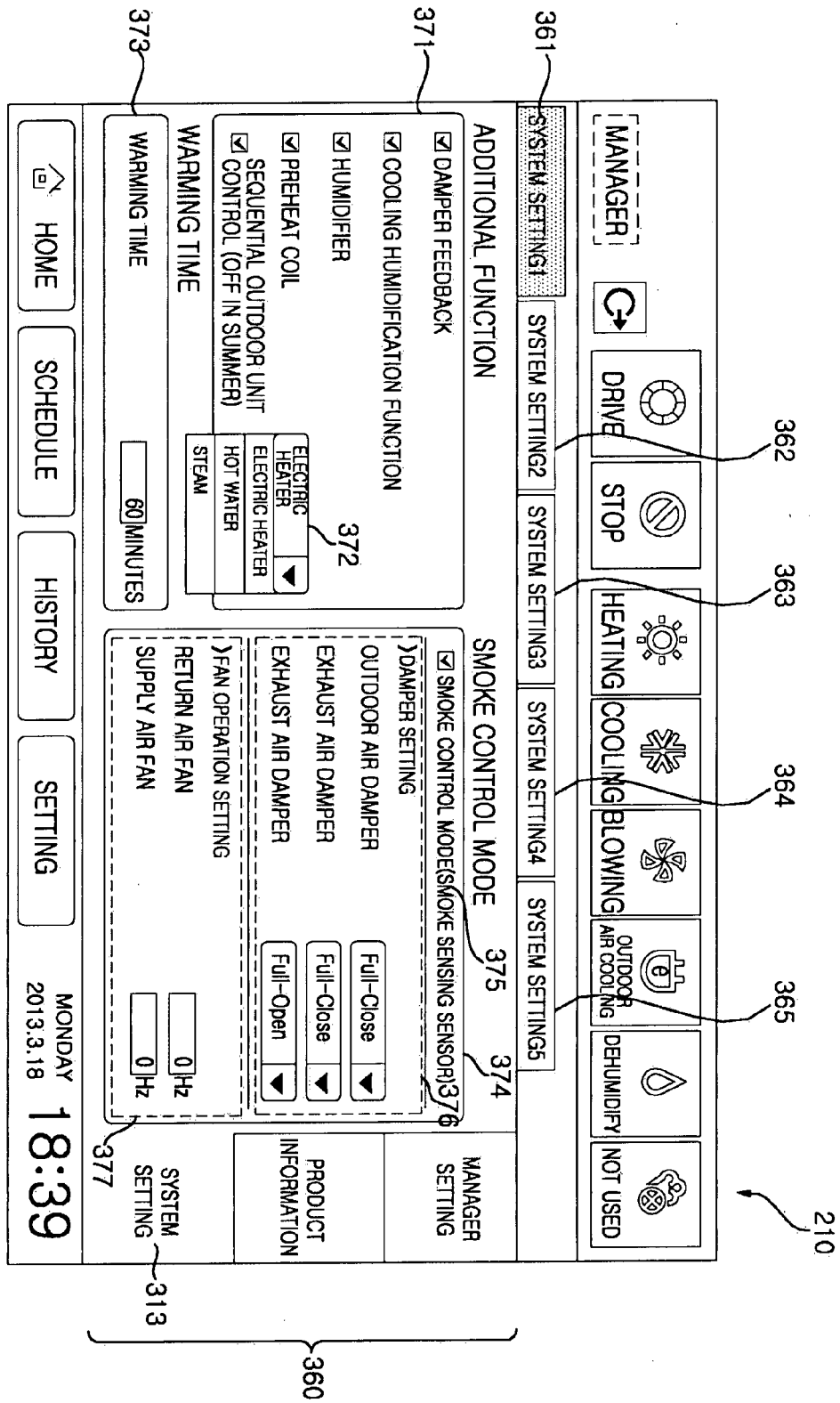


Fig. 19

210

362

[MANAGER]

