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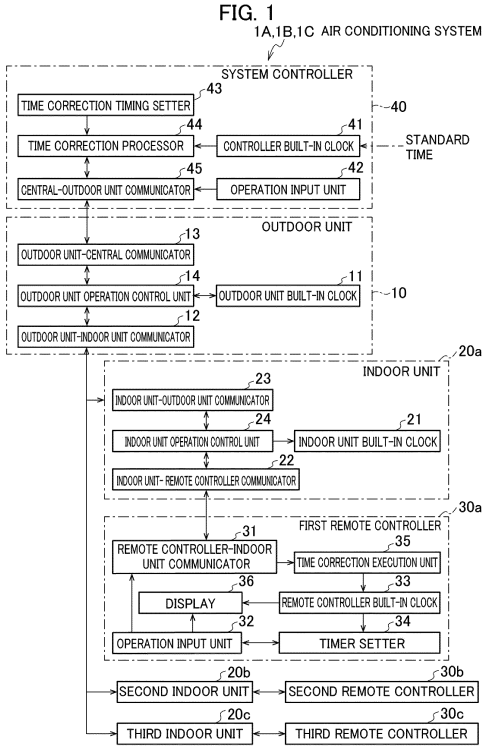
(54) CENTRAL MANAGEMENT DEVICE FOR AIR-CONDITIONING SYSTEM AND TIME CORRECTION METHOD

(57) A system controller (40) as a central control device of an air conditioning system (1) to which a remote controller (30) is connected has a central built-in clock (41), a time correction timing setter (43), and a time correction processor (44). The remote controller (30) has a remote controller built-in clock (33) and has a timer function based on clocking performed by the remote controller built-in clock. In the time correction timing setter (43), time correction timing information indicating a time other than a time in which a ones place value of a minutes unit is "0" or "5" is set as a timing at which a time correction process of the built-in clock (33) is performed. Upon determining that the time of the central built-in clock has reached the time indicated by the time correction timing information, the time correction processor (44) transmits a correction instruction for correcting a clocked time of the remote controller built-in clock to the time of the central built-in clock, to the remote controller (30).

FIG. 1



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Description

TECHNICAL FIELD

[0001] Embodiments of the present invention relate to a central control device and a time correction method of an air conditioning system.

BACKGROUND ART

[0002] Large buildings such as commercial facilities and office buildings are equipped with a multi-type air conditioning system in which a plurality of indoor units are connected to a single outdoor unit. Remote controllers are connected to the indoor units of this kind of air conditioning system, respectively. A user can use one of the remote controllers to operate the corresponding indoor unit.

[0003] In general, each remote controller of each indoor unit has a built-in clock and a timer function. The timer function is performed based on a clocked time of the clock. Suppose that a user uses one of the remote controllers to perform a timer setting operation such that an operation of the corresponding indoor unit starts at a prescribed time, for example. In the above case, the remote controller monitors whether the time has arrived based on clocking performed by the built-in clock, and transmits an operation start instruction to the connected indoor unit when the remote controller determines that the time has arrived.

[0004] The built-in clocks of the plurality of remote controllers in the air conditioning system are individually and separately performing clocking operations, and as time passes, a time deviation from the correct time gradually occurs. In order to cope with the above, there is a technique of performing a time correction process on these built-in clocks at every prescribed period based on an externally acquired standard time. For example, a higher order central control device of a plurality of air conditioning systems is provided, and a built-in clock of each air conditioning system is corrected by using the time of an internal clock of the central control device as a standard time.

[0005] By periodically performing the time correction process at the remote controllers in the air conditioning system, the occurrence of a large time deviation in the clocked time of each built-in clock is avoided, and a timer function or the like is appropriately performed.

CITATION LIST

PATENT LITERATURE

[0006] Patent Literature 1: Japanese Unexamined Patent Application Publication No. Hei 01-265398

SUMMARY OF INVENTION

[0007] When the time correction process is performed on the remote controllers or the like in the air conditioning system as described above, if a delay occurs in a built-in clock to be corrected, by performing the time correction process, the clocked time is shifted forward by a prescribed period. Therefore, a blank period during which no clocking is performed by the built-in clock occurs.

[0008] Here, in the remote controller, if a timer relating to any operation is set by using a time in the blank period as an execution time, the corresponding operation is not executed because the time in the blank period is not clocked.

[0009] Suppose that the built-in clock of the remote controller is clocking 11:59:50 which is 10 seconds later than the standard time and an instruction for correcting the time to 12:00:00 is acquired by means of the time correction process. In the above case, the clocked time of the built-in clock changes to 12:00:00. This means the time period from immediately after 11:59:50 to 12:00 becomes a blank period. In a case where a timer is set to start an operation at 12:00 in the remote controller, depending on the method of creating the timer operation program, the time may fall in the blank period of the built-in clock and not be counted, and the operation may not be started.

