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(71) Applicant: **Hitachi-Johnson Controls Air Conditioning, Inc.**
Tokyo 105-0022 (JP)

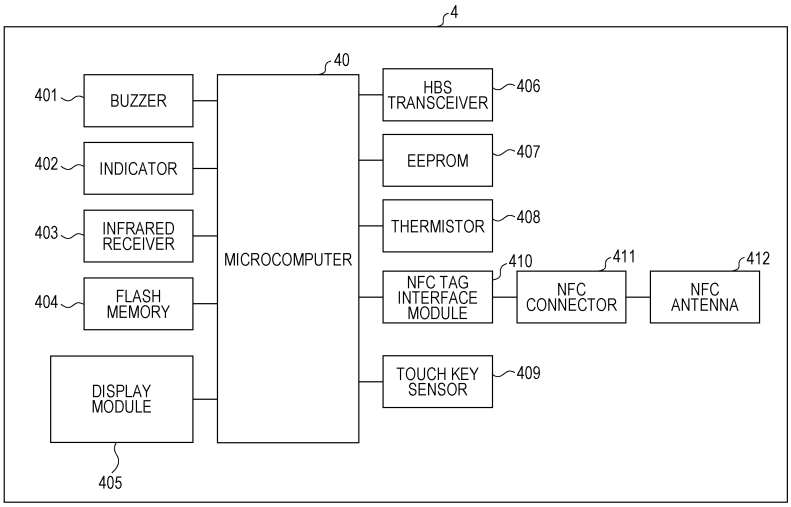
(72) Inventors:
- **MATSUNAGA Takuya**
  Tokyo 105-0022 (JP)
- **TAKI Mitsuhiro**
  Tokyo 105-0022 (JP)

(74) Representative: **MERH-IP Matias Erny Reichl Hoffmann**
Patentanwälte PartG mbB
Paul-Heyse-Strasse 29
80336 München (DE)

(54) AIR CONDITIONER, OPERATION DEVICE, AND CONTROL METHOD

(57) An air-conditioner including an operation device (4) is disclosed. The operation device (4) is provided with a near field communication unit (410, 411, 412). The air-conditioner includes a control unit (40) that determines whether a mode is a permission mode for permitting use of the near field communication unit (410, 411, 412) or an inhibition mode for inhibiting the use of the near field communication unit (410, 411, 412) and performs control of making setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device (7) via the near field communication unit (410, 411, 412) in a case of the permission mode.

FIG. 3



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Description

TECHNICAL FIELD

[0001] The present invention relates to an air-conditioner, and more particularly to an air-conditioner including an operation device, the operation device connected to the air-conditioner, and a control method for the operation device.

BACKGROUND ART

[0002] Conventionally, there has been known a technique enabling transmission of an initial setting made on an AC control terminal upon installation or maintenance via near field communication. For example, Patent Literature 1 (Japanese Patent No. 6299785) discloses a configuration in which each remote control device has a communication unit that communicates with a corresponding AC indoor unit and a near field communication unit that performs near field communication with a communication device having a near field communication function.

[0003] In addition, Patent Literature 2 (Japanese Patent No. 6743383) discloses a configuration in which a determination unit determines whether to establish administrator connection based on appropriateness of administrator password information included in a request signal and determines whether to establish user connection based on appropriateness of user password information included in a request signal.

CITATION LIST

PATENT LITERATURE

[0004]

PATENT LITERATURE 1: Japanese Patent No. 6299785
PATENT LITERATURE 2: Japanese Patent No. 6743383

SUMMARY OF INVENTION

PROBLEMS TO BE SOLVED BY INVENTION

[0005] In the related art described above, it is possible to improve serviceability and comfort upon installation and maintenance by using the near field communication. However, it is not enough because consideration is not given to access by an unauthorized third party without permission.

[0006] The present disclosure has been made to solve the above problems, and an object of the present disclosure is to provide an air-conditioner, an operation device, and a control method capable of reducing a probability that a third party makes an access without permission in, e.g., setting using near field communication.

SOLUTION TO PROBLEMS

[0007] In order to solve the above problems, the present disclosure provides an air-conditioner including an operation device and having the following features. The air-conditioner includes a near field communication unit provided in the operation device, and a control unit that determines whether a mode is a permission mode for permitting use of the near field communication unit or an inhibition mode for inhibiting the use of the near field communication unit and performs control of making setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device via the near field communication unit in a case of the permission mode.

[0008] The present disclosure further provides an operation device connected to an air-conditioner to control the air-conditioner and having the following features. The operation device includes a near field communication unit, and a control unit that determines whether a mode is a permission mode for permitting use of the near field communication unit or an inhibition mode for inhibiting the use of the near field communication unit and performs control of making setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device via the near field communication unit in a case of the permission mode.

[0009] The present disclosure further provides a control method for an operation device connected to an air-conditioner to control the air-conditioner and having the following features. The control method includes a step of determining whether a mode is a permission mode for permitting use of a near field communication unit provided in the operation device or an inhibition mode for inhibiting the use of the near field communication unit, and a step of making setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device

via the near field communication unit when it is determined as the permission mode in the determining step.

EFFECTS OF INVENTION

[0010] With the above configuration, it is possible to reduce the probability that the third party makes an access without permission in, e.g., setting using the near field communication.

BRIEF DESCRIPTION OF INVENTION

[0011]

Fig. 1 is a block diagram illustrating an overall configuration example of environment in which an air-conditioner and a remote operation device according to an embodiment of the present invention are arranged;
Fig. 2 is a block diagram illustrating a configuration example of the AC according to the embodiment of the present invention;
Fig. 3 is a block diagram illustrating a configuration example of the remote operation device according to the embodiment of the present invention;
Fig. 4 is a schematic view illustrating the appearance of the remote operation device according to the embodiment of the present invention;
Fig. 5 is a block diagram illustrating a configuration example of a portable information terminal according to the embodiment of the present invention;
Fig. 6 is a flowchart for describing processing executed by the remote operation device of the air-conditioner according to the embodiment of the present invention when a setting is made or information is provided via near field communication using the portable information terminal;
Fig. 7 is a flowchart for describing data communication executed by the remote operation device of the air-conditioner according to the embodiment of the present invention via the near field communication;
Fig. 8 illustrates, as an example, an operation screen displayed on a display of the remote operation device of the air-conditioner according to the embodiment of the present invention;
Fig. 9 illustrates, as an example, another operation screen displayed on the display of the remote operation device of the air-conditioner according to the embodiment of the present invention;
Fig. 10 illustrates, as an example, still another operation screen displayed on the display of the remote operation device of the air-conditioner according to the embodiment of the present invention;
Fig. 11 illustrates, as an example, an application screen displayed on a display unit of the portable information terminal performing the near field communication with the remote operation device of the air-conditioner according to the embodiment of the present invention; and
Fig. 12 illustrates, as an example, another application screen displayed on the display unit of the portable information terminal performing the near field communication with the remote operation device of the air-conditioner according to the embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0012] Hereinafter, embodiments of the present invention will be described with reference to the drawings, but the embodiments of the present invention are not limited to illustrated specific embodiments described below. Note that as an operation device and an air-conditioner according to the embodiments of the present invention, a remote operation device 4 and an air-conditioner (hereinafter, "air-conditioner" or "air-conditioning" may be abbreviated as "AC") including the remote operation device 4 will be hereinafter described. Note that in the drawings, the same reference numerals denote the same or corresponding components.

[0013] Hereinafter, environment 1 where the remote operation device 4 and the air-conditioner according to an embodiment of the present invention are installed will be described with reference to Fig. 1. Fig. 1 illustrates an overall configuration example of the environment 1 where ACs 2, 6 and the remote operation device 4 are installed.

[0014] The environment 1 illustrated in Fig. 1 includes a plurality of ACs 2, 6 and one or more remote operation devices 4. In the environment 1, the plurality of ACs 2, 6 is not particularly limited, but is connected via, for example, non-polar two-core crossover wiring. This forms an AC network 3. Here, the "AC 2" is an indoor AC, and the "AC 6" is an outdoor AC.

[0015] The remote operation device 4 is generally called a "remote controller" or a "remote" for short, and includes a panel and a button (switch) for performing AC setting. Indoor ACs 2a to 2c and remote operation devices 4a to 4c are connected via, for example, connection lines 5a to 5c. Note that in Fig. 1, the indoor AC 2 and the remote operation device 4 are illustrated as being connected one-to-one via the connection line 5, but are not particularly limited. The indoor AC 2 and the remote operation device 4 may be connected via crossover wiring, and a plurality of indoor ACs 2

may be operated using one remote operation device 4. Alternatively, the plurality of indoor ACs 2 may be connected via the AC network 3 with no crossover wiring.

[0016] In the environment 1, the indoor AC 2 (and the outdoor AC 6 coupled to the indoor AC 2 via a refrigerant pipe and also involved in refrigeration cycle control) can be operated from the remote operation device 4 connected thereto.

[0017] In the environment 1, a portable information terminal 7 is further arranged to make various settings of the remote operation device 4 (and therefore, the AC 2 to be operated by the remote operation device 4) described above. The portable information terminal 7 is an information terminal carried by an administrator (e.g., worker who performs an installation work, service person who performs maintenance and inspection, or building manager) who makes initial settings and performs maintenance of the remote operation device 4 and the ACs 2, 6. As the portable information terminal 7, a general-purpose terminal device such as a smartphone or a tablet computer is used.

[0018] The above initial settings are made, for example, not only in a case of overall initial introduction including installation of the indoor ACs 2a to 2c, outdoor ACs 6a, 6b, and the remote operation devices 4a to 4c, but also in a case of additional introduction in which some or all of the indoor ACs 2a to 2c and the outdoor ACs 6a, 6b have been already introduced and one or more remote operation devices 4 are newly installed instead of some or all of the old remote operation devices.

[0019] The portable information terminal 7 is configured to perform near field communication 12 for initial setting or maintenance of the remote operation device 4 (remote operation device 4a in Fig. 1). In addition, the portable information terminal 7 is configured to perform the near field communication 12 also when reading, e.g., current setting states and diagnosis results of the ACs 2, 6 in addition to a case of making the settings of the ACs 2, 6 such as the initial setting and the maintenance described above.

[0020] A wireless communication method of the near field communication 12 between the remote operation device 4 and the portable information terminal 7 is preferably a general method of performing communication in a shorter distance than that of a wireless local area network (LAN), such as Wifi (registered trademark), and specifically preferably near field communication (NFC). In order for the administrator to easily physically recognize the remote operation device 4 (or the AC 2 connected thereto) to be set, the near field communication 12 is preferably near-field wireless communication such as NFC. Hereinafter, the description will be continued on the assumption that NFC is used as the near field communication 12.

[0021] In the above description, one remote operation device 4 is connected to the air-conditioner, and forms the operation device for controlling the air-conditioner in the embodiment of the present invention. A set of at least one remote operation device 4, at least one indoor AC 2 to be operated by the remote operation device 4, and at least one outdoor AC 6 involved in the refrigeration cycle control of the indoor AC 2 forms the air-conditioner including the operation device according to the embodiment of the present invention.

[0022] Hereinafter, a configuration example of each device will be first described with reference to Figs. 2 to 5.

[0023] Fig. 2 is a block diagram illustrating a configuration example of the AC 2 (and the AC 6) according to the embodiment of the present invention. In Fig. 2, the AC 2 includes a main board 20, a load 22, and a power source 23 for device operation. The main board 20 includes a power source block 200.

[0024] In the indoor AC 2 (outdoor AC 6), the load 22 (62) include a load such as a compressor that condenses refrigerant (in a case of the outdoor AC 6) and an actuator such as a fan for sending air. Note that when the outdoor AC 6 is described, a corresponding component on the outdoor AC 6 will be referred to by replacing the most significant digit of the reference numeral of the indoor AC 2 with "6" from "2."

[0025] The power source block 200 includes a control unit 201, a first storage unit 202, a main storage unit 203, a second storage unit 204, and an AC control communication unit 205. The control unit 201 is, for example, a microcomputer, the main storage unit 203 is, for example, a dynamic random access memory (DRAM), the first storage unit 202 is, for example, a FLASH-ROM, and the second storage unit 204 is, for example, an electrically erasable programmable read-only memory (EEPROM). The AC control communication unit 205 communicates with the outdoor AC 6 connected via the AC network 3 and the remote operation device 4 connected via the connection line 5. Note that the AC control communication unit 205 corresponds to a connection form with the AC 6 or the remote operation device 4 connected thereto. When power is supplied from the power source 23, the control unit 201 reads firmware from the first storage unit 202, and performs operation as an indoor AC according to the firmware loaded into the main storage unit 203. Note that in the outdoor AC 6, firmware read from a first storage unit 602 and loaded is for performing AC control as the outdoor AC 6.

[0026] Fig. 3 is a block diagram illustrating a configuration example of the remote operation device 4 according to the embodiment of the present invention. In Fig. 3, the remote operation device 4 includes a microcomputer 40 that performs overall control and various modules connected to the microcomputer 40. The microcomputer 40 forms a control unit in the present embodiment.

[0027] More specifically, the remote operation device 4 includes a buzzer 401, an indicator 402, an infrared receiver 403, a flash memory 404, a display module 405, a home bus system (HBS) transceiver 406, an EEPROM 407, a thermistor 408, a touch key sensor 409, an NFC tag interface 410, an NFC connector 411, and an NFC antenna 412.

