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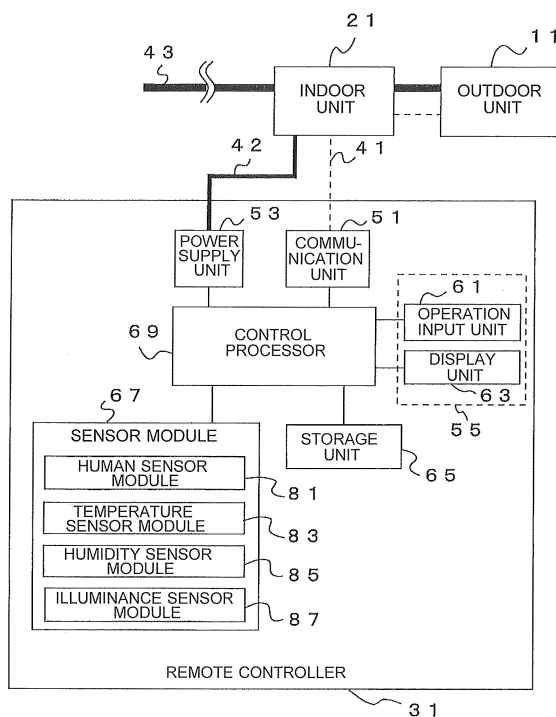
REMOTE CONTROLLER

(57)

A remote controller 31 for controlling an air-conditioning apparatus including an outdoor unit 11 and an indoor unit 21 includes a storage unit 65 that stores data of different types of digital objects 211, a touch panel display 55 including a display unit 63 that displays the digital objects 211 and an operation input unit 61 that

detects an operation of the digital objects 211, and a control processor 69 that controls the touch panel display 55. The control processor 69 displays one of the digital objects 211 associated with an operation expected from a surrounding environment of the indoor unit 21 or an operation history of the operation input unit 61.

FIG. 2



Description

Technical Field

[0001] The present invention relates to remote controllers.

Background Art

[0002] There have been remote controllers that do not display unnecessary display content when shifting to a power-save mode (see, for example, Patent Literature 1).

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2006-029634 (paragraph [0092])

Summary of Invention

Technical Problem

[0004] A known technique described in Patent Literature 1 is intended to save power consumption, and thus, a user interface is not designed for user's convenience. Thus, in the known technique described in Patent Literature 1, a user interface different from an operating environment is displayed in some cases. Thus, the known technique described in Patent Literature 1 does not display an optimum user interface depending on the operating environment.

[0005] Since the known technique described in Patent Literature 1 is intended to save energy consumption, operation of hiding text information is performed to save energy consumption, rather than to ease intuitive understanding. Thus, in the known technique described in Patent Literature 1, an intuitive user interface is not displayed depending on the operating environment.

[0006] In view of the above, known techniques as described in Patent Literature 1 have a problem of a failure in providing an optimum intuitive user interface depending on an operating environment.

[0007] The present invention has been made to solve problems as described above, and an object thereof is to provide a remote controller that can provide an optimum intuitive user interface depending on an operating environment. **Solution to Problem**

[0008] A remote controller according to the present invention is configured to control an air-conditioning apparatus including an outdoor unit and an indoor unit, and includes a storage unit configured to store data of digital objects of different types, a touch panel display including a display unit configured to display the digital objects and an operation input unit configured to detect an operation of the digital objects, and a control processor configured

to control the touch panel display. The control processor displays one of the digital objects associated with an operation expected from a surrounding environment of the indoor unit or an operation history of the operation input unit.

Advantageous Effects of Invention

[0009] According to the present invention, display content of a user interface can be configured depending on a type of an operation expected from a surrounding environment or an operation history. Thus, the present invention can provide a remote controller for providing an optimum intuitive user interface depending on an operating environment.

Brief Description of Drawings

[0010]

[Fig. 1] Fig. 1 illustrates an example of a schematic configuration of an air-conditioning system 1 according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 illustrates an example of a schematic configuration of a remote controller 31 according to Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 illustrates an example of a detailed configuration of the remote controller 31 according to Embodiment 1 of the present invention.

[Fig. 4] Fig. 4 illustrates an example of state transition between a normal configuration state and a special configuration state according to Embodiment 1 of the present invention.

[Fig. 5] Fig. 5 is a flowchart showing an operation example of the remote controller 31 according to Embodiment 1 of the present invention.

[Fig. 6] Fig. 6 illustrates an example of display of digital objects 211 in a normal configuration state for cooling according to Embodiment 1 of the present invention.

[Fig. 7] Fig. 7 illustrates an example of a room temperature determination index 530 according to Embodiment 1 of the present invention.

[Fig. 8] Fig. 8 illustrates an example of state transition between a normal configuration state and a special configuration state according to Embodiment 2 of the present invention.

[Fig. 9] Fig. 9 is a flowchart showing an operation example of the remote controller 31 according to Embodiment 2 of the present invention.

[Fig. 10] Fig. 10 illustrates an example of display of digital objects 251 in a special configuration state for a setting in cooling operation start according to Embodiment 3 of the present invention.

[Fig. 11] Fig. 11 illustrates an example of display of digital objects 261 in a special configuration state for a setting in heating operation start according to Embodiment 3 of the present invention.

[Fig. 12] Fig. 12 illustrates an example of display of digital objects 271 in a special configuration state for a setting in a cooling operation according to Embodiment 3 of the present invention.

[Fig. 13] Fig. 13 illustrates an example of display of digital objects 281 in a special configuration state for a setting in a heating operation according to Embodiment 3 of the present invention.

[Fig. 14] Fig. 14 illustrates an example of display of digital objects 291 in a special configuration state for a setting in cooling operation start according to Embodiment 4 of the present invention.

[Fig. 15] Fig. 15 illustrates an example of display of digital objects 311 in a special configuration state for a setting in heating operation start according to Embodiment 4 of the present invention.

[Fig. 16] Fig. 16 illustrates an example of display of digital objects 321 in a special configuration state for a setting in a cooling operation according to Embodiment 4 of the present invention.

[Fig. 17] Fig. 17 illustrates an example of display of digital objects 331 in a special configuration state for a setting in a heating operation according to Embodiment 4 of the present invention.

[Fig. 18] Fig. 18 illustrates an example of display of digital objects 341 in a special configuration state for a setting in cooling operation start according to Embodiment 5 of the present invention.

[Fig. 19] Fig. 19 illustrates an example of display of digital objects 351 in a special configuration state for a setting in heating operation start according to Embodiment 5 of the present invention.

[Fig. 20] Fig. 20 illustrates an example of display of digital objects 361 in a special configuration state for a setting in a cooling operation according to Embodiment 5 of the present invention.

[Fig. 21] Fig. 21 illustrates an example of display of digital objects 371 in a special configuration state for a setting in a heating operation according to Embodiment 5 of the present invention.

[Fig. 22] Fig. 22 illustrates an example of display of digital objects 381 in a special configuration state for a setting in cooling operation start according to Embodiment 6 of the present invention.

[Fig. 23] Fig. 23 illustrates an example of display of digital objects 391 in a special configuration state for a setting in heating operation start according to Embodiment 6 of the present invention.

[Fig. 24] Fig. 24 illustrates an example of display of digital objects 411 in a special configuration state for a setting in a cooling operation according to Embodiment 6 of the present invention.

[Fig. 25] Fig. 25 illustrates an example of display of digital objects 421 in a special configuration state for a setting in a heating operation according to Embodiment 6 of the present invention.

Description of Embodiments

[0011] Embodiments of the present invention will be described in detail with reference to the drawings. Steps describing programs for performing operations according to the embodiments of the present invention are processes that are performed on a time-series basis in the order described herein. However, the processes do not need to be performed on a time-series basis and may include processes that are performed in parallel or individually performed.

[0012] Functions described in the embodiments may be implemented by any one of hardware or software. That is, each block diagram described in the embodiments may be a block diagram of hardware or a functional block diagram of software. For example, each block diagram may be implemented by hardware such as a circuit device or by software executed on an arithmetic unit such as an unillustrated processor.

[0013] Blocks of block diagrams that will be referred to in the embodiments only need to have their functions performed, and do not need to be separated from one another in terms of configuration. In Embodiments 1 to 6, aspects that are not specifically described are assumed to be the same among Embodiments 1 to 6, and the same reference signs denote the same functions or components. Each of Embodiments 1 to 6 may be performed solely or in combination. In either case, advantages described later can be obtained. Each embodiment shows only one example of a specific setting, but the present invention is not limited to these examples.

[0014] In the embodiments, a system refers to an entire apparatus constituted by a plurality of devices. In the embodiments, a network refers to a mechanism in which at least two devices are connected to each other so that information can be transmitted to one device to the other. Devices that communicate with one another through the network may be independent devices or internal blocks constituting one device. In the embodiments, communication may be wireless communication or wire communication, of course, and may be communication as a combination of wireless communication and wire communication. For example, wireless communication may be performed in one section with wire communication being performed in another section. Alternatively, communication from one device to another may be performed in wire communication with communication from the other device to the one device being performed in wireless communication.

Embodiment 1

(Configuration of Embodiment 1)

[0015] Fig. 1 illustrates an example of a schematic configuration of an air-conditioning system 1 according to Embodiment 1 of the present invention. In Fig. 1, according to Embodiment 1 of the present invention, the content

displayed on an user interface 201 described later is designed depending on an operation expected from a surrounding environment or an operation history, thereby providing an optimum intuitive user interface 201 depending on an operating environment. This will be described in detail below.

[0016] As illustrated in Fig. 1, the air-conditioning system 1 includes an outdoor unit 11, an indoor unit 21 a, an indoor unit 21 b, an indoor unit 21 c, a remote controller 31 a, a remote controller 31 b, and a remote controller 31 c.

[0017] The outdoor unit 11 is connected to the indoor unit 21 a, the indoor unit 21 b, and the indoor unit 21 c through refrigerant pipes 43. The outdoor unit 11 is connected to the indoor unit 21 a, the indoor unit 21 b, and the indoor unit 21 c through transmission lines 41. The indoor unit 21 a is connected to the indoor unit 21 b and the remote controller 31 a through transmission lines 41. The indoor unit 21 c is connected to the remote controller 31 b and the remote controller 31 c through transmission lines 41.

[0018] The indoor unit 21 a, the indoor unit 21 b, and the remote controller 31 a are defined as a group #1, for example. The indoor unit 21 c, the remote controller 31 b, and the remote controller 31 c are defined as a group #3, for example. For example, in group #1, operations of the indoor unit 21 a and the indoor unit 21 b are controlled based on various signals transmitted from the remote controller 31 a, and the outdoor unit 11 is controlled accordingly. For example, in group #2, an operation of the indoor unit 21 c is controlled based on various signals transmitted from the remote controller 31 b or the remote controller 31 c, and the outdoor unit 11 is controlled accordingly. That is, the outdoor unit 11 is in cooperation with an operation of one of the indoor unit 21 a to the indoor unit 21 c, and a refrigeration cycle is formed as described later.

[0019] The indoor unit 21 a, the indoor unit 21 b, and the indoor unit 21 c will be collectively referred to as indoor units 21 unless otherwise specified. The remote controller 31 a, the remote controller 31 b, and the remote controller 31 c will be collectively referred to as remote controllers 31 unless otherwise specified.

[0020] The transmission lines 41 described above are an example in which a communication medium is wired. However, the present invention is not limited to this example. For example, the transmission lines 41 may use a wireless communication medium. The communication medium may be either wired or wireless, and a communication protocol thereof is not specifically limited. For example, communication may be performed between the outdoor unit 11 and the indoor unit 21 through a wired or wireless communication medium using a dedicated communication protocol or a general-purpose communication protocol.

[0021] For example, communication may be performed between the indoor unit 21 and the remote controller 31 through a wired or wireless communication me-

dium using a dedicated communication protocol. For example, communication may be performed between the indoor unit 21 and the remote controller 31 through a wired or wireless communication medium using a general-purpose communication protocol. Specifically, communication may be performed between the indoor unit 21 and the remote controller 31 through a wireless communication medium using a communication protocol defined according to a request for comments (RFC). In this case, the remote controller 31 does not need to be dedicated equipment for controlling the indoor unit 21, and may be virtual equipment virtually implemented as an application for smartphones or other devices as long as the equipment has functions described later.

[0022] As described above, when various instructions are issued from the remote controller 31 to the indoor unit 21, the indoor unit 21 operates in cooperation with the outdoor unit 11 based on the issued various instructions. For example, since the outdoor unit 11 and the indoor unit 21 are connected to each other through the refrigerant pipes 43, compression and expansion of refrigerant are alternately repeated, thereby forming a refrigeration cycle. Consequently, the indoor unit 21 conditions air in an air-conditioned space.

[0023] Specifically, the air-conditioning system 1 includes an unillustrated refrigerant circuit, and supplies conditioned air to an air-conditioned space in a cooling operation or a heating operation. The air-conditioning system 1 supplies cold air in the cooling operation, for example. The air-conditioning system 1 supplies hot air in the heating operation, for example. The unillustrated refrigerant circuit is charged with refrigerant. Thus, the refrigerant in the refrigerant circuit circulates in the refrigerant pipes 43, thereby forming a vapor compression refrigeration cycle.

[0024] More specifically, in the unillustrated refrigerant circuit, the outdoor unit 11 includes a compressor, an outdoor unit-side heat exchanger, an outdoor unit-side fan, an outdoor unit-side expansion valve, and a four-way valve (each not shown), for example. For example, in the unillustrated refrigerant circuit, the indoor unit 21 includes an indoor unit-side heat exchanger, an indoor unit-side fan, and an indoor unit-side expansion valve (each not shown). In the refrigerant circuit, the compressor, the four-way valve, the outdoor unit-side heat exchanger, the outdoor unit-side expansion valve, the indoor unit-side expansion valve, and the indoor unit-side heat exchanger are connected to one another through the refrigerant pipes 43.

[0025] The outdoor unit 11 controls the compressor, the four-way valve, the outdoor unit-side heat exchanger, the outdoor unit-side fan, and the outdoor unit-side expansion valve based on various instructions transmitted from the outside, such as various instructions transmitted from the remote controller 31 through the indoor unit 21.

[0026] For example, the outdoor unit 11 drives the compressor based on various instructions transmitted from the remote controller 31, compresses refrigerant

sucked into the compressor, and discharges the refrigerant under an optional pressure. The outdoor unit 11 actuates the four-way valve based on various instructions transmitted from the remote controller 31 and switches paths of the refrigerant pipes 43 to supply high-temperature high-pressure refrigerant discharged from the compressor to the outdoor unit-side heat exchanger and the indoor unit-side heat exchanger and switch an operation between a cooling operation and a heating operation. The outdoor unit 11 exchanges heat between refrigerant passing through the outdoor unit-side heat exchanger and air around the outdoor unit-side heat exchanger. The outdoor unit 11 drives the outdoor unit-side fan based on various instructions transmitted from the remote controller 31, and supplies air for heat exchange to the outdoor unit-side heat exchanger to promote heat exchange in the outdoor unit-side heat exchanger. The outdoor unit 11 adjusts an opening degree of the outdoor unit-side expansion valve based on various instructions transmitted from the remote controller 31 and controls a flow rate of refrigerant flowing in the refrigerant pipes 43.

[0027] The indoor unit 21 controls the indoor unit-side heat exchanger, the indoor unit-side fan, and the indoor unit-side expansion valve based on various instructions transmitted from the outside, such as various instructions transmitted from the remote controller 31 through the indoor unit 21. For example, the indoor unit 21 exchanges heat between refrigerant passing through the indoor unit-side heat exchanger and air around the indoor unit-side heat exchanger. The indoor unit 21 adjusts an opening degree of the indoor unit-side expansion valve based on various instructions transmitted from the remote controller 31 and controls a flow rate of refrigerant flowing in the refrigerant pipes 43.

[0028] Then, an example of addresses set in the outdoor unit 11 and the indoor unit 21 will be described. The addresses are set at values that do not overlap among devices to specify one device in a network among the outdoor unit 11, the indoor unit 21 a, the indoor unit 21 b, the indoor unit 21 c, the remote controller 31 a, the remote controller 31 b, and the remote controller 31 c.

[0029] For example, "051" is set as an address in the outdoor unit 11. In the indoor unit 21 a, "001" is set as an address. In the indoor unit 21 b, "002" is set as an address. In the indoor unit 21 c, "003" is set as an address. In the remote controller 31 a, "101" is set as an address. In the remote controller 31 b, "103" is set as an address. In the remote controller 31 c, "153" is set as an address.

[0030] Addresses set in the outdoor unit 11 are, for example, from "051" to "100" but is not limited to these values. Addresses set in the indoor unit 21 are, for example, from "001" to "050" but is not limited to these values. Addresses set in the remote controller 31 are, for example, "101" to "200" but is not limited to these values.

[0031] Setting of the addresses may be performed by, for example, an unillustrated rotary switch or other devices. The numerical values of the addresses described

above are merely examples, and the present invention is not limited to these values. The numbers of the outdoor units 11, the indoor units 21, and the remote controllers 31 described above are merely examples, and the present invention is not limited to these numbers. For example, the air-conditioning system 1 may include one outdoor unit 11, one indoor unit 21, and one remote controller 31. The method for setting the addresses is an example, and the present invention is not limited to this method.

[0032] A configuration of the remote controller 31 will be described below with reference to Figs. 2 and 3. Fig. 2 illustrates an example of a schematic configuration of the remote controller 31 according to Embodiment 1 of the present invention. Fig. 3 illustrates an example of a detailed configuration of the remote controller 31 according to Embodiment 1 of the present invention. An apparatus including the outdoor unit 11 and the indoor unit 21 illustrated in Fig. 1 or Fig. 2 is assumed to be an air-conditioning apparatus.

[0033] As illustrated in Fig. 2, the indoor unit 21 and the outdoor unit 11 are connected to each other through the refrigerant pipe 43. Each of the outdoor unit 11, the indoor unit 21, and the remote controller 31 transmits and receives various signals through the transmission lines 41. The indoor unit 21 and the remote controller 31 are connected to each other through a power supply line 42. The indoor unit 21 supplies power to the remote controller 31 through the power supply line 42. Thus, the remote controller 31 is actuated by receiving power from the indoor unit 21.

[0034] As described above, through the transmission lines 41, the indoor unit 21 and the remote controller 31 also are assumed to perform wire communication, but the present invention is not limited to this example. That is, the transmission lines 41 only needs to be a communication medium. Since the transmission lines 41 may be a wireless medium, the indoor unit 21 and the remote controller 31 may perform wireless communication.

[0035] The power supply line 42 described above is assumed to be connected by wires, but the present invention is not limited to this example. For example, the power transmission medium of the indoor unit 21 may be air. In this case, the indoor unit 21 wirelessly supplies electric power to the remote controller 31. That is, the indoor unit 21 may supply electric power to the remote controller 31 by wireless power supply. The type of the wireless power supply is not specifically limited, and may be electromagnetic induction, resonant coupling, or electric field coupling, for example.

[0036] In the example described above, the indoor unit 21 is used as a power supply source from the outside to the remote controller 31. However, the present invention is not limited to this example. Electric power may be directly supplied to the remote controller 31 from an unillustrated external power supply, such as a commercial power supply.

[0037] In the example described above, electric power

is supplied to the remote controller 31 from the outside. However, the present invention is not limited to this example. For example, the remote controller 31 may be equipped with a secondary battery or a primary battery so that the remote controller 31 can perform various functions even without external power supply. The secondary battery is not specifically limited, and may be a lithium ion secondary battery, for example. The primary battery is not specifically limited, and may be a lithium battery, for example.

[0038] The remote controller 31 includes a communication unit 51, a power supply unit 53, a touch panel display 55, a storage unit 65, a sensor module 67, and a control processor 69, for example. The touch panel display 55 is constituted by an operation input unit 61 and a display unit 63. The operation input unit 61 is a unit serving as the user interface 201 described later and configured to receive the type of an operation from the outside, and is variously configured based on an operation principle of a touch panel.

[0039] For example, the touch panel is assumed to be constituted by a matrix switch. In this case, the touch panel is constituted by a plane of switches composed of electrodes arranged in columns and rows with regular intervals in a lattice pattern. Thus, two upper and lower layers of electrodes are each formed. When an operator depresses a part of the plane, the two upper and lower layers of electrodes come into contact with each other. Consequently, a closed circuit is formed so that position information regarding a vertical direction and a lateral direction is detected. That is, the operation input unit 61 is constituted by the two upper and lower layers of electrodes described above.

[0040] As another configuration, it is assumed that the touch panel is of a resistive film type, for example. In this case, the touch panel is constituted by metal thin films in which electrodes formed in two upper and lower layers are transparent electrodes. The metal thin films have a predetermined resistance, and a voltage is applied to one of the two opposed metal thin films. In this state, when an operator depresses a part of the first plane, a voltage corresponding to the location of the operation is generated on the second plane. When the generated voltage is detected, the location of the operation is detected as an analog quantity. That is, the operation input unit 61 is constituted by the metal thin films described above.

[0041] As still another configuration, it is assumed that the touch panel is of a surface acoustic wave type, for example. In this case, in the touch panel, piezoelectric elements are provided at a plurality of corners on a substrate such as a rigid glass. When a part of the plane of the piezoelectric elements is depressed, oscillatory waves are generated. At this time, if a finger of the operator is in contact with the plane, this contact point becomes a fixed point at which the oscillatory waves are absorbed and some of the oscillatory waves are bounced. Such bounced oscillatory waves are detected due to generation of a voltage of the piezoelectric ele-

ments. Thus, if reflection times are measured at various locations on the plane, information on the location with which the operator is in contact is detected. That is, the operation input unit 61 is constituted by the piezoelectric elements described above.

[0042] As yet another configuration, it is assumed that the touch panel is of an infrared ray type, for example. In this case, in the touch panel, an infrared ray LED is used as a light source, infrared light emitted from the infrared ray LED is shut off, and a light-receiving element detects a shut-off location so that information on the location with which the operator is in contact is detected. That is, the operation input unit 61 is constituted by the infrared ray LED and the light-receiving element described above.

[0043] As yet another configuration, it is assumed that the touch panel is of a capacitance type, for example. In this case, the touch panel includes a drive electrode, a reception electrode, and a dielectric covering the reception electrode. An electric field is generated from the drive electrode, and a change in capacitance between a contact end, such as a finger, of an operator and the dielectric is obtained by the reception electrode so that information on the location with which the operator is in contact is detected. That is, the operation input unit 61 is constituted by the drive electrode and the reception electrode.

[0044] As yet another configuration, it is assumed that the touch panel is of an electromagnetic induction type, for example. In this case, in the touch panel, a magnetic field detection sensor is located in a lower portion of a screen, and electromagnetic induction occurs at a location with which a device generating a magnetic field, such as an electronic pen, is in contact with the screen. Consequently, a contact location of the electronic pen used by the operator is detected. That is, the operation input unit 61 is constituted by the magnetic field detection sensor.

[0045] In the above description, the example of the operation input unit 61 has been described. However, the present invention is not limited to this example. For example, in a case where an unillustrated reproducing device plays back a digital object 211 described later as a stereoscopic vision or a stereoscopic image in a three-dimensional space, the unillustrated image pickup device may capture a position of a physical object such as a finger operating the digital object 211. In this case, the operation input unit 61 is an unillustrated image pickup device.

[0046] That is, the operation input unit 61 only needs to be the user interface 201 that receives a control instruction associated with an operation by a user as described later, and an embodiment thereof is not specifically limited.

[0047] The display unit 63 is a device serving as the user interface 201 described later and configured to output display content to the outside. The display unit 63 is a liquid crystal display, for example. However, the display unit 63 is not limited to the liquid crystal display. For ex-

ample, the display unit 63 may be an organic electroluminescence (EL) display. In this case, the user interface 201 described later is constituted by the organic EL display and a touch panel. The display unit 63, for example, may be a reproduced image of a stereoscopic vision or a stereoscopic image obtained as a hologram. In this case, the display unit 63 only needs to be constituted by, for example, a reproducing device using a laser irradiation device and a hologram and an image pickup device that detects a location at which a user touches a reproduced image.

[0048] In short, the display unit 63 only needs to be the user interface 201 that displays a target of an operation by a user or an operation result, for example, as described later, and an embodiment thereof is not specifically limited.