[0010] Further, suppose that a clocked time of a built-in clock to be corrected is advanced, and by performing the time correction process, the clocked time is shifted backward by a prescribed period. In the above case, an overlapping period during which clocking is performed twice by means of the built-in clock occurs. Here, suppose that in the remote controller, a timer relating to any operation is set by using a time in the overlapping period as an execution time. In this case, even if the operation performed by means of the timer function when the time is clocked for the first time is canceled immediately thereafter by means of a user operation or the like, the operation is performed again by means of the timer function when the time is clocked for the second time, which may cause inconvenience to the user.

[0011] Suppose that when the built-in clock of the remote controller clocks 12:00:20 which is 20 seconds ahead of the standard time, an instruction for correcting the time to 12:00:00 is acquired by means of the time correction process. In the above case, the clocked time of the built-in clock changes to 12:00:00, and thus the time period from 12:00 to 12:00:20 becomes an overlapping period. In a case where a timer is set to start an operation at 12:00 in the remote controller, the operation of the corresponding indoor unit is started by means of the timer function when 12:00 is clocked for the first time (before performing the time correction process). Immediately thereafter, even if the user operates the remote controller to stop the indoor unit, the clocked time changes from 12:00:20 to 12:00 due to the time correction process.

[0012] Therefore, there is a risk that the operation of the air conditioner may be started again by means of the timer function when 12:00 is clocked for the second time, and in this case, an operation that is unintended by the user is performed.

[0013] Consequently, if the time in the timer setting is the same as the time subjected to the correction, there arises a problem that an operation based on the timer setting is sometimes performed or sometimes not performed.

[0014] The present invention has been devised in view of the above described problems, and an object of the present invention is to provide a central control device and a time correction method of an air conditioning system which perform a time correction process for clocks built into equipment in an air conditioning system while appropriately operating the equipment.

[0015] In order to achieve the above object, a central control device in an air conditioning system in accordance with the present invention is communicatively connected to a remote controller including a remote controller built-in clock and including a timer function based on clocking performed by the remote controller built-in clock, the central control device including: a central built-in clock configured to clock a time; a time correction timing setter in which time correction timing information indicating a time other than a time in which a ones place value of a minutes unit is "0" or "5" is set as a timing at which a time correction process of the remote controller built-in clock is performed; and a time correction processor configured to, upon determining that the time of the central built-in clock has reached the time indicated by the time correction timing information set in the time correction timing setter, transmits a correction instruction for correcting a clocked time of the remote controller built-in clock to a corresponding time, to the remote controller.

[0016] A time correction method of an air conditioning system in accordance with the present invention includes: using a central control device that is communicatively connected to a remote controller including a remote controller built-in clock and including a timer function based on clocking performed by the remote controller built-in clock, and includes a central built-in clock configured to clock a time, setting time correction timing information indicating a time other than a time in which a ones place value of a minutes unit is "0" or "5", as a timing at which a time correction process of the remote controller built-in clock is performed; and upon determining that the time of the central built-in clock has reached the time indicated by the set time correction timing information, transmitting a correction instruction for correcting a clocked time of the remote controller built-in clock to the time of the central built-in clock, to the remote controller.

BRIEF DESCRIPTION OF DRAWINGS

[0017]

FIG. 1 is an overall view showing a configuration of an air conditioning system using a system controller as a central control device according to first to third embodiments of the present invention.

FIG. 2 is a front view of a remote controller installed in an air conditioning system using a central control device according to first to third embodiments of the present invention.

FIG. 3 is a sequence diagram showing operations of an air conditioning system using a system controller as a central control device according to first to third embodiments of the present invention.

FIG. 4 is an explanatory diagram showing how a clocked time is corrected when a time correction instruction is transmitted from a system controller as a central control device according to a first embodiment of the present invention and a time correction process is performed to a built-in clock of a remote controller.

FIG. 5 is an explanatory diagram showing how a clocked time is corrected when a time correction instruction is transmitted from a system controller as a central control device according to a second embodiment of the present invention and a time correction process is performed to a built-in clock of a remote controller.

FIG. 6 is an explanatory diagram showing how a clocked time is corrected when a time correction instruction is transmitted from a system controller as a central control device according to a third embodiment of the present invention and a time correction process is performed to a built-in clock of a remote controller.

DESCRIPTION OF EMBODIMENTS

<<First embodiment>>

<Configuration of air conditioning system using central control device according to first embodiment>

[0018] A configuration of an air conditioning system using a central control device according to a first embodiment of the present invention will be described with reference to FIG. 1. An air conditioning system 1A according to the present embodiment includes an outdoor unit 10 installed in a prescribed building, a plurality of indoor units (a first indoor unit 20a, a second indoor unit 20b, and a third indoor unit 20c) connected to the outdoor unit 10 by using refrigerant piping and communication lines, a plurality of remote controllers (a first remote controller 30a, a second remote controller 30b, and a third remote controller 30c) that are respectively communicatively connected to the indoor units, and a system controller 40 as the central control device connected to the outdoor unit 10.

[0019] In the present embodiment, the case is described in which the number of indoor units connected

to the outdoor unit 10 and the number of remote controllers are three. However, more than three indoor units and remote controllers may be connected.

