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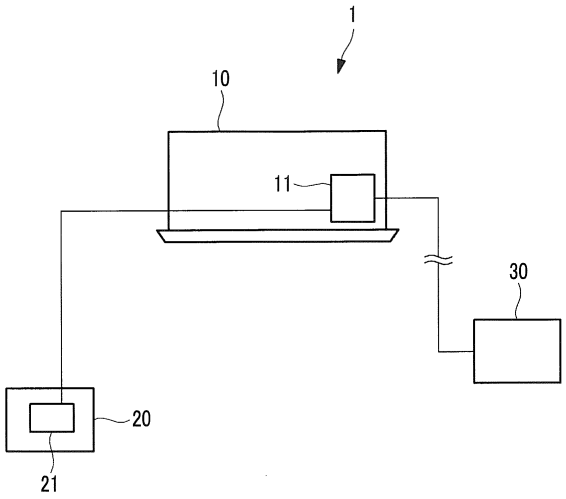
(54) AIR CONDITIONING SYSTEM, AIR CONDITIONING SYSTEM CONTROL METHOD, AND AIR CONDITIONING SYSTEM CONTROL PROGRAM

(57) Provided is an air conditioning system (1) comprising at least one indoor unit (10), at least one outdoor unit, and a remote controller (20) for operating the indoor unit (10), wherein: the indoor unit (10) comprises an indoor unit control device (11) that controls the indoor unit (10) and that includes an external input terminal (18) for receiving an input from an external device (30); the remote controller (20) includes a remote controller control unit (21) that stores preset specific operation setting information and that controls the remote controller (20); the indoor unit control device (11) receives a specific operation start input from the external device (30) and transmits a specific operation start signal; the remote controller control unit (21) transmits specific operation setting information upon receiving the specific operation start signal; and the indoor unit control device (11) performs operation control of the indoor unit (10) on the basis of the specific operation setting information.

FIG. 1



EP 3 425 299 A1

Description

Technical Field

[0001] The present invention relates to an air conditioning system, an air conditioning system control method, and an air conditioning system control program, and more particularly, to an air conditioning system, an air conditioning system control method, and an air conditioning system control program capable of performing an operation setting through an external input.

Background Art

[0002] In the related art, in an air conditioning system which is provided in a facility such as a hotel, a technique in which an operation start of an indoor unit and a manual operation from a user are allowed in conjunction with input information of an external device by inserting a key or a card key for performing locking and unlocking of a room into a holder, for example, is known.

[0003] For example, PTL 1 discloses a key card system in which in a system that performs locking and unlocking of a room using a card key, an operation state (cooling and heating, air flow rate, temperature, or the like) of an air conditioner in a state where the card key is inserted in a card holder is stored in a storage unit inside the card holder. In the technique disclosed in PTL 1, in a case where the card key is extracted from the card holder, the air conditioner is stopped, and then, in a case where the card key is inserted into the card holder again, the operation is started in the operation state of the air conditioner stored before the card key is previously extracted.

[0004] Further, PTL 2 discloses a technique in which information is written in a card key in advance and a card key reading unit of a guest room reads the information to perform an operation at an environment setting of the guest room, for example, a specific room temperature of an air conditioner.

Citation List

Patent Literature

[0005]

[PTL 1] Japanese Unexamined Patent Application Publication No. 2010-229680
[PTL 2] Japanese Unexamined Patent Application Publication No. 2007-323360

Summary of Invention

Technical Problem

[0006] However, in the technique disclosed in PTL 1, since the operation state of the air conditioner is stored in the storage unit inside the card holder, it is necessary to perform design change, remodeling, and installation of the card holder, which takes cost for introduction. In addition, in the technique disclosed in PTL 2, since writing and reading of information with respect to the card key are performed, it is necessary to newly provide a card key writing unit and a card key reading unit, which similarly leads to cost problems.

[0007] Further, in the techniques disclosed in PTL 1 and PTL 2, in a case where a key, a card key, or the like is inserted in an external device such as a holder or the like, an operation start of an indoor unit and a manual operation thereof are possible, but in a case where the key, the card key, or the like is extracted from the holder or the like, the indoor unit is stopped and the manual operation is not possible, which makes it impossible to perform a specific operation.