[0049] The power supply unit 53 converts supplied electric power to a working power in the remote controller 31. For example, in the case of supplying alternating current (AC) power, the power supply unit 53 converts the AC power to a direct current (DC) power in a range usable in the remote controller 31. In the case of supplying DC power, the power supply unit 53 converts the DC power to DC power in a range usable in the remote controller 31. In the case of supplying power from a secondary battery or a primary battery, the power supply unit 53 only needs to be configured to have a control function for stably obtaining electric power from the secondary battery or the primary battery.

[0050] The communication unit 51 modulates various signals transmitted from the control processor 69 to transmission signals, and transmits the modulated transmission signals to the indoor unit 21 through the transmission lines 41. The communication unit 51 demodulates various signals transmitted from the indoor unit 21 to reception signals, and transmits the demodulated reception signals to the control processor 69.

[0051] The storage unit 65 temporarily stores data using a rewritable random access memory (RAM). The storage unit 65 stores, various data items associated with various modules constituted by various processing programs, various parameters, and types of operations of, for example, the digital objects 211 described later, by using a read only memory (ROM). That is, the storage unit 65 is constituted by a RAM and a ROM, for example. Detailed examples of the various data items stored in the storage unit 65 will be described with reference to Fig. 3.

[0052] The sensor module 67 detects a surrounding environment of the remote controller 31, for example. The sensor module 67 includes, for example, a human sensor module 81, a temperature sensor module 83, a humidity sensor module 85, and an illuminance sensor module 87. The human sensor module 81 detects the presence of a person. The temperature sensor module 83 detects a room temperature. The humidity sensor module 85 detects humidity in a room. The illuminance sensor module 87 detects an illuminance in a room.

[0053] The sensor module 67 may include only a tem-

perature sensor module 83. The sensor module 67 may be constituted by the human sensor module 81 and the temperature sensor module 83. As an embodiment of the configuration of the sensor module 67, the temperature sensor module 83 and the humidity sensor module 85 may be integrated. A detailed example of the sensor module 67 will be described later with reference to Fig. 3.

[0054] The control processor 69 is, for example, a processor that reads various data items or other information from the storage unit 65, and processes the various readout data or other information based on a frequency of an unillustrated oscillator configured to transmit a constant clock. The control processor 69 processes various signals transmitted from the operation input unit 61. The control processor 69 processes various signals to be output by the display unit 63. The control processor 69 processes various signals transmitted from the sensor module 67. The control processor 69 stores various data items in the storage unit 65. The control processor 69 transmits various signals to the communication unit 51. The various modules virtually implemented when the control processor 69 processes various signals will be described with reference to Fig. 3.

[0055] With reference to Fig. 3, examples of detailed configurations of the control processor 69, the storage unit 65, and the sensor module 67 will be described. First, an example of a detailed configuration of the control processor 69 will be described. As illustrated in Fig. 3, in the control processor 69, an operation status determining module 101, a surrounding environment determining module 102, an operation history determining module 103, and an image processing module 105, for example, are virtually configured depending on execution of various processes.

[0056] The operation status determining module 101 determines whether the indoor unit 21 operates or not based on various information items transmitted from the communication unit 51. The operation status determining module 101 may determine an operation status of the indoor unit 21 based on various information items stored in the storage unit 65, such as various information items stored in an operation status data storage region 181 as described later.

[0057] The surrounding environment determining module 102 determines a surrounding environment of the remote controller 31. The surrounding environment determining module 102 includes a presence determining module 111, a temperature determining module 112, a humidity determining module 113, and an illuminance determining module 114, for example. The presence determining module 111 determines whether a person is present around the remote controller 31 or not, based on various signals transmitted from the human sensor module 81.

[0058] The temperature determining module 112 determines a temperature around the remote controller 31 based on various signals transmitted from the temperature sensor module 83 and a predetermined threshold

value of temperature. The predetermined threshold value of temperature, which will be specifically described later, includes a plurality of threshold values, such as a cooling determination temperature to be used by the remote controller 31 for assuming that a cooling operation is performed and a heating determination temperature to be used by the remote controller 31 for assuming that a heating operation is performed.

[0059] The humidity determining module 113 determines humidity around the remote controller 31 based on various signals transmitted from the humidity sensor module 85 and a predetermined threshold value of humidity. The illuminance sensor module 87 determines an illuminance around the remote controller 31 based on various signals transmitted from the illuminance sensor 161 and a predetermined threshold value of illuminance.

[0060] In short, the surrounding environment determining module 102 uses an output of the sensor module 67, and performs determination corresponding to sensors provided in the sensor module 67. For example, in a case where the sensor module 67 includes a wind speed sensor, an airflow rate sensor, or other sensors, the surrounding environment determining module 102 performs determination corresponding to these sensors. In a case where the sensor module 67 includes a sensor for measuring brain waves of a human, the surrounding environment determining module 102 only needs to include a computing module for associating the brain waves of a human with an action pattern associated with the brain waves of a human.

[0061] The surrounding environment determining module 102 may determine the surrounding environment with reference to various information items stored in the storage unit 65 such as various information items stored in a surrounding environment data storage region 182 as described later, as well as the various signals directly transmitted from the sensor module 67.

[0062] The operation history determining module 103 determines an operation history of the remote controller 31. The operation history determining module 103 includes an operation mode determining module 116, for example. The operation mode determining module 116 determines a last performed operation mode with reference to a past operation history, based on various information items stored in the storage unit 65, such as various information items stored in an operation history data storage region 184 as described later.

[0063] The image processing module 105 transmits digital object data as data for producing a digital image to the display unit 63 and the storage unit 65. The image processing module 105 determines various states of the digital objects 211 based on digital object data stored in the storage unit 65. For example, the image processing module 105 is constituted by an object state determining module 118 and an object drawing module 119, for example.

[0064] The object state determining module 118 determines various states of the digital objects 211 based on

various information items stored in the operation history data storage region 184 allocated to the storage unit 65 described later, for example. Based on various information items held in a default data storage region 183 and the operation history data storage region 184 allocated to the storage unit 65 as described later, the object drawing module 119 generates digital object data, transmits the generated result to the display unit 63, and causes the display unit 63 to display a digital image, for example.

[0065] An example of a detailed configuration of the storage unit 65 will be described below. Storage regions such as the operation status data storage region 181, the surrounding environment data storage region 182, the default data storage region 183, and the operation history data storage region 184 are allocated to the storage unit 65.

[0066] The operation status data storage region 181 stores, for example, operation status data of the indoor unit 21 among various signals transmitted from the communication unit 51. Here, the operation status data storage region 181 may be a ring buffer as a logical configuration that holds transmitted various signals on a time-series basis and, when there become no regions to hold signals, restarts holding signals from a region holding a signal first.

[0067] The surrounding environment data storage region 182 stores various signals transmitted from the sensor module 67 or various signals transmitted from the surrounding environment determining module 102, for example. Here, the surrounding environment data storage region 182 may be a ring buffer as a logical configuration that holds transmitted various signals on a time-series basis and, when there become no regions to hold signals, restarts holding signals from a region holding a signal first.

[0068] For example, determination results of the presence of a person transmitted from the human sensor module 81 are stored in the surrounding environment data storage region 182 on a time-series basis for each presence determination period of the human sensor module 81. The person presence determination results transmitted from the human sensor module 81 are sequentially stored on a time-series basis so that the remote controller 31 can refer to the person presence determination results based on a current detection result, and also refer to the person presence determination results based on an immediately preceding detection result, such as a result of 30 seconds before.

[0069] The presence determination periods of the human sensor module 81 may be finely defined so that the immediately preceding presence determination can be performed in a shorter time. In a case where it is expected that persons less frequently come and go in a period such as nighttime, the presence determination periods of the human sensor module 81 may be set relatively longer.

[0070] The default data storage region 183 stores digital object data with a default setting, for example. The digital object data is composed of object shape data, ob-

ject location data, object size data, object type data, and object color space data, for example.

[0071] The object shape data includes various information items specifying a shape of digital object data to be displayed through the display unit 63, for example. Specifically, the object shape data includes data concerning normal display image information and data concerning highlighted display image information.

[0072] The object location data includes various information items specifying a location of digital object data to be displayed through the display unit 63, for example. The object size data includes various information items specifying a size of digital object data to be displayed through the display unit 63, for example. The object type data includes various information items specifying a type of digital object data, for example.

[0073] The object color space data includes various information items specifying a color of digital object data to be displayed through the display unit 63, for example. Specifically, the object color space data is composed of hue data, saturation data, lightness data, and luminance data. Among these data items, the lightness data and the luminance data are selected depending on an algorithm for producing a color of digital object data. For example, in a case where a hue saturation value (HSV) color space is used for color production, the hue data, the saturation data, and the lightness data are applied. In a case where a hue saturation lightness (HLS) color space is used for color production, for example, the hue data, the saturation data, and the luminance data are applied.

[0074] The digital object data described above is merely an example, and the present invention is not limited to this example. As the digital object data described above, for example, the object shape data, the object location data, the object size data, and the object color space data may be associated with each object type data. In the logical configuration, the object shape data, the object location data, the object size data, the object type data, and the object color space data, for example, may be associated with one another so that these data items are referred to by one another.

[0075] The operation history data storage region 184 stores operation mode data, operation mode relation data, and digital object data, for example. The operation mode data is associated with an operation mode among, for example, the digital objects 211 operated by the operation input unit 61, for example, and is data associated with a specified operation mode. The operation mode relation data is, for example, various data items related to a specified operation mode. For example, in a case where a cooling operation is specified as an operation mode, the operation mode relation data is various data items on settings in the cooling operation. Similarly, in a case where a heating operation is specified as an operation mode, the operation mode relation data is various data items on settings in the heating operation.

[0076] Digital object data stored in the operation history

data storage region 184 is composed of object state data, object shape data, object location data, object size data, object type data, and object color space data, for example. In the object state data, various drawing histories of digital object data are held on a time-series basis. The object shape data, the object location data, the object size data, the object type data, and the object color space data are data items similar to those described above, and an immediately preceding state is held. The operation history data described above is merely an example, and the present invention is not limited to this example.

[0077] An example of a detailed configuration of the sensor module 67 will be described below. The human sensor module 81 includes a pyroelectric infrared ray sensor 131, a signal processor 132, and a human detector 133. The pyroelectric infrared ray sensor 131 is constituted by, for example, a Fresnel lens, a pyroelectric element, and a junction field effect transistor. The pyroelectric infrared ray sensor 131 causes infrared rays collected by the Fresnel lens to be supplied onto the pyroelectric element and changes a gate voltage of the junction field effect transistor depending on an output of the pyroelectric element so that an output voltage of the junction field effect transistor changes and the resulting output voltage is supplied as an output of the pyroelectric infrared ray sensor 131 to the signal processor 132.

[0078] The number of pyroelectric elements is not specifically limited. For example, the pyroelectric infrared ray sensor 131 may include only one pyroelectric element. Alternatively, a plurality of pyroelectric elements may be arranged in the pyroelectric infrared ray sensor 131.

[0079] The signal processor 132 is constituted by a low pass filter (LPF), an amplifier, and an A/D converter, reduces noise of an output voltage supplied from the pyroelectric infrared ray sensor 131, converts the resulting output voltage to a digital signal, and transmits the digital signal to the human detector 133. The LPF removes power supply noise, for example, from the minute output voltage of the pyroelectric infrared ray sensor 131 and transmits the resulting signal as an analog signal to the amplifier. The amplifier amplifies the analog signal and transmits the analog signal to the A/D converter. The A/D converter converts the amplified analog signal to a digital signal in a predetermined sampling period, and transmits the digital signal to the human detector 133. The human detector 133 is constituted by a threshold value setting unit and a comparator. The human detector 133 uses the comparator to perform a comparison to determine whether the digital value exceeds a threshold value set by the threshold value setting unit or not, and transmits a comparison result to the control processor 69.

[0080] The temperature sensor module 83 includes a temperature sensor 141 and a signal processor 142. The temperature sensor 141 is constituted by a plurality of thermistors, for example. The temperature sensor 141 has its resistance vary depending on a change in temperature, and transmits this variation of the resistance as an analog signal to the signal processor 142. The sig-

nal processor 142 is constituted by an LPF, an amplifier, and an A/D converter. The LPF removes a noise component of the analog signal transmitted from the temperature sensor 141, and transmits the resulting signal to the amplifier. The amplifier amplifies the analog signal and transmits the amplified analog signal to the A/D converter. The A/D converter converts the amplified analog signal to a digital signal in a predetermined sampling period, and transmits the digital signal to the control processor 69.

[0081] The humidity sensor module 85 includes a humidity sensor 151 and a signal processor 152. The humidity sensor 151 is constituted by a plurality of sets of capacitance sensors each including an upper electrode, a lower electrode, and a high molecule moisture sensitive material, for example. In the humidity sensor 151, a capacitance of the high molecule moisture sensitive material disposed between the upper electrode and the lower electrode varies with a humidity change, and this variation of capacitance is transmitted as an analog signal to the signal processor 152. The signal processor 152 is constituted by an LPF, an amplifier, and an A/D converter. The LPF removes a noise component of the analog signal transmitted from the humidity sensor 151, and transmits the resulting signal to the amplifier. The amplifier amplifies the analog signal and transmits the amplified analog signal to the A/D converter. The A/D converter converts the amplified analog signal to a digital signal in a predetermined sampling period, and transmits the digital signal to the control processor 69.

[0082] The illuminance sensor module 87 includes an illuminance sensor 161 and a signal processor 162. The illuminance sensor 161 is constituted by a plurality of photodiodes, for example. The illuminance sensor 161 transmits detection results of the photodiodes as an analog signal to the signal processor 162. The signal processor 162 is constituted by an LPF, an amplifier, and an A/D converter. The LPF removes a noise component of the analog signal transmitted from the illuminance sensor 161, and transmits the resulting signal to the amplifier. The amplifier amplifies the analog signal and transmits the amplified analog signal to the A/D converter. The A/D converter converts the amplified analog signal to a digital signal in a predetermined sampling period, and transmits the digital signal to the control processor 69.

[0083] The configurations described above are merely examples, and the present invention is not limited to these examples. For example, the control processor 69 only needs to perform various computations, and a functional configuration thereof is not specifically limited. For example, regions allocated in the storage unit 65 are merely examples, and the control processor 69 only needs to refer to a region from which data is obtained and a region in which data is stored. The sensor module 67 may have a configuration simpler than that described above.

[0084] Specifically, the human sensor module 81 may be constituted only by the pyroelectric infrared ray sensor

131, and does not need to include the other components. In this case, a process corresponding to the signal processor 132 can be performed by providing an interface between the sensor module 67 and the control processor 69. A process corresponding to the human detector 133 only needs to be performed by the control processor 69. Similarly, the temperature sensor module 83 may be constituted only by the temperature sensor 141, the humidity sensor module 85 may be constituted only by the humidity sensor 151, and the illuminance sensor module 87 may be constituted only by the illuminance sensor 161.

(Operation in Embodiment 1)

[0085] Transition of a configuration state of, for example, the digital object 211 to be displayed by the display unit 63 of the remote controller 31 will be described. Fig. 4 illustrates an example of state transition between a normal configuration state and a special configuration state according to Embodiment 1 of the present invention. As illustrated in Fig. 4, the digital object 211, for example, is assumed to be in the normal configuration state and the special configuration state. The normal configuration state is a configuration in a case where digital object data is drawn in a default setting. The special configuration state is a configuration in which display content of the user interface 201 is drawn depending on the type of an operation expected from a surrounding environment or an operation history. For example, the following state transition is performed.

(Normal Configuration State)

[0086] If no special configuration mode instruction is issued (step S11), the control processor 69 maintains the normal configuration state. If a special configuration mode instruction is issued (step S12), the control processor 69 causes the state to transition to the special configuration state.

(Special Configuration State)

[0087] If a predetermined time has not elapsed (step S13), the control processor 69 maintains the special configuration state. If a special configuration display instruction is issued (step S13), the control processor 69 maintains the special configuration state. If the predetermined time has elapsed (step S14), the control processor 69 causes the state to transition to the normal configuration state. If no special configuration display instruction is not issued (step S14), the control processor 69 causes the state to transition to the normal configuration state.

[0088] An example of operation of a digital object display process will be described on the premise of the state transition described above. Fig. 5 is a flowchart showing an operation example of the remote controller 31 according to Embodiment 1 of the present invention.

[0089] Processes in steps S23 to S25 are temperature

determination processes in which the digital objects 211, for example, are displayed depending on a surrounding environment. Processes in steps S27 to S29 are operation history determination processes in which the digital objects 211, for example, are displayed depending on an operation history. That is, operations described with reference to Fig. 5 are processes in which the digital objects 211, for example, are displayed depending on the surrounding environment or the operation history. As triggers for transitioning to processes depending on the surrounding environment or the operation history, the presence/absence of a special configuration mode instruction and an operation status of the indoor unit 21, for example, are used.

(Step S21)

[0090] The remote controller 31 determines whether a special configuration mode instruction is issued or not. If the special configuration mode instruction is issued, the remote controller 31 proceeds to step S22. On the other hand, if no special configuration mode instruction is issued, the remote controller 31 returns to step S21.

[0091] The special configuration mode instruction may be an instruction transmitted from an external terminal such as a smartphone. In the case where a user is assumed to wish to start air-conditioning at 7 p.m., for example, the user issues a special configuration mode instruction to the remote controller 31 with a smartphone or other devices so that the user can operate the digital object 211, for example, displayed in the special configuration mode after having entered a room provided with the remote controller 31. If an application for implementing a virtual environment of the remote controller 31 is installed in the smartphone or other devices, the digital object 211 supposed to be displayed on the remote controller 31, for example, can be displayed on the smartphone or other devices.

[0092] For example, as the special configuration mode instruction, the special configuration mode may be instructed based on information such as various preset time information items that have been previously set. For example, the remote controller 31 may transition to the special configuration mode based on a preset action history or a preset schedule of a person, for example. Specifically, in a case where it is determined based on, for example, an action history or a schedule of a person that a user uses a room to be air-conditioned from 9 a.m., the remote controller 31 may transition to the special configuration mode at 9 a.m.

[0093] For example, the special configuration mode instruction may depend on a person presence determination result. For example, the remote controller 31 may transition to a state in which the special configuration mode instruction is issued when the person presence determination result changes from absent to present. Such a case of using the person presence determination result will be described later with reference to Figs. 8 and

9 in Embodiment 2.

(Step S22)

5 **[0094]** The remote controller 31 determines whether the indoor unit 21 operates or not. If the indoor unit 21 does not operate, the remote controller 31 proceeds to step S23. On the other hand, if the indoor unit 21 operates, the remote controller 31 proceeds to step S27.

10 **[0095]** The state in which the indoor unit 21 does not operate herein includes not only a state in which a power supply to the indoor unit 21 is shut off but also a state in which the indoor unit 21 is on standby for operation. For example, the indoor unit 21 and the outdoor unit 11 may perform refrigerant stagnation operation. On the other hand, the state in which the indoor unit 21 operates is a state in which the outdoor unit 11 operates with operation of the indoor unit 21 and a refrigeration cycle is formed in the indoor unit 21 and the outdoor unit 11, and is assumed to be a state in which air-conditioning is performed.

(Step S23)

25 **[0096]** The remote controller 31 determines a range of a room temperature. If the room temperature is in the range from a heating determination temperature to cooling determination temperature, both inclusive, the remote controller 31 proceeds to step S30. If the room temperature is lower than the heating determination temperature, the remote controller 31 proceeds to step S24. If the room temperature is higher than the cooling determination temperature, the remote controller 31 proceeds to step S25.

(Step S24)

30 **[0097]** The remote controller 31 displays the digital object 211 associated with a setting in heating operation start, and transitions to step S26.

(Step S25)

35 **[0098]** The remote controller 31 displays the digital object 211 associated with a setting in cooling operation start, and transitions to step S26.

(Step S26)

40 **[0099]** The remote controller 31 determines whether a predetermined time has elapsed or not. If the predetermined time has elapsed, the remote controller 31 finishes the process. On the other hand, if the predetermined time has not elapsed, the remote controller 31 returns to step S22. Here, the predetermined time is, for example, 5 minutes, but the present invention is not limited to this time. That is, the remote controller 31 only needs to transition from the special configuration mode to the normal con-

figuration mode if a predetermined time in which a user is assumed to use the remote controller 31 has elapsed.

(Step S27)

[0100] The remote controller 31 determines the type of an operation mode. If the operation mode is neither cooling nor heating, the remote controller 31 proceeds to step S30. If the operation mode is heating, the remote controller 31 proceeds to step S28. If the operation mode is cooling, the remote controller 31 proceeds to step S29.

(Step S28)

[0101] The remote controller 31 displays the digital object 211 associated with a setting in the heating operation, and proceeds to step S26.

(Step S29)

[0102] The remote controller 31 displays the digital object 211 associated with a setting in the cooling operation, and proceeds to step S26.

(Step S30)

[0103] The remote controller 31 displays the digital object 211 associated with a normal configuration, and proceeds to step S26.

[0104] With reference to the operation example described above, an example of operation of the remote controller 31 will be described. Fig. 6 illustrates an example of display of the digital objects 211 in a normal configuration state for cooling according to Embodiment 1 of the present invention. The remote controller 31 displays the digital object 211 as the user interface 201. Thus, in a case where the digital object 211 displayed on the user interface 201 is operated, an operation associated with the specified digital object 211 is performed. Here, the user interface 201 is constituted by a liquid crystal display serving as the display unit 63 and a touch panel serving as the operation input unit 61, for example.

[0105] Here, the digital object 211 refers to one of digital objects 211 a to 211 g. The digital object 211 a is drawn as an inverted triangle button, for example, and is used for transmitting a control instruction for reducing a set temperature to the control processor 69 by an operation such as depression of the button. The digital object 211 b is drawn as an upright triangle button, for example, and is used for transmitting a control instruction for increasing the set temperature to the control processor 69 by an operation such as depression of the button.

[0106] The digital object 211 c is drawn as a left-facing button, for example, and is used for transmitting a control instruction for calling a virtual image hidden to the left of the screen to the control processor 69 by an operation such as depression of the button. The digital object 211 d is drawn as a button indicating a sign "OPERATION,"

for example, and is used for transmitting a control instruction for performing an operation to the control processor 69 by an operation such as depression of the button. The digital object 211 e is drawn as a button indicating a sign "COOLING MODE," for example, and is used for transmitting a control instruction for displaying a setting associated with a cooling mode to the control processor 69 by an operation such as depression of the button.

[0107] The digital object 211 f is drawn as a button indicating a sign "MENU," for example, and is used for transmitting a control instruction for displaying a setting associated with a menu to the control processor 69 by an operation such as depression of the button. The digital object 211 g is drawn as a right-facing button, for example, and is used for transmitting a control instruction for calling a virtual image hidden to the right of the screen to the control processor 69 by an operation such as depression of the button.

[0108] The display configurations are merely examples, and the present invention is not limited to these examples. For example, the numbers, sizes, colors, and locations, for example, of buttons drawn as the digital objects 211 do not need to be uniform, and may be suitably changed depending on the situation. For example, as described above, in a case where the control processor 69 causes the display unit 63 to display the digital object 211 associated with a setting in the heating operation start, the control processor 69 causes the display unit 63 to redisplay the digital object 211 associated with a setting in the heating operation start to change the display example illustrated in Fig. 6 to a setting at the heating operation start. For example, as described above, in a case where the control processor 69 causes the display unit 63 to display the digital object 211 associated with a setting in the cooling operation start, the control processor 69 causes the display unit 63 to redisplay the digital object 211 associated with a setting in the cooling operation start to change the display example illustrated in Fig. 6 to a setting in the cooling operation start.

[0109] For example, as described above, in a case where the control processor 69 causes the display unit 63 to display the digital object 211 associated with a setting in the heating operation, the control processor 69 causes the display unit 63 to redisplay the digital object 211 associated with a setting in the heating operation to change the display example illustrated in Fig. 6 to a setting in the heating operation. For example, as described above, in a case where the control processor 69 causes the display unit 63 to display the digital object 211 associated with a setting in the cooling operation, the control processor 69 causes the display unit 63 to redisplay the digital object 211 associated with a setting in the cooling operation to change the display example illustrated in Fig. 6 to a setting in the cooling operation.

[0110] The temperature determination process described with reference to Fig. 5 will be specifically described below with reference to Fig. 7. Fig. 7 illustrates an example of a room temperature determination index

530 according to Embodiment 1 of the present invention. As illustrated in Fig. 7, the room temperature determination index 530 is an index for determining a room temperature. In the room temperature determination index 530, a temperature range for use in determining a room temperature is divided into a first temperature range, a second temperature range, and a third temperature range by defining a cooling determination temperature and a heating determination temperature. The first temperature range corresponds to a temperature range in which the digital object 211 associated with a cooling mode operation start is displayed, for example. The second temperature range corresponds to a temperature range in which the digital object 211 currently displayed is maintained, for example. The third temperature range corresponds to a temperature range in which the digital object 211 associated with heating mode operation start is displayed, for example.