[0028] The buzzer 401 emits buzzer sound for, e.g., a notice. The indicator 402 includes, e.g., an LED, and indicates a state. The infrared receiver 403 receives an infrared signal. The display module 405 is a module including, for example, a liquid crystal panel, a backlight, and a controller. The HBS transceiver 406 communicates with the indoor AC 2 connected via the connection line 5. Note that although the HBS transceiver 406 is provided, one corresponding to a connection form with the AC 6 or the remote operation device 4 connected thereto is provided. The thermistor 408 measures a temperature around the remote operation device 4. The touch key sensor 409 is mounted with various keys included in an operation panel of the remote operation device 4. The NFC tag interface 410 provides an interface between the microcomputer 40 and the NFC. The NFC connector 411 is a connector for connecting the NFC antenna 412. The NFC antenna 412 is an antenna for the NFC. In the present embodiment, the NFC tag interface 410, the NFC connector 411, and the NFC antenna 412 form a near field communication unit for performing the near field communication 12 with an external device such as the portable information terminal 7.

[0029] When power is supplied, the microcomputer 40 reads firmware from, e.g., a built-in ROM to a built-in main storage unit, and performs operation as the remote operation device 4 according to the firmware loaded into the main storage unit. The flash memory 404 or the EEPROM 407 appropriately stores information such as the settings and diagnosis results of the air-conditioner held by the remote operation device 4.

[0030] Fig. 4 is a schematic view illustrating the appearance of the remote operation device 4 according to the embodiment of the present invention. The remote operation device 4 illustrated in Fig. 4 includes a housing 45, a display panel 451 incorporated in the housing 45 and forming the display module 405, such as a liquid crystal display or an organic electro-luminescence (OEL) display, and an operation panel 452 provided in the housing 45. Various screens related to the AC operation and settings are displayed on the display panel 451. The operation panel 452 receives input operation from the administrator or a user via various screens displayed on the display panel 451.

[0031] More specifically, the operation panel 452 includes an operation/stop button 4521 for switching between operation and stop of the corresponding indoor AC 2, left, right, up, and down keys 4522L, 4522R, 4522U, 4522D for moving a cursor and making a selection on each screen, an OK button 4523 for confirming selection contents on each screen, and a return button 4524 for discarding the held contents and returning to a previous screen on each screen.

[0032] In the embodiment to be described, in the remote operation device 4, the NFC antenna 412 forming the above near field communication unit is arranged on the back side of a substantially center portion of the display panel 451. With this configuration, an antenna portion of the portable information terminal 7 for the near field communication 12 is brought close to the substantially center portion of the display panel 451, whereby the near field communication between the remote operation device 4 and the portable information terminal 7 is established.

[0033] Fig. 5 is a block diagram illustrating a configuration example of the portable information terminal 7 according to the embodiment of the present invention. The portable information terminal 7 illustrated in Fig. 5 includes a control unit 71, a main storage unit 72, a first storage unit 73, a second storage unit 74, a near field communication unit 75, and a wireless communication unit 76. For example, a program (including an operating system and application for AC setting) recorded in the first storage unit 73 such as a FLASH-ROM is loaded into the main storage unit 72 such as a DRAM, and the control unit 71 such as a microcomputer operates based on the loaded program. The wireless communication unit 76 is a wireless adapter that performs wireless communication such as WiFi (registered trademark).

[0034] The near field communication unit 75 performs the near field communication 12 with an external device having a near field communication function, such as the remote operation device 4. In a case of using the NFC as the near field communication 12, the portable information terminal 7 has an NFC reader/writer function.

[0035] The portable information terminal 7 illustrated in Fig. 5 further includes an input unit 77 and a display unit 78. The input unit 77 includes an input device such as a touch panel sensor, a button, a keyboard, a mouse, or a microphone. The display unit 78 includes a display such as a liquid crystal panel or an OEL panel. The input unit 77 and the display unit 78 are used to implement a function for making various settings of the AC 2.

[0036] In the portable information terminal 7, an application is installed for enabling to make the setting of the AC upon the installation and the maintenance described above using the near field communication. When power is supplied, the control unit 71 first reads an operating system program from the first storage unit 73, loads the program into the main storage unit 72, and performs operation as a portable information terminal according to the loaded program. In addition, in response to calling of an AC setting application after the operating system has been activated, an application program is read from the first storage unit 73, is loaded into the main storage unit 72, and performs operation as a terminal device for making the AC setting according to the loaded program. At this time, various application screens are displayed on the display unit 78, and various types of operation are executed based on input made on the screens via the input unit 77. When the near field communication function is called, the near field communication unit 75 is activated to establish the near field communication with a communication partner and transmit/receive data.

[0037] As described above, the settings of the remote operation device 4 and the AC 2, 6 upon the installation and the maintenance are made using the near field communication, so that service and comfort can be improved. However, since the remote operation device 4 is generally used by a user of an AC facility other than the administrator, the remote operation device 4 is arranged at a location accessible by an arbitrary person who can enter and exit an AC target space

(for example, indoor space). However, when the remote operation device 4 is provided at the location accessible by the arbitrary person, an unauthorized third party can access a setting item to be managed by the administrator such as the service person or the building manager described above without permission, and there is a probability that the AC setting is changed without permission.

[0038] For this reason, the air-conditioner and the remote operation device 4 according to the embodiment of the present invention have the following features in order to reduce a probability of the third party accessing the setting and the information without permission in making a setting and providing information using the near field communication 12. That is, in the air-conditioner (2, 4, 6) and the remote operation device 4, the near field communication unit, more specifically the NFC tag interface 410, the NFC connector 411, and the NFC antenna 412, is provided in the remote operation device 4, and the control unit, more specifically the microcomputer 40 of the remote operation device 4, performs control of determining whether a mode is a permission mode in which use of the near field communication unit is permitted or an inhibition mode in which the use of the near field communication unit is inhibited.

[0039] In the case of the permission mode, the microcomputer 40 further performs control of making the setting of the air-conditioner (2, 4, 6) or providing information on the air-conditioner (2, 4, 6) based on data communication with the external portable information terminal 7 via the near field communication unit. In the case of the inhibition mode, the microcomputer 40 further performs control of not making the setting or providing the information based on the data communication with the external portable information terminal 7 via the near field communication unit. Moreover, in the permission mode, the microcomputer 40 activates the near field communication unit, and performs control of determining whether or not the data received via the near field communication unit includes predefined information related to the service/maintenance. When the predefined information is included, the microcomputer 40 performs control of requesting a password.

[0040] As described above, in the air-conditioner (2, 4, 6) and the remote operation device 4 according to the embodiment of the present invention, security is ensured in a function of making the setting and providing the information via the near field communication 12 using the portable information terminal 7.

[0041] Hereinafter, with reference to Figs. 6 to 12, a function of making the setting or providing the information via the near field communication 12 using the portable information terminal 7 while ensuring the security according to the embodiment of the present invention will be described in more detail.

[0042] Fig. 6 is a flowchart for describing processing executed by the remote operation device 4 forming the air-conditioner according to the embodiment of the present invention when the setting is made or the information is provided via the near field communication using the portable information terminal 7. Figs. 8 to 10 illustrate, as an example, various operation screens displayed on the display of the remote operation device 4 of the air-conditioner according to the embodiment of the present invention. Figs. 11 and 12 illustrate, as an example, various screens of the AC setting application displayed on the display unit 78 of the portable information terminal 7 performing the near field communication with the remote operation device 4 of the air-conditioner according to the embodiment of the present invention.

[0043] The control illustrated in Fig. 6 is started from Step S100, for example, in response to power-ON of the remote operation device 4.

[0044] In Step S101, the microcomputer 40 determines whether the mode is the permission mode in which use of the near field communication unit (410, 411, 412) provided in the remote operation device 4 is permitted or the inhibition mode in which the use of the near field communication unit (410, 411, 412) is inhibited.

[0045] Here, it is assumed that the permission mode and the inhibition mode are set in advance by the administrator via a screen as illustrated in Fig. 8(A). Alternatively, it is assumed that the mode is set as a default value upon factory shipment.

[0046] Fig. 8(A) illustrates, as an example, a near field communication setting screen 1000 for selecting the inhibition mode or the permission mode, which is displayed on the display panel 451 of the remote operation device 4. The near field communication setting screen 1000 illustrated in Fig. 8(A) includes a text 1001 for describing setting contents and radio buttons 1002, 1003 for selecting any one of the permission mode or the inhibition mode. Using the up and down key buttons 4522U, 4522D of the operation panel 452 described above, a desired mode is selected from the plurality of modes indicated by the radio buttons 1002, 1003. By pressing the OK button 4523 of the operation panel 452, any selected one of the inhibition mode or the permission mode is set in the remote operation device 4. In the control illustrated in Fig. 6, it is assumed that the mode is selected in advance for the remote operation device 4 by the administrator using the near field communication setting screen 1000 illustrated in Fig. 8(A).

[0047] When it is determined as the permission mode in Step S101 (YES), the processing proceeds to Step S102, and thereafter, the control of making the setting or providing the information based on the data communication with the external portable information terminal 7 via the near field communication unit is performed. On the other hand, when it is determined in Step S101 that the mode is not the permission mode but the inhibition mode (NO), a loop to Step S101 is made. In the inhibition mode, the processing cannot proceed to a step after Step S102, and therefore, the control of making the setting or providing the information based on the data communication with the external portable information terminal 7 via the near field communication unit is not available.

[0048] In Step S102, the microcomputer 40 executes data reception processing via the near field communication unit. Regarding the setting of the air-conditioner or the provision of the information on the air-conditioner based on the data communication with the external portable information terminal 7 via the near field communication unit, the following two methods are assumed.

[0049] In a first method, by performing a specific operation in a specific state, the screen transitions to a dedicated screen (referred to as a near field communication guidance screen) for receiving reading and writing of the setting of the air-conditioner via the near field communication 12, and in a state in which the near field communication guidance screen is displayed, reading and writing of the setting via the near field communication 12 are received. For example, when a specific hidden switch is pressed (for example, the left key 4522L and the right key 4522R are simultaneously pressed and held for a predetermined period of time) with a home screen 1020 as illustrated in Fig. 8(C) displayed, the screen transitions to a near field communication guidance screen 1030 as illustrated in Fig. 8(D). The near field communication guidance screen 1030 illustrated in Fig. 8(D) includes a message 1031 for guiding an antenna portion of the near field communication unit 75 of the portable information terminal 7 to approach an antenna portion at the center of the display panel 451 of the remote operation device (remote control) 4 and an icon indication 1032 schematically indicating the position of the antenna portion.

[0050] When it is determined as the permission mode in Step S101 described above (YES), the screen transitions, in Step S102, to the near field communication guidance screen 1030 for making the setting using the near field communication unit in response to the specific operation, and the near field communication unit is activated. Thus, the near field communication 12 with the portable information terminal 7 is available. On the other hand, when it is determined as the inhibition mode in Step S101 (NO), the transition itself to the near field communication guidance screen 1030 is restrained regardless of execution of the specific operation such as pressing of the hidden switch. In this case, since the near field communication unit is not activated, the near field communication 12 cannot be performed even when the antenna portion of the portable information terminal 7 is brought close to the substantially center of the display panel 451.

[0051] In a second method, on a specific screen (referred to as a specific screen) displayed by following a hierarchical structure of a menu, reading of the information on the air-conditioner is received via the near field communication 12. For example, an inspection screen 1040 as illustrated in Fig. 9(A) is not a dedicated screen that guides the user to the near field communication 12, but a screen that displays a state 1041 of a predetermined inspection item 1040, regardless of the near field communication 12. The inspection screen 1040 illustrated in Fig. 9(A) further displays an icon indication 1042 indicating that the information can be provided via the near field communication 12. As illustrated in Fig. 9(A), in a state in which the icon indication 1042 is included in the inspection screen 1040, by bringing the antenna portion of the near field communication unit 75 of the portable information terminal 7 close to the antenna portion at the center of the display panel 451 of the remote operation device 4, the portable information terminal 7 can read information on the state of the predetermined inspection item including the information being displayed via the near field communication 12.

[0052] Note that although the inspection screen 1040 has been described as one example of the specific screen, the specific screen is not limited thereto and other screens such as an indoor/outdoor board diagnostic screen may be used as the specific screen.

[0053] When it is determined as the permission mode in Step S101 (YES), the microcomputer 40 activates, in Step S102, the near field communication unit in a state in which such a specific screen, for example the inspection screen 1040, is displayed, so that the near field communication 12 with the portable information terminal 7 can be performed. On the other hand, when it is determined as the inhibition mode in Step S101 (NO), the inspection screen 1040 itself is displayed, but the icon indication 1042 is not displayed. In this case, since the microcomputer 40 of the remote operation device 4 does not activate the near field communication unit, the near field communication 12 cannot be performed even when the antenna portion of the portable information terminal 7 is brought close to the substantially center of the display panel 451.

[0054] As described above, in the permission mode, the indication indicating that the provision of the information using the near field communication unit is active is displayed on the screen for providing the information, and in the inhibition mode, the indication indicating that the provision of the information is active is not displayed. Note that in the embodiment to be described, the icon indication 1042 indicating that the near field communication unit is active is not displayed in the inhibition mode, but the present invention is not limited thereto. Instead of the icon indication 1042 indicating that the near field communication unit is active, an explicit indication (for example, grayed-out icon) indicating that the provision of the information using the near field communication unit is inactive may be displayed.