[0008] The present invention has been made in consideration of the above-mentioned problems, and an object thereof is to provide an air conditioning system capable of employing a configuration in which its cost is reduced without adding a new component, and capable of performing a specific operation even in a case where an operation of an air conditioner is stopped in conjunction with an external device.

Solution to Problem

[0009] In order to solve the above-mentioned problems, an air conditioning system, an air conditioning system control method, and an air conditioning system control program according to the invention employ the following means.

[0010] According to a first aspect of the invention, there is provided an air conditioning system including at least one indoor unit; at least one outdoor unit; and a manual operating device that manually operates the indoor unit, in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device, the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device, the indoor unit control device receives a specific operation start input from the external device through the external input terminal and transmits a specific operation start signal to the manual operating device control unit, the manual operating device control unit receives the specific operation start signal and transmits the specific operation setting information to the indoor unit control device, and the indoor unit control device performs an operation control of the indoor unit on the basis of the received specific operation setting information.

[0011] In a case where a specific operation is started, a specific operation start input is received from the external device and a specific operation start signal is transmitted to the manual operating device control unit from the indoor unit control device. Then, specific operation

setting information corresponding to the signal is transmitted to the indoor unit control device from the manual operating device control unit, and then, the indoor unit control device performs an operation control of the indoor unit on the basis of the specific operation setting information.

[0012] According to this configuration, since transmission and reception with respect to the external device is performed through the external input terminal provided in the indoor unit control device, it is not necessary to additionally provide a new terminal or to perform a design change in view of hardware. By using the external input terminal provided in the indoor unit control device in the related art, it is possible to easily realize the configuration. Further, since specific operation setting information is stored in the manual operating device, it is possible to set a variety of information for controlling an operation of the indoor unit using a user interface provided in the manual operating device. Thus, it is not necessary to additionally provide components or to perform a design change in view of hardware, and accordingly, it is possible to realize the configuration without increasing cost.

[0013] Further, it is possible to easily change the specific operation setting information using the manual operating device, and thus, it is possible to perform an operation control in accordance with an intention of a user.

[0014] Further, since the operation of the indoor unit is started in a specific operation state in accordance with the specific operation start input from the external device, it is not necessary for a user to start the operation of the indoor unit in person.

[0015] In addition, when there is an OFF input of the indoor unit from the external device, the operation of the indoor unit is stopped and the indoor unit does not receive a manual operation of the manual operating device, and when there is an ON input of the indoor unit from the external device, the indoor unit starts the operation and the operation is controlled by a manual operation of the manual operating device. In this case, by setting the OFF input of the indoor unit as a specific operation start input, it is possible to perform the operation of the indoor unit based on a specific operation setting in a state where the manual operation of the manual operating device is not performed and is not received.

[0016] Here, the specific operation setting information refers to information on a combination of setting values of an operation mode such as cooling or heating, a setting temperature, a wind direction, an air flow rate, and a swing function that represent an operation state of the indoor unit. Further, the specific operation start signal refers to a signal for calling specific operation setting information on the basis of the specific operation start input from the external device.

[0017] In the first aspect of the invention, it is preferable that the specific operation setting information includes a combination of setting values of an operation mode, a setting temperature, a wind direction, an air flow rate, and a swing function that represent an operation state of the indoor unit.

[0018] According to this configuration, since the specific operation setting information includes the combination of the setting values of the operation mode, the setting temperature, the wind direction, the air flow rate, and the swing function that represent the operation state of the indoor unit, it is possible to uniquely determine the operation state of the indoor unit as an operation setting intended by a user, on the basis of the reception of the specific operation setting information, and to perform an operation control in accordance with the intention of the user.

[0019] According to a second aspect of the invention, there is provided a control method of an air conditioning system including at least one indoor unit, at least one outdoor unit, and a manual operating device that manually operates the indoor unit, in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device, and the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device, the method including: a step of receiving an input from the external device through the external input terminal and transmitting a specific operation start signal to the manual operating device control unit by the indoor unit control device, a step of receiving the specific operation start signal and transmitting the specific operation setting information to the indoor unit control device by the manual operating device control unit, and a step of performing an operation control of the indoor unit by the indoor unit control device, on the basis of the received specific operation setting information.