[0111] The cooling determination temperature and the heating determination temperature will be described. First, the cooling determination temperature is a cooling setting temperature set through the user interface 201 when the operation mode is a cooling mode, for example. The cooling determination temperature may be a cooling setting temperature transmitted from a smartphone or other devices. The cooling determination temperature may be a cooling setting temperature previously set based on an operation schedule, for example. Next, the heating determination temperature is a heating setting temperature set through the user interface 201 when the operation mode is a heating mode, for example. The heating determination temperature may be a heating setting temperature transmitted from a smartphone or other devices. The heating determination temperature may be a heating setting temperature previously set based on an operation schedule, for example.

[0112] An example of comparison between the room temperature and either the cooling determination temperature or the heating determination temperature will be described. For example, in the case of a room temperature determination example 531 a, the room temperature exceeds the cooling determination temperature, and thus, this example belongs to the first temperature range. In this case, since the room temperature is in the temperature range in which the digital object 211 associated with the cooling mode operation start is displayed, the remote controller 31 displays the digital object 211 associated with a setting in the cooling operation start. In the case of a room temperature determination example 531 b, the room temperature is lower than the heating determination temperature, and thus, this example belongs to the third temperature range. In this case, since the room temperature is in the temperature range in which the digital object 211 associated with the heating mode operation start is displayed, the remote controller 31 displays the digital object 211 associated with a setting in the heating operation start. In the case of a room temperature determination example 531 c, the room temper-

ature is between the cooling determination temperature and the heating determination temperature, and thus, this example belongs to the second temperature range. In this case, since the room temperature is in the temperature range in which the digital object 211 currently displayed is maintained, the remote controller 31 displays the digital object 211 associated with the normal configuration.

[0113] The cooling determination temperature may be lower than the heating determination temperature. The heating determination temperature may exceed the cooling determination temperature. Any one of the cooling determination temperature or the heating determination temperature may be set.

[0114] In the foregoing description, the remote controller 31 determines whether the operation status of the indoor unit 21 is cooling or heating based on the operation history of the operation mode. However, the present invention is not limited to this example. For example, the remote controller 31 may determine whether the operation status of the indoor unit 21 is cooling or heating based on an operation history except the operation mode. Specifically, in a case where a set temperature that has been immediately previously input belongs to the first temperature range, the remote controller 31 may determine that the indoor unit 21 performs a cooling operation to proceed to step S29. Similarly, in a case where the set temperature that has been immediately previously input belongs to the third temperature range, the remote controller 31 may determine that the indoor unit 21 performs a heating operation to proceed to step S28. Similarly, in a case where the set temperature that has been immediately previously input belongs to the second temperature range, the remote controller 31 may determine that the indoor unit 21 performs an operation except the cooling operation and the heating operation to proceed to step S30.

[0115] In the foregoing description, operations are performed based on the room temperature. However, the present invention is not limited to this example. The operations may be performed based on a room humidity, for example. In this case, a comparison process only needs to be performed between the room humidity and a preset humidity threshold value. Alternatively, the operation may be performed based on a room illuminance, for example. In this case, a comparison process only needs to be performed between the room illuminance and a preset illuminance threshold value. The operation may be also performed based on an image pickup result of surroundings of the remote controller 31. For example, in a case where a plurality of persons are detected from an image pickup result, the number of persons and clothes of the persons are obtained from, for example, an algorithm for recognizing images of persons. If the obtained number of persons is greater than or equal to a threshold value and the persons are dressed in summer clothes, the remote controller 31 displays the digital object 211 associated with the cooling mode operation start.

Similarly, in a case where a plurality of persons are detected from the image pickup result, the number of persons and clothes of the persons are obtained from, for example, an algorithm for recognizing images of persons, if the obtained number of persons is greater than or equal to a threshold value and the persons are dressed in winter clothes, the remote controller 31 displays the digital object 211 associated with the heating mode operation start.

(Advantages of Embodiment 1)

[0116] As described above, in a case where the indoor unit 21 does not operate, the remote controller 31 determines the surrounding environment such as the room temperature, and constitutes display content of the user interface 201 depending on a type of an operation expected from a determination result. In a case where the indoor unit 21 operates, the remote controller 31 determines the operation history such as the operation mode, and constitutes display content of the user interface 201 depending on a type of an operation expected from a determination result. Thus, by constituting the display content of the user interface 201 depending on the type of the operation expected from the surrounding environment or the operation history, the optimum intuitive user interface 201 can be provided depending on an operating environment.

[0117] As described above, in Embodiment 1, there is provided a remote controller 31 configured to control an air-conditioning apparatus including an outdoor unit 11 and an indoor unit 21, and the remote controller 31 includes a storage unit 65 configured to store data of digital objects 211 of different types, a touch panel display 55 including a display unit 63 configured to display the digital objects 211 and an operation input unit 61 configured to detect an operation of the digital objects 211, and a control processor 69 configured to control the touch panel display 55. The control processor 69 displays one of the digital objects 211 associated with an operation expected from a surrounding environment of the indoor unit 21 or an operation expected from an operation history of the operation input unit 61.

[0118] In this configuration, the display content of the user interface 201 is designed depending on the type of the operation expected from the surrounding environment or the operation history, and thus, the optimum intuitive user interface 201 can be provided depending on an operating environment.

[0119] In Embodiment 1, in a case where the outdoor unit 11 and the indoor unit 21 operate, the control processor 69 displays the digital object 211 associated with the operation expected from the operation history. In the case where neither the outdoor unit 11 nor the indoor unit 21 operates, the control processor 69 displays the digital object 211 associated with the operation expected from the surrounding environment.

[0120] In Embodiment 1, the digital objects 211 are

buttons displayed as digital images.

[0121] In the configuration described above, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

Embodiment 2

(Difference from Another Embodiment)

[0122] Embodiment 2 is different from Embodiment 1 in that a preceding process to a process of determining an operation status of the indoor unit 21 is based on a person presence determination result. Fig. 8 illustrates an example of state transition between a normal configuration state and a special configuration state according to Embodiment 2 of the present invention.

(Operation of Embodiment 2)

[0123] As illustrated in Fig. 8, digital objects 211, for example, are assumed to be in a normal configuration state and a special configuration state. The normal configuration state is a configuration in a case where digital object data is drawn in a default setting. The special configuration state is a configuration in which display content of a user interface 201 is drawn depending on the type of an operation expected from a surrounding environment of an operation history. For example, state transition is performed as follows.

(Normal Configuration State)

[0124] If the absence of a person is detected (step S41), a control processor 69 maintains the normal configuration state. If the presence of a person is detected (step S42), the control processor 69 causes the state to transition to the special configuration state.

(Special Configuration State)

[0125] If a predetermined time has not elapsed (step S43), the control processor 69 maintains the special configuration state. If the predetermined time has elapsed (step S44), the control processor 69 causes the state to transition to the normal configuration state.

[0126] An example of operation of a digital object display process will be described on the premise of the state transition described above. Fig. 9 is a flowchart showing an operation example of the remote controller 31 according to Embodiment 2 of the present invention.

[0127] Processes in steps S54 to S56 are temperature determination processes in which the digital object 211 is displayed depending on a surrounding environment. Processes in steps S58 to S60 are operation history determination processes in which the digital object 211 is displayed depending on an operation history. That is, operations described with reference to Fig. 9 are processes

in which the digital objects 211 are displayed depending on the surrounding environment or the operation history. As triggers for transitioning to processes depending on the surrounding environment or the operation history, a person presence determination result and an operation status of the indoor unit 21 are used, for example.

(Step S51)

[0128] The remote controller 31 determines whether a current presence determination result is a person presence state or not. If a current presence determination result is the person presence state, the remote controller 31 proceeds to step S52. On the other hand, if the current presence determination result is not the person presence state, the remote controller 31 returns to step S51.

(Step S52)

[0129] If an immediately preceding presence determination result is a person absence state, the remote controller 31 proceeds to step S53. On the other hand, if the immediately preceding presence determination result is not the person absence state, the remote controller 31 proceeds to step S61.

[0130] For example, the remote controller 31 obtains the current person presence determination result in step S51 and determines a presence state of a person (whether a person is either present or absent) 30 seconds before as an immediately preceding person presence determination result in step S52, thereby determining whether the person presence state has continued for a long time or the state currently transitions to the person presence state. Specifically, if a person is currently present in a room and was present in the room immediately before, the remote controller 31 determines that the person is present in the room for a long time, and does not transition to the determination process of the operation status of the indoor unit 21. On the other hand, if a person is currently present in the room and was absent immediately before, the remote controller 31 determines that the state currently transitions to the person presence state, that is, the person entered a vacant room, and transitions to the determination process of the operation status of the indoor unit 21. The immediately preceding time of 30 seconds before is merely an example, and the present invention is not limited to this example. For example, the immediately preceding time may be 10 seconds before.

(Step S53)

[0131] The remote controller 31 determines whether the indoor unit 21 operates or not. If the indoor unit 21 does not operate, the remote controller 31 proceeds to step S54. On the other hand, if the indoor unit 21 operates, the remote controller 31 proceeds to step S58.

[0132] Here, the state in which the indoor unit 21 does not operate includes not only a state in which a power

supply to the indoor unit 21 is shut off but also a state in which the indoor unit 21 is on standby for operation. For example, the indoor unit 21 and the outdoor unit 11 may perform refrigerant stagnation operation. On the other hand, the state in which the indoor unit 21 operates is a state in which the outdoor unit 11 operates with operation of the indoor unit 21 and a refrigeration cycle is formed in the indoor unit 21 and the outdoor unit 11, and is assumed to be a state in which air-conditioning is performed.

(Step S54)

[0133] The remote controller 31 determines a room temperature. If the room temperature is in the range from a heating determination temperature to a cooling determination temperature, both inclusive, the remote controller 31 proceeds to step S61. If the room temperature is lower than the heating determination temperature, the remote controller 31 proceeds to step S55. If the room temperature is higher than the cooling determination temperature, the remote controller 31 proceeds to step S56.

(Step S55)

[0134] The remote controller 31 displays the digital object 211 associated with a setting in heating operation start, and transitions to step S57.

(Step S56)

[0135] The remote controller 31 displays the digital object 211 associated with a setting in cooling operation start, and transitions to step S57.

(Step S57)

[0136] The remote controller 31 determines whether a predetermined time has elapsed or not. If the predetermined time has elapsed, the remote controller 31 finishes the process. On the other hand, if the predetermined time has not elapsed, the remote controller 31 returns to step S53.

[0137] Here, the predetermined time is, for example, 5 minutes, but the present invention is not limited to this time. That is, the remote controller 31 only needs to transition from the special configuration mode to the normal configuration mode if a predetermined time in which a user is assumed to use the remote controller 31 has elapsed.

(Step S58)

[0138] The remote controller 31 determines the type of an operation mode. If the operation mode is neither cooling nor heating, the remote controller 31 proceeds to step S61. If the operation mode is heating, the remote controller 31 proceeds to step S59. If the operation mode

is cooling, the remote controller 31 proceeds to step S60.

(Step S59)

[0139] The remote controller 31 displays the digital object 211 associated with a setting in the heating operation, and proceeds to step S57.

(Step S60)

[0140] The remote controller 31 displays the digital object 211 associated with a setting in the cooling operation, and proceeds to step S57.

(Step S61)

[0141] The remote controller 31 displays the digital object 211 associated with a normal configuration, and proceeds to step S57.

(Advantages of Embodiment 2)

[0142] As described above, in Embodiment 2, in a case where the presence state of a person in a room that is an air-conditioned space transitions from the person absence state to the person presence state, the temperature determination process or the operation history determination process is performed. Thus, in a case where it is assumed that a person is present in the room for a long time, neither the temperature determination process nor the operation history determination process is performed. On the other hand, in a case where the presence state of a person in a room that is an air-conditioned space transitions from the person absence state to the person presence state, the operation status of the indoor unit 21 is determined to select one of the temperature determination process or the operation history determination process. Thus, the digital object 211 is displayed depending on the surrounding environment or the operation history at the time when a person enters the room. Thus, the digital object 211 displayed by the remote controller 31 reflects an immediately preceding state, and the remote controller 31 can provide the optimum intuitive user interface 201 to a user especially significantly depending on an operating environment.

[0143] As described above, in Embodiment 2, the control processor 69 displays one of the digital objects 211 associated with the operation expected from the surrounding environment or the operation history when the presence state of a person in an air-conditioned space to be air-conditioned by the indoor unit 21 transitions from the person absence state to the person presence state.

[0144] In Embodiment 2, the control processor 69 displays one of the digital objects 211 to be used in an operation start of a cooling operation or a heating operation, based on a room temperature, a cooling determination temperature, and a heating determination temperature for the air-conditioned space to be air-conditioned by the

indoor unit 21, in a case where one of the digital objects 211 associated with the operation expected from the surrounding environment is to be displayed.

[0145] In Embodiment 2, the control processor 69 displays one of the digital objects 211 to be used for setting an operation mode associated with a previous operation in the operation history in a case where one of the digital objects 211 associated with the operation expected from the operation history is to be displayed.

[0146] In the configuration described above, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

15 Embodiment 3

(Difference from Other Embodiments)

[0147] Embodiment 3 is different from Embodiments 1 and 2 in that an example of a special configuration state will be specifically described. In Embodiment 3, a remote controller 31 changes display sizes of digital objects 251, digital objects 261, digital objects 271, and digital objects 281 described later.

(Operation of Embodiment 3)

[0148] Fig. 10 illustrates an example of display of the digital objects 251 in a special configuration state for a setting in cooling operation start according to Embodiment 3 of the present invention. As illustrated in Fig. 10, in a state before temperature determination (pre-temperature determination state) 601, a digital object 251 a, a digital object 251 b, a digital object 251 c, a digital object 251 d, and a digital object 251 e are displayed on a user interface 201. The digital object 251 a, the digital object 251 b, the digital object 251 c, the digital object 251 d, and the digital object 251 e will be collectively referred to as digital objects 251 unless otherwise specified.

[0149] As illustrated in Fig. 10, it is assumed that the pre-temperature determination state 601 transitions to a first state after temperature determination (first post-temperature determination state) 631. In this case, in the first post-temperature determination state 631, the size of the digital object 251 is changed depending on a surrounding environment, and thus, a display size is changed. For example, the display size of the digital object 251 b is enlarged. As illustrated in Fig. 10, it is also assumed that the pre-temperature determination state 601 transitions to a second state after temperature determination (second post-temperature determination state) 661. In this case, in the second post-temperature determination state 661, the size of the digital object 251 b is changed, and thus, the display size is changed and enlarged, and at the same time, a button drawn as the digital object 251 c is removed.

[0150] Fig. 11 illustrates an example of display of digital objects 261 in a special configuration state for a setting

in heating operation start according to Embodiment 3 of the present invention. As illustrated in Fig. 11, in a pre-temperature determination state 602, a digital object 261 a, a digital object 261 b, a digital object 261 c, a digital object 261 d, and a digital object 261 e are displayed on a user interface 201. The digital object 261 a, the digital object 261 b, the digital object 261 c, the digital object 261 d, and the digital object 261 e will be collectively referred to as digital objects 261 unless otherwise specified.

[0151] As illustrated in Fig. 11, it is assumed that the pre-temperature determination state 602 transitions to a first post-temperature determination state 632. In this case, in the first post-temperature determination state 632, the size of the digital object 261 is changed depending on the surrounding environment, and thus, a display size is changed. For example, the display size of the digital object 261 b is enlarged. As illustrated in Fig. 11, it is also assumed that the pre-temperature determination state 602 transitions to a second post-temperature determination state 662. In this case, in the second post-temperature determination state 662, the size of the digital object 261 b is changed, and thus, the display size is changed and enlarged, and at the same time, a button drawn as the digital object 261 c is removed.

[0152] Fig. 12 illustrates an example of display of digital objects 271 in a special configuration state for a setting in a cooling operation according to Embodiment 3 of the present invention. As illustrated in Fig. 12, in a state before operation history determination (pre-operation history determination state) 701, a digital object 271 a, a digital object 271 b, a digital object 271 c, a digital object 271 d, a digital object 271 e, a digital object 271 f, and a digital object 271 g are displayed on the user interface 201. The digital object 271 a, the digital object 271 b, the digital object 271 c, the digital object 271 d, the digital object 271 e, the digital object 271 f, and the digital object 271 g will be collectively referred to as digital objects 271 unless otherwise specified.

[0153] As illustrated in Fig. 12, it is assumed that the pre-operation history determination state 701 transitions to a state after operation history determination (post-operation history determination state) 731. In this case, in the post-operation history determination state 731, sizes of the digital object 271 a, the digital object 271 b, the digital object 271 d, and the digital object 271 e are changed depending on an operation history, and thus, display sizes are changed. For example, the display sizes of the digital object 271 a, the digital object 271 b, the digital object 271 d, and the digital object 271 e are enlarged.

[0154] Fig. 13 illustrates an example of display of digital objects 281 in a special configuration state for a setting in a heating operation according to Embodiment 3 of the present invention. As illustrated in Fig. 13, in a pre-operation history determination state 702, a digital object 281 a, a digital object 281 b, a digital object 281 c, a digital object 281 d, a digital object 281 e, a digital object 281

f, and a digital object 281 g are displayed on the user interface 201. The digital object 281 a, the digital object 281 b, the digital object 281 c, the digital object 281 d, the digital object 281 e, the digital object 281 f, and the digital object 281 g will be collectively referred to as digital objects 281 unless otherwise specified.

[0155] As illustrated in Fig. 13, it is assumed that the pre-operation history determination state 702 transitions to a post-operation history determination state 732. In this case, in the post-operation history determination state 732, the sizes of the digital object 281 a, the digital object 281 b, the digital object 281 d, and the digital object 281 e are changed depending on the operation history, and thus, the display sizes are changed. For example, display sizes of the digital object 281 a, the digital object 281 b, the digital object 281 d, and the digital object 281 e are enlarged.

[0156] In the example described above, the specific digital objects 251, the digital objects 261, the digital objects 271, and the digital objects 281 are displayed in an enlarged manner. However, the present invention is not limited to this example. In the remote controller 31, unnecessary digital objects 251, digital objects 261, digital objects 271, and digital objects 281 may be drawn in sizes smaller than normal sizes.

(Advantages of Embodiment 3)

[0157] As described above, in Embodiment 3, a setting in the cooling operation start is emphasized in display, as illustrated in Fig. 10. For example, the digital object 251 b is displayed as a sign "COOLING ON/OFF," serves as a button for starting a cooling operation, and is enlarged in display. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0158] In Embodiment 3, as illustrated in Fig. 11, a setting in the heating operation start is emphasized. For example, the digital object 261 b is displayed as a sign "HEATING ON/OFF," serves as a button for starting a heating operation, and is enlarged in display. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0159] In Embodiment 3, as illustrated in Fig. 12, a setting in the cooling operation is emphasized. For example, the digital object 271 a is an inverted triangle button. By an operation such as depression of the button, a control instruction for reducing a set temperature is transmitted to the control processor 69. In display, the digital object 271 a is enlarged, and thus, emphasized. The digital object 271 b is an upright triangle button, and transmits a control instruction for increasing a set temperature to the control processor 69 by an operation such as depression of the button. In display, the digital object 271 b is enlarged, and thus, emphasized.

[0160] For example, the digital object 271 d is displayed

as a sign "COOLING ON/OFF," serves as a button for stopping a cooling operation, and is enlarged in display. The digital object 271e is displayed as a sign "COOLING MODE," serves as a button for transition to a setting of a cooling mode, and is enlarged in display. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on an operation history, which is one of operating environments.

[0161] In Embodiment 3, as illustrated in Fig. 13, a setting in the heating operation is emphasized in display. For example, the digital object 281 a is an inverted triangle button and is used to transmit a control instruction for reducing a set temperature to the control processor 69 by an operation such as depression of the button. In display, the digital object 281 a is enlarged, and thus, emphasized. The digital object 281 b is an upright triangle button, and is used for transmitting a control instruction for increasing a set temperature to the control processor 69 by an operation such as depression of the button. In display, the digital object 281 b is enlargement, and thus, emphasized.

[0162] For example, the digital object 281d is displayed as a sign "HEATING ON/OFF," serves as a button for stopping a heating operation, and is enlarged in display. The digital object 281e is displayed as a sign "HEATING MODE," serves as a button for transition to a setting of a heating mode, and is enlarged in display. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on an operation history, which is one of operating environments.

[0163] As described above, the remote controller 31 in the Embodiment 3 can provide the optimum intuitive user interface 201 especially significantly depending on an operating environment.

[0164] As described above, in Embodiment 3, the control processor 69 changes display sizes of the digital objects 251, 261, 271, and 281.

[0165] In Embodiment 3, the control processor 69 makes the display size of one of the digital objects 251 and 261 associated with the surrounding environment larger than the display size of one of the digital objects 251 and 261 not associated with the surrounding environment in a case where one of the digital objects 251 and 261 associated with the operation expected from the surrounding environment is to be displayed.

[0166] In Embodiment 3, the control processor 69 makes the display size of one of the digital objects 271 and 281 associated with the operation history larger than the display size of one of the digital objects 271 and 281 not associated with the operation history in a case where one of the digital objects 271 and 281 associated with the operation expected from the operation history is to be displayed.

[0167] In the configuration described above, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

Embodiment 4

(Difference from Other Embodiments)

- 5 [0168] Embodiment 4 is different from Embodiments 1 to 3 in that an example of the special configuration state is specifically described. In Embodiment 4, a remote controller 31 changes display locations of digital objects 291, digital objects 311, digital objects 321, and digital objects 331 described later.

(Operation of Embodiment 4)

- 10 [0169] Fig. 14 illustrates an example of display of digital objects 291 in a special configuration state for a setting in cooling operation start according to Embodiment 4 of the present invention. As illustrated in Fig. 14, in a pre-temperature determination state 603, a digital object 291 a, a digital object 291 b, a digital object 291 c, a digital object 291 d, and a digital object 291e are displayed on a user interface 201. The digital object 291 a, the digital object 291 b, the digital object 291 c, the digital object 291 d, and the digital object 291 e will be collectively referred to as digital objects 291 unless otherwise specified.

- 15 [0170] As illustrated in Fig. 14, it is assumed that a pre-temperature determination state 603 transitions to a first post-temperature determination state 633. In this case, in the first post-temperature determination state 633, a location of the digital object 291 is changed, a display location thereof is changed. For example, the control processor 69 displays the digital object 291 b on a center portion of a display screen that is the user interface 201 so that the digital object 291 b associated with a surrounding environment is easily operated.

- 20 [0171] As illustrated in Fig. 14, it is assumed that the pre-temperature determination state 603 transitions to the second post-temperature determination state 663. In this case, in the second post-temperature determination state 663, since the location of the digital object 291 b is changed, a display location is changed, and at the same time, a button drawn as the digital object 291 c is removed.

- 25 [0172] The control processor 69 may display, for example, the digital object 291 d on an edge portion of the display screen that is the user interface 201 so that the digital object 291 d, for example, not associated with the surrounding environment is not easily operated.

- 30 [0173] Fig. 15 illustrates an example of display of digital objects 311 in a special configuration state for a setting in heating operation start according to Embodiment 4 of the present invention. As illustrated in Fig. 15, in a pre-temperature determination state 604, a digital object 311 a, a digital object 311 b, a digital object 311 c, a digital object 311 d, and a digital object 311 e are displayed on the user interface 201. The digital object 311 a, the digital object 311 b, the digital object 311 c, the digital object 311 d, and the digital object 311 e will be collectively

referred to as digital objects 311 unless otherwise specified.

[0174] As illustrated in Fig. 15, it is assumed that the pre-temperature determination state 604 transitions to a first post-temperature determination state 634. In this case, in the first post-temperature determination state 634, a location of the digital object 311 is changed, and thus, a display location is changed. For example, the control processor 69 displays the digital object 311 b on a center portion of the display screen that is the user interface 201 so that the digital object 311 b associated with the surrounding environment is easily operated.

[0175] As illustrated in Fig. 15, it is assumed that the pre-temperature determination state 604 transitions to a second post-temperature determination state 664. In this case, in the second post-temperature determination state 664, a location of the digital object 311 b is changed, and thus, a display location is changed, and at the same time, a button drawn as the digital object 311 c is removed.