[0055] Fig. 7 is a flowchart for describing the data reception processing in Step S102 illustrated in Fig. 6, which is executed by the remote operation device 4 of the air-conditioner according to the embodiment of the present invention. The flowchart illustrated in Fig. 7 summarizes the two methods described above. As described above, in Step S102, the data reception processing of making the setting of the air-conditioner or providing the information on the air-conditioner based on the data communication with the external portable information terminal 7 via the near field communication unit is performed.

[0056] The processing illustrated in Fig. 7 starts from Step S200, and in Step S201, the microcomputer 40 determines

whether or not the specific key operation has been performed in a state in which the home screen 1020 as illustrated in Fig. 8(C) is displayed. When it is determined in Step S201 that the specific key operation has been performed on the home screen (YES), the processing branches to Step S204. In Step S204, the microcomputer 40 displays the near field communication guidance screen 1030 as illustrated in Fig. 8(D), and in Step S205, activates the near field communication 12.

[0057] On the other hand, when it is determined in Step S201 that the specific key operation has not been performed on the home screen (NO), the processing branches to Step S202. In Step S202, the microcomputer 40 further determines whether or not the specific screen such as the inspection screen 1040 illustrated in Fig. 9(A) is displayed. When it is determined in Step S202 that the specific screen is displayed (YES), the processing branches to Step S203. In Step S203, the microcomputer 40 displays the icon indication 1042 indicating that the near field communication is available on, for example, the inspection screen 1040 as illustrated in Fig. 9(A), and in Step S205, activates the near field communication 12.

[0058] In Step S206, the microcomputer 40 waits for establishment of the near field communication 12, and when it is not established (NO), makes a loop to Step S206 via Step S207. In Step S207, the microcomputer 40 determines whether or not there has been screen transition by, e.g., pressing the return button 4524. When it is determined in Step S207 that the near field communication guidance screen 1030 or the specific screen remains displayed and there is no screen transition (NO), the processing returns to Step S206.

[0059] When it is determined in Step S206 that the near field communication 12 has been established (YES), the processing proceeds to Step S208. In Step S208, the microcomputer 40 receives data via the near field communication 12.

[0060] Here, operation of the portable information terminal 7 on an application side will be supplementally described with reference to Figs. 11 and 12. Fig. 11(A) illustrates an on-site setting screen 1200 for performing "ON-SITE SETTING." The on-site setting screen 1200 illustrated in Fig. 11(A) is a screen for displaying a list of on-site setting items, to which the screen transitions and which is displayed when the user taps "ON-SITE SETTING" on a home screen of the application. For each of one or more sub-items of the on-site setting which is a main item, the on-site setting screen 1200 illustrated in Fig. 11(A) includes a title 1201, an indication 1202 of a current setting value of each item, an editing screen call button 1203 for calling a setting editing screen for each item, and an icon indication 1204 indicating that the near field communication is available. Note that only a first setting item "INDOOR FAN DOUBLE SPEED" is numbered and numbers for the other items are omitted.

[0061] Here, the indication 1202 of the current setting value of each item is blank in an initial state, but the current setting value is reflected on the indication 1202 by performing reading operation once using the near field communication 12. When the reading has already been performed once, the current setting value is reflected from the beginning.

[0062] On the on-site setting screen 1200 illustrated in Fig. 11(A), when the user taps an item whose setting needs to be changed (or the editing screen call button 1203 therefor), a setting editing screen 1210 as illustrated in Fig. 11(B) is displayed. The setting editing screen 1210 illustrated in Fig. 11(B) is related to a setting item "FAN DECELERATION IN HEATING THERMO-OFF," and includes radio buttons 1211 to 1213 for providing a plurality of options for the setting item and receiving selection from the plurality of options provided and a save button 1214. When one option is selected by the radio buttons 1211 to 1213 and the save button 1214 is tapped, a selected state is held in the application.

[0063] On the on-site setting screen 1200 illustrated in Fig. 11(A), when the user finishes editing all items whose settings need to be changed and taps the icon indication 1204, a menu for giving an instruction by selecting reading or writing is popped up, and when the writing is selected on the menu, the screen transitions to a writing screen 1220 as illustrated in Fig. 12(A). The writing screen 1220 includes a message 1221 for guiding the antenna portion of the near field communication unit 75 of the portable information terminal 7 to be close to the antenna portion at the center of the display panel 451 of the remote operation device 4 and a return button 1222.

[0064] While the writing screen 1220 is displayed on the display unit 78 of the portable information terminal 7, the user performs, for example, a specific operation on the home screen also in the remote operation device 4, and causes the display panel 451 of the remote operation device 4 to display the near field communication guidance screen 1030. In this state, when the user brings a part where the antenna portion of the portable information terminal 7 is displayed close to the center portion of the display panel 451 of the remote operation device 4, an attempt is made to establish the near field communication 12 and transmit data including the setting values held by the application. When the transmission is successfully completed, a writing completion screen 1230 for notifying completion of the writing as illustrated in Fig. 12(B) is displayed. The writing completion screen 1230 includes a message 1231 for notifying successful completion of the writing and a close button 1232. When the close button 1232 is tapped, the screen is returned to, e.g., the home screen of the application.

[0065] Note that in the above description, the writing operation using the near field communication 12 has been described, but the same also applies to reading operation using the near field communication 12. Moreover, in the above description, the on-site setting and the setting editing screen 1210 for the sub-item "FAN DECELERATION IN HEATING THERMO-OFF" have been described as a representative example, but the same also applies to other setting items. Further, in the above description, the writing of the setting using the near field communication guidance screen 1030

has been described, but reading operation on a specific screen such as the inspection screen 1040 can also be performed with a similar configuration.

[0066] Returning to Fig. 7 again, when data reception is performed in Step S208, the processing proceeds to Step S209. In Step S209, the microcomputer 40 deactivates the near field communication unit, ends the present processing in Step S210, and returns the control to the flow illustrated in Fig. 6. Also, when it is determined in Step S207 that the screen has transitioned by, e.g., pressing the return button 4524 (YES), the processing directly branches to Step S209, the near field communication 12 is deactivated, and the control returns to the flow illustrated in Fig. 6.

[0067] See Fig. 6 again. In Step S103, the microcomputer 40 determines whether or not data has been received. For example, when specific key operation is not performed in a specific state and a specific screen is not displayed, the data reception is not performed. When it is determined in Step S103 that there has been no data reception (NO), the processing returns to Step S101, and in the case of the mode determination and the permission mode, the processing waits for the specific key operation or display of the specific screen. On the other hand, when the near field communication 12 has been established on the near field communication guidance screen 1030 or the specific screen displayed by the specific key operation, the data is received from the portable information terminal 7. When it is determined in Step S103 that the data has been received (YES), the processing proceeds to Step S104.

[0068] In Step S104, the microcomputer 40 determines whether or not the data received via the near field communication unit includes the predefined information on the service/maintenance. When it is determined in Step S104 that the service/maintenance information is not included (NO), the processing directly branches to Step S110 without requesting password input, and in Step S110, the microcomputer 40 displays the received information on the display panel 451 of the remote operation device 4.

[0069] Here, the service/maintenance includes setting upon installation of the air-conditioner and maintenance setting for the air-conditioner. The service/maintenance information is an item set upon installation or maintenance, such as function selection and contact information registration. This information is information requesting administrator password input not only upon writing using the near field communication 12 but also upon manual setting change by the remote operation device 4. Note that for example, an item operated by an end user (function described in an instruction manual distributed to the end user), such as a language setting, a time setting, and an operation schedule, does not correspond to the service/maintenance information.

[0070] Specifically, the service/maintenance information may include items described in Table 1 below. These pieces of information are defined in advance.

[Table 1]

Items	
Power Saving Setting	**Power Saving Advanced Setting**

(continued)

Items	
On-Site Setting	Function Selection
	External Input/Output Setting
	Contact Information Registration
	Hotel Mode
	Upper and Lower Set Temperature Limit Setting
	Automatic Cooling and Heating Dual Temperature Setting
	Main/Sub Display Setting
	Thermostat Selection
	Remote Thermostat Correction Value
	Power Source Start/Stop 1
	Power Source Start/Stop 2
	Indoor Fan Double Speed
	Operation Activation/Deactivation Setting
	Fan Deceleration in Cooling Thermo-OFF
	Fan Deceleration in Heating Thermo-OFF
	Compressor Preheating Control Deactivation
	Power-Up Setting
Test Operation	

[0071] In the above description, "Hotel Mode" is a setting for switching the mode of the remote operation device 4 to a hotel mode. By setting the hotel mode, it is possible to set a "language" a "cutoff timer," etc. often used for an accommodation, such as a hotel, from the home screen. "Automatic Cooling and Heating Dual Temperature Setting" is a function of individually setting set temperatures of cooling and heating in an automatic cooling and heating mode. "Remote Control Thermostat Correction Value" is a function of performing correction when a remote control thermostat detects a high or low temperature in user's use environment. "Power Source Start/Stop 1" is a setting function of operating/stopping the unit by ON/OFF of the power source. "Power Source Start/Stop 2" is a setting function of automatically resuming the unit in subsequent recovery when blackout exceeding 2 seconds has occurred during operation. "Fan Deceleration in Cooling Thermo-OFF" decelerates, when activated, the fan in cooling thermo-off. "Fan Deceleration in Heating Thermo-OFF" decelerates, when activated, the fan in heating thermo-off. "Compressor Preheating Control Deactivation" is a setting of deactivating preheating control for a compressor. "Power-Up Setting" sets an increase in performance of an outdoor unit.

[0072] When it is determined in Step 104 that the received data includes the predefined service/maintenance information (YES), the processing branches to Step S105. When it is determined that this predefined information is included, password input is requested in principle.

[0073] In Step 105, the microcomputer 40 determines whether or not the administrator password for the remote operation device 4 remains as an initial value. The initial value of the administrator password is set for the remote operation device 4 upon factory shipment, and it is expected that the administrator password is changed to an appropriate value different from the initial value after the installation work has been performed. Here, the determination as to whether the administrator password remains as the initial value is performed to determine whether or not the device is in a factory shipment state (unset state), and a determination method is not particularly limited. For example, in other embodiments, after the initial setting has been completed, a flag holding a value of "true" may be set in a nonvolatile storage area, and the determination may be performed with reference to this value. When the initial setting is completed, it can also be expected that the time setting is completed. Thus, instead of whether or not the administrator password remains as the initial value, based on whether or not the time is an initial value, it may be determined whether or not the device is in the factory shipment state.

[0074] When it is determined in Step 105 that the administrator password for the remote operation device 4 remains

as the initial value (YES), it can be determined that the installation work has not been completed yet. Thus, the processing directly branches to Step S110 without requesting any password input as an exception, and the microcomputer 40 displays the received information on the display panel 451 of the remote operation device 4. When it is determined in Step 105 that the administrator password for the remote operation device 4 does not remain as the initial value (NO), the processing branches to step S106.

[0075] In Step 106, the microcomputer 40 determines whether or not the password is included in the data received from the portable information terminal 7 and whether or not the password information included in the received data matches password information held by the microcomputer 40 itself, i.e., whether or not the password is proper.

[0076] Here, the remote operation device 4 is configured to request password input when transitioning to a specific screen (item related to the service/maintenance) upon control of the indoor AC 2. Fig. 9(B) illustrates an operation menu screen 1050 for displaying a list of items of various operation menus. For example, on the operation menu screen 1050, when a menu 1053 for service/maintenance requiring a password is selected from a plurality of menus 1052 to 1054 and the OK button 4523 is pressed, a password input dialog box 1060 as illustrated in Fig. 9(C) is displayed. The administrator password can be input to the dialog box 1060 using a plurality of spinners 1061. When the administrator password is input and the OK button 4523 on the operation panel 452 is pressed in a state in which an OK button 1062 is selected, a service/maintenance menu screen 1070 as illustrated in Fig. 9(D) is displayed when the password is proper. The service/maintenance menu screen 1070 is a screen leading to a setting item for which a password is requested, and further includes a plurality of menu items 1071 to 1073.

[0077] Note that the application of the portable information terminal 7 has a function of setting and holding the administrator password for the target remote operation device 4 in advance, and when the administrator password for the target remote operation device 4 is held in advance, data including the password is transmitted upon data transmission via the near field communication 12 at the time of writing operation. In addition, it is assumed that a proper administrator password is set at the time of initial setting. Note that a method of requesting password input on the remote operation device 4 side every time without holding the administrator password on the application side is also allowed. However, by holding the administrator password on the application side and transmitting the password every time via the near field communication 10, it is possible to omit time and effort for the administrator to input the password every time by operating the remote operation device 4.

[0078] When it is determined in Step 106 that the proper password is included in the data received from the portable information terminal 7 (YES), the microcomputer 40 does not request password input, and in Step S110, displays the received information on the display panel 451 of the remote operation device 4. On the other hand, when it is determined in Step S106 that the proper password is not included in the data received from the portable information terminal 7 (NO), the processing branches to Step S107.

[0079] In Step 107, the microcomputer 40 determines whether or not an administrator password re-request period has elapsed. Here, it is assumed that a period (administrator password re-request period) in which a request is made again after authentication with the administrator password has been confirmed is set in the remote operation device 4 in advance via a password unlock effective period setting screen 1010 as illustrated in Fig. 8(B) or as an initial value. This is provided considering convenience of a worker and the administrator upon installation. Normally, the initial setting is performed by the worker or the administrator in front of the remote operation device 4 over a certain period of time. The same worker or administrator occupies the remote operation device 4 for a certain period of time, and it can be expected that safety can be ensured without requiring password input every time.