SYSTEM SETTING1 SYSTEM SETTING2 SYSTEM SETTING3 SYSTEM SETTING4 SYSTEM SETTING5

378

SENSOR RANGE

	MINIMUM	MAXIMUM		MINIMUM	MAXIMUM
RETURN AIR TEMPERATURE	-40°C	70°C	SUPPLY AIR TEMPERATURE	-40°C	70°C
OUTDOOR AIR TEMPERATURE	-40°C	70°C	MIXED AIR TEMPERATURE	-40°C	70°C
FILTER DIFFERENTIAL PRESSURE SENSOR	-40 Pa	70 Pa	SUPPLY AIR STATIC PRESSURE SENSOR	0 Pa	1000 Pa
RETURN AIR FLOW	0.0 m/s	20.0 m/s	SUPPLY AIR FLOW	0.0 m/s	20.0 m/s
CO2 SENSOR	100 ppm	1500 ppm			

379

HEAT SOURCE SECURING TEMPERATURE

COOLING HEAT SOURCE 12.0°C 18.0°C HEATING HEAT SOURCE 40.0°C 50.0°C

HOME SCHEDULE HISTORY SETTING

MONDAY 2013.3.18 18:39

313

360

Fig. 20

MANAGER

DRIVE STOP HEATING COOLING BLOWING OUTDOOR AIR COOLING DEHUMIDIFY NOT USED

SYSTEM SETTING1 SYSTEM SETTING2 SYSTEM SETTING3 SYSTEM SETTING4 SYSTEM SETTING5

CENTER CONTROLLED ADDRESS

ADDRESS SETTING 01 ADDRESS SETTING METHOD DECIMAL NUMBER

NUMBER OF FANS 6 SUPPLY AIR (SA) 6

FAN DRIVING REFERENCE DURING DEFROSTING OPERATION

OFF (SUPPLY AIR) 25.0°C ON (PIPING) 25.0°C SYSTEM SETTING 30.0°C

HOME SCHEDULE HISTORY SETTING MONDAY 2013.3.18 18:39

363

381

383

379

313

360

210

Fig. 21

MANAGER

DRIVE STOP HEATING COOLING BLOWING OUTDOOR AIR COOLING DEHUMIDIFY NOT USED

SYSTEM SETTING1 SYSTEM SETTING2 SYSTEM SETTING3 SYSTEM SETTING4 SYSTEM SETTING5

INVERTER FAN CONTROL REFERENCE

☒ AIR VOLUME BASED ☐ STATIC PRESSURE BASED

STATIC PRESSURE BASED

STATIC PRESSURE CONTROL CYCLE 5 MINUTE 450 Pa

INVERTER FREQUENCY

SUPPLY AIR (STRONG)	60 Hz	RETURN AIR (STRONG)	60 Hz
SUPPLY AIR (MEDIUM)	50 Hz	RETURN AIR (MEDIUM)	50 Hz
SUPPLY AIR (WEAK)	40 Hz	RETURN AIR (MEDIUM)	40 Hz