[0176] The control processor 69 may display, for example, the digital object 311 d on an edge portion of the display screen that is the user interface 201 so that the digital object 311 d, for example, not associated with the surrounding environment is not easily operated.

[0177] Fig. 16 illustrates an example of display of digital objects 321 in a special configuration state for a setting in a cooling operation according to Embodiment 4 of the present invention. As illustrated in Fig. 16, in a pre-operation history determination state 703, a digital object 321 a, a digital object 321 b, a digital object 321 c, a digital object 321 d, a digital object 321 e, a digital object 321 f, and a digital object 321 g are displayed on the user interface 201.

[0178] The digital object 321 a, the digital object 321 b, the digital object 321 c, the digital object 321 d, the digital object 321 e, the digital object 321 f, and the digital object 321 g will be collectively referred to as digital objects 321 unless otherwise specified.

[0179] As illustrated in Fig. 16, it is assumed that the pre-operation history determination state 703 transitions to a post-operation history determination state 733. In this case, in the post-operation history determination state 733, locations of the digital object 321 a, the digital object 321 b, the digital object 321 d, and the digital object 321 e associated with an operation history are changed, and thus, display locations are changed. For example, the control processor 69 displays the digital object 321 a, the digital object 321 b, the digital object 321 d, and the digital object 321 e on a center portion of the display screen that is the user interface 201 so that the digital object 321 a, the digital object 321 b, the digital object 321 d, and the digital object 321 e associated with the operation history are easily operated.

[0180] The control processor 69 may display the digital object 321 f, for example, on an edge portion of the display screen that is the user interface 201 so that the digital object 321 f, for example, not associated with the oper-

ation history is not easily operated.

[0181] Fig. 17 illustrates an example of display of digital objects 331 in a special configuration state for a setting in a heating operation according to Embodiment 4 of the present invention. As illustrated in Fig. 17, in a pre-operation history determination state 704, a digital object 331 a, a digital object 331 b, a digital object 331 c, a digital object 331 d, a digital object 331 e, a digital object 331 f, and a digital object 331 g are displayed on the user interface 201.

[0182] The digital object 331 a, the digital object 331 b, the digital object 331 c, the digital object 331 d, the digital object 331 e, the digital object 331 f, and the digital object 331 g will be collectively referred to as digital objects 331 unless otherwise specified.

[0183] As illustrated in Fig. 17, it is assumed that the pre-operation history determination state 704 transitions to a post-operation history determination state 734. In this case, in the post-operation history determination state 734, locations of the digital object 331 a, the digital object 331 b, the digital object 331 d, and the digital object 331 e associated with the operation history are changed, and thus, display locations are changed. For example, the control processor 69 displays the digital object 331 a, the digital object 331 b, the digital object 331 d, and the digital object 331 e on a center portion of the display screen that is the user interface 201 so that the digital object 331 a, the digital object 331 b, the digital object 331 d, and the digital object 331 e associated with the operation history are easily operated.

[0184] The control processor 69 may display the digital object 331 f, for example, not associated with the operation history on an edge portion of the display screen that is the user interface 201 so that the digital object 331 f, for example, is not easily operated.

(Advantages of Embodiment 4)

[0185] As described above, in Embodiment 4, a setting in cooling operation start is emphasized in display, as illustrated in Fig. 14. For example, the digital object 291 b is displayed as a sign "COOLING ON/OFF," serves as a button for starting a cooling operation, and is displayed on a center portion of the display screen. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0186] In Embodiment 4, a setting in the heating operation start is emphasized in display, as illustrated in Fig. 15. For example, the digital object 311 b is displayed as a sign "HEATING ON/OFF," serves as a button for starting a heating operation, and is displayed on a center portion of the display screen. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0187] In Embodiment 4, a setting in the cooling operation is emphasized in display, as illustrated in Fig. 16.

For example, the digital object 321 a is an inverted triangle button, and is used for transmitting a control instruction for reducing a set temperature to the control processor 69 by an operation such as depression of the button. The digital object 321 a is displayed on a center portion of the display screen, and thus, is emphasized in display. The digital object 321 b is an upright triangle button, and is used for transmitting a control instruction for increasing a set temperature to the control processor 69 by an operation such as depression of the button. The digital object 321 b is displayed in a center portion of the display screen, and thus, is emphasized in display.

[0188] For example, the digital object 321 d is displayed as a sign "COOLING ON/OFF," serves as a button for stopping a cooling operation, and is displayed on a center portion of the display screen. The digital object 321 e is displayed as a sign "COOLING MODE," serves as a button for transition to a setting of a cooling mode, and is displayed on a center portion of the display screen. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the operation history, which is one of operating environments.

[0189] In Embodiment 4, a setting in a heating operation is emphasized in display, as illustrated in Fig. 17. For example, the digital object 331 a is an inverted triangle button, and is used for transmitting a control instruction for reducing a set temperature to the control processor 69 by an operation such as depression of the button. The digital object 331 a is displayed on a center portion of the display screen, and thus, is emphasized in display. The digital object 331 b is an upright triangle button, and is used for transmitting a control instruction for increasing a set temperature to the control processor 69 by an operation such as depression of the button. The digital object 331 b is displayed on a center portion of the display screen, and thus is emphasized in display.

[0190] For example, the digital object 331 d is displayed as a sign "HEATING ON/OFF," serves as a button for stopping a heating operation, and is displayed on a center portion of the display screen. The digital object 331 e is displayed as a sign "HEATING MODE," serves as a button for transition to a setting of a heating mode, and is displayed on a center portion of the display screen. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the operation history, which is one of operating environments.

[0191] As described above, the remote controller 31 in Embodiment 4 can provide the optimum intuitive user interface 201 especially significantly depending on an operating environment.

[0192] As described above, in Embodiment 4, the control processor 69 changes display locations of the digital objects 291, 311, 321, and 331.

[0193] In Embodiment 4, the control processor 69 displays the digital objects 291 and 311 on a display screen output by the display unit 63, displays one of the digital objects 291 and 311 associated with the surrounding environment in an center portion of the display screen and

one of the digital objects 291 and 311 not associated with the surrounding environment on an edge portion of the display screen, in a case where one of the digital objects 291 and 311 associated with the operation expected from the surrounding environment is to be displayed.

[0194] In Embodiment 4, the control processor 69 displays the digital objects 321 and 331 on a display screen output by the display unit 63, displays one of the digital objects 321 and 331 associated with the operation history in a center portion of the display screen and one of the digital objects 321 and 331 not associated with the operation history on an edge portion of the display screen, in a case where one of the digital objects 321 and 331 associated with the operation expected from the operation history is to be displayed.

[0195] In the configuration described above, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

Embodiment 5

(Difference from Other Embodiments)

[0196] Embodiment 5 is different from Embodiments 1 to 4 in that an example of the special configuration state is specifically described. In Embodiment 5, a remote controller 31 changes display colors of digital objects 341, digital objects 351, digital objects 361, and digital objects 371 described later.

(Operation of Embodiment 5)

[0197] Fig. 18 illustrates an example of display of digital objects 341 in a special configuration state for a setting in cooling operation start according to Embodiment 5 of the present invention. As illustrated in Fig. 18, in a pre-temperature determination state 605, a digital object 341 a, a digital object 341 b, a digital object 341 c, a digital object 341 d, and a digital object 341 e are displayed on a user interface 201. The digital object 341 a, the digital object 341 b, the digital object 341 c, the digital object 341 d, and the digital object 341 e will be collectively referred to as digital objects 341 unless otherwise specified.

[0198] As illustrated in Fig. 18, it is assumed that the pre-temperature determination state 605 transitions to a first post-temperature determination state 635. In this case, in the first post-temperature determination state 635, colors of the digital objects 341 are changed, and thus, display colors are changed. For example, to emphasize the digital object 341 b associated with a surrounding environment, the control processor 69 makes a lightness or a saturation of a display color of the digital object 341 b higher than those of the digital object 341 a, the digital object 341 c, the digital object 341 d, and the digital object 341 e not associated with the surrounding environment.

[0199] As illustrated in Fig. 18, it is assumed that the pre-temperature determination state 605 transitions to a second post-temperature determination state 665. In this case, in the second post-temperature determination state 665, the color of the digital object 341 b is changed, and thus, the display color is changed, and at the same time, a button drawn as the digital object 341 c is removed.

[0200] Fig. 19 illustrates an example of display of digital objects 351 in a special configuration state for a setting in heating operation start according to Embodiment 5 of the present invention. As illustrated in Fig. 19, in a pre-temperature determination state 606, a digital object 351 a, a digital object 351 b, a digital object 351 c, a digital object 351 d, and a digital object 351 e are displayed on the user interface 201. The digital object 351 a, the digital object 351 b, the digital object 351 c, the digital object 351 d, and the digital object 351 e will be collectively referred to as digital objects 351 unless otherwise specified.

[0201] As illustrated in Fig. 19, it is assumed that the pre-temperature determination state 606 transitions to a first post-temperature determination state 636. In this case, in the first post-temperature determination state 636, colors of the digital objects 351 are changed, and thus, display colors are changed. For example, to emphasize the digital object 351 b associated with the surrounding environment, the control processor 69 makes a lightness or a saturation of a display color of the digital object 351 b higher than those of the digital object 351 a, the digital object 351 c, the digital object 351 d, and the digital object 351 e not associated with the surrounding environment.

[0202] As illustrated in Fig. 19, it is assumed that the pre-temperature determination state 606 transitions to a second post-temperature determination state 666. In this case, in the second post-temperature determination state 666, the color of the digital object 351 b is changed, and thus, the display color is changed, and at the same time, a button drawn as the digital object 351 c is removed.

[0203] Fig. 20 illustrates an example of display of digital objects 361 in a special configuration state for a setting in a cooling operation according to Embodiment 5 of the present invention. As illustrated in Fig. 20, in a pre-operation history determination state 705, a digital object 361 a, a digital object 361 b, a digital object 361 c, a digital object 361 d, a digital object 361 e, a digital object 361 f, and a digital object 361 g are displayed on the user interface 201.

[0204] The digital object 361 a, the digital object 361 b, the digital object 361 c, the digital object 361 d, the digital object 361 e, the digital object 361 f, and the digital object 361 g will be collectively referred to as digital objects 361 unless otherwise specified.

[0205] As illustrated in Fig. 20, it is assumed that a pre-operation history determination state 705 transitions to a post-operation history determination state 735. In this

case, in the post-operation history determination state 735, colors of the digital object 351 a, the digital object 351 b, the digital object 351 d, and the digital object 351 e associated with an operation history are changed, and thus, display colors are changed. For example, to emphasize the digital object 361 a, the digital object 361 b, the digital object 361 d, and the digital object 361 e associated with the operation history, the control processor 69 makes lightnesses or saturations of display colors of the digital object 361 a, the digital object 361 b, the digital object 361 d, and the digital object 361 e higher than those of display colors of the digital object 361 c, the digital object 361 f, and the digital object 361 g not associated with the surrounding environment.

[0206] Fig. 21 illustrates an example of display of digital objects 371 in a special configuration state for a setting in a heating operation according to Embodiment 5 of the present invention. As illustrated in Fig. 21, in a pre-operation history determination state 706, a digital object 371 a, a digital object 371 b, a digital object 371 c, a digital object 371 d, a digital object 371 e, a digital object 371 f, and a digital object 371 g are displayed on the user interface 201.

[0207] The digital object 371 a, the digital object 371 b, the digital object 371 c, the digital object 371 d, the digital object 371 e, the digital object 371 f, and the digital object 371 g will be collectively referred to as digital objects 371 unless otherwise specified.

[0208] As illustrated in Fig. 21, it is assumed that the pre-operation history determination state 706 transitions to a post-operation history determination state 736. In this case, in the post-operation history determination state 736, colors of the digital object 371 a, the digital object 371 b, the digital object 371 d, and the digital object 371 e associated with the operation history are changed, and thus, display colors are changed. For example, to emphasize the digital object 371 a, the digital object 371 b, the digital object 371 d, and the digital object 371 e associated with the operation history, the control processor 69 makes lightnesses and saturations of display colors of the digital object 371 a, the digital object 371 b, the digital object 371 d, and the digital object 371 e higher than those of display colors of the digital object 371 c, the digital object 371 f, and the digital object 371 g not associated with the surrounding environment.

(Advantages of Embodiment 5)

[0209] As described above, in the remote controller 31 according to Embodiment 5, the setting in the cooling operation start is emphasized in display as illustrated in Fig. 18. For example, the digital object 341 b is displayed as a sign "COOLING ON/OFF," serves as a button for starting a cooling operation, and makes the lightness or saturation of its display color higher than those of the other digital objects 341 not associated with the surrounding environment. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 de-

pending on the surrounding environment, which is one of operating environments.

[0210] In Embodiment 5, as illustrated in Fig. 19, the setting in the heating operation start is emphasized in display. For example, the digital object 351 b is displayed as a sign "HEATING ON/OFF," serves as a button for starting a heating operation, and makes the lightness or saturation of its display color higher than those of the other digital objects 351 not associated with the surrounding environment. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0211] In Embodiment 5, as illustrated in Fig. 20, the setting in the cooling operation is emphasized in display. For example, the digital object 361 a is an inverted triangle button, and is used for transmitting a control instruction for reducing a set temperature to the control processor 69 by an operation such as depression of the button. Since the digital object 361 a has a lightness or saturation of its display color higher than those of the other digital objects 361 not associated with the operation history, the digital object 361 a is emphasized in display. The digital object 361 b is an upright triangle button, and is used for transmitting a control instruction for increasing the set temperature to the control processor 69 by an operation such as depression of the button. Since the digital object 361 b has a lightness or saturation of its display color higher than those of the other digital objects 361 not associated with the operation history, the digital object 361 b is emphasized in display.

[0212] For example, the digital object 361 d is displayed as a sign "COOLING ON/OFF," serves as a button for stopping a cooling operation, and has a lightness or saturation of its display color higher than those of the other digital objects 361 not associated with the operation history. Thus, the digital object 361 d is emphasized in display. The digital object 361 e is displayed as a sign "COOLING MODE," serves as a button for transition to a setting of a cooling mode, and has a lightness or saturation of its display color higher than those of the other digital objects 361 not associated with the operation history. Thus, the digital object 361 e is emphasized in display. As a result, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the operation history, which is one of operating environments.

[0213] In Embodiment 5, as illustrated in Fig. 21, the setting in the heating operation is emphasized in display. For example, the digital object 371 a is an inverted triangle button, and is used for transmitting a control instruction for reducing the set temperature to the control processor 69 by an operation such as depression of the button. Since the digital object 371 a has a lightness or saturation of its display color higher than those of the other digital objects 371 not associated with the operation history, the digital object 371 a is emphasized in display. The digital object 371 b is an upright triangle button, and

is used for transmitting a control instruction for increasing the set temperature to the control processor 69 by an operation such as depression of the button. Since the digital object 371 b has a lightness or saturation of its display color higher than those of the other digital objects 371 not associated with the operation history, the digital object 371 b is emphasized in display.

[0214] For example, the digital object 371 d is displayed as a sign "HEATING ON/OFF," serves as a button for stopping a heating operation, and has a lightness or saturation of its display color higher than those of the other digital objects 371 not associated with the operation history. Thus, the digital object 371 d is emphasized in display. The digital object 371 e is displayed as a sign "HEATING MODE," serves as a button for transition to a setting of a heating mode, and has a lightness or saturation of its display color higher than those of the other digital objects 371 not associated with the operation history. Thus, the digital object 371 e is emphasized in display. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the operation history, which is one of operating environments.

[0215] As described above, in the remote controller 31 according to Embodiment 5, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

[0216] As described above, in Embodiment 5, the control processor 69 changes display colors of the digital objects 341, 351, 361, and 371.

[0217] In Embodiment 5, the control processor 69 makes lightnesses or saturations of the display colors of some of the digital objects 341 and 351 associated with the surrounding environment higher than those of the display colors of the other digital objects 341 and 351 not associated with the surrounding environment, in a case where some of the digital objects 341 and 351 associated with the operation expected from the surrounding environment are to be displayed.

[0218] In Embodiment 5, the control processor 69 makes lightnesses or saturations of the display colors of some of the digital objects 361 and 371 associated with the operation history higher than those of the display colors of the other digital objects 361 and 371 not associated with the operation history, in a case where some of the digital objects 361 and 371 associated with the operation expected from the operation history are to be displayed.

[0219] In the configuration described above, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

Embodiment 6

(Difference from Other Embodiments)

[0220] Embodiment 6 is different from Embodiments 1 to 5 in that an example of a special configuration state

will be specifically described. In Embodiment 6, a remote controller 31 changes display shapes of digital objects 381, digital objects 391, digital objects 411, and digital objects 421 described later.

(Operation of Embodiment 6)

[0221] Fig. 22 illustrates an example of display of digital objects 381 in a special configuration state for a setting in cooling operation start according to Embodiment 6 of the present invention. As illustrated in Fig. 22, in a pre-temperature determination state 607, a digital object 381 a, a digital object 381 b, a digital object 381 c, a digital object 381 d, and a digital object 381 e are displayed on a user interface 201. The digital object 381 a, the digital object 381 b, the digital object 381 c, the digital object 381 d, and the digital object 381 e will be collectively referred to as digital objects 381 unless otherwise specified.

[0222] As illustrated in Fig. 22, it is assumed that the pre-temperature determination state 607 transitions to a first post-temperature determination state 637. In this case, in the first post-temperature determination state 637, shapes of digital objects 381 are changed, and thus, display shapes are changed. For example, to emphasize the digital object 381 b associated with a surrounding environment, the control processor 69 displays the display shape of the digital object 381 b based on highlighted display image information.

[0223] As illustrated in Fig. 22, it is assumed that the pre-temperature determination state 607 transitions to a second post-temperature determination state 667. In this case, in the second post-temperature determination state 667, the shape of the digital object 381 b is changed, and thus, the display shape is changed, and at the same time, a button drawn as the digital object 381 c is removed.

[0224] Fig. 23 illustrates an example of display of digital objects 391 in a special configuration state for a setting in heating operation start according to Embodiment 6 of the present invention. As illustrated in Fig. 23, in a pre-temperature determination state 608, a digital object 391 a, a digital object 391 b, a digital object 391 c, a digital object 391 d, and a digital object 391 e are displayed on the user interface 201. The digital object 391 a, the digital object 391 b, the digital object 391 c, the digital object 391 d, and the digital object 391 e will be collectively referred to as digital objects 391 unless otherwise specified.

[0225] As illustrated in Fig. 23, it is assumed that the pre-temperature determination state 608 transitions to a first post-temperature determination state 638. In this case, in the first post-temperature determination state 638, a shape of the digital object 391 is changed, and thus, a display shape is changed. For example, to emphasize the digital object 391 b associated with the surrounding environment, the control processor 69 displays a display shape of the digital object 391 b based on high-

lighted display image information.

[0226] As illustrated in Fig. 23, it is assumed that the pre-temperature determination state 608 transitions to the second post-temperature determination state 668. In this case, in the second post-temperature determination state 668, a shape of the digital object 391 b is changed, and thus, a display shape is changed, and at the same time, a button drawn as the digital object 391 c is removed.

[0227] Fig. 24 illustrates an example of display of digital objects 411 in a special configuration state for a setting in a cooling operation according to Embodiment 6 of the present invention. As illustrated in Fig. 24, in a pre-operation history determination state 707, a digital object 411 a, a digital object 411 b, a digital object 411 c, a digital object 411 d, a digital object 411 e, a digital object 411 f, and a digital object 411 g are displayed on the user interface 201.

[0228] The digital object 411 a, the digital object 411 b, the digital object 411 c, the digital object 411 d, the digital object 411 e, the digital object 411 f, and the digital object 411 g will be collectively referred to as digital objects 411 unless otherwise specified.

[0229] As illustrated in Fig. 24, it is assumed that the pre-operation history determination state 707 transitions to the post-operation history determination state 737. In this case, in the post-operation history determination state 737, shapes of the digital object 411 a, the digital object 411 b, the digital object 411 d, and the digital object 411 e associated with an operation history are changed, and thus, display shapes are changed. For example, to emphasize the digital object 361 a, the digital object 361 b, the digital object 361 d, and the digital object 361 e associated with the operation history, the control processor 69 displays the display shapes of the digital object 361 a, the digital object 361 b, the digital object 361 d, and the digital object 361 e based on highlighted display image information.

[0230] Fig. 25 illustrates an example of display of digital objects 421 in a special configuration state for a setting in a heating operation according to Embodiment 6 of the present invention. As illustrated in Fig. 25, in a pre-operation history determination state 708, a digital object 421 a, a digital object 421 b, a digital object 421 c, a digital object 421 d, a digital object 421 e, a digital object 421 f, and a digital object 421 g are displayed on the user interface 201.

[0231] The digital object 421 a, the digital object 421 b, the digital object 421 c, the digital object 421 d, the digital object 421 e, the digital object 421 f, and the digital object 421 g will be collectively referred to as digital objects 421 unless otherwise specified.

[0232] As illustrated in Fig. 25, it is assumed that the pre-operation history determination state 708 transitions to a post-operation history determination state 738. In this case, in the post-operation history determination state 738, shapes of the digital object 421 a, and the digital object 421 b, and the digital object 421 d, and the

digital object 421 e associated with the operation history are changed, display shapes are changed. For example, to emphasize the digital object 421 a, the digital object 421 b, the digital object 421 d, and the digital object 421 e associated with the operation history, the control processor 69 displays the display shapes of the digital object 421 a, the digital object 421 b, the digital object 421 d, and the digital object 421 e based on highlighted display image information.

(Advantages of Embodiment 6)

[0233] As described above, in the remote controller 31 according to Embodiment 6, the setting in the cooling operation start is emphasized in display, as illustrated in Fig. 22. For example, the digital object 381 b is displayed as a sign "COOLING ON/OFF," serves as a button for starting a cooling operation, and displays a display shape based on highlighted display image information. The remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0234] In Embodiment 6, as illustrated in Fig. 23, a setting in heating operation start is emphasized in display. For example, the digital object 391 b is displayed as a sign "HEATING ON/OFF," serves as a button for starting a heating operation, and displays a display shape based on highlighted display image information. Thus, remote controller 31 can provide the optimum intuitive user interface 201 depending on the surrounding environment, which is one of operating environments.

[0235] In Embodiment 6, as illustrated in Fig. 24, a setting in a cooling operation is emphasized in display. For example, the digital object 411 a is an inverted triangle button, and is used for transmitting a control instruction for reducing a set temperature to the control processor 69 by an operation such as depression of the button. Since the display shape of the digital object 411 a is displayed based on highlighted display image information, the digital object 411 a is emphasized in display. The digital object 411 b is an upright triangle button, and is used for transmitting a control instruction for increasing the set temperature to the control processor 69 by an operation such as depression of the button. Since the display shape of the digital object 411 b is displayed based on the highlighted display image information, the digital object 411 b is emphasized in display.

[0236] For example, the digital object 411 d is displayed as a sign "COOLING ON/OFF," serves as a button for stopping a cooling operation, and has its display shape displayed based on highlighted display image information. Thus, the digital object 411 d is emphasized in display. The digital object 411 e is displayed as a sign "COOLING MODE," serves as a button for transition to a setting of a cooling mode, and has its display shape displayed based on highlighted display image information. Thus, the digital object 411 e is emphasized in display. Thus, the remote controller 31 can provide the op-

timum intuitive user interface 201 depending on the operation history, which is one of operating environments.

[0237] In Embodiment 6, as illustrated in Fig. 25, a setting in a heating operation is emphasized in display. For example, the digital object 421 a is an inverted triangle button, and is used for transmitting a control instruction for reducing the set temperature to the control processor 69 by an operation such as depression of the button. Since the display shape of the digital object 421 a is displayed based on highlighted display image information, the digital object 421 a is emphasized in display. The digital object 421 b is an upright triangle button, and is used for transmitting a control instruction for increasing the set temperature to the control processor 69 by an operation such as depression of the button. Since the display shape of the digital object 421 b is displayed based on highlighted display image information, the digital object 421 b is emphasized in display.

[0238] For example, the digital object 421 d is displayed as a sign "HEATING ON/OFF," serves as a button for stopping a heating operation, and has its display shape displayed based on highlighted display image information. Thus, the digital object 421 d is emphasized in display. The digital object 421 e is displayed as a sign "HEATING MODE," serves as a button for transition to a setting of the heating mode, and has its display shape displayed based on the highlighted display image information. Thus, the digital object 421 e is emphasized in display. Thus, the remote controller 31 can provide the optimum intuitive user interface 201 depending on the operation history, which is one of operating environments.