[0080] The password unlock effective period setting screen 1010 illustrated in Fig. 8(B) has an indication 1011 of a setting item and radio buttons 1012 to 1015 for displaying a plurality of options regarding the administrator password re-request period. When a desired value is selected from the plurality of options indicated by the radio buttons 1012 to 1015 using the up and down key buttons 4522U, 4522D of the operation panel 452 described above and the OK button 4523 of the operation panel 452 is pressed, the administrator password re-request period is set. When the re-request period is set, in both cases of the password being input on the remote operation device 4 and the password being transmitted from the portable information terminal 7, once authentication is completed with the administrator password, a re-request for the password is omitted until time indicated by the selected option has elapsed. For example, when 10 minutes is selected, the request for password input is not performed for 10 minutes after unlock has been once made with the input password.

[0081] When it is determined in Step S107 that the password re-request period has not elapsed yet (NO), it can be said that the security is ensured, and therefore, no password input is exceptionally requested. In Step S110, the microcomputer 40 displays the received information on the display panel 451 of the remote operation device 4. On the other hand, when it is determined in Step S107 that the password re-request period has elapsed (YES), the processing branches to Step S108.

[0082] In Step S108, the microcomputer 40 displays a screen similar to the password input dialog box 1060 illustrated in Fig. 9(C) on the display panel 451 of the remote operation device 4, for example, and requests password input. In Step S 109, the microcomputer 40 determines whether or not the input password is correct. In Step S109, when the

input password is not correct (NO), the control returns to Step S108, and password input is requested again. When it is confirmed in Step S109 that the input password is correct (YES), the processing proceeds to Step S110, and in Step S110, the microcomputer 40 displays the received information on the display panel 451 of the remote operation device 4.

[0083] Note that in the embodiment described above, the administrator password requested when the predefined setting item related to the service/maintenance is changed on the remote operation device 4 is set in the remote operation device 4, and the administrator password set using the remote operation device 4 and the password set using the portable information terminal 7 are the same as each other. This is preferable from the viewpoint that protection levels are the same between both paths. The same also applies to a password unlock effective period. However, the password may be different between a case of using the portable information terminal 7 and a case of using the remote operation device 4, or a difference in the password unlock effective period may be provided.

[0084] Fig. 10(A) illustrates a writing setting confirmation screen 1080 for displaying the information received via the near field communication 12, which is displayed on the display panel 451 of the remote operation device 4 in Step S110. The writing setting confirmation screen 1080 shows a list of setting items 1081 for confirming writing and an indication 1082 of a corresponding state. The writing setting confirmation screen 1080 illustrated in Fig. 10(A) also includes data which cannot be set on the system of the air-conditioner or data which can be only partially set among the data received from the portable information terminal 7. For example, when the remote operation device 4 is replaced or is connected to an old indoor unit 2 in an existing facility, setting data which is not supported by the old indoor unit may be received from the portable information terminal 7. In this case, in a specific embodiment, marks corresponding to (1) to (3) below are displayed as the state indications 1082:

(1) a data exclamation symbol "!" indicating that data cannot be systematically reflected;
(2) a data hyphen symbol "-" indicating that data is not received from portable information terminal 7; and
(3) a data check symbol indicating that data can be reflected.

[0085] The above state indications 1082 enable confirmation of the written data list from the portable information terminal 7. Note that in the embodiment described, the exclamation symbol, the hyphen symbol, and the check symbol have been specifically exemplified, but the embodiment of the present invention is not limited to the specific marks exemplified here. For example, other marks such as a circular mark and a cross mark may be used.

[0086] Referring again to Fig. 6, in Step S111, the microcomputer 40 determines, through user interaction, whether or not writing is required. For example, when the user presses the OK button 4523 after completion of confirmation on the writing setting confirmation screen 1080 of Fig. 10(A), a writing confirmation dialog box 1090 as illustrated in Fig. 10(B) is displayed. The writing confirmation dialog box 1090 includes a message 1091 for confirming writing, a "Yes" button 1092, and a "No" button 1093. When the OK button 4523 is pressed with the "YES" button 1092 selected, it is determined in Step S111 that writing is required. When the OK button 4523 is pressed with the "NO" button 1093 selected, it is determined in Step S111 that writing is not required.

[0087] When it is determined in Step S111 that writing is required (YES), the microcomputer 40 writes the information in the remote operation device 4 itself or transmits and writes the information in the other ACs 2, 6 in Step S112, and ends this processing in Step S113. Note that In a case of a setting item for the remote operation device 4 itself, such as a remote display setting, writing is performed on the remote operation device 4 itself as an information writing destination. On the other hand, in a case of a setting item on the AC 2, 6 side, such as the "FAN DECELERATION IN HEATING THERMO-OFF" in the "ON-SITE SETTING" described above, the information is transmitted to the indoor AC 2 via, e.g., the connection line 5 or is further transmitted from the indoor AC 2 to the outdoor AC 6 via the AC network 3, and is written in the indoor AC 2 or the outdoor AC 6.

[0088] During setting writing processing, a writing-in-progress display screen 1110 as illustrated in Fig. 10(C) is displayed. At this time, among the data set from the portable information terminal 7, data which cannot be set on the system is discarded, and when only part of the data can be reflected, only such data is reflected. When writing is not required (NO), the data received via the near field communication 12 is discarded. As a result, even when there is an unintended setting, it is possible to discard data without manually changing the setting on the remote operation device 4. In this case, writing via the near field communication may be performed again.

[0089] When it is determined in Step S111 that writing is not required (NO), the processing directly proceeds to Step S113, and this processing ends. Once this processing ends, the processing can be started again from Step S100. Note that in the embodiment described, the processing ends after writing has been performed, but it is also possible to display a work continuation confirmation screen 1120 illustrated in Fig. 10(D) and continuously receive an additional setting work.

[0090] As described above, according to the above embodiment, there are provided the air-conditioner, the operation device, and the control method capable of reducing a probability that a third party makes an access without permission in, e.g., setting using the near field communication unit.

[0091] When the remote operation device 4 can be arranged at an installation location where a third party can make an access without permission, the mode is set to the inhibition mode for inhibiting use of the near field communication

unit (410, 411, 412) so that an unauthorized access can be prevented in advance. In addition, in writing of the setting using the near field communication unit (410, 411, 412), it is possible to determine whether or not the user is the administrator of the remote operation device 4 and whether or not the information for which the security needs to be ensured is to be written. Since the password input request can be omitted as necessary, it is possible to shorten work time while ensuring the security. Further, when there is a probability that there are items which cannot be set by the system of the air-conditioner in the setting data received via the near field communication (410, 411, 412), the user can grasp which item is to be set on the writing setting confirmation screen 1080 according to the above embodiment.

[0092] Note that the embodiment of the present invention is not limited to the above embodiment and includes various modifications. For example, the above embodiment has been described in detail in order to simply describe the present invention, and is not limited to one having all configurations described above. In addition, part of the configuration of a certain embodiment can be replaced with the configuration of another embodiment, and the configuration of a certain embodiment can be added to the configuration of another embodiment. Further, it is possible to make addition, omission, and replacement of other configurations for part of the configuration of each embodiment.

[0093] Some or all of the above configurations, functions, processing units, processors, etc. may be implemented by hardware, for example, by designing with an integrated circuit. Further, some or all of the above configurations, functions, etc. can be implemented by a computer-executable program causing a processor to implement each function, which is described in, e.g., a legacy programming language such as assembler, C, C++, C#, or Java (registered trademark) or an object oriented programming language, and information for implementing each function, such as a program, a table, or a file can be stored in a storage device such as a hard disk drive (HDD), a solid state drive (SSD), a ROM, an EEPROM, an EPROM, or a flash memory or a device-readable recording medium such as a flexible disk, a CD-ROM, a CD-RW, a DVD-ROM, a DVD-RAM, a DVD-RW, a Blu-ray disk, a SD (registered trademark) card, or an MO, or can be distributed through an electric communication line.

[0094] Further, some or all of the above configurations, functions, etc. can be implemented on a programmable device (PD) such as a field programmable gate array (FPGA), and can be distributed by a recording medium as circuit configuration data (bit stream data) to be downloaded to the PD in order to implement the above functional units on the PD and data described by, e.g., a hardware description language (HDL), a very high speed integrated circuits hardware description language (VHDL), or Verilog-HDL for generating the circuit configuration data. Further, the control line and the information line are described as being necessary for description, and not all the control lines and information lines are necessary for a product. In practice, it may be considered that almost all the configurations are connected to each other. In addition, the formats of various types of data exemplified in the above description can be configured by, for example, comma-separated values (CSV), an extensible markup language (XML), or binary, but are not necessarily limited thereto.

LIST OF REFERENCE SIGNS

[0095]

2	AC (Indoor Unit)
3	AC Network
4	Remote Operation Device
5	Connection Line
6	AC (Outdoor Unit)
7	Portable Information Terminal
12	Near Field Communication
22, 62	Load
20	Main Board
22	Load
23	Power Source
25	Housing
200	Power Source Block
201	Control Unit
202	First Storage Unit
203	Main Storage Unit
204	Second Storage Unit
205	AC Control Communication Unit
40	Microcomputer
401	Buzzer
402	Indicator

403 Infrared Receiver
404 Flash Memory
405 Display Module
406 HBS Receiver
407 EEPROM
408 Thermistor
409 Touch Key Sensor
410 NFC Tag Interface Module
411 NFC Connector
412 NFC Antenna
451 Display Panel
452 Operation Panel
71 Control Unit
72 Main Storage Unit
73 First Storage Unit
74 Second Storage Unit
75 Near Field Communication Unit
76 Wireless Communication Unit
77 Input Unit
78 Display Unit
1000 Near Field Communication Setting Screen
1010 Password Unlock Effective Period Setting Screen
1020 Home Screen
1030 Near Field Communication Guidance Screen
1040 Inspection Screen
1050 Operation Menu Screen
1060 Password Input Dialog Box
1070 Service/Maintenance Menu Screen
1080 Writing setting Confirmation Screen
1090 Writing Confirmation Dialog Box
1110 Writing-In-Progress Display Screen
1120 Work Continuation Confirmation Screen
1200 On-Site Setting Screen
1210 Setting Editing Screen
1220 Writing Screen
1230 Writing Completion Screen

Claims

1. An air-conditioner including an operation device, comprising:

a near field communication unit provided in the operation device; and
a control unit that determines whether a mode is a permission mode for permitting use of the near field communication unit or an inhibition mode for inhibiting the use of the near field communication unit and performs control of making a setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device via the near field communication unit in a case of the permission mode.

2. The air-conditioner according to claim 1, wherein
in the permission mode, the control unit activates the near field communication unit, determines whether or not data received via the near field communication unit includes predefined information related to service/maintenance, and performs control of requesting a password when the predefined information is included.

3. The air-conditioner according to claim 2, wherein
the control unit determines whether or not password information included in the received data from the external terminal device matches password information held by the control unit itself.

4. The air-conditioner according to claim 3, wherein
the control unit controls the operation device to request password input when the password information does not match in the determination.

5. The air-conditioner according to any one of claims 2 to 4, wherein
the control unit has a plurality of options for time until the password input is requested again after the password has been once confirmed as proper, and omits the password request until time selected from the plurality of options elapses.

6. The air-conditioner according to any one of claims 2 to 5, wherein
the control unit determines whether or not the operation device is in an unset state, and omits the password request in a case of the unset state.

7. The air-conditioner according to any one of claims 2 to 6, wherein
an administrator password to be requested when a predefined setting item related to the service/maintenance is changed on the operation device is set in the operation device, and the password is identical to the administrator password.

8. The air-conditioner according to any one of claims 1 to 7, wherein
the control unit determines whether or not information included in the data received via the near field communication unit is written in the operation device or is transmitted and written in the air-conditioner.

9. The air-conditioner according to any one of claims 1 to 8, wherein
in the permission mode, in response to a specific operation, a screen transitions to a screen for performing a setting using the near field communication unit, and in the inhibition mode, the transition to the screen for performing the setting using the near field communication unit is inhibited regardless of the specific operation.

10. The air-conditioner according to any one of claims 1 to 9, wherein
in the permission mode, an indication indicating that provision of the information using the near field communication unit is active is displayed on a screen for providing the information, and in the inhibition mode, the indication indicating that the provision is active is not displayed or an indication indicating that the provision of the information using the near field communication unit is inactive is displayed.

11. An operation device connected to an air-conditioner to control the air-conditioner, comprising:

a near field communication unit; and
a control unit that determines whether a mode is a permission mode for permitting use of the near field communication unit or an inhibition mode for inhibiting the use of the near field communication unit and performs control of making a setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device via the near field communication unit in a case of the permission mode.

12. A control method for an operation device connected to an air-conditioner to control the air-conditioner, comprising:

a step of determining whether a mode is a permission mode for permitting use of a near field communication unit provided in the operation device or an inhibition mode for inhibiting the use of the near field communication unit; and
a step of making a setting of the air-conditioner or providing information on the air-conditioner based on data communication with an external terminal device via the near field communication unit when it is determined as the permission mode in the determining step.