[0020] According to a third aspect of the invention, there is provided a control program of an air conditioning system including at least one indoor unit, at least one outdoor unit, and a manual operating device that manually operates the indoor unit, in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device, and the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device, the program including: a step of receiving an input from the external device through the external input terminal and transmitting a specific operation start signal to the manual operating device control unit by the indoor unit control device, a step of receiving the specific operation start signal and transmitting the specific operation setting information to the indoor unit control device by the manual operating device control unit, and a step of performing an operation control of the indoor unit by the indoor unit control device, on the basis of the received specific operation setting information.

Advantageous Effects of Invention

[0021] According to the invention, since it is possible to easily change a configuration without changing the configuration in view of hardware, it is possible to reduce cost, to thereby economically change the configuration.

[0022] Further, in an air conditioning system in which an operation is stopped in conjunction with an external device and a manual operation cannot be performed, it is possible to perform an operation of an indoor unit based on a specific operation setting even in a case where the manual operation is not possible. Thus, it is possible to perform a smooth operation in which a user's intention is reflected.

Brief Description of Drawings

[0023]

Fig. 1 is a schematic configuration diagram showing an air conditioning system according to an embodiment of the invention.

Fig. 2 is a schematic configuration diagram showing a part of an air conditioner control device in the air conditioning system according to the embodiment of the invention.

Fig. 3 is a flowchart showing a control of the air conditioner control device and a manual operating device control unit in the air conditioning system according to the embodiment of the invention.

Description of Embodiments

[0024] Hereinafter, an embodiment of an air conditioning system, an air conditioning system control method, and an air conditioning system control program according to an embodiment of the invention will be described with reference to accompanying drawings.

Fig. 1 shows a schematic configuration of the air conditioning system, the air conditioning system control method, and the air conditioning system control program according to this embodiment.

[0025] As shown in Fig. 1, an air conditioning system 1 includes an indoor unit 10, a remote controller 20 (manual operating device), and an outdoor unit (not shown), as main components. Further, the indoor unit 10 includes an indoor unit control device 11, and the remote controller 20 includes a remote controller control unit (manual operating device control unit) 21. An external device 30 may be connected to the indoor unit 10. A manual operation of the indoor unit 10 may be performed by a manual operation of the remote controller 20. A user appropriately inputs operation information such as ON/OFF of an operation of the indoor unit 10, an operation mode such as cooling, heating or ventilation, a setting temperature, an air flow rate, a wind direction a swing function, or the like (for example, by pressing a corresponding button) using the remote controller 20, so that the indoor unit 10 is operated. In a case where each piece of operation information is input through the remote controller 20 by the user, the remote controller control unit 21 transmits the operation setting information to the indoor unit control device 11, and the indoor unit control device 11 performs an operation control of the indoor unit 10 on the basis of the received operation setting information.

[0026] In Fig. 1, the indoor unit control device 11 and the remote controller control unit 21 are connected to each other through wired communication based on wired connection, but instead, wireless communication may be employed.

[0027] Further, the indoor unit 10 and the outdoor unit (not shown) are connected to each other through a refrigerant circuit (not shown), and heat exchange is performed between the indoor unit 10 and the outdoor unit through the refrigerant circuit.

[0028] The external device 30 is a device that is provided in each living room, such as a card key and a holder therefor in a hotel guest room or a coin timer, a central control device controlled by a manager, or the like, for example. The external device 30 may be connected to an external input terminal 18 (which will be described later) on the indoor unit control device 11, and does not need to be exclusively used for the air conditioning system 1.

[0029] The indoor unit control device 11 and the remote controller control unit 21 are micro processing units (MPU), for example, and have a recording medium on which a program for executing each process is recorded, in which a central processing unit (CPU) reads out the program recorded on the recording medium using a main memory such as a random access memory (RAM) for execution, so that each process is realized.

[0030] Fig. 2 shows a schematic configuration of a part of an air conditioner control device in the air conditioning system according to the embodiment.

[0031] As shown in Fig. 2, the indoor unit control device 11 includes a control board 16, and the control board 16 includes the external input terminal 18.

[0032] The external input terminal 18 provided on the control board 16 is switched on or off through a signal from the external device 30. In general, the indoor unit 10 is switched on or off according to ON or OFF (closing or opening of a circuit) of the external input terminal 18 by a preset setting.

[0033] Specifically, the external input terminal 18 is switched on or off using a relay that is operated in conjunction with ON or OFF of the external device 30.