[0239] As described above, in the remote controller 31 according to Embodiment 6, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

[0240] As described above, in Embodiment 6, the control processor 69 changes the display shapes of the digital objects 381, 391, 411, and 421.

[0241] In Embodiment 6, the storage unit 65 includes highlighted display image information corresponding to each of the digital objects 381 and 391, and normal display image information corresponding to the digital objects 381 and 391, and the control processor 69 displays the display shape of one of the digital objects 381 and 391 associated with the surrounding environment based on the highlighted display image information and displays the display shape of one of the digital objects 381 and 391 not associated with the surrounding environment based on the normal display image information, in a case where one of the digital objects 381 and 391 associated with the operation expected from the surrounding environment is to be displayed.

[0242] In Embodiment 6, the storage unit 65 includes highlighted display image information corresponding to each of the digital objects 411 and 421, and normal display image information corresponding to each of the digital objects 411 and 421, and the control processor 69

displays the display shape of one of the digital objects 411 and 421 associated with the operation history based on the highlighted display image information, and displays the display shape of one of the digital objects 411 and 421 not associated with the operation history based on the normal display image information, in a case where one of the digital objects 411 and 421 associated with the operation expected from the operation history is to be displayed.

[0243] In the configuration described above, the optimum intuitive user interface 201 can be provided especially significantly depending on an operating environment.

Reference Signs List

[0244]

1 air-conditioning system, 11 outdoor unit, 21, 21 a to 21 c indoor unit, 31, 31 a to 31 c remote controller, 41 transmission line, 42 power supply line, 43 refrigerant pipe, 51 communication unit, 53 power supply unit, 55 touch panel display, 61 operation input unit, 63 display unit, 65 storage unit, 67 sensor module, 69 control processor, 81 human sensor module, 83 temperature sensor module, 85 humidity sensor module, 87 illuminance sensor module, 101 operation status determining module, 102 surrounding environment determining module, 103 operation history determining module, 105 image processing module, 111 presence determining module, 112 temperature determining module, 113 humidity determining module, 114 illuminance determining module, 116 operation mode determining module, 118 object state determining module, 119 object drawing module, 131 pyroelectric infrared ray sensor, 132, 142, 152, 162 signal processor, 133 human detector, 141 temperature sensor, 151 humidity sensor, 161 illuminance sensor, 181 operation status data storage region, 182 surrounding environment data storage region, 183 default data storage region, 184 operation history data storage region, 201 user interface, 211, 211 a to 211 g, 251, 251 a to 251 e, 261, 261 a to 261 e, 271, 271 a to 271 g, 281, 281 a to 281 g, 291, 291 a to 291 e, 311, 311 a to 311 e, 321, 321 a to 321 g, 331, 331 a to 331 g, 341, 341 a to 341 e, 351, 351 a to 351 e, 361, 361 a to 361 g, 371, 371 a to 371 g, 381, 381 a to 381 e, 391, 391 a to 391 e, 411, 411 a to 411 g, 421, 421 a to 421 g digital object, 530 room temperature determination index, 531, 531 a to 531 c room temperature determination example, 601 to 608 pre-temperature determination state, 631 to 638 first post-temperature determination state, 661 to 668 second post-temperature determination state, 701 to 708 pre-operation history determination state, 731 to 738 post-operation history determination state

Claims

1. A remote controller configured to control an air-conditioning apparatus including an outdoor unit and an indoor unit, the remote controller comprising:

a storage unit configured to store data of digital objects of different types;
a touch panel display including a display unit configured to display the digital objects and an operation input unit configured to detect an operation of the digital objects; and
a control processor configured to control the touch panel display,

the control processor displaying one of the digital objects associated with an operation expected from a surrounding environment of the indoor unit or an operation expected from an operation history of the operation input unit.

2. The remote controller of claim 1, wherein the control processor

displays one of the digital objects associated with the operation expected from the operation history when the outdoor unit and the indoor unit are in operation, and
displays one of the digital objects associated with the operation expected from the surrounding environment when the outdoor unit and the indoor unit are out of operation.

3. The remote controller of claim 1 or 2, wherein the control processor displays one of the digital objects associated with the operation expected from the surrounding environment or the operation history when a presence state of a person in an air-conditioned space to be air-conditioned by the indoor unit transitions from a person absence state to a person presence state.

4. The remote controller of any one of claims 1 to 3, wherein the control processor displays one of the digital objects to be used in an operation start of a cooling operation or a heating operation, based on a room temperature, a cooling determination temperature, and a heating determination temperature for an air-conditioned space to be air-conditioned by the indoor unit, in a case where one of the digital objects associated with the operation expected from the surrounding environment is to be displayed.

5. The remote controller of any one of claims 1 to 3, wherein the control processor displays one of the digital objects to be used for setting an operation mode asso-

- ciated with a previous operation in the operation history in a case where one of the digital objects associated with the operation expected from the operation history is to be displayed.
6. The remote controller of claim 4 or 5, wherein the control processor changes a display size of each of the digital objects.
 7. The remote controller of claim 6, wherein the control processor makes the display size of one of the digital objects associated with the surrounding environment larger than the display size of one of the digital objects not associated with the surrounding environment in a case where one of the digital objects associated with the operation expected from the surrounding environment is to be displayed.
 8. The remote controller of claim 6, wherein the control processor makes the display size of one of the digital objects associated with the operation history larger than the display size of one of the digital objects not associated with the operation history in a case where one of the digital objects associated with the operation expected from the operation history is to be displayed.
 9. The remote controller of claim 4 or 5, wherein the control processor changes a display location of each of the digital objects.
 10. The remote controller of claim 9, wherein the control processor
 - displays the digital objects on a display screen output by the display unit, and
 - displays one of the digital objects associated with the surrounding environment in a center portion of the display screen and one of the digital objects not associated with the surrounding environment in an edge portion of the display screen, in a case where one of the digital objects associated with the operation expected from the surrounding environment is to be displayed.
 11. The remote controller of claim 9, wherein the control processor
 - displays the digital objects on a display screen output by the display unit, and
 - displays one of the digital objects associated with the operation history in a center portion of the display screen and one of the digital objects not associated with the operation history in an edge portion of the display screen, in a case where one of the digital objects associated with the operation expected from the operation history is to be displayed.
 12. The remote controller of claim 4 or 5, wherein the control processor changes a display color of each of the digital objects.
 13. The remote controller of claim 12, wherein the control processor makes a lightness or a saturation of the display color of one of the digital objects associated with the surrounding environment higher than a lightness or a saturation of the display color of one of the digital objects not associated with the surrounding environment, in a case where one of the digital objects associated with the operation expected from the surrounding environment is to be displayed.
 14. The remote controller of claim 12, wherein the control processor makes a lightness or a saturation of the display color of one of the digital objects associated with the operation history higher than a lightness or a saturation of the display color of one of the digital objects not associated with the operation history, in a case where one of the digital objects associated with the operation expected from the operation history is to be displayed.
 15. The remote controller of claim 4 or 5, wherein the control processor changes a display shape of each of the digital objects.
 16. The remote controller of claim 15, wherein the storage unit includes
 - highlighted display image information corresponding to each of the digital objects, and
 - normal display image information corresponding to each of the digital objects, and
 the control processor displays the display shape of one of the digital objects associated with the surrounding environment based on the corresponding highlighted display image information and displays the display shape of one of the digital objects not associated with the surrounding environment based on the corresponding normal display image information, in a case where one of the digital objects associated with the operation expected from the surrounding environment is to be displayed.
 17. The remote controller of claim 15, wherein the storage unit includes
 - highlighted display image information corresponding to each of the digital objects, and
 - normal display image information corresponding to each of the digital objects, and
 the control processor displays the display shape of one of the digital objects associated with the opera-

tion history based on the corresponding highlighted display image information and displays the display shape of one of the digital objects not associated with the operation history based on the corresponding normal display image information, in a case where one of the digital objects associated with the operation expected from the operation history is to be displayed. 5

18. The remote controller of any one of claims 1 to 17, 10
wherein
the digital objects are composed of digital images displayed as buttons.