FIG. 1

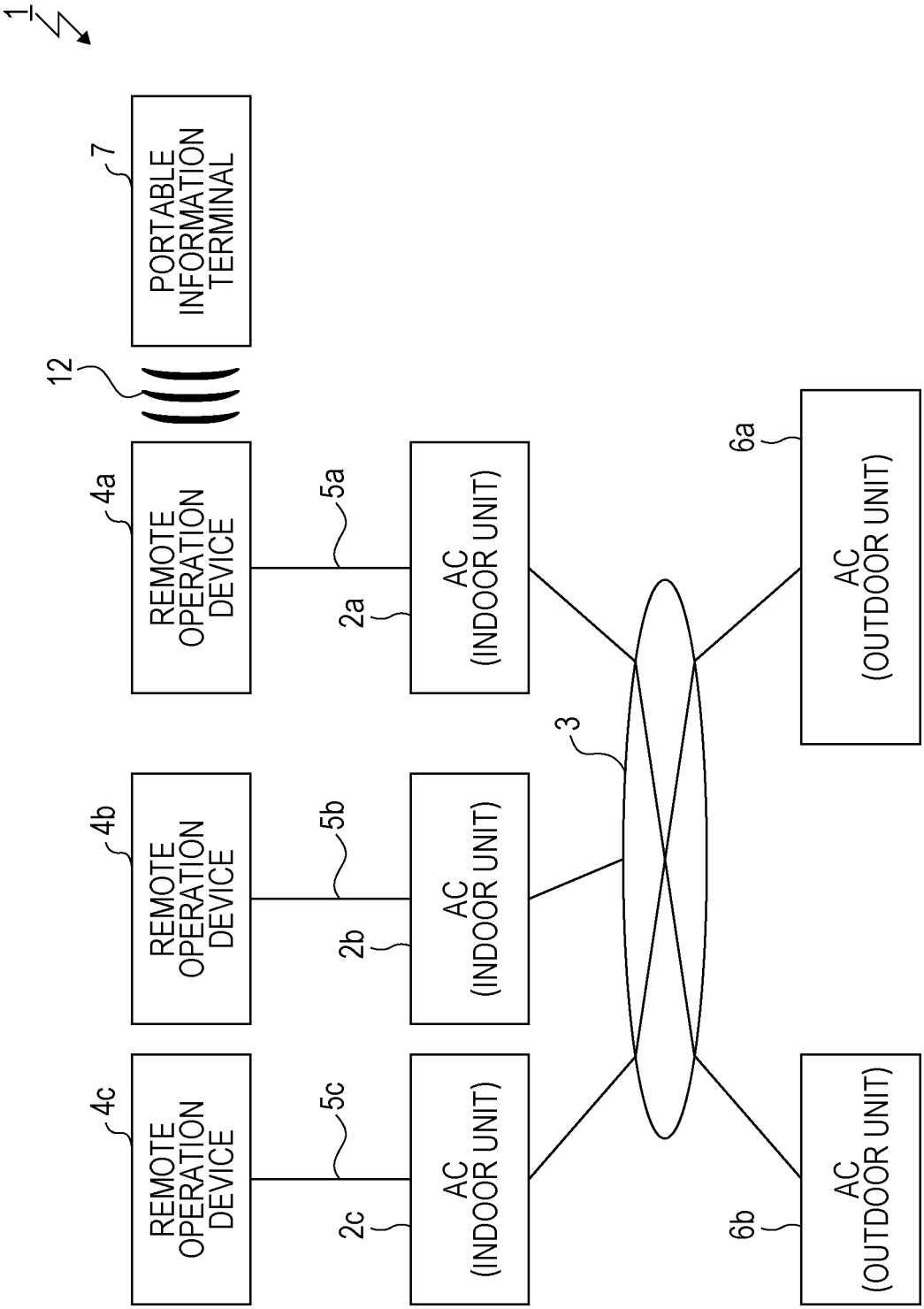

1
7
PORTABLE INFORMATION TERMINAL
12
4a
REMOTE OPERATION DEVICE
5a
2a
AC (INDOOR UNIT)
6a
AC (OUTDOOR UNIT)
4b
REMOTE OPERATION DEVICE
5b
2b
AC (INDOOR UNIT)
3
4c
REMOTE OPERATION DEVICE
5c
2c
AC (INDOOR UNIT)
6b
AC (OUTDOOR UNIT)

FIG. 2

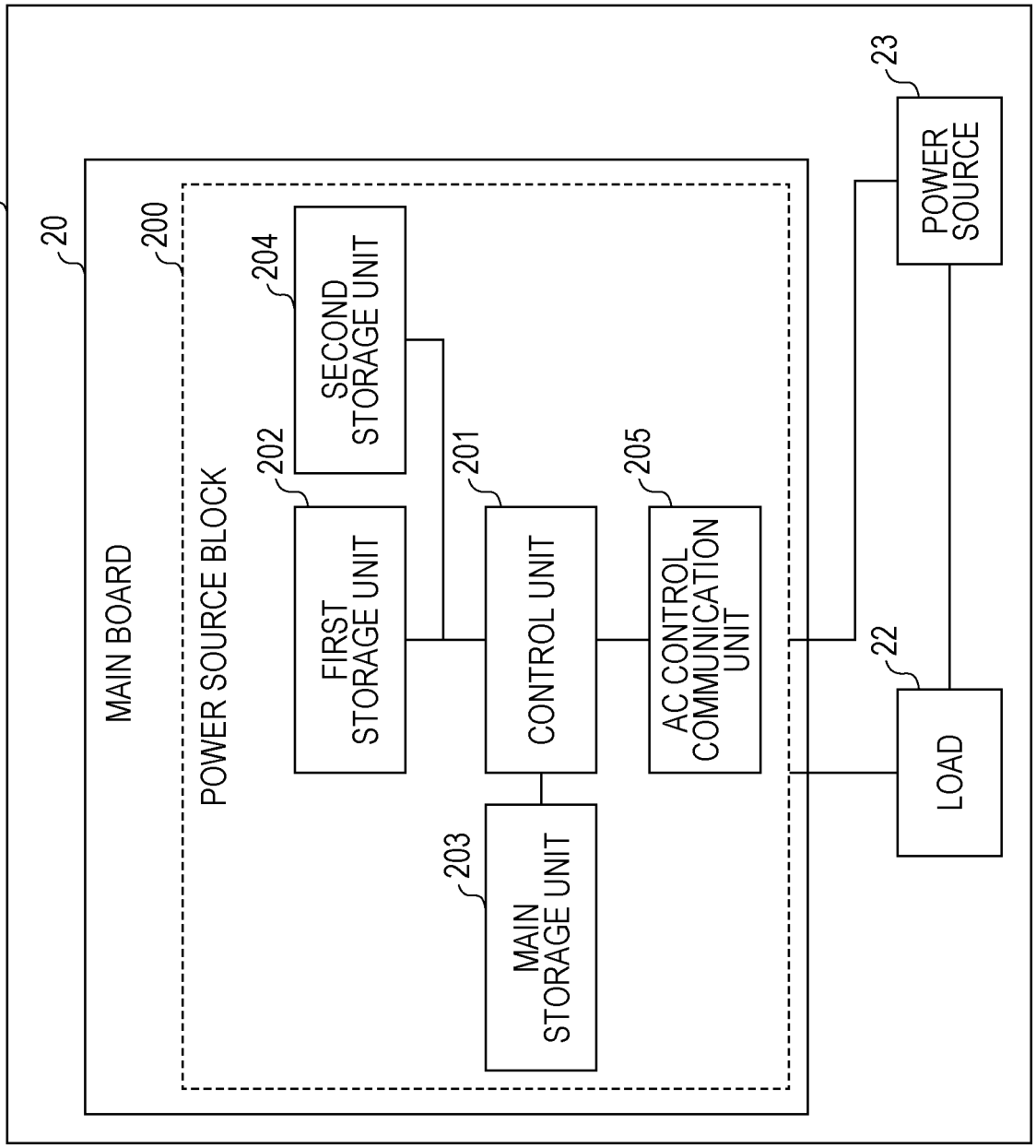
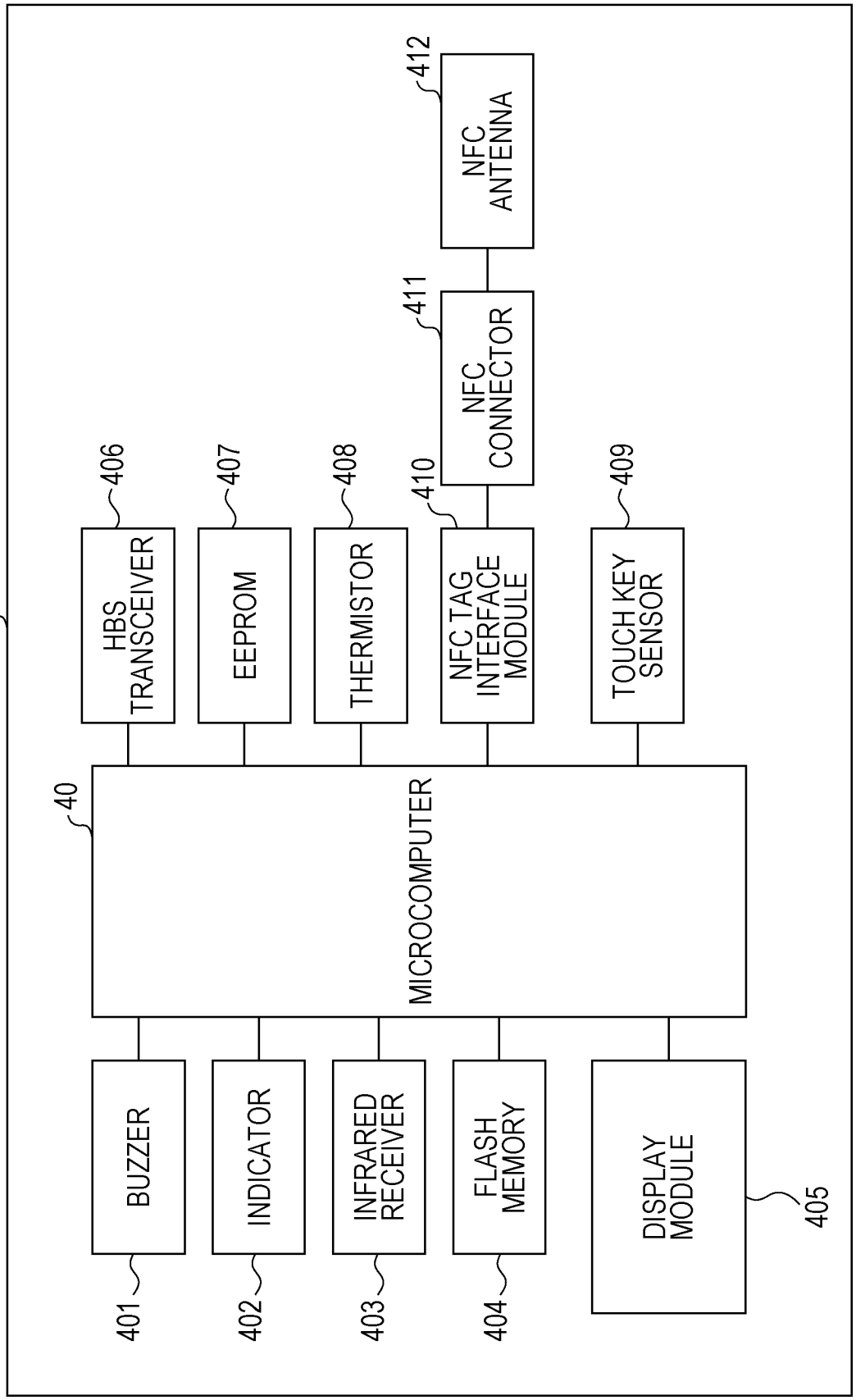

2(or 6)
20
MAIN BOARD
200
POWER SOURCE BLOCK
204
SECOND STORAGE UNIT
202
FIRST STORAGE UNIT
201
CONTROL UNIT
205
AC CONTROL COMMUNICATION UNIT
203
MAIN STORAGE UNIT
23
POWER SOURCE
22
LOAD

FIG. 3


4
40
MICROCOMPUTER
HBS TRANSCEIVER
406
EEPROM
407
THERMISTOR
408
NFC TAG INTERFACE MODULE
410
NFC CONNECTOR
411
NFC ANTENNA
412
TOUCH KEY SENSOR
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401
INDICATOR
402
INFRARED RECEIVER
403
FLASH MEMORY
404
DISPLAY MODULE
405