MANAGER SETTING

PRODUCT INFORMATION

SYSTEM SETTING

HOME SCHEDULE HISTORY SETTING

MONDAY 2013.3.18 18:39

Fig. 22

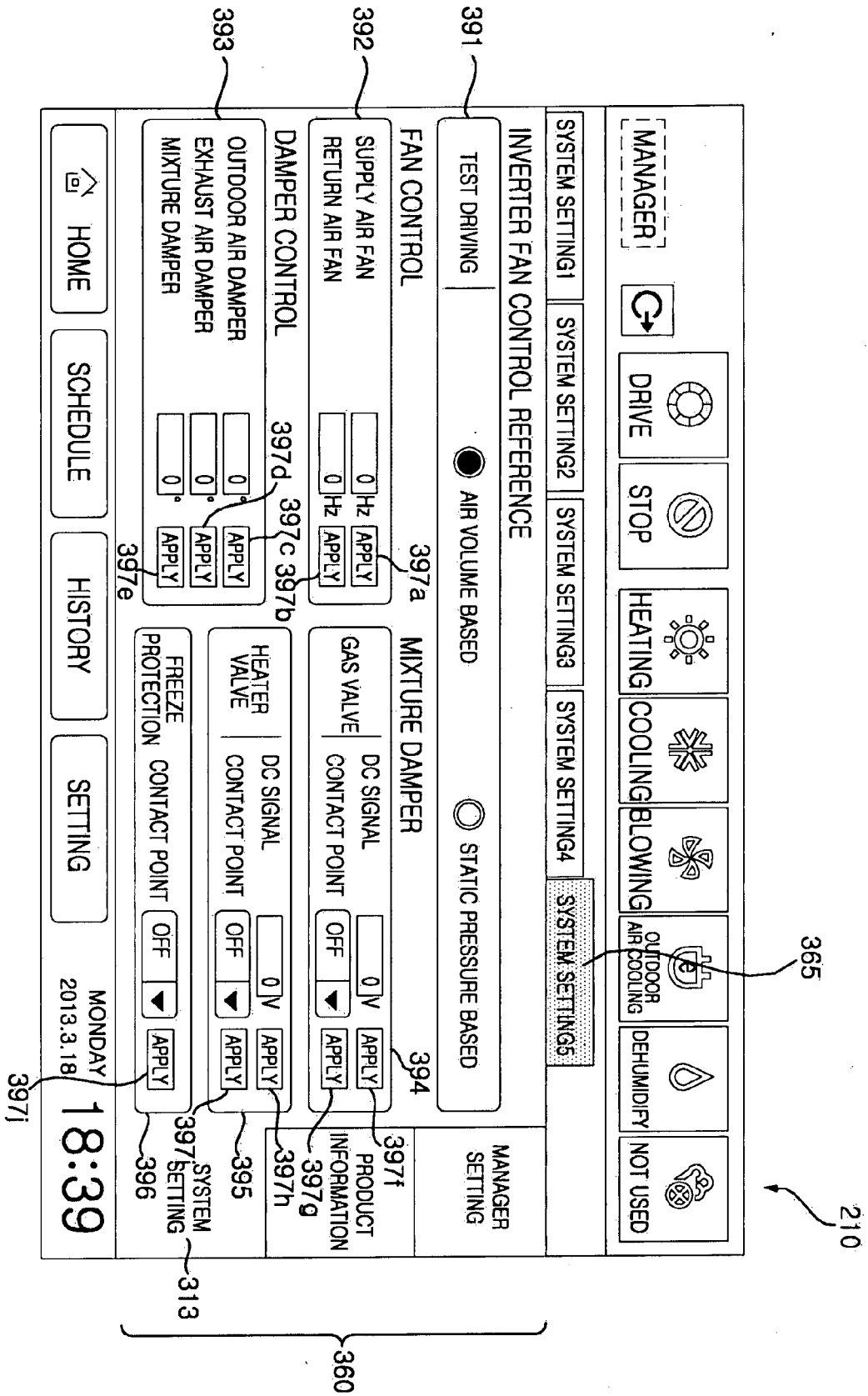


Fig. 23