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FIG. 1

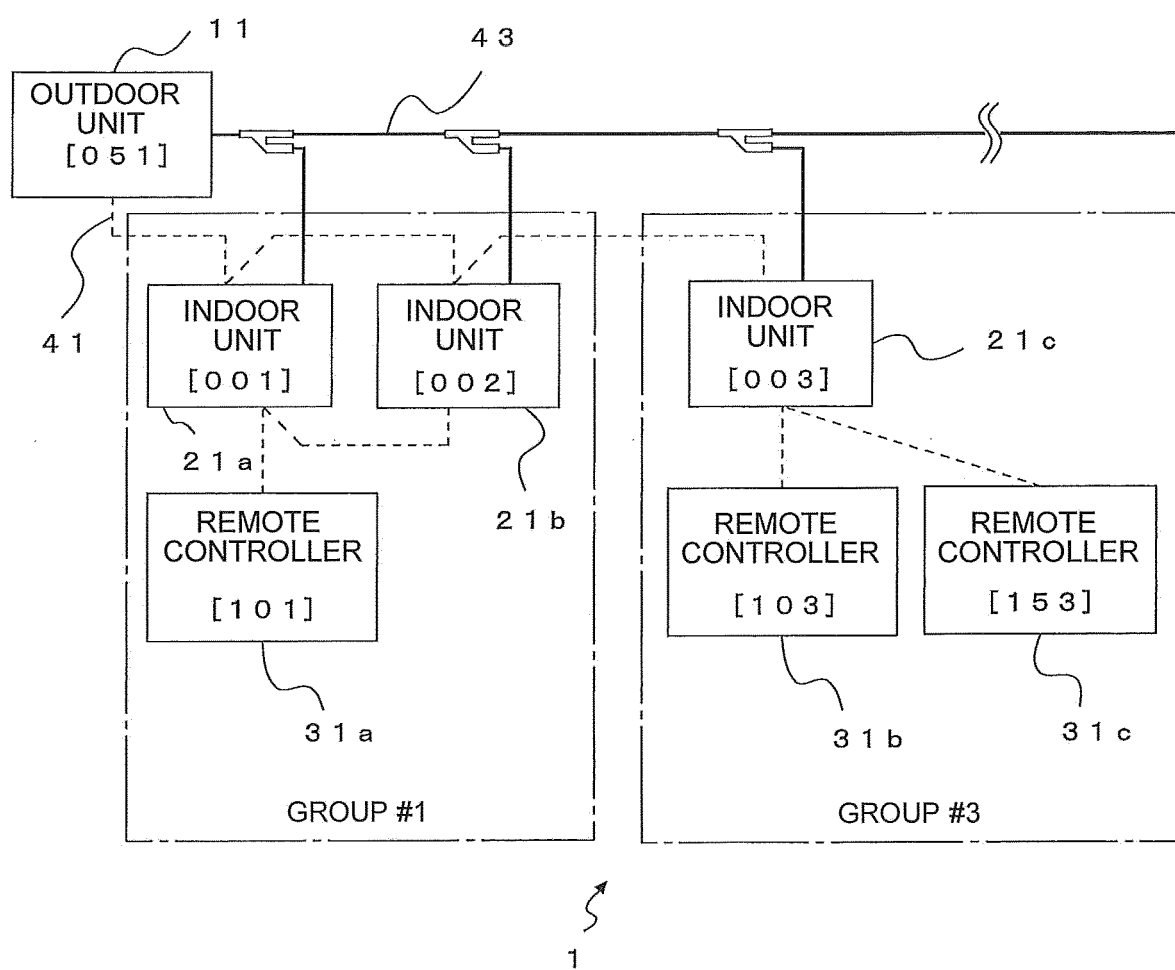


FIG. 2

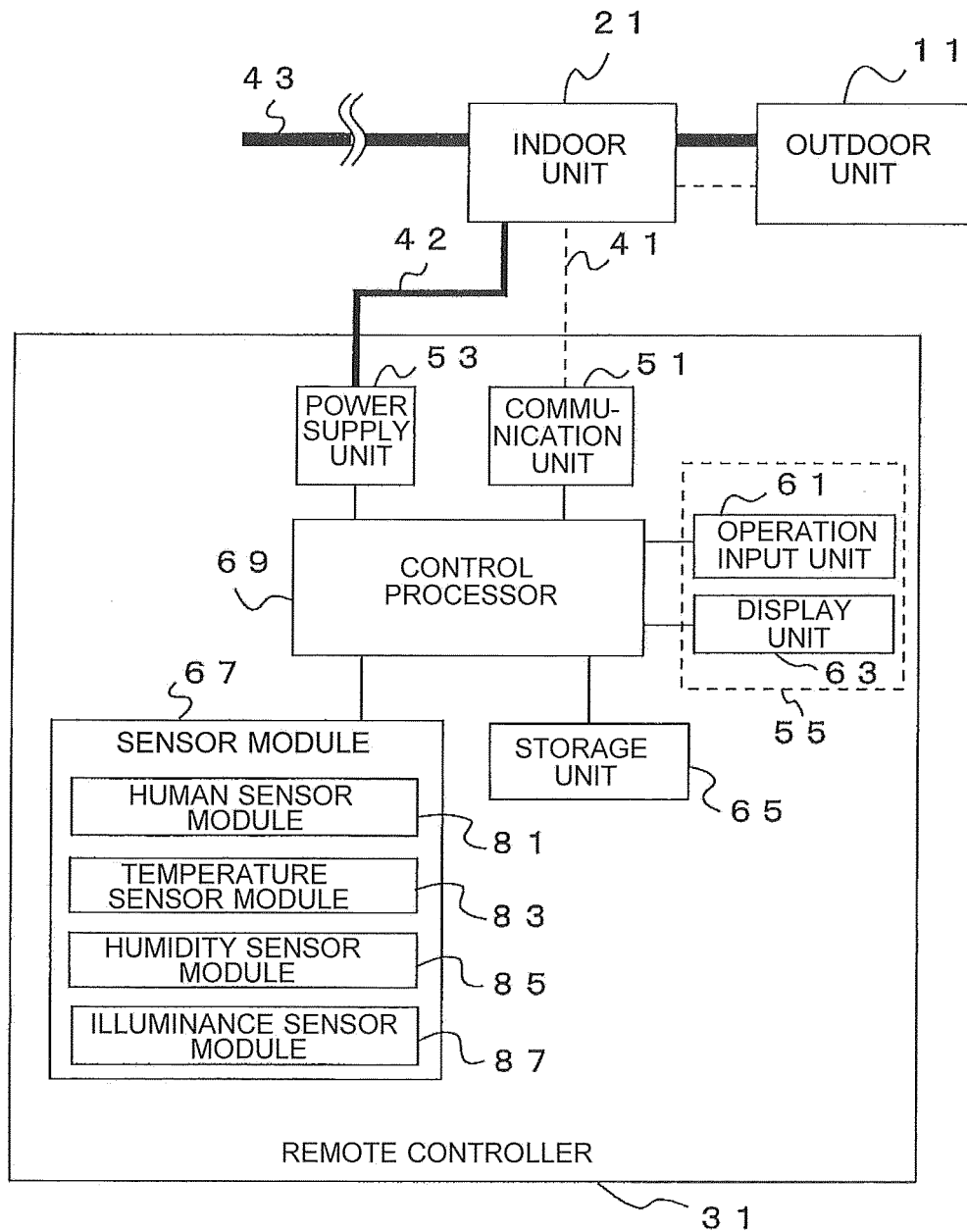


FIG. 3

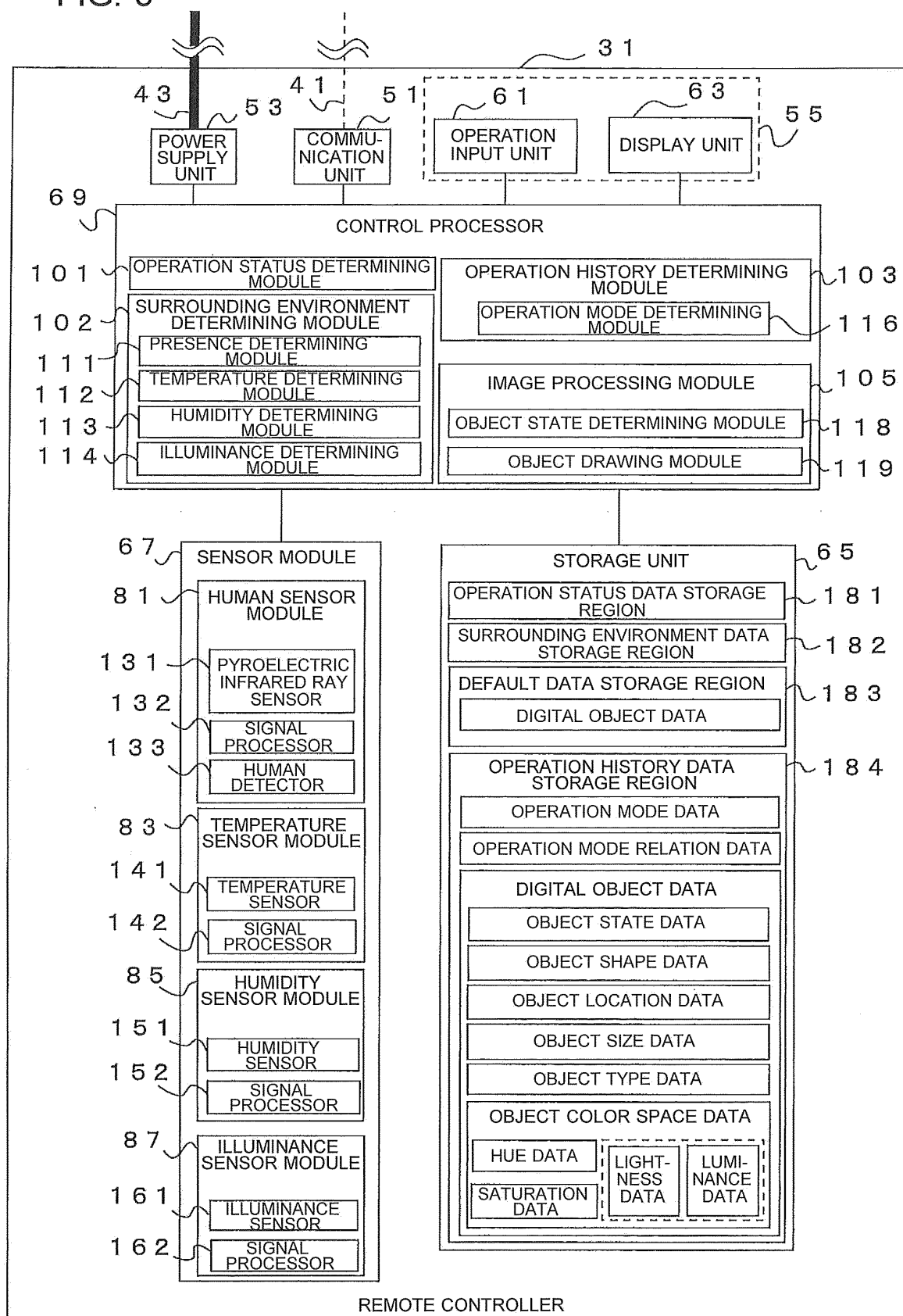


FIG. 4

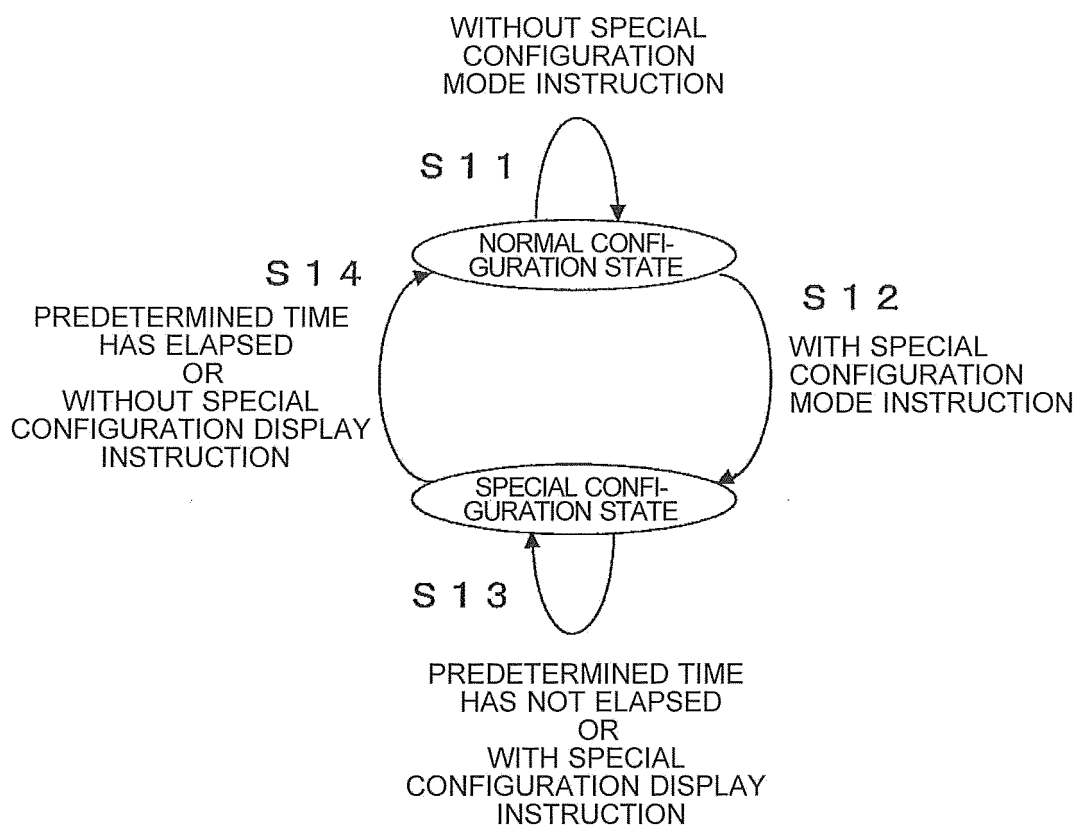


FIG. 5

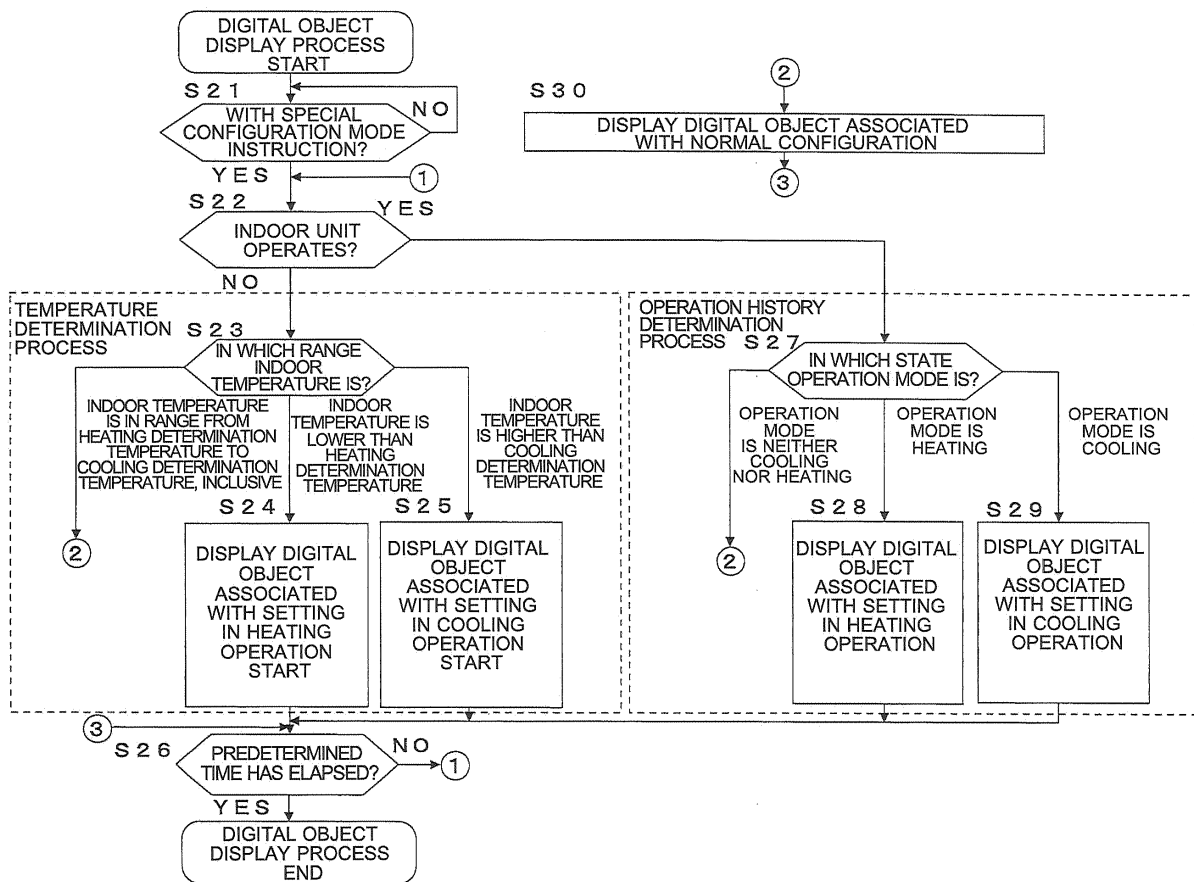


FIG. 6

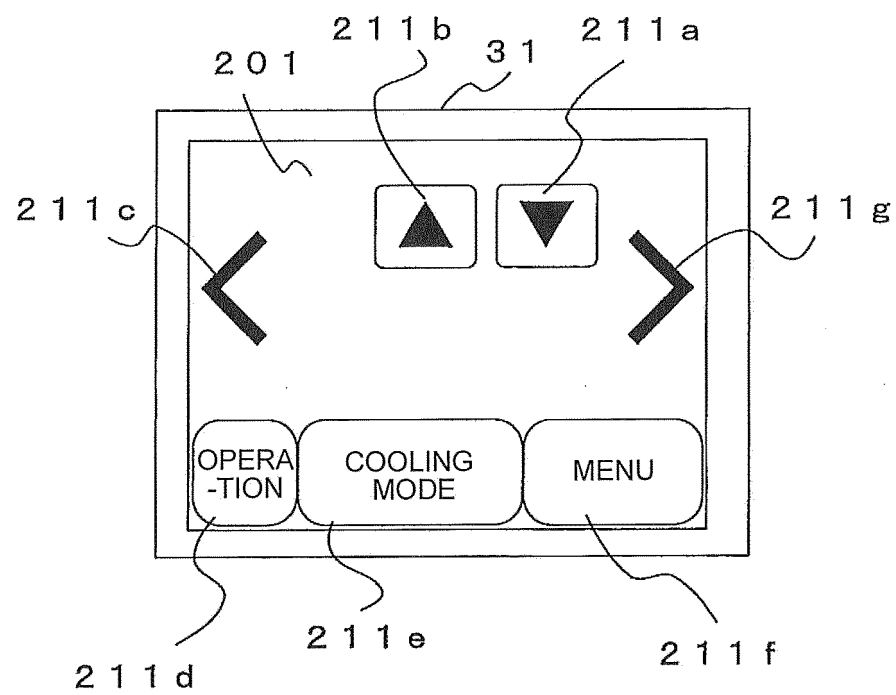


FIG. 7

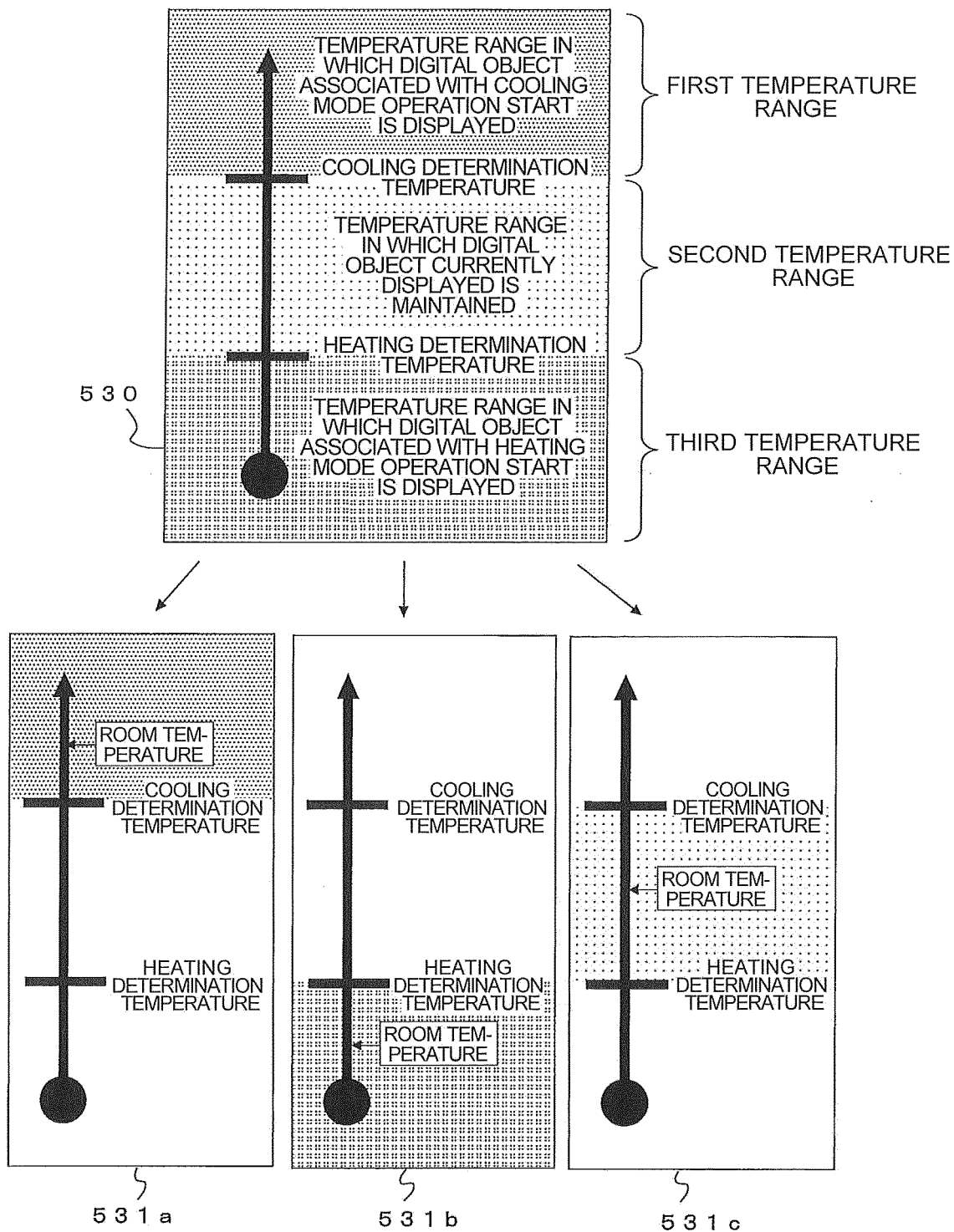


FIG. 8

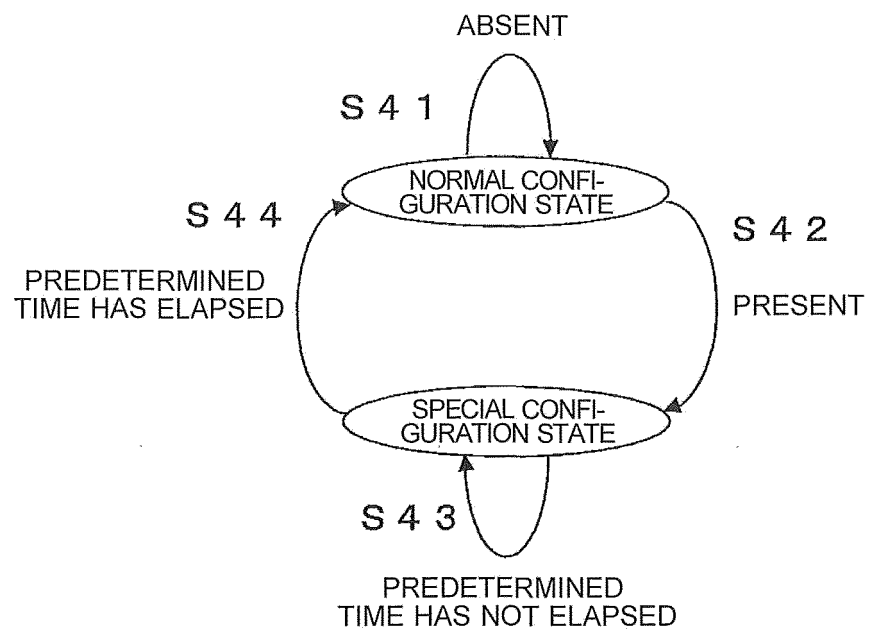


FIG. 9

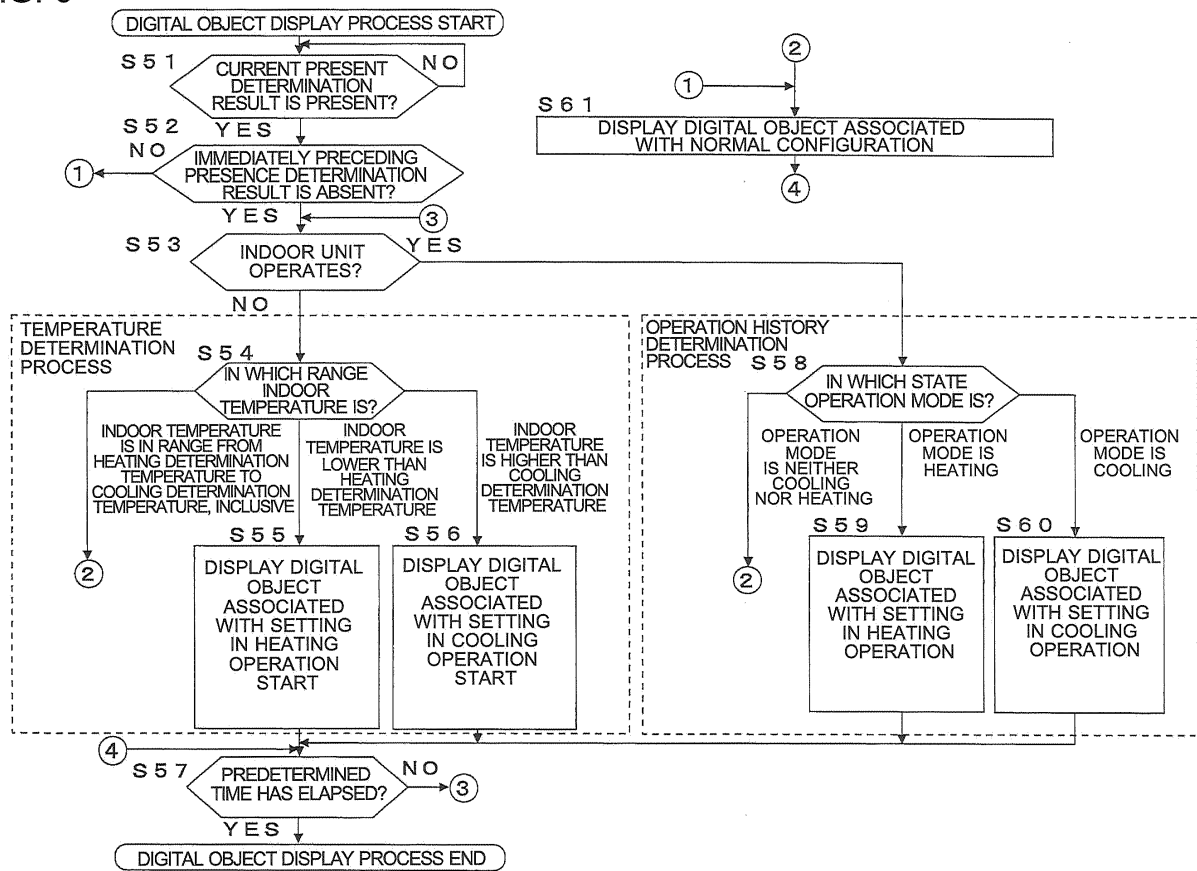


FIG. 10

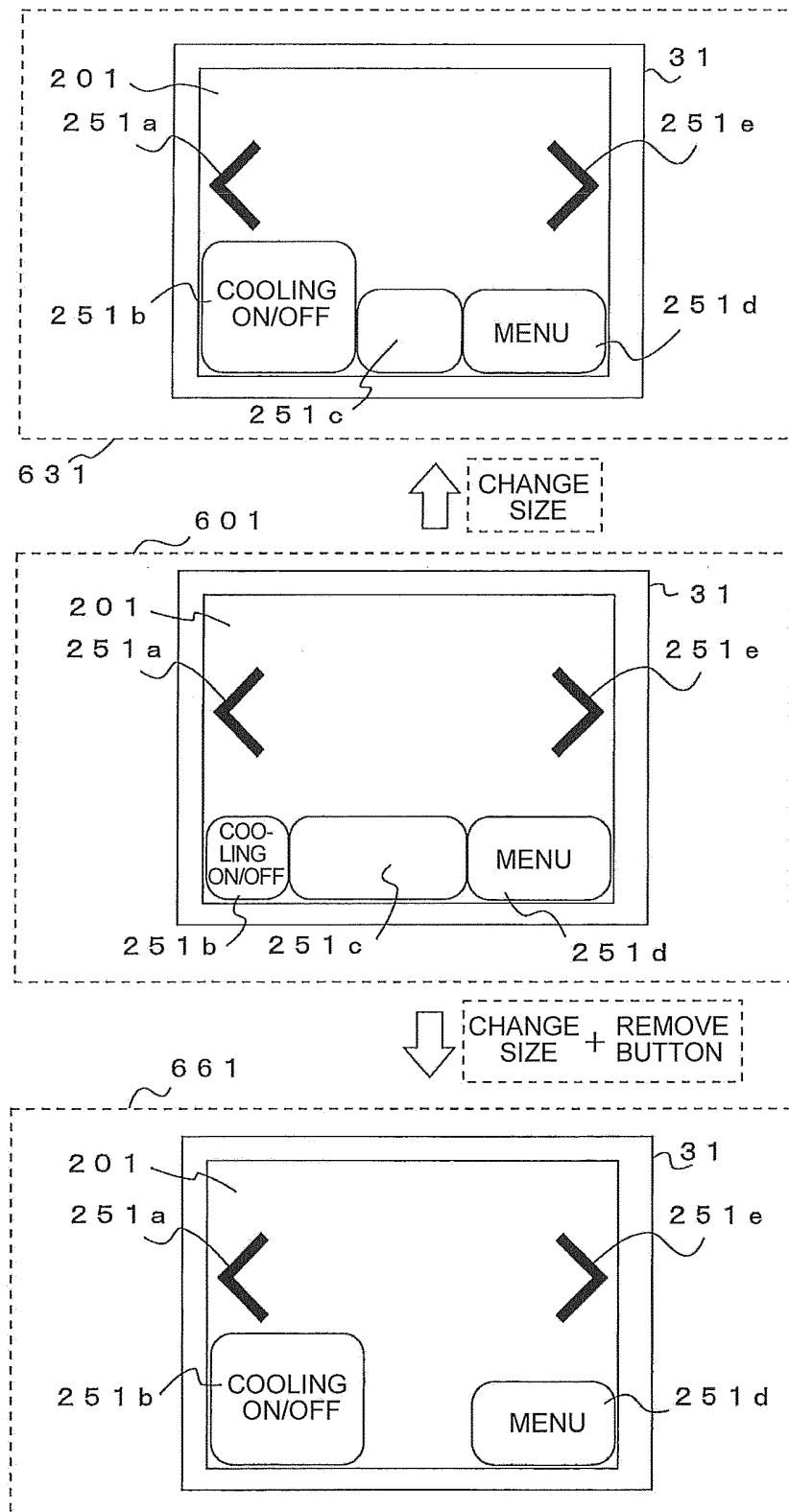


FIG. 11

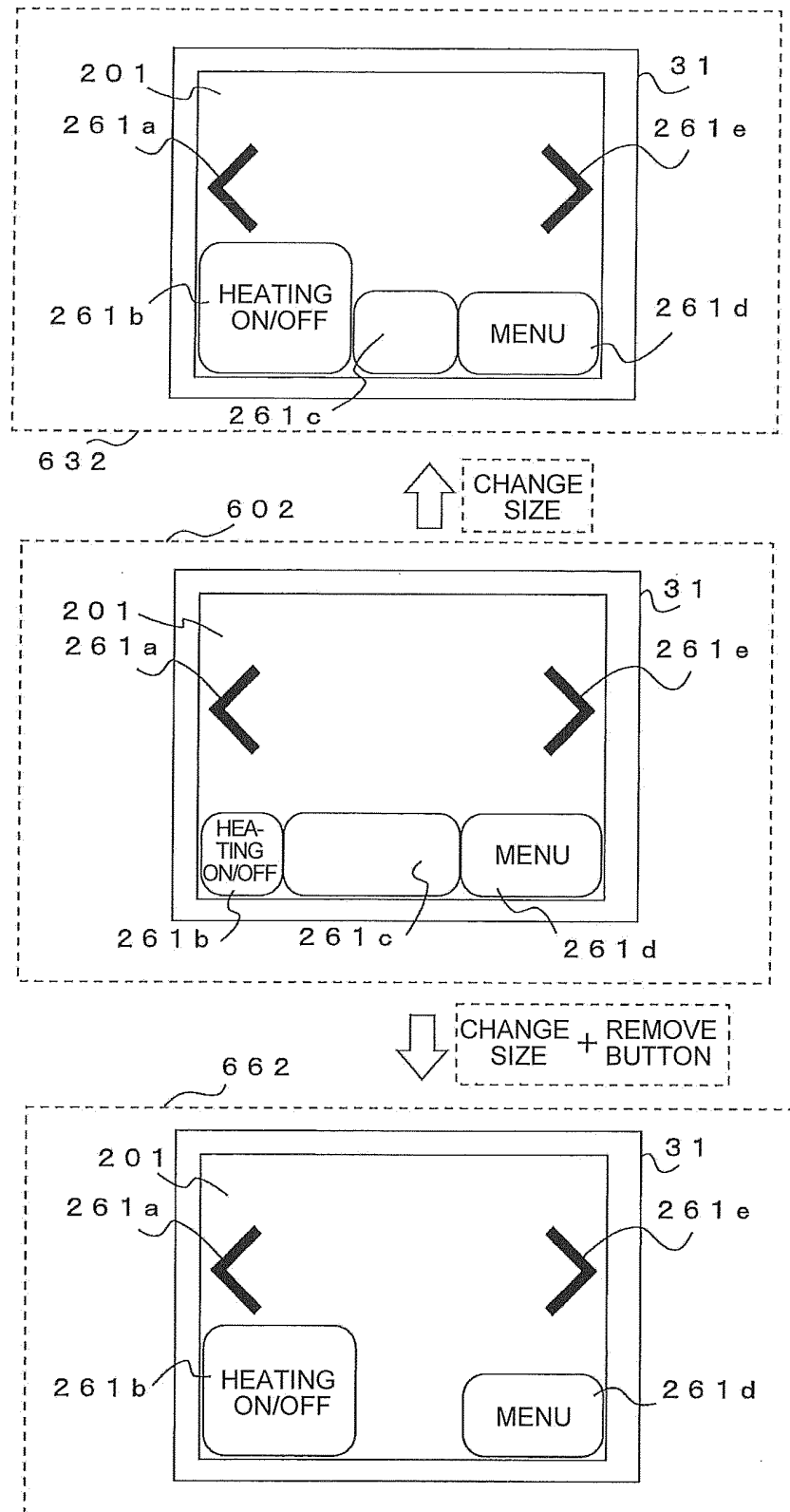


FIG. 12

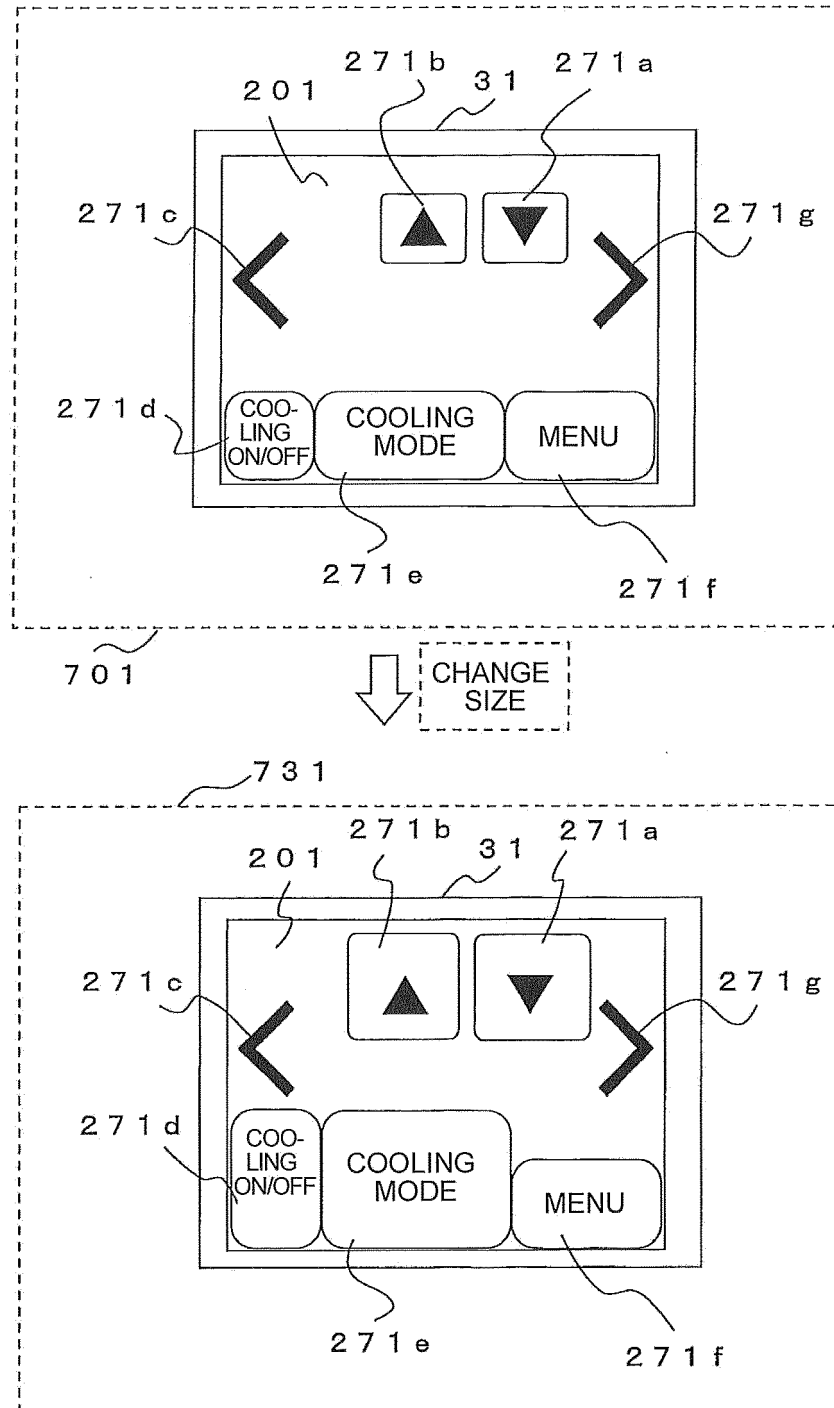


FIG. 13

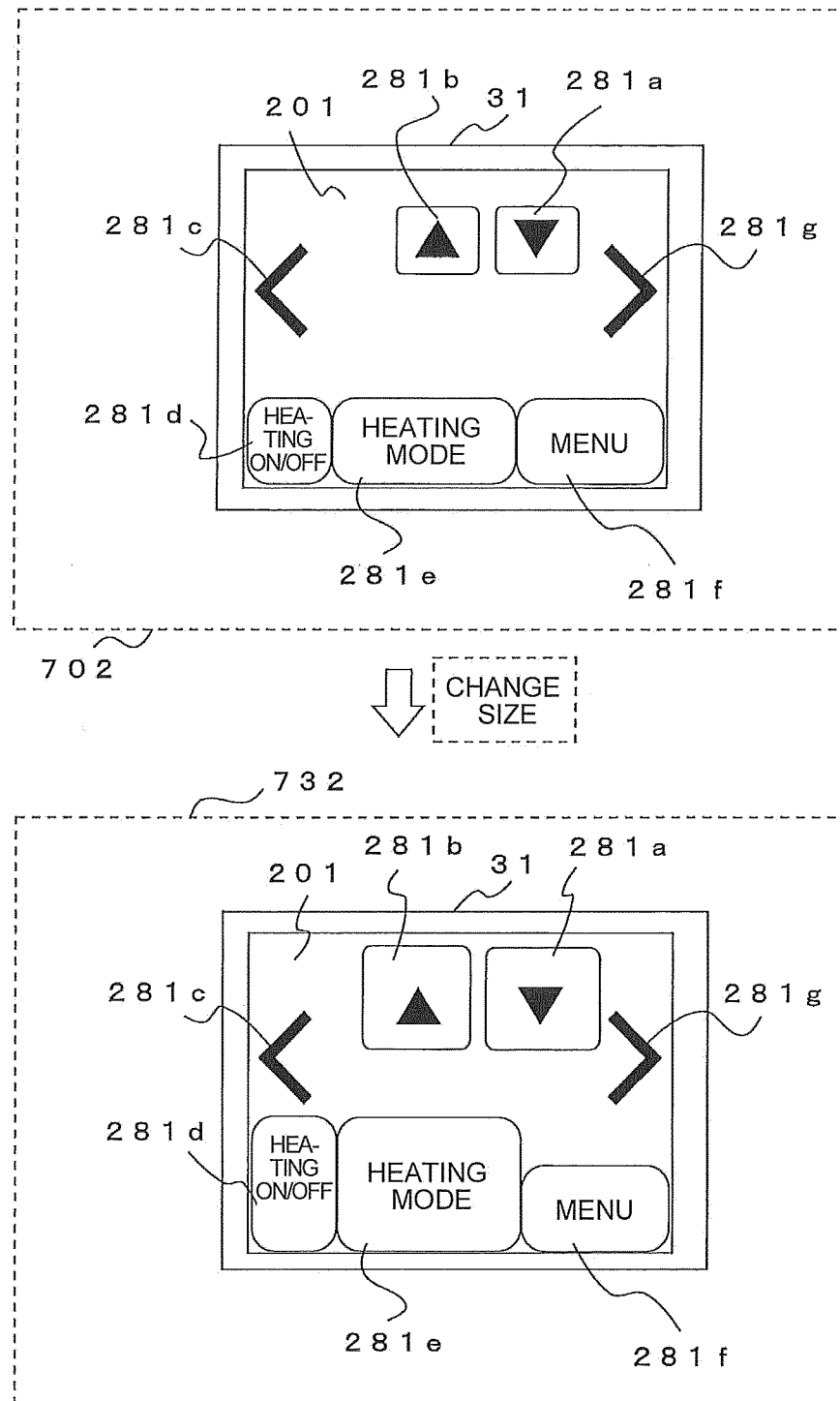


FIG. 14

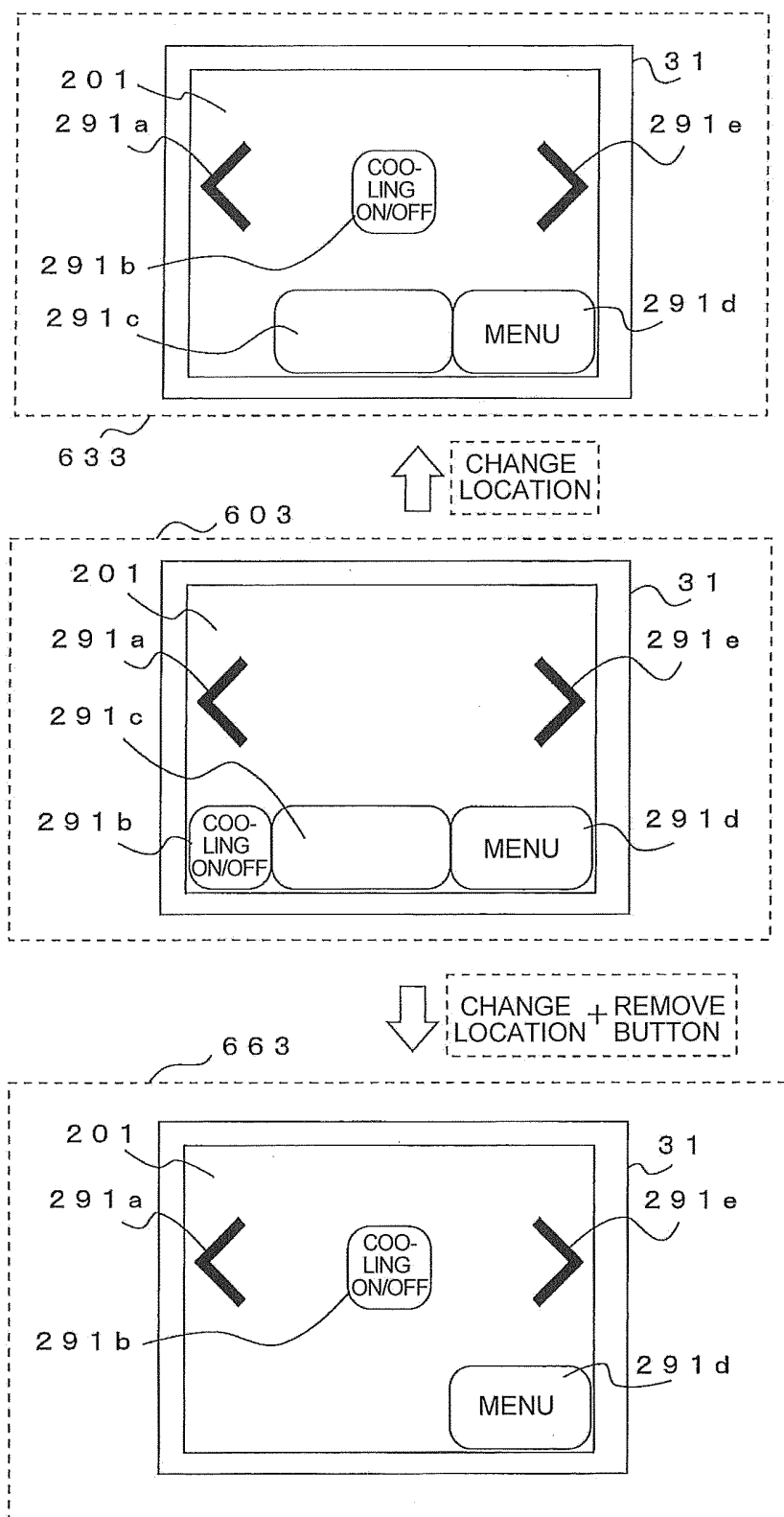