FIG. 4

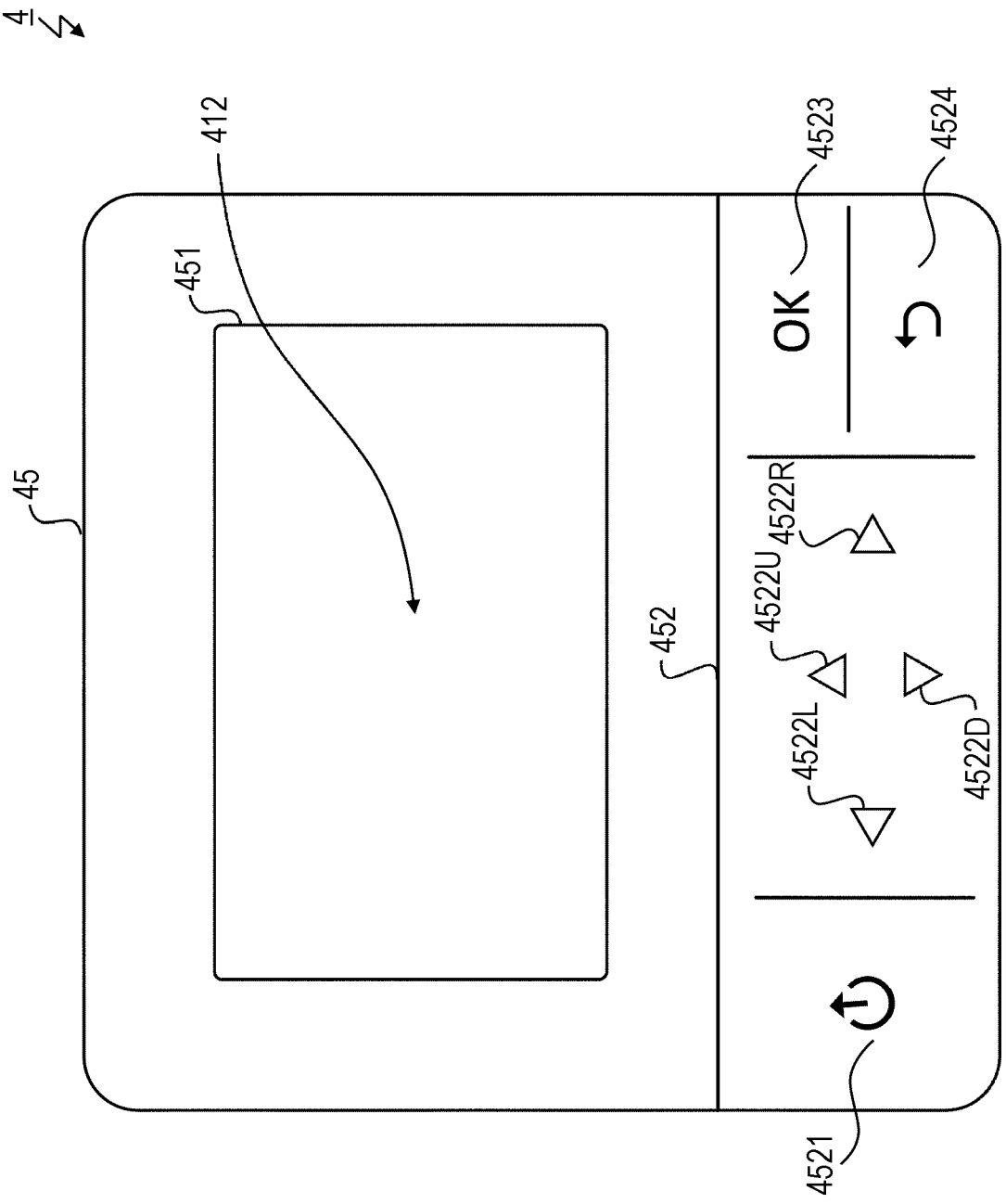


FIG. 5

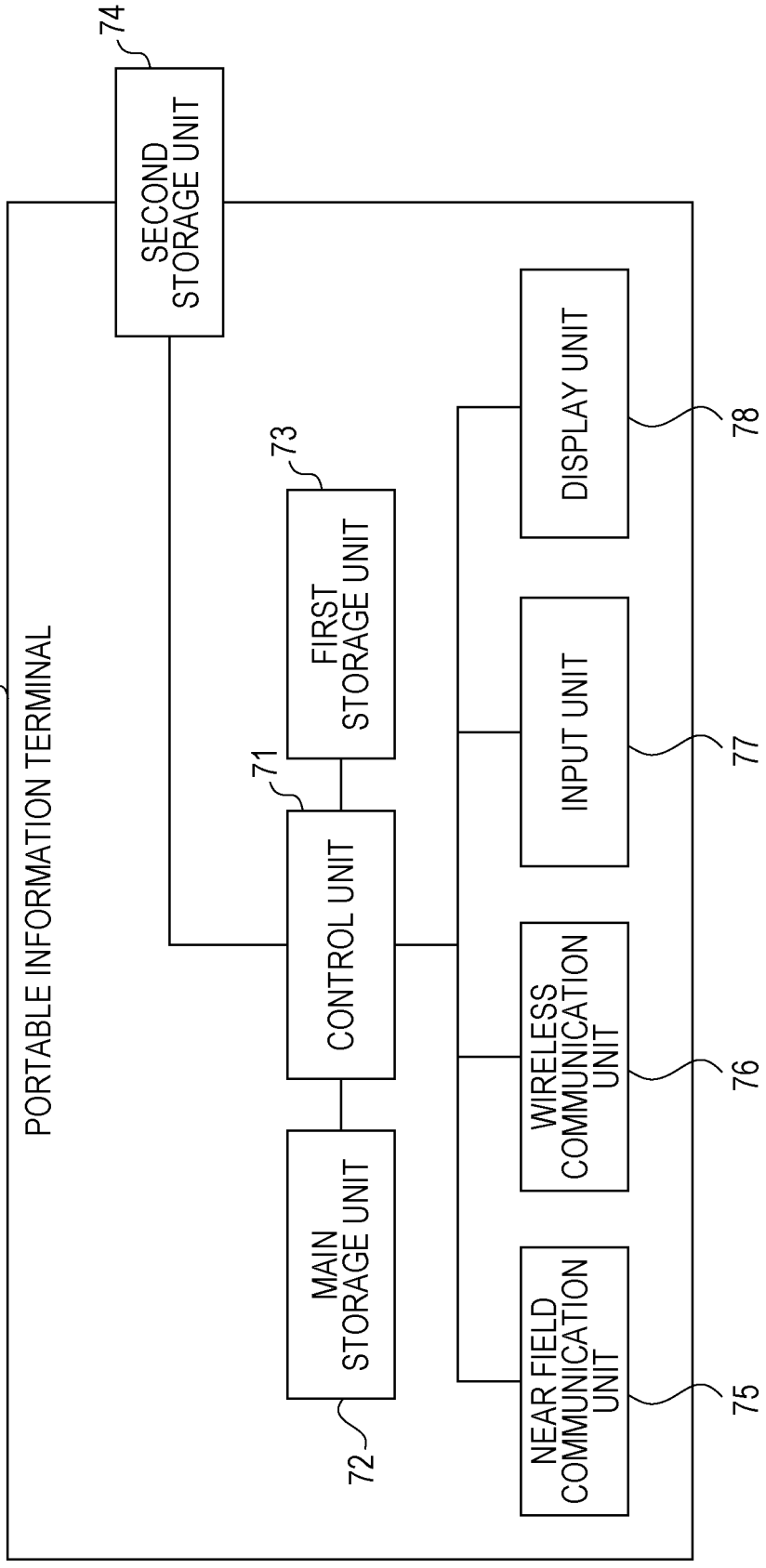

7
PORTABLE INFORMATION TERMINAL
74
SECOND STORAGE UNIT
73
FIRST STORAGE UNIT
71
CONTROL UNIT
72
MAIN STORAGE UNIT
DISPLAY UNIT
78
INPUT UNIT
77
WIRELESS COMMUNICATION UNIT
76
NEAR FIELD COMMUNICATION UNIT
75

FIG. 6

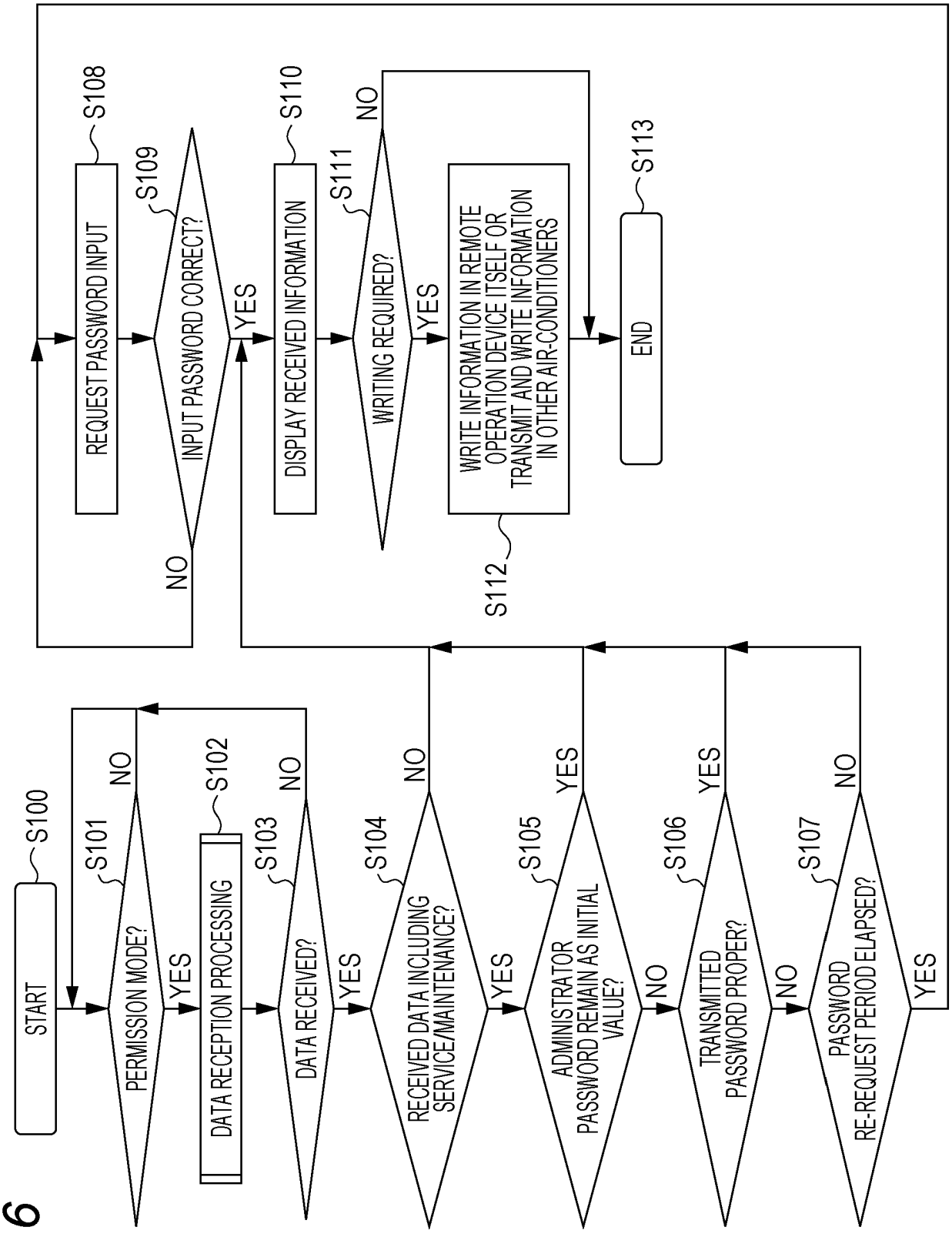

START
S100
PERMISSION MODE?
S101
NO
YES
DATA RECEPTION PROCESSING
S102
DATA RECEIVED?
S103
NO
YES
RECEIVED DATA INCLUDING SERVICE/MAINTENANCE?
S104
NO
YES
ADMINISTRATOR PASSWORD REMAIN AS INITIAL VALUE?
S105
YES
NO
TRANSMITTED PASSWORD PROPER?
S106
YES
NO
PASSWORD RE-REQUEST PERIOD ELAPSED?
S107
NO
YES
REQUEST PASSWORD INPUT
S108
INPUT PASSWORD CORRECT?
S109
NO
YES
DISPLAY RECEIVED INFORMATION
S110
WRITING REQUIRED?
S111
NO
YES
WRITE INFORMATION IN REMOTE OPERATION DEVICE ITSELF OR TRANSMIT AND WRITE INFORMATION IN OTHER AIR-CONDITIONERS
S112
END
S113