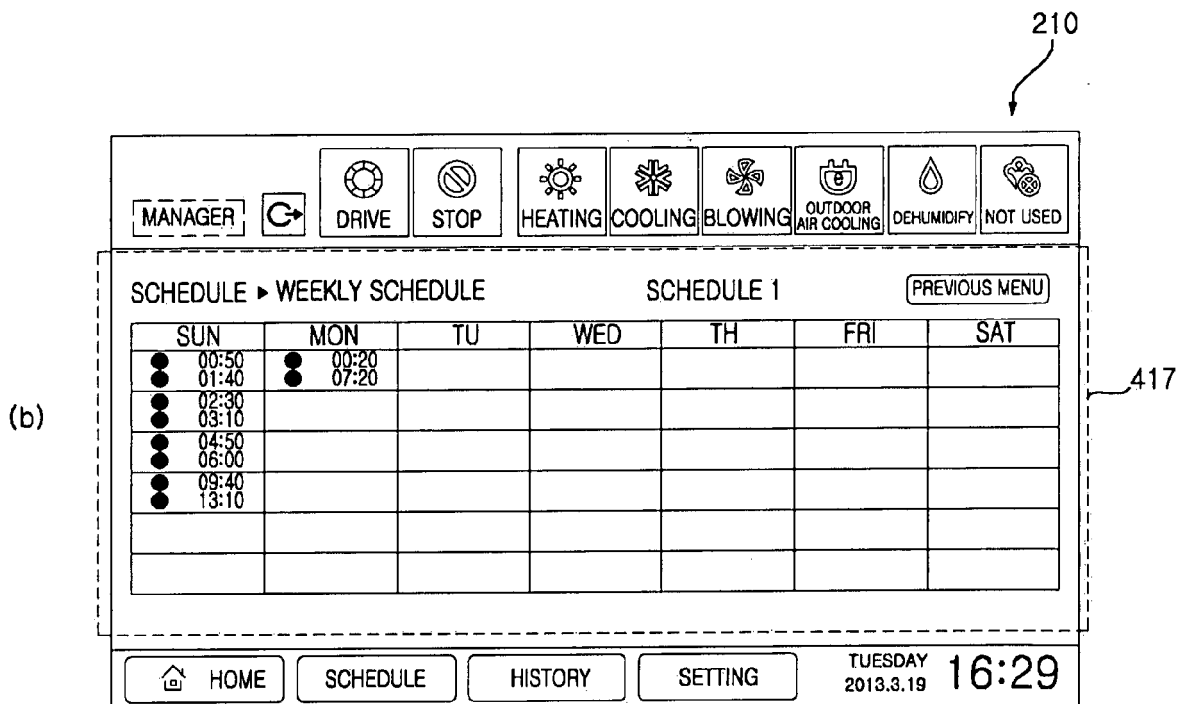
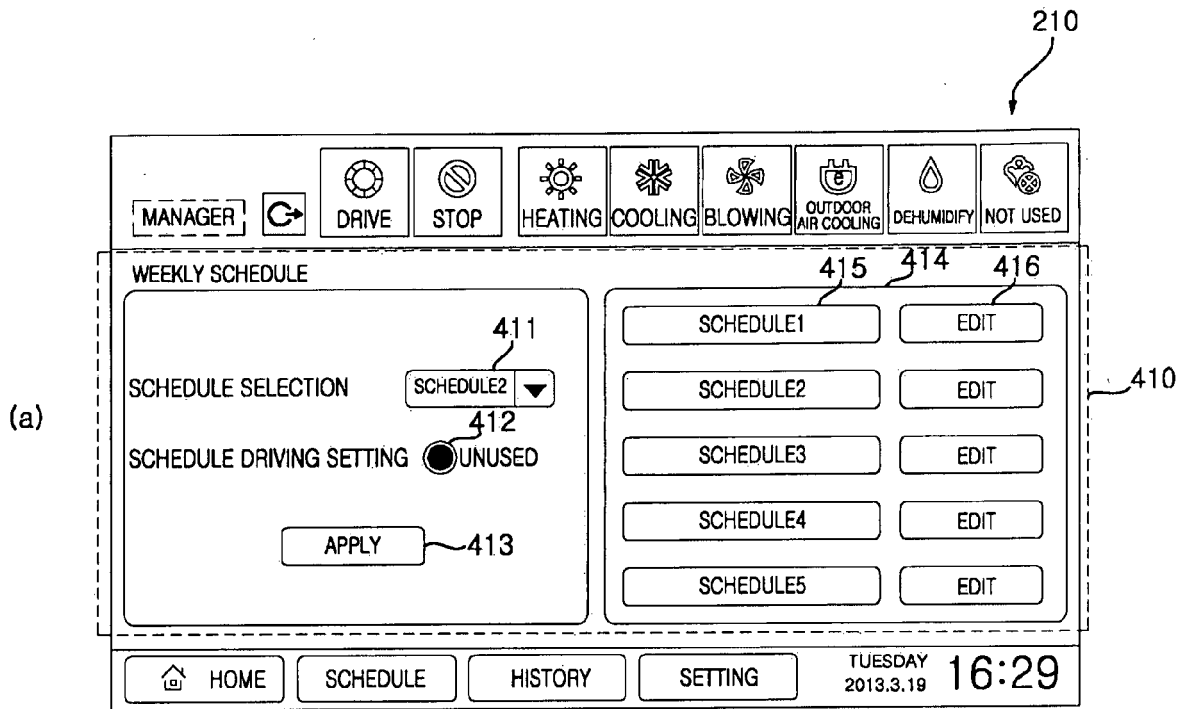