FIG. 15

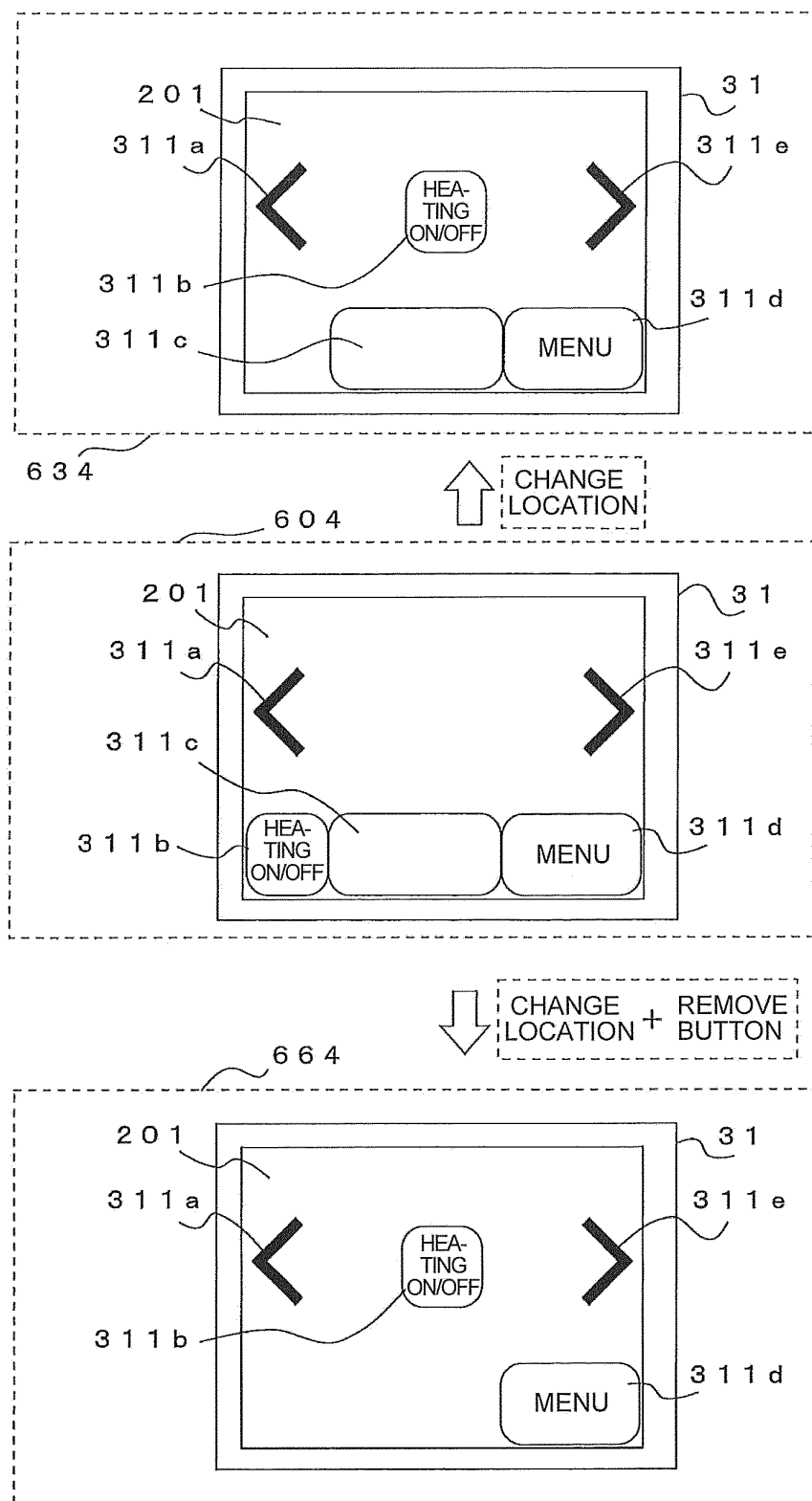


FIG. 16

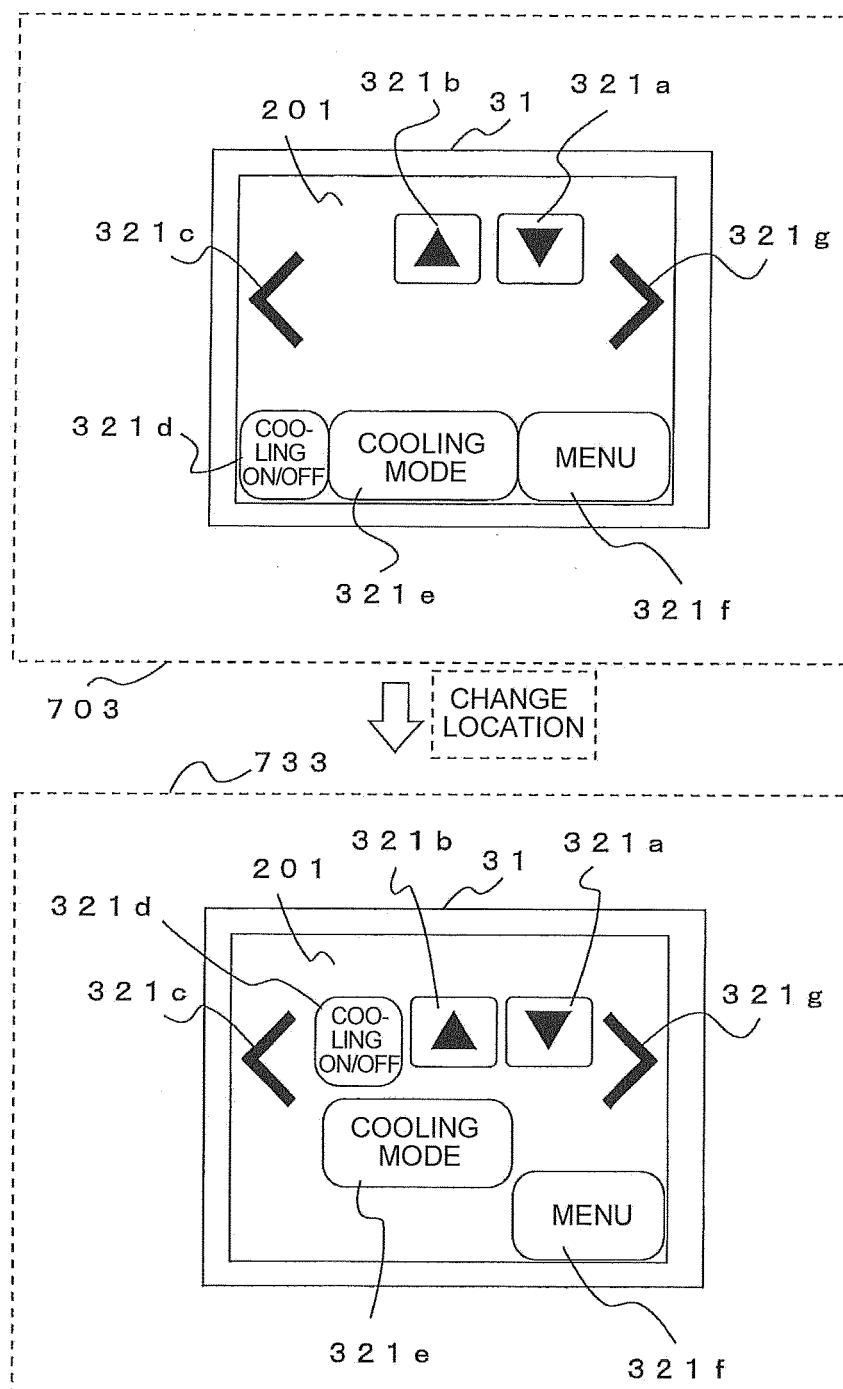


FIG. 17

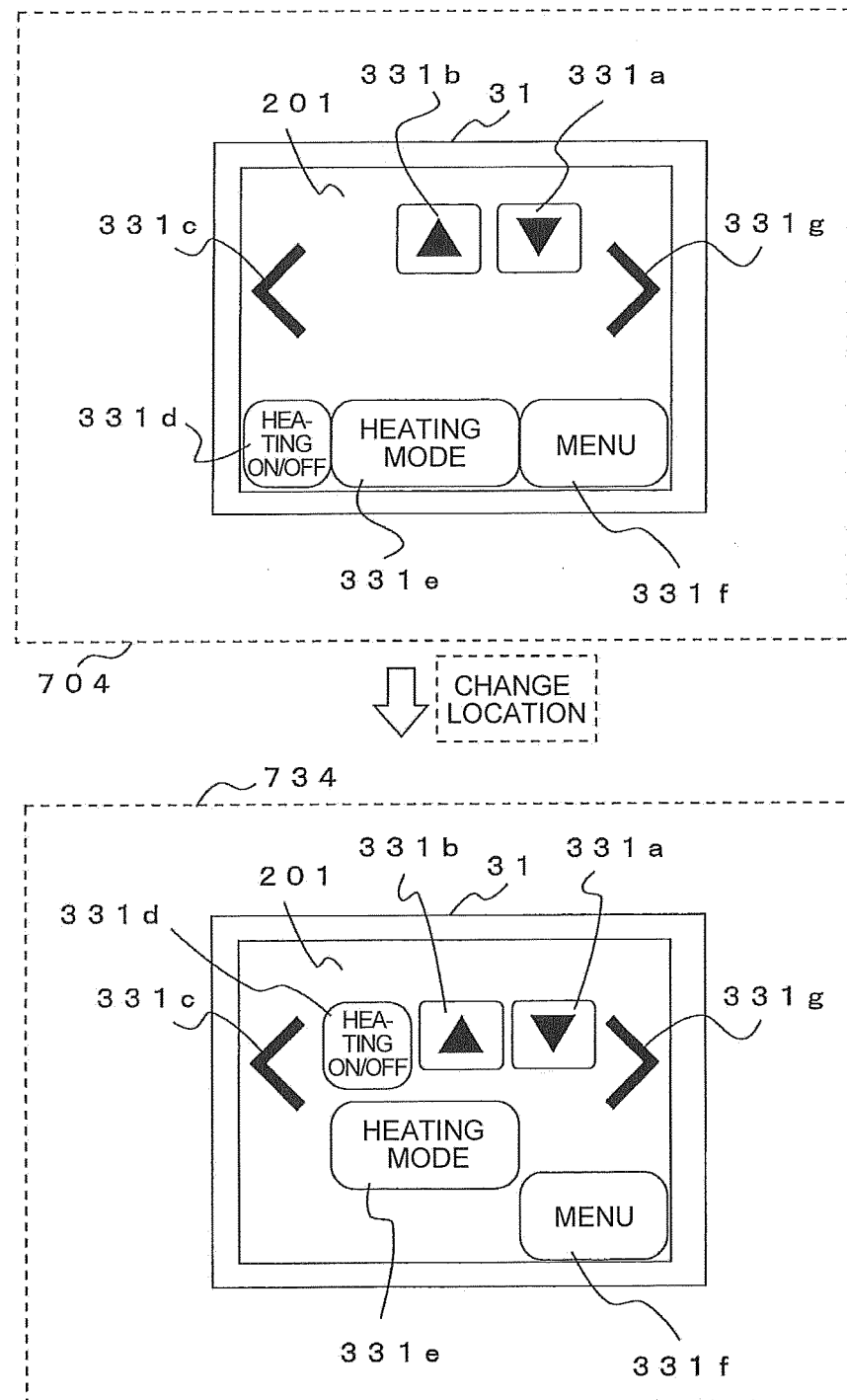


FIG. 18

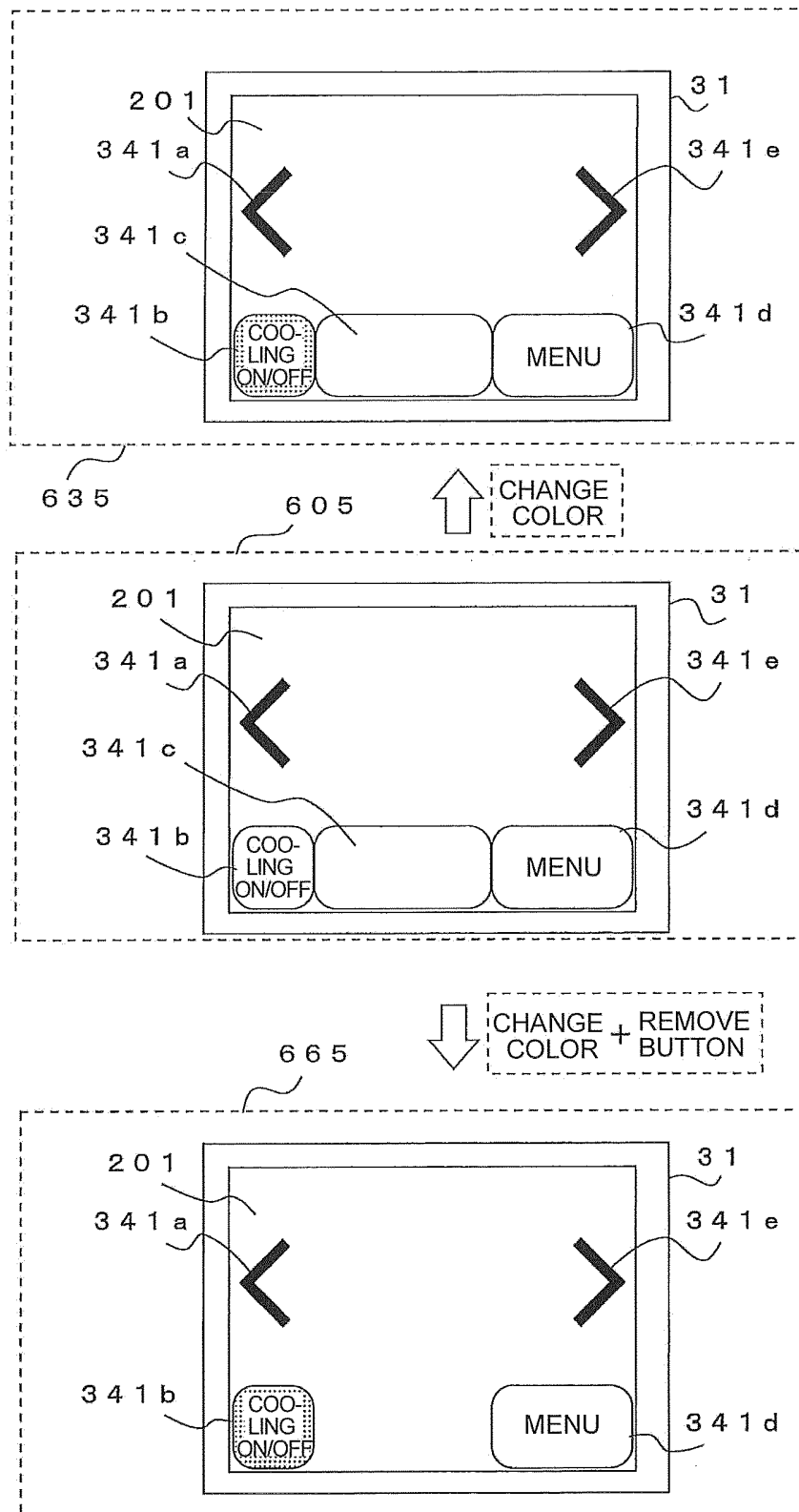


FIG. 19

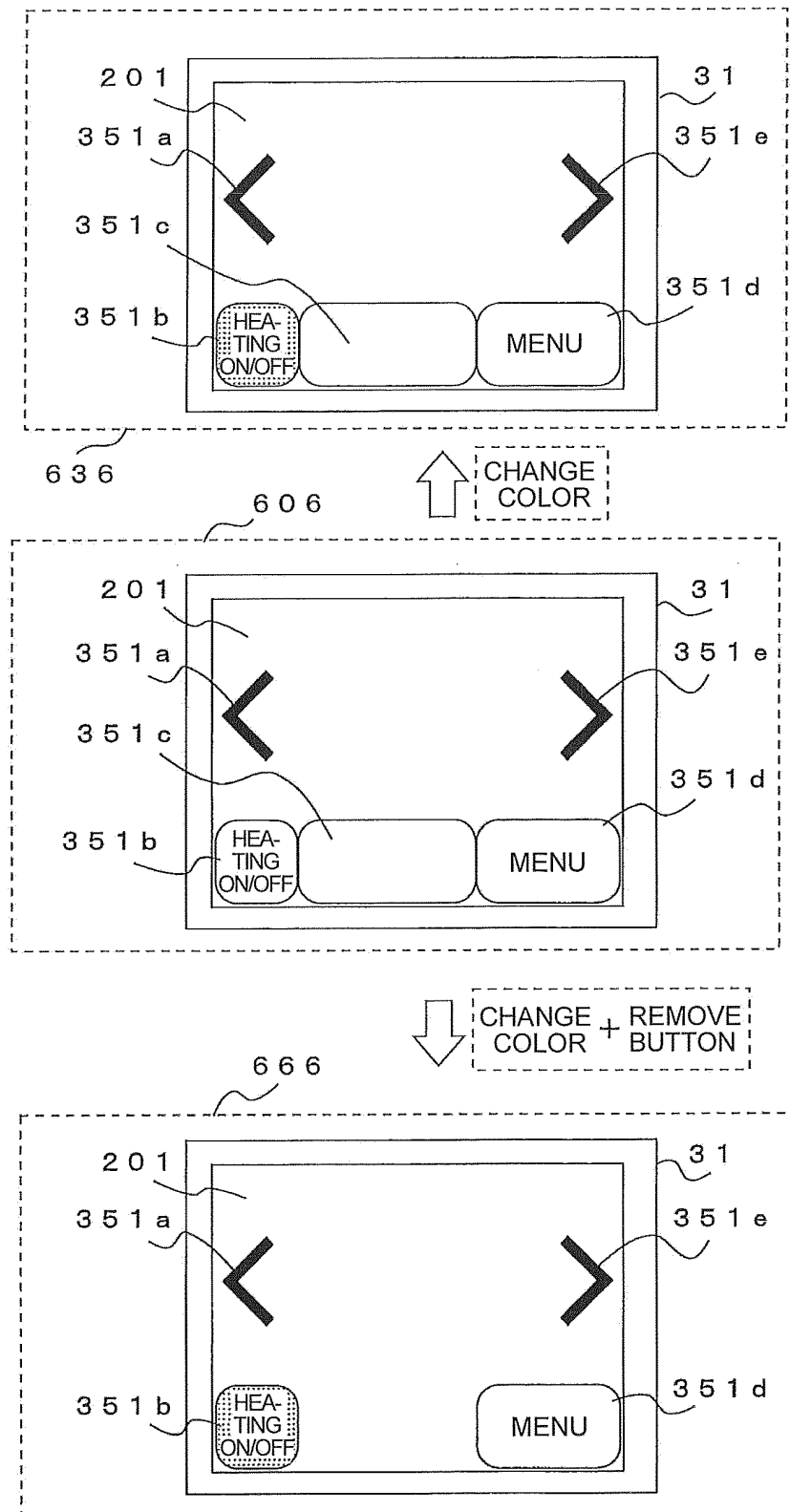


FIG. 20

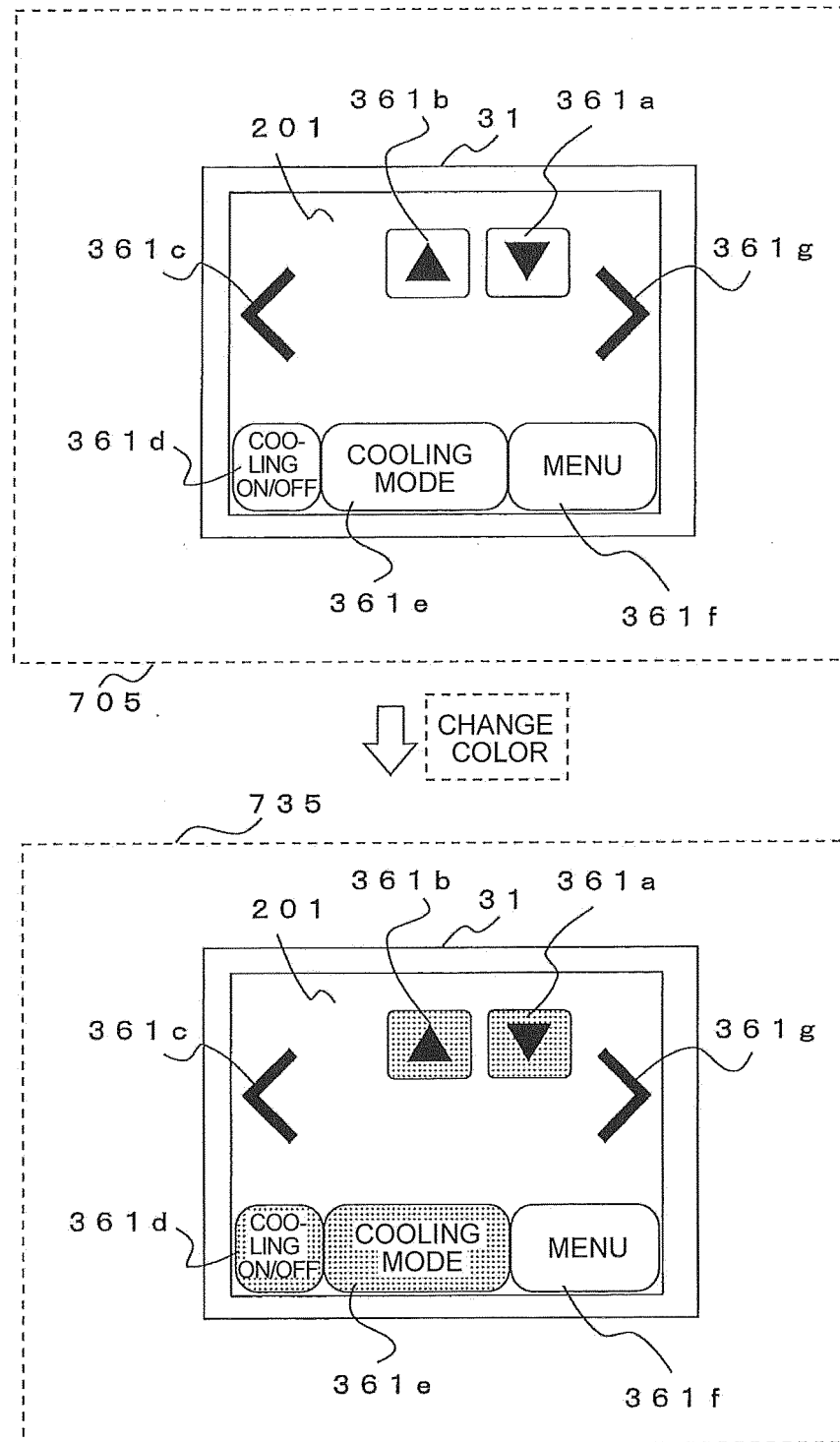


FIG. 21

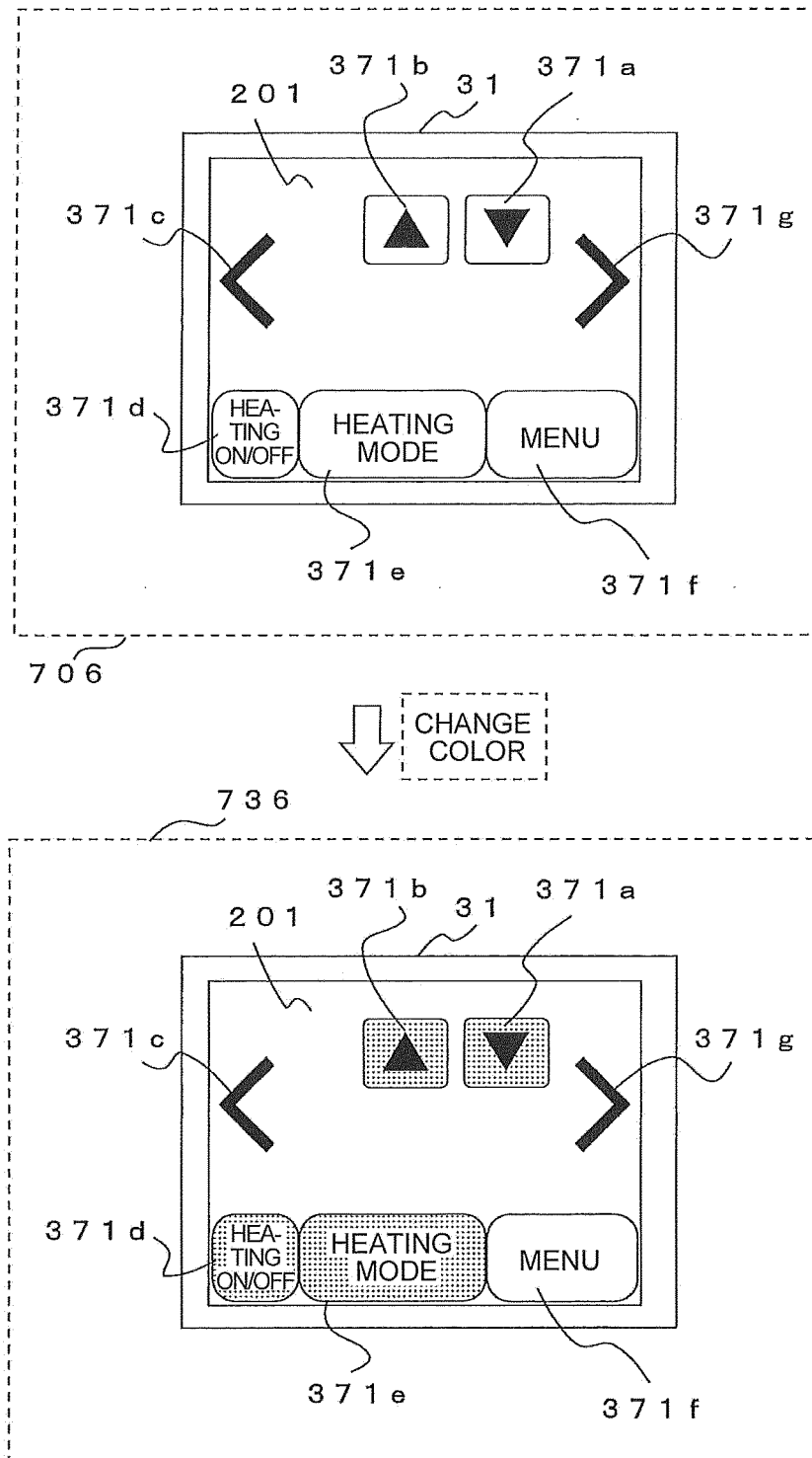


FIG. 22

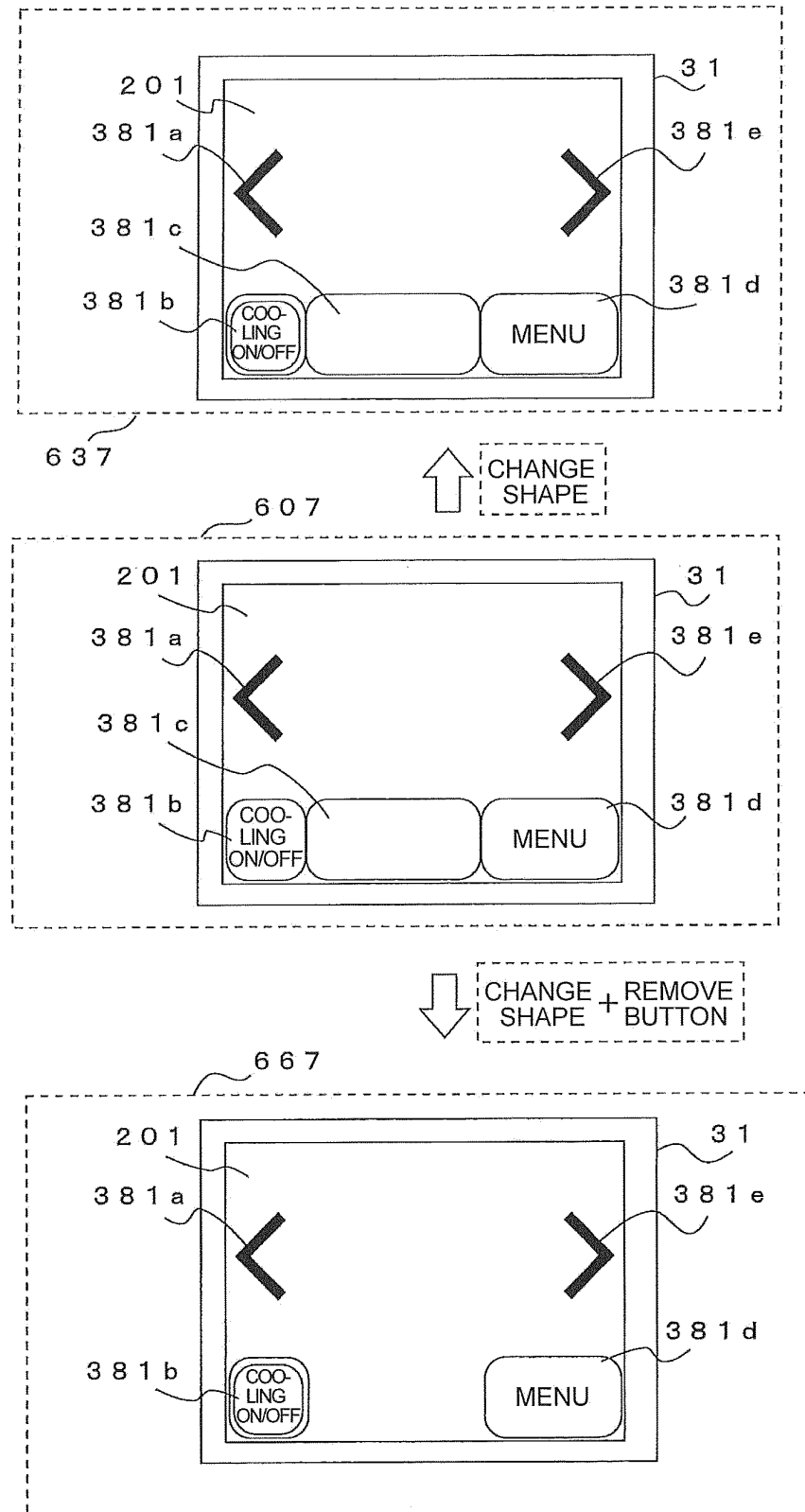


FIG. 23

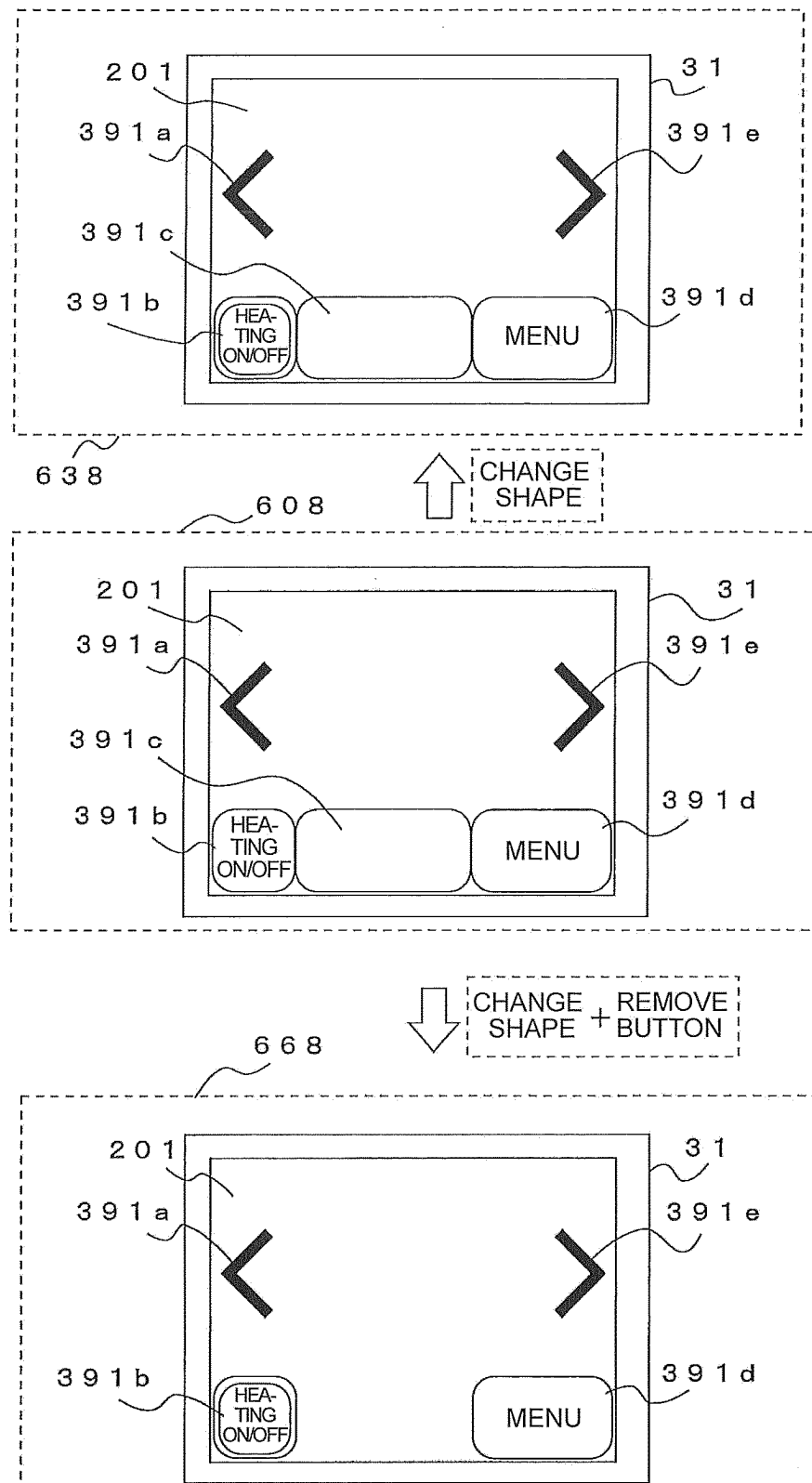


FIG. 24

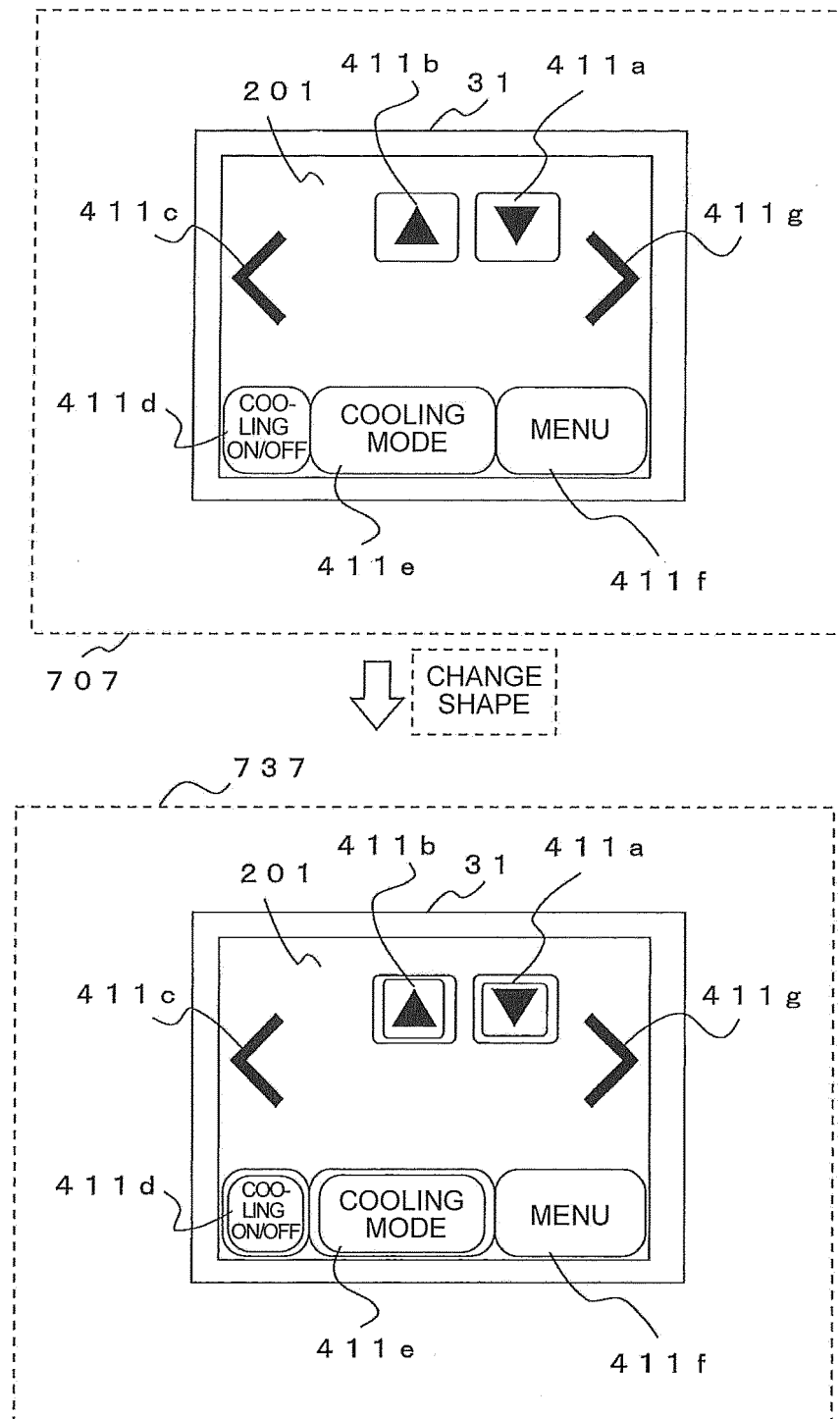
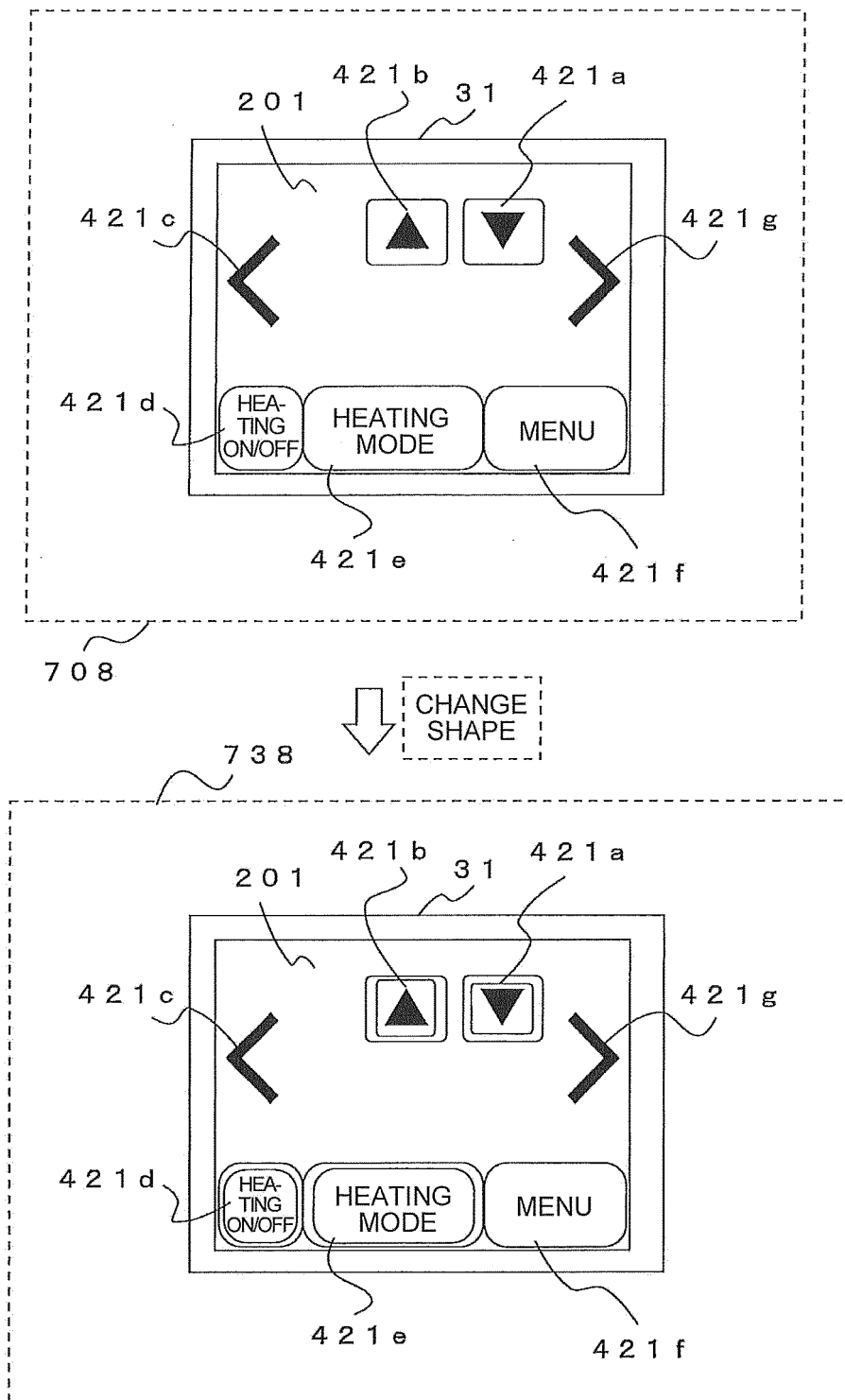


FIG. 25



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/080548

A. CLASSIFICATION OF SUBJECT MATTER

F24F11/02(2006.01) i

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)

F24F11/02

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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.
A	JP 2010-255954 A (Daikin Industries, Ltd.), 11 November 2010 (11.11.2010), paragraphs [0044] to [0117]; fig. 1 to 13 (Family: none)	1-18
A	JP 11-195186 A (Shimizu Corp.), 21 July 1999 (21.07.1999), paragraphs [0029] to [0034]; fig. 6 (Family: none)	1-18
A	JP 2003-219490 A (Fujitsu General Ltd.), 31 July 2003 (31.07.2003), paragraphs [0010] to [0016]; fig. 1 to 3 (Family: none)	1-18

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

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2009-276037 A (Panasonic Corp.), 26 November 2009 (26.11.2009), paragraph [0036] (Family: none)	1-18

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006029634 A [0003]