FIG. 7

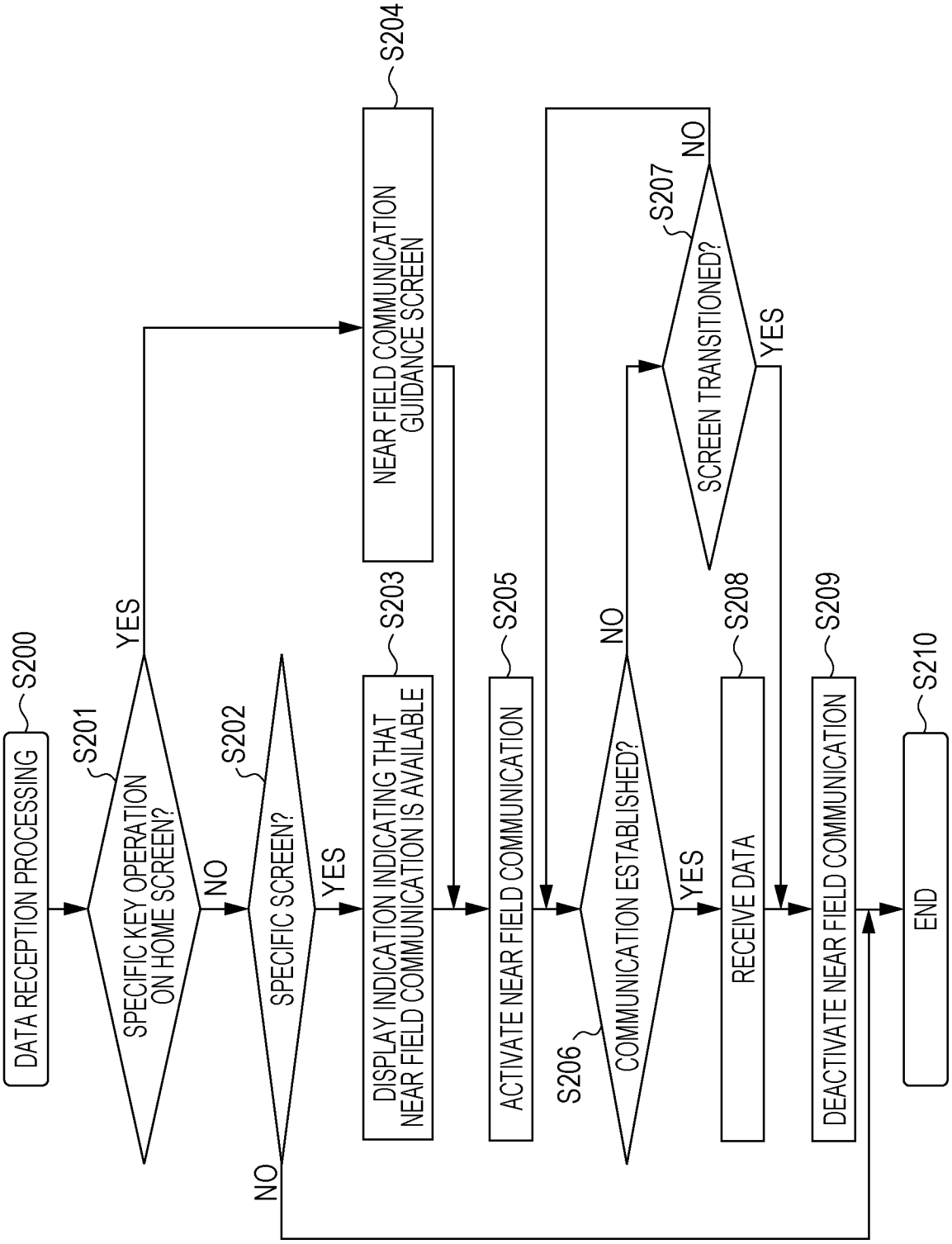

DATA RECEPTION PROCESSING
S200
SPECIFIC KEY OPERATION ON HOME SCREEN?
S201
YES
NO
SPECIFIC SCREEN?
S202
YES
NO
NEAR FIELD COMMUNICATION GUIDANCE SCREEN
S204
DISPLAY INDICATING THAT NEAR FIELD COMMUNICATION IS AVAILABLE
S203
ACTIVATE NEAR FIELD COMMUNICATION
S205
COMMUNICATION ESTABLISHED?
S206
NO
YES
SCREEN TRANSITIONED?
S207
NO
YES
RECEIVE DATA
S208
DEACTIVATE NEAR FIELD COMMUNICATION
S209
END
S210

FIG. 8

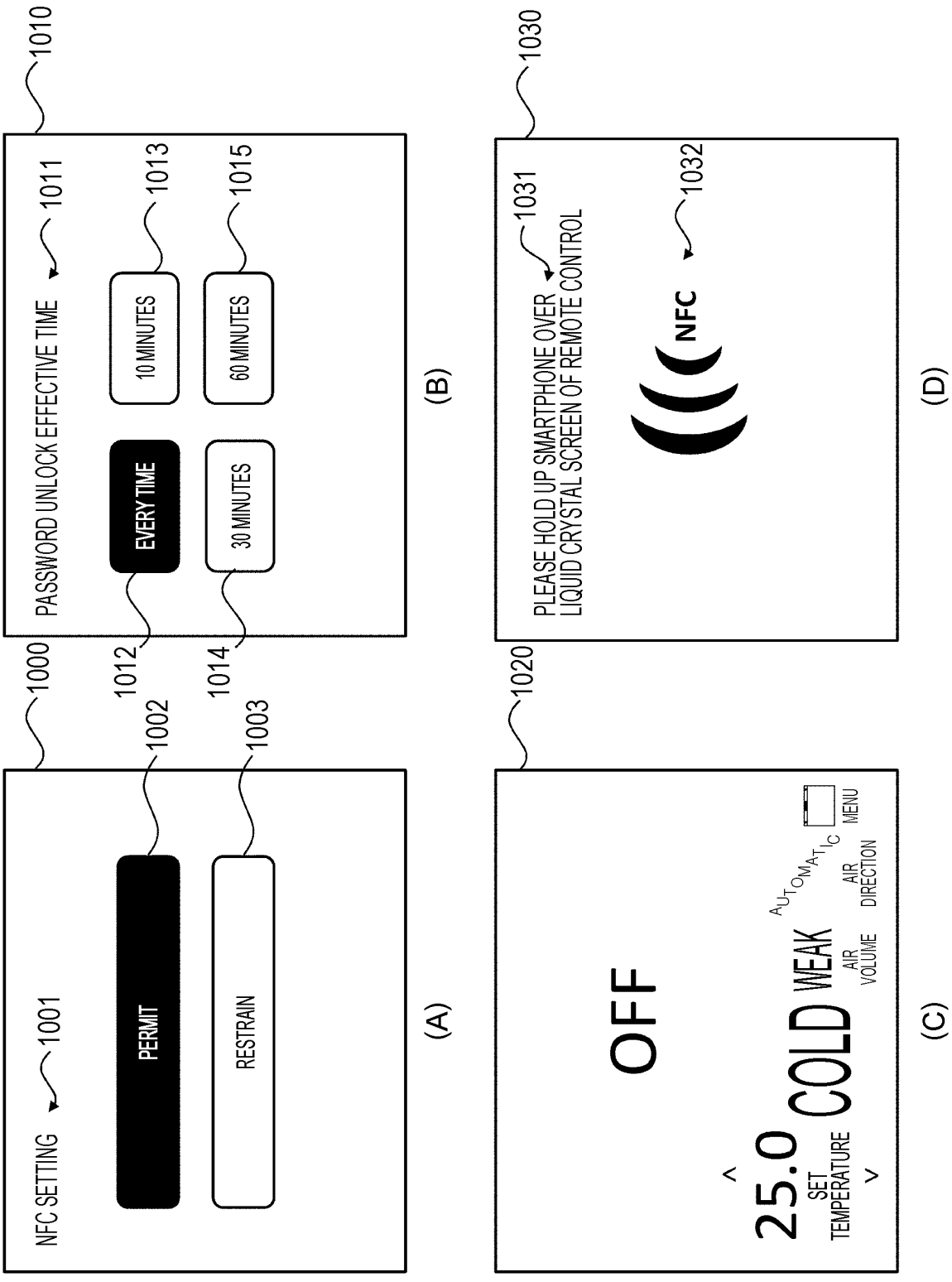

1000
NFC SETTING
1001
PERMIT
1002
RESTRAIN
1003
(A)
1010
PASSWORD UNLOCK EFFECTIVE TIME
1011
EVERY TIME
1012
10 MINUTES
1013
30 MINUTES
1014
60 MINUTES
1015
(B)
1020
OFF
25.0
SET TEMPERATURE
COLD
WEAK
AIR VOLUME
AUTOMATIC
AIR DIRECTION
MENU
(C)
1030
PLEASE HOLD UP SMARTPHONE OVER LIQUID CRYSTAL SCREEN OF REMOTE CONTROL
1031
NFC
1032
(D)

FIG. 9

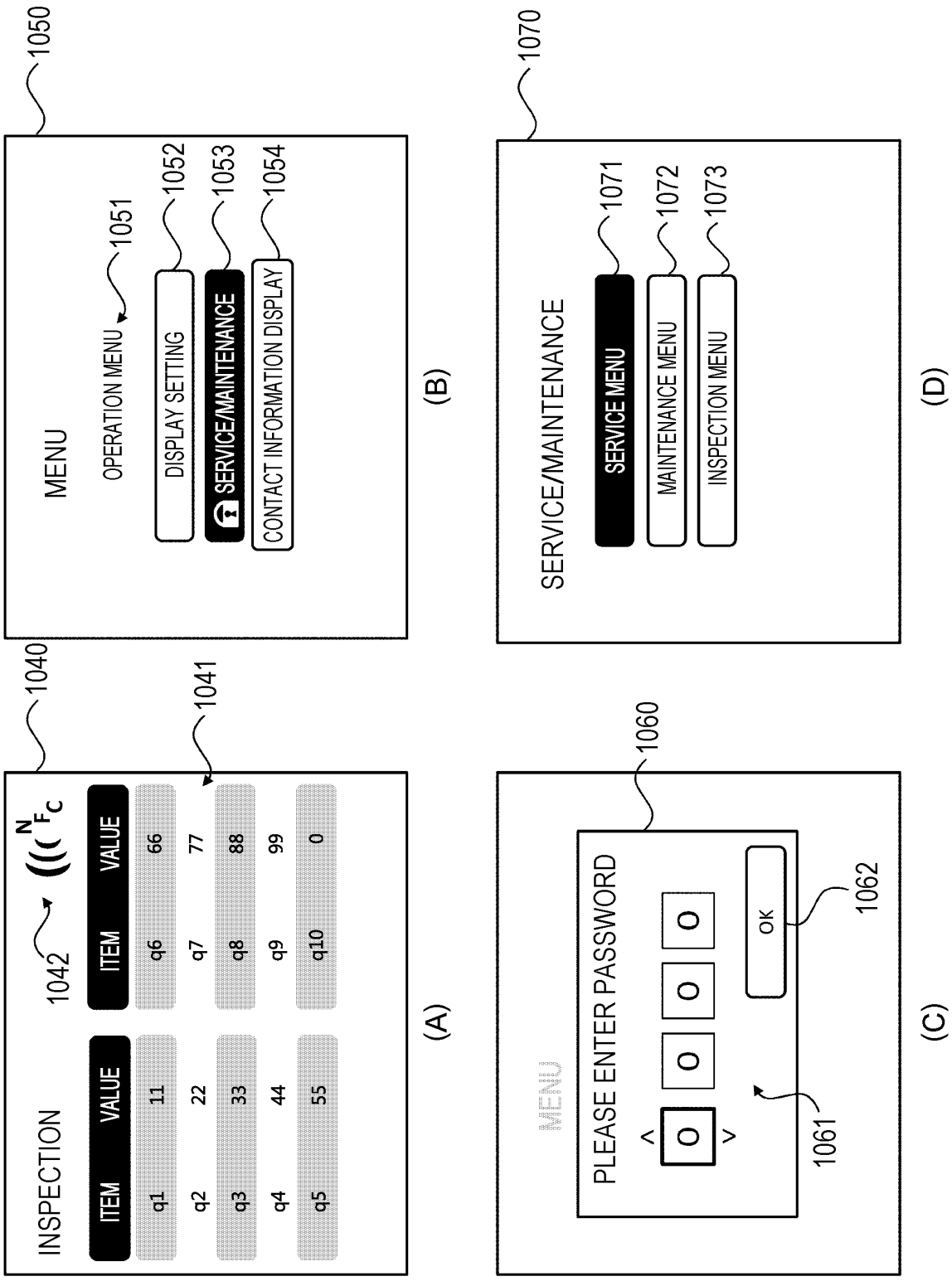

1050
MENU
OPERATION MENU
1051
DISPLAY SETTING
1052
SERVICE/MAINTENANCE
1053
CONTACT INFORMATION DISPLAY
1054
(B)
1070
SERVICE/MAINTENANCE
SERVICE MENU
1071
MAINTENANCE MENU
1072
INSPECTION MENU
1073
(D)
1040
INSPECTION
1042
ITEM
VALUE
1041
q1 11
q2 22
q3 33
q4 44
q5 55
q6 66
q7 77
q8 88
q9 99
q10 0
(A)
1060
PLEASE ENTER PASSWORD
OK
1062
1061
(C)