[0034] In this embodiment, an operation based on specific operation setting information may be performed in accordance with ON or OFF of the external input terminal 18.

[0035] Fig. 3 shows a flowchart showing a control of the air conditioner control device and a manual operating device control unit in the air conditioning system according to the embodiment of the invention.

[0036] A signal (specific operation start input) is trans-

mitted to the indoor unit control device 11 from the external device 30, and the external input terminal 18 on the control board 16 of the indoor unit control device 11 is turned on (step S301). Determination of the turning-on in the indoor unit control device may be performed by setting any one of a level input or a pulse input in advance.

[0037] Then, the indoor unit control device 11 transmits the specific operation start signal to the remote controller control unit 21 in accordance with the ON input of the external input terminal 18 (step S302).

[0038] After the specific operation start signal is received, the remote controller control unit 21 transmits specific operation start setting information stored therein to the indoor unit control device 11 (step S303).

[0039] Here, the specific operation start setting information refers to certain operation information specified in the indoor unit 10. By setting operation state setting information of the indoor unit 10 desired by a user as the specific operation setting information in advance and storing the operation state setting information inside the remote controller control unit 21, it is possible to perform an operation in an operation state that is set in advance, that is, an operation state desired by the user according to an input of the external input terminal 18. The specific operation setting information refers to information on a combination of setting values of respective operation states such as an operation mode such as cooling, heating or ventilation, a setting temperature, a wind direction, an air flow rate, and a swing function. Further, the specific operation start signal refers to a signal for calling the specific operation setting information on the basis of an input of the external input terminal 18.

[0040] The indoor unit control device 11 controls the operation of the indoor unit 10 on the basis of the received specific operation setting information (step S304).

[0041] In a case where a signal for specific operation termination is transmitted to the indoor unit control device 11 from the external device 30 and the external input terminal 18 on the control board 16 of the indoor unit control device 11 is turned off, the indoor unit control device 11 stops the operation of the indoor unit 10 based on the specific operation setting information in accordance with the OFF input of the external input terminal 18 (step S305).

[0042] As described above, according to the air conditioning system control method and the air conditioning system control program according to this embodiment, the following effects are shown.

[0043] In this embodiment, in a case where a specific operation is started, as a specific operation start input is received from the external device 30, a specific operation start signal is transmitted to the remote controller control unit 21 from the indoor unit control device 11. Then, specific operation setting information corresponding to the signal is transmitted to the indoor unit control device 11 from the remote controller control unit 21, and then, the indoor unit control device 11 performs an operation control of the indoor unit 10 on the basis of the specific operation setting information.

[0044] According to this embodiment, since transmission and reception with respect to the external device 30 is performed through the external input terminal 18 provided in the indoor unit control device 11, it is not necessary to additionally provide a new terminal or to perform a design change in view of hardware. By using the external input terminal 18 provided in the indoor unit control device 11 in the related art, it is possible to easily realize the configuration. Further, since specific operation setting information is stored using a storage processing unit of operation setting information provided in the remote controller 20 in the related art, it is possible to set a variety of information for controlling an operation of the indoor unit 10 using a user interface provided in the remote controller 20, and thus, it is not necessary to additionally provide a new device or to perform a design change in view of hardware. Accordingly, since it is not necessary to additionally provide components or to perform a design change in view of hardware, it is possible to easily realize the configuration without increasing cost.

[0045] Further, it is possible to easily change the specific operation setting information using the remote controller 20, and thus, it is possible to perform an operation control in accordance with an intention of a user. In addition, since the operation of the indoor unit 10 is started in a specific operation state in accordance with the specific operation start input from the external device 30, it is not necessary for a user to start the operation of the indoor unit 10 in person.

[0046] Further, in a case where there is an OFF input of the indoor unit from the external device 30, the operation of the indoor unit 10 is stopped and does not receive a manual operation of the remote controller 20, and in a case where there is an ON input of the indoor unit from the external device 30, the indoor unit 10 starts the operation and the operation is controlled by a manual operation of the remote controller 20. In this case, by setting the OFF input of the indoor unit as a specific operation start input, it is possible to perform the operation of the indoor unit 10 based on a specific operation setting in a state where the manual operation of the remote controller 20 is not performed and is not received.