Fig. 24

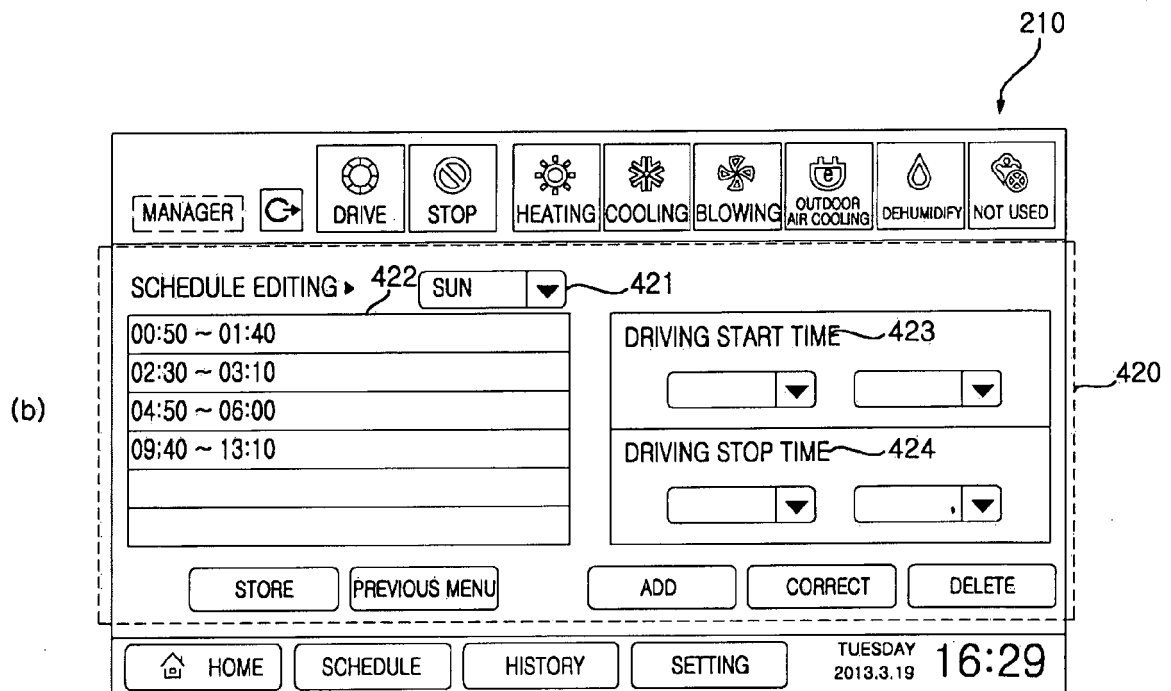
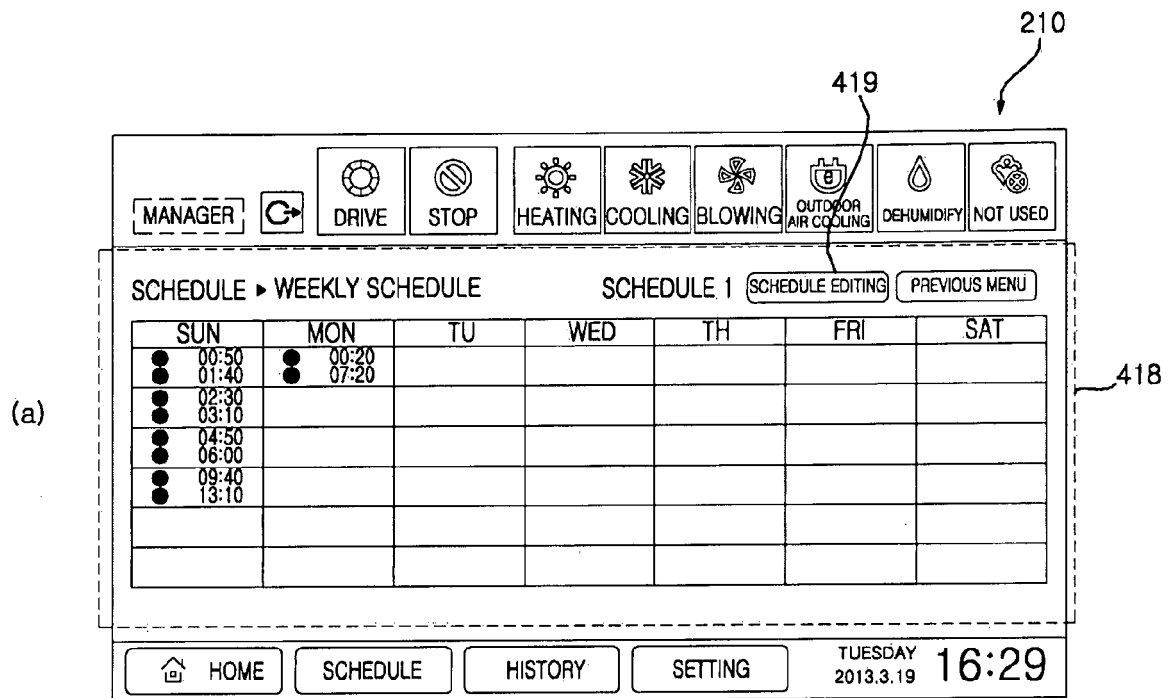