FIG. 10

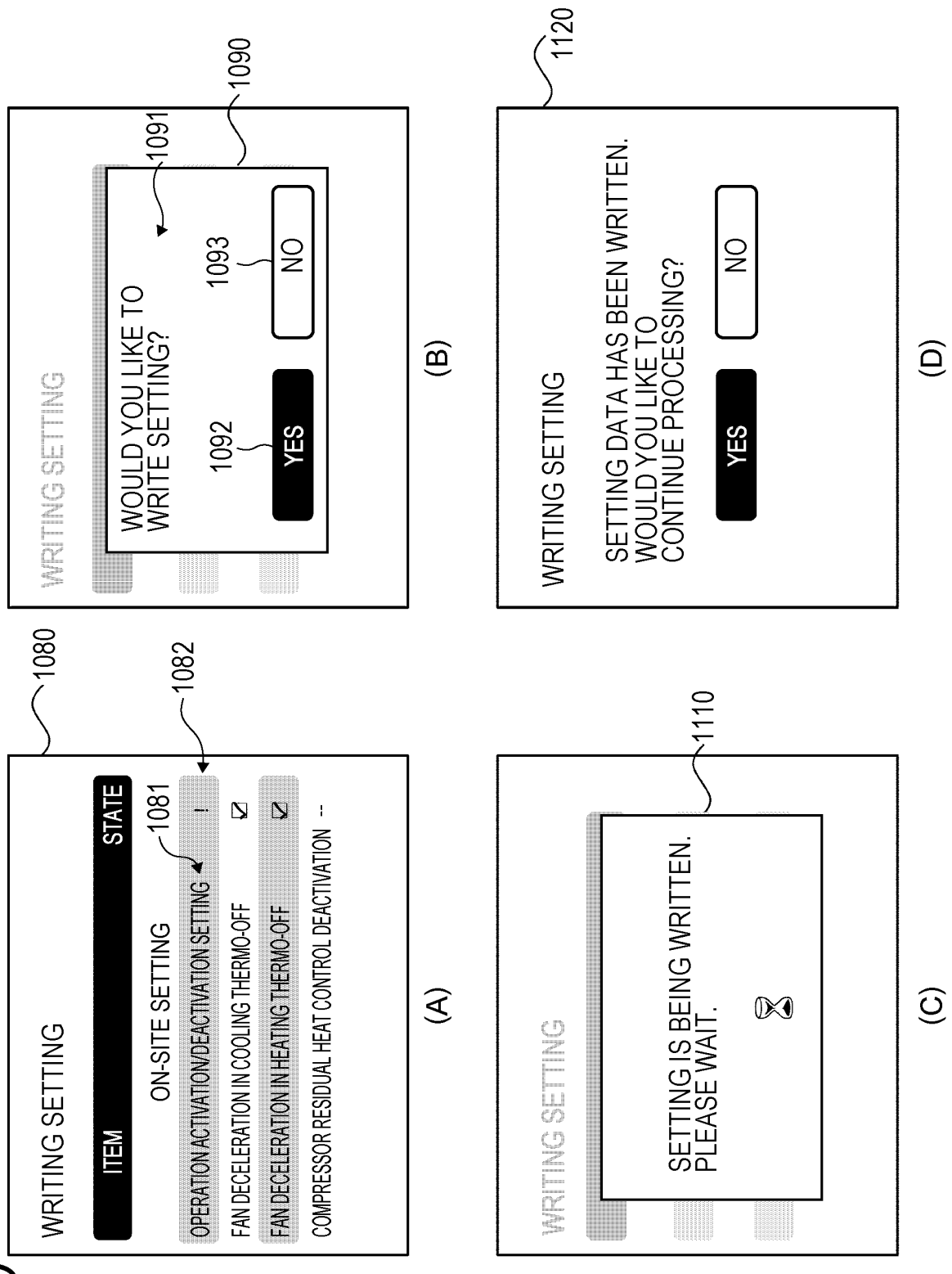

WRITING SETTING
ITEM
STATE
ON-SITE SETTING
OPERATION ACTIVATION/DEACTIVATION SETTING
FAN DECELERATION IN COOLING THERMO-OFF
FAN DECELERATION IN HEATING THERMO-OFF
COMPRESSOR RESIDUAL HEAT CONTROL DEACTIVATION
1080
1081
1082
(A)
WRITING SETTING
WOULD YOU LIKE TO WRITE SETTING?
YES
NO
1090
1091
1092
1093
(B)
WRITING SETTING
SETTING IS BEING WRITTEN. PLEASE WAIT.
1110
(C)
WRITING SETTING
SETTING DATA HAS BEEN WRITTEN. WOULD YOU LIKE TO CONTINUE PROCESSING?
YES
NO
1120
(D)

FIG. 11

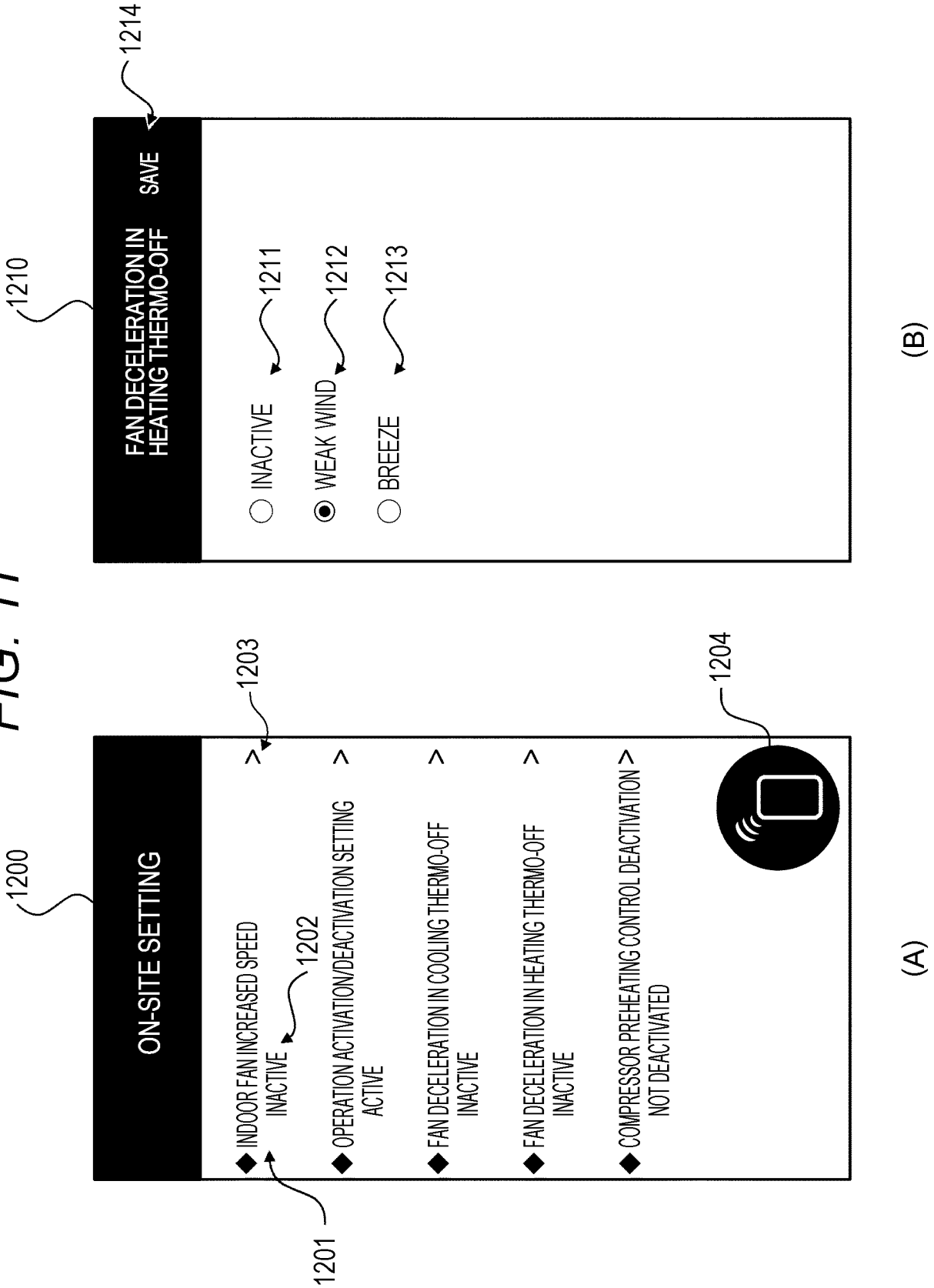
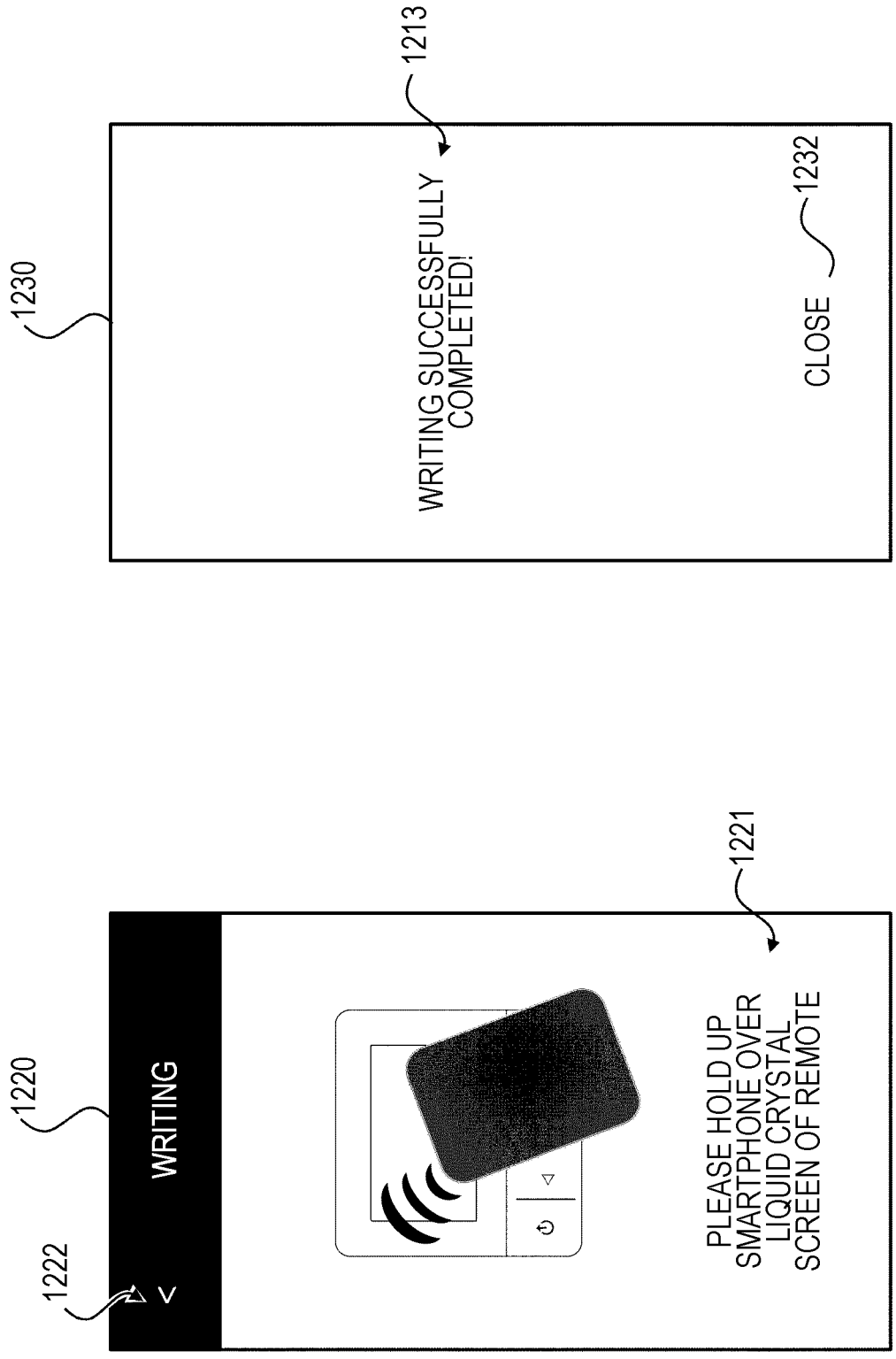

1200
ON-SITE SETTING
INDOOR FAN INCREASED SPEED
INACTIVE
OPERATION ACTIVATION/DEACTIVATION SETTING
ACTIVE
FAN DECELERATION IN COOLING THERMO-OFF
INACTIVE
FAN DECELERATION IN HEATING THERMO-OFF
INACTIVE
COMPRESSOR PREHEATING CONTROL DEACTIVATION
NOT DEACTIVATED
1201
1202
1203
1204
(A)
1210
FAN DECELERATION IN HEATING THERMO-OFF
SAVE
1214
INACTIVE
WEAK WIND
BREEZE
1211
1212
1213
(B)

FIG. 12


1230
1213
WRITING SUCCESSFULLY COMPLETED!
CLOSE
1232
1220
WRITING
1222
1221
PLEASE HOLD UP SMARTPHONE OVER LIQUID CRYSTAL SCREEN OF REMOTE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/036053

A. CLASSIFICATION OF SUBJECT MATTER

F24F 11/56(2018.01)i
FI: F24F11/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F11/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2021
Registered utility model specifications of Japan 1996-2021
Published registered utility model applications of Japan 1994-2021

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2020/202439 A1 (HITACHI-JOHNSON CONTROLS AIR CONDITIONING, INC.) 08 October 2020 (2020-10-08) paragraphs [0012]-[0074]	1-5, 7-8, 10-12
A		6, 9
Y	WO 2017/002616 A1 (TOSHIBA CARRIER CORP.) 05 January 2017 (2017-01-05) paragraphs [0010]-[0061]	1-5, 7-8, 10-12
Y	JP 2018-186479 A (NORITZ CORP.) 22 November 2018 (2018-11-22) paragraphs [0014]-[0080]	2-5, 7-8, 10
Y	JP 2021-129174 A (DAIKIN IND., LTD.) 02 September 2021 (2021-09-02) paragraphs [0042]-[0082]	7-8, 10

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 October 2021	**30 November 2021**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/036053

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
WO 2020/202439 A1	08 October 2020	(Family: none)	
WO 2017/002616 A1	05 January 2017	EP 3318810 A1 paragraphs [0010]-[0061]	
JP 2018-186479 A	22 November 2018	(Family: none)	
JP 2021-129174 A	02 September 2021	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 6299785 B **[0002] [0004]**
- JP 6743383 B **[0003] [0004]**