[0047] In addition, according to this embodiment, since the specific operation setting information includes a combination of setting values of an operation mode, a setting temperature, a wind direction, an air flow rate, and a swing function that represent an operation state of the indoor unit 10, it is possible to uniquely determine the operation state of the indoor unit 10 in accordance with an operation setting intended by a user, on the basis of the reception of the specific operation setting information, and to perform an operation control in accordance with the intention of the user.

[0048] Hereinbefore, the embodiment of the invention has been described with reference to the accompanying drawings, but its specific configuration is not limited to the embodiment, and may include a design change or

the like in a range without departing from the concept of the invention.

[0049] For example, in a case where the indoor unit control device 11 transmits a specific operation start signal when the external input terminal 18 is turned on (ON) by a signal from the external device 30, and in a case where the external input terminal 18 is turned off by a signal from the external device 30, any setting may be performed in accordance with an operation form desired by a user. For example, (1) a setting in which an immediately previous operation state indicating a previous ON state is stored and the operation is started in the operation state, (2) a setting in which the operation is started in an immediately previous operation state based on an OFF input (that is, the operation is continued), or (3) a setting in which the operation is started in a standard operation state that is set and stored in advance in accordance with an operation form desired by a user may be used.

[0050] Further, a configuration in which in a case where the external input terminal 18 is turned on (ON) by a signal from the external device 30, the indoor unit control device 11 transmits a specific operation start signal has been described, but a configuration in which in a case where the external input terminal 18 is turned off (OFF) by a signal from the external device 30, the indoor unit control device 11 transmits a specific operation start signal may be employed.

Reference Signs List

[0051]

1: air conditioning system
10: indoor unit
11: indoor unit control device
16: control board
18: external input terminal
20: remote controller (operating device)
21: remote controller control unit (operating device control unit)
30: external device

Claims

1. An air conditioning system comprising:

at least one indoor unit;
at least one outdoor unit; and
a manual operating device that manually operates the indoor unit,
wherein the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device,
the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device,
the indoor unit control device receives a specific operation start input from the external device through the external input terminal and transmits a specific operation start signal to the manual operating device control unit,
the manual operating device control unit receives the specific operation start signal and transmits the specific operation setting information to the indoor unit control device, and
the indoor unit control device performs an operation control of the indoor unit on the basis of the received specific operation setting information.

2. The air conditioning system according to claim 1, wherein the specific operation setting information includes a combination of setting values of an operation mode, a setting temperature, a wind direction, an air flow rate, and a swing function that represent an operation state of the indoor unit.

3. A control method of an air conditioning system including at least one indoor unit, at least one outdoor unit, and a manual operating device that manually operates the indoor unit,
in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device, and
the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device,
the method comprising:

a step of receiving an input from the external device through the external input terminal and transmitting a specific operation start signal to the manual operating device control unit by the indoor unit control device;
a step of receiving the specific operation start signal and transmitting the specific operation setting information to the indoor unit control device by the manual operating device control unit; and
a step of performing an operation control of the indoor unit by the indoor unit control device, on the basis of the received specific operation setting information.

4. A control program of an air conditioning system including at least one indoor unit, at least one outdoor unit, and a manual operating device that manually operates the indoor unit,
in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an

external device, and
the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device,
the program comprising:

a step of receiving an input from the external device through the external input terminal and transmitting a specific operation start signal to the manual operating device control unit by the indoor unit control device;
a step of receiving the specific operation start signal and transmitting the specific operation setting information to the indoor unit control device by the manual operating device control unit; and
a step of performing an operation control of the indoor unit by the indoor unit control device, on the basis of the received specific operation setting information.

Amended claims under Art. 19.1 PCT

1. (Amended) An air conditioning system comprising:

at least one indoor unit;
at least one outdoor unit; and
a manual operating device that manually operates the indoor unit,
wherein the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device,
the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device,
the indoor unit control device receives a specific operation start input from the external device through the external input terminal and transmits a specific operation start signal to the manual operating device control unit,
the manual operating device control unit receives the specific operation start signal and transmits the specific operation setting information to the indoor unit control device,
the indoor unit control device performs an operation control of the indoor unit on the basis of the received specific operation setting information, and
in a case where an operation of the indoor unit is stopped and a manual operation of the manual operating device is not received when there is an OFF input of the indoor unit from the external device, the OFF input of the indoor unit is set as the specific operation start input.