Fig. 25

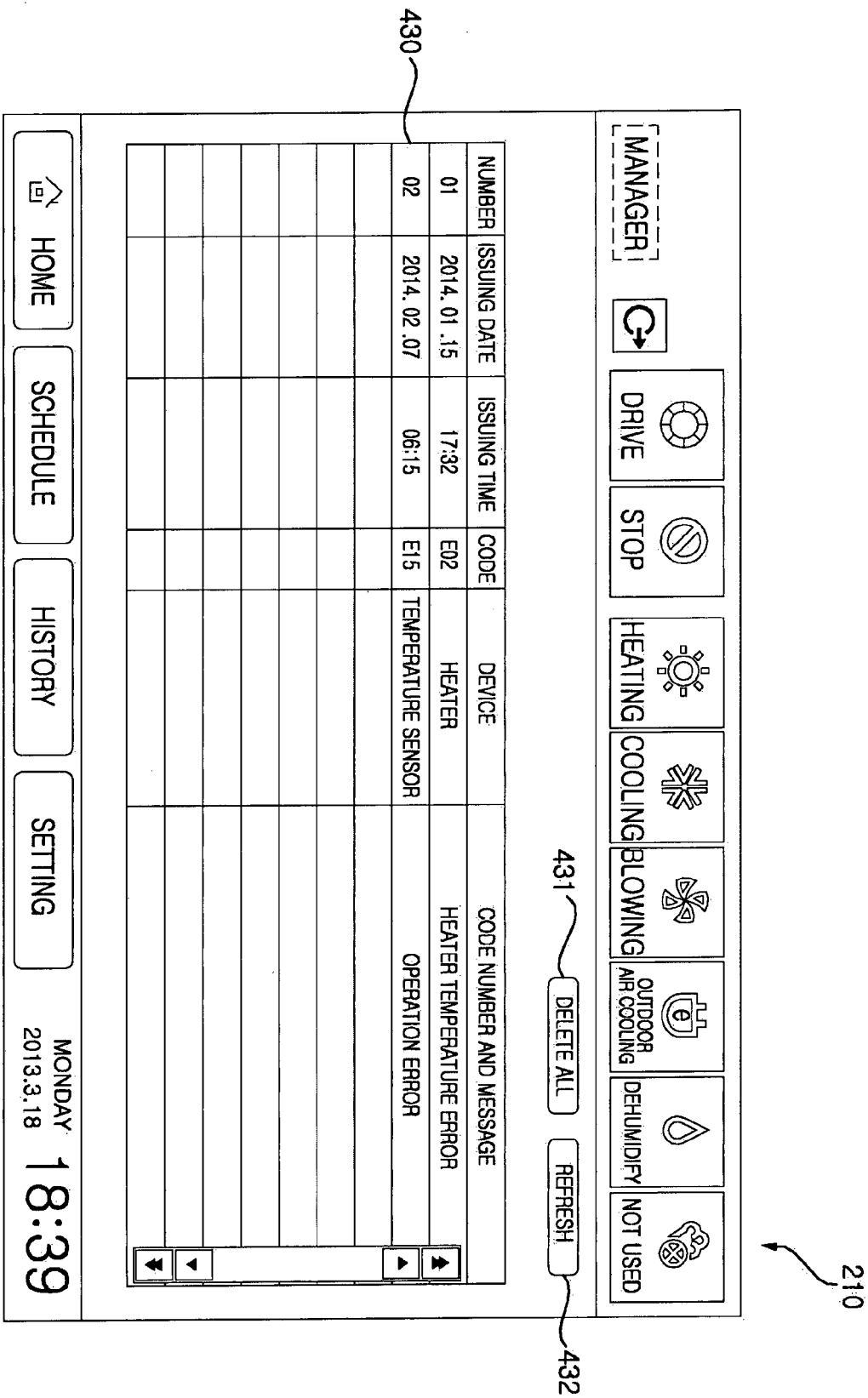
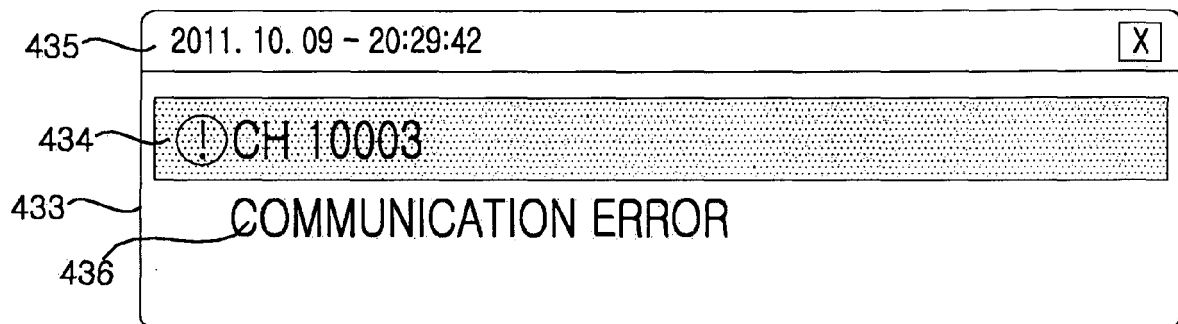


Fig. 26





EUROPEAN SEARCH REPORT

Application Number
EP 15 17 8238

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X	EP 2 733 432 A2 (LG ELECTRONICS INC [KR]) 21 May 2014 (2014-05-21) * paragraph [0037] - paragraph [0043]; figures 3-9 *	1,4,8,9, 11-13	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 December 2015	Examiner Anconetani, Mirco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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ON EUROPEAN PATENT APPLICATION NO.**

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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