2. The air conditioning system according to claim 1, wherein the specific operation setting information includes a combination of setting values of an operation mode, a setting temperature, a wind direction, an air flow rate, and a swing function that represent an operation state of the indoor unit.

3. (Amended) A control method of an air conditioning system including at least one indoor unit, at least one outdoor unit, and a manual operating device that manually operates the indoor unit,
in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device, and
the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device,
the method comprising:

a step of receiving an input from the external device through the external input terminal and transmitting a specific operation start signal to the manual operating device control unit by the indoor unit control device;
a step of receiving the specific operation start signal and transmitting the specific operation setting information to the indoor unit control device by the manual operating device control unit;
a step of performing an operation control of the indoor unit by the indoor unit control device, on the basis of the received specific operation setting information; and
a step of setting, in a case where an operation of the indoor unit is stopped and a manual operation of the manual operating device is not received when where there is an OFF input of the indoor unit from the external device, the OFF input of the indoor unit as the specific operation start input.

4. (Amended) A control program of an air conditioning system including at least one indoor unit, at least one outdoor unit, and a manual operating device that manually operates the indoor unit,
in which the indoor unit includes an indoor unit control device that controls the indoor unit and includes an external input terminal for receiving an input from an external device, and
the manual operating device includes a manual operating device control unit that stores preset specific operation setting information and controls the manual operating device,
the program comprising:

a step of receiving an input from the external device through the external input terminal and

transmitting a specific operation start signal to the manual operating device control unit by the indoor unit control device;

a step of receiving the specific operation start signal and transmitting the specific operation setting information to the indoor unit control device by the manual operating device control unit;

a step of performing an operation control of the indoor unit by the indoor unit control device, on the basis of the received specific operation setting information; and

a step of setting, in a case where an operation of the indoor unit is stopped and a manual operation of the manual operating device is not received when there is an OFF input of the indoor unit from the external device, the OFF input of the indoor unit as the specific operation start input.

FIG. 1

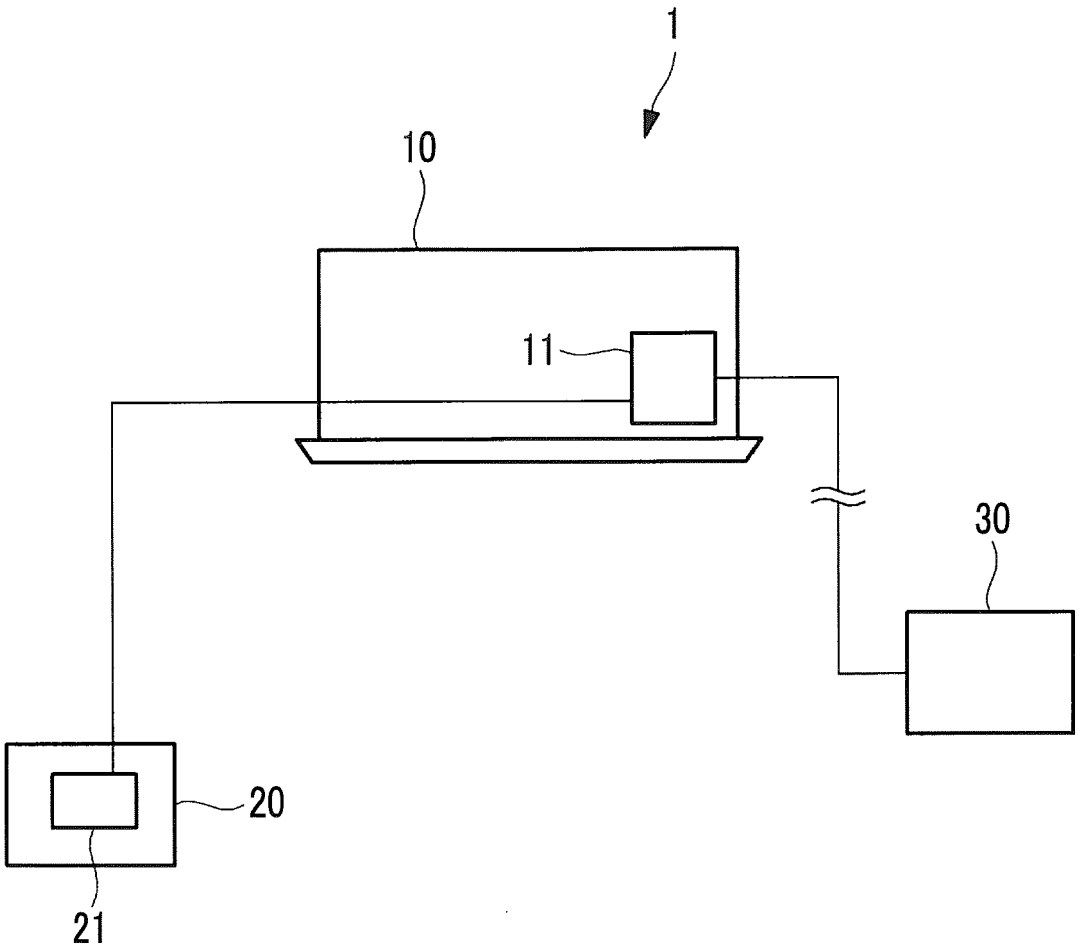


FIG. 2

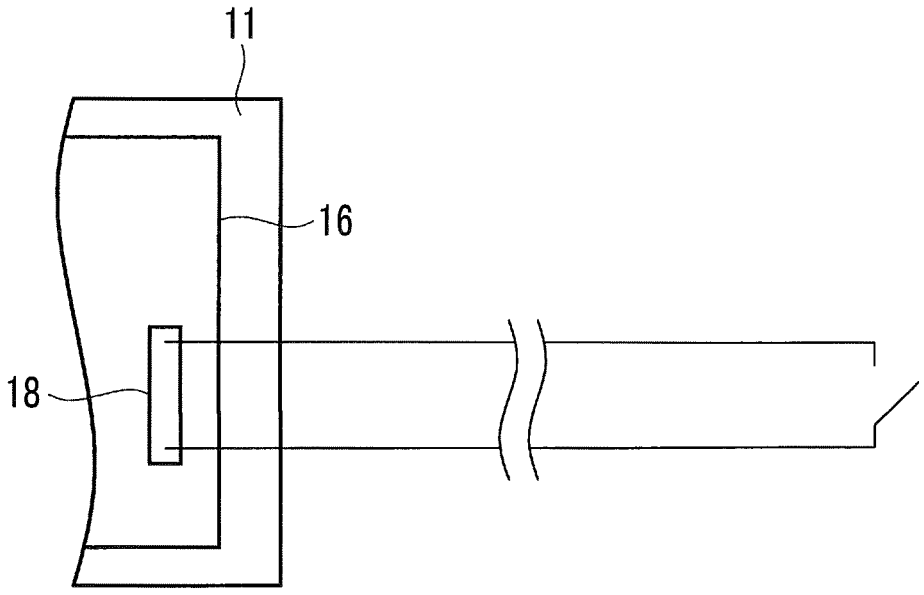
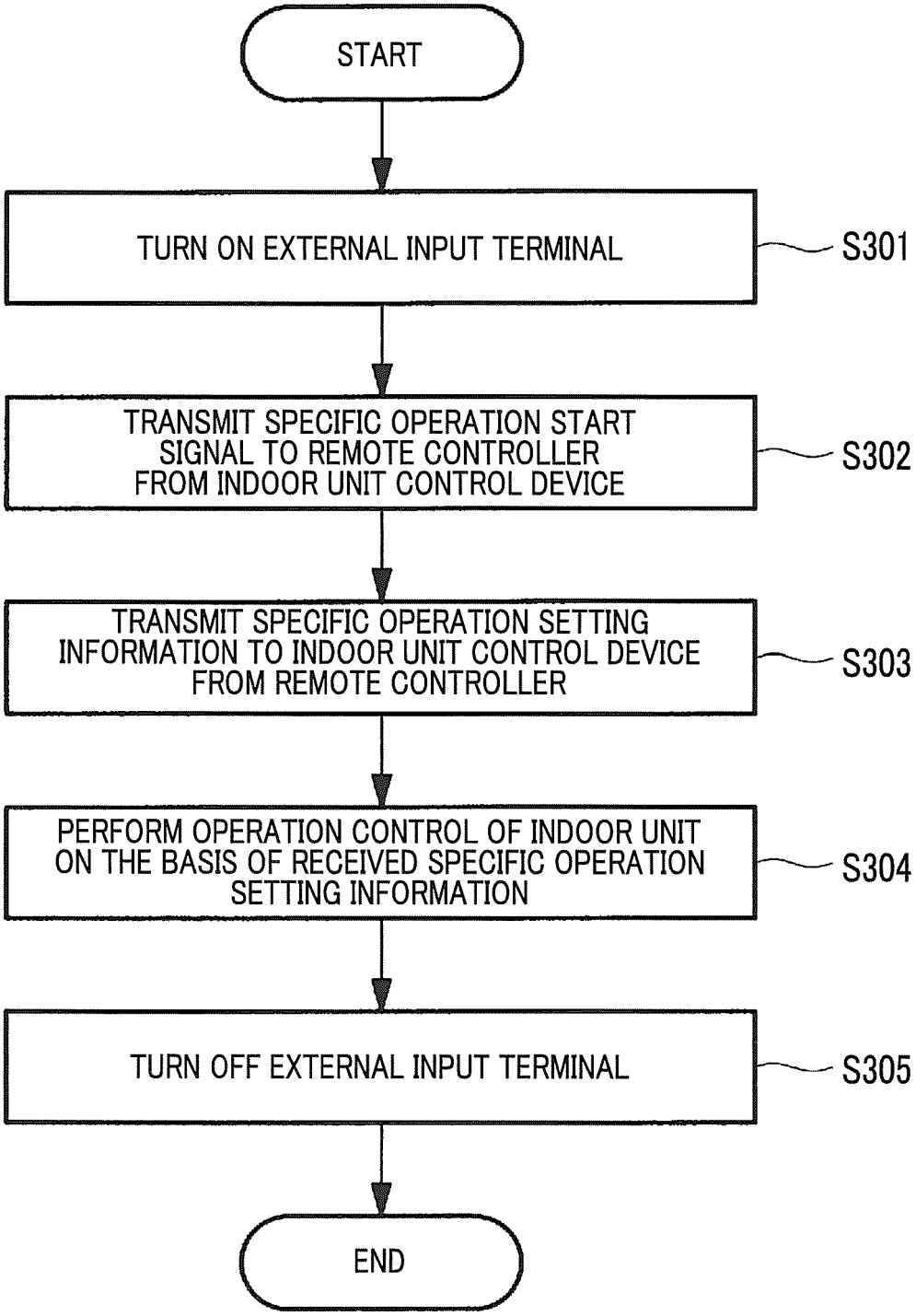


FIG. 3


START
TURN ON EXTERNAL INPUT TERMINAL
S301
TRANSMIT SPECIFIC OPERATION START SIGNAL TO REMOTE CONTROLLER FROM INDOOR UNIT CONTROL DEVICE
S302
TRANSMIT SPECIFIC OPERATION SETTING INFORMATION TO INDOOR UNIT CONTROL DEVICE FROM REMOTE CONTROLLER
S303
PERFORM OPERATION CONTROL OF INDOOR UNIT ON THE BASIS OF RECEIVED SPECIFIC OPERATION SETTING INFORMATION
S304
TURN OFF EXTERNAL INPUT TERMINAL
S305
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/029053

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 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-243074 A (Mitsubishi Electric Corp.), 28 October 2010 (28.10.2010), paragraphs [0001] to [0052]; fig. 1 to 3 (Family: none)	1-4
Y	JP 6-74540 A (Hitachi, Ltd.), 15 March 1994 (15.03.1994), paragraph [0002]; fig. 1 (Family: none)	1-4
A	JP 2005-180800 A (Sharp Corp.), 07 July 2005 (07.07.2005), paragraphs [0014] to [0037] (Family: none)	1-4

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

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Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2017 (11.10.17)	24 October 2017 (24.10.17)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/029053

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 9-126534 A (Samsung Electronics Co., Ltd.), 16 May 1997 (16.05.1997), paragraphs [0002] to [0032]; fig. 1 to 4 & KR 10-0169435 B1	1-4
A	JP 2002-31394 A (Sanyo Electric Co., Ltd.), 31 January 2002 (31.01.2002), paragraphs [0001] to [0028]; fig. 1 to 3 (Family: none)	1-4
A	JP 2011-99622 A (Mitsubishi Electric Corp.), 19 May 2011 (19.05.2011), paragraphs [0007], [0034] to [0035] (Family: none)	1-4

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- JP 2010229680 A **[0005]**
- JP 2007323360 A **[0005]**