[0020] In the present embodiment, when it is not necessary to specify which of the indoor unit 20a, 20b, and 20c is meant, indoor units are referred to as an indoor units 20. Similarly, when it is not necessary to specify which of the remote controllers 30a, 30b, and 30c is meant, remote controllers are referred to as remote controllers 30.

[0021] The outdoor unit 10 includes an outdoor unit built-in clock 11, an outdoor unit-indoor unit communicator 12, an outdoor unit-central communicator 13, and an outdoor unit operation control unit 14. The outdoor unit-indoor unit communicator 12 communicates with each of the indoor unit 20a, 20b, and 20c. The outdoor unit-central communicator 13 communicates with the system controller 40. The outdoor unit operation control unit 14 controls, based on an instruction transmitted from the system controller 40, operations of the equipment in the outdoor unit 10 including time correction process of the outdoor unit built-in clock 11. When receiving an instruction transmitted from the system controller 40 to any one of the indoor units 20, the outdoor unit operation control unit 14 transfers the instruction to the corresponding indoor unit 20.

[0022] The first indoor unit 20a includes an indoor unit built-in clock 21, an indoor unit-remote controller communicator 22, an indoor unit-outdoor unit communicator 23, and an indoor unit operation control unit 24. The indoor unit-remote controller communicator 22 communicates with the corresponding first remote controller 30a. The indoor unit-outdoor unit communicator 23 communicates with the outdoor unit 10.

[0023] The indoor unit operation control unit 24 controls the operation of the equipment in the indoor unit 20a based on the instruction which is transmitted from the system controller 40 and then transferred by means of the outdoor unit 10 and the instruction transmitted from the first remote controller 30a connected to the indoor unit. After the indoor unit operation control unit 24 receives the time correction instruction transmitted from the system controller 40, the indoor unit operation control unit 24 transfers the instruction to the first remote controller 30a connected to the indoor unit.

[0024] Since the second indoor unit 20b and the third indoor unit 20c have the same configuration as the first indoor unit 20a, a detailed description thereof will be omitted.

[0025] The first remote controller 30a includes a remote controller-indoor unit communicator 31, an operation input unit 32, a remote controller built-in clock 33, a timer setter 34, a time correction execution unit 35, and a display 36.

[0026] The remote controller-indoor unit communicator 31 communicates with the corresponding indoor unit 20a. The operation input unit 32 inputs operation information by the user and appropriately transmits the input information to the indoor unit 20a.

[0027] After receiving the operation information specifying a prescribed operation of the indoor unit 20a and the execution time of the operation from the operation input unit 32, the timer setter 34 sets a timer for monitoring the arrival of the time. When it is determined that the time has arrived based on the clocking of the remote controller built-in clock, the arrival of the execution time of the operation is notified to the operation input unit 32. Examples of the timer setting content include the start or stop of the operation of the indoor unit 20a at a prescribed time and the combination of the start and stop of the operation. Further, in the operation start setting, it is possible to specify the modes of cooling, heating, dehumidification, blowing, and the like of starting operation, set temperature, set humidity, and the like. The first remote controller 30a has a clock display (not shown) so that the user can recognize the current time. The user sets the timer time after recognizing the displayed current time.

[0028] After receiving the time correction instruction transmitted from the system controller 40, the time correction execution unit 35 executes the time correction process of the remote controller built-in clock 33. The display 36 displays information generated based on the operation information received from the operation input unit 32, information on the time being clocked by means of the remote controller built-in clock 33, and the like.

[0029] The second remote controller 30b and the third remote controller 30c have the same configuration as the first remote controller 30a, and therefore, a detailed description thereof will be omitted.

[0030] FIG. 2 shows a front view of each of the first remote controller 30a, the second remote controller 30b, and the third remote controller 30c. In the lower part of the front surface of each of the remote controllers 30, as the operation input unit 32, the followings are arranged: a "start/stop" button 321, a "menu" button 322, an upward pointing arrow button 323, a downward pointing arrow button 324, and a "cancel" button 325. Above these buttons, the display 36 composed of a monitor screen is provided.

[0031] The system controller 40 includes a controller built-in clock 41 as a central built-in clock, an operation input unit 42, a time correction timing setter 43, and a time correction processor 44.

[0032] The operation input unit 42 is an operation unit through which the manager inputs information on the group operation and schedule operation of the air conditioning system 1A. In the time correction timing setter 43, time information indicating a timing at which a preset time correction process is performed is set as time correction timing information.

[0033] The controller built-in clock 41 is a clock having a higher clocking accuracy than other built-in clocks in the air conditioning system 1A. Alternatively, the controller built-in clock 41 is a clock designed to have a higher clocking accuracy than other built-in clocks by periodically obtaining standard time information from a standard

clock on the Internet and adjusting the time to be clocked by means of the controller built-in clock 41 to the standard time, for example.

[0034] After determining that the clocked time of the controller built-in clock 41 has reached the time indicated by the time correction timing information set in the time correction timing setter 43, the time correction processor 44 transmits, to each piece of equipment in the air conditioning system 1A, a time correction instruction for correcting the clocked time of a built-in clock of each piece of equipment to the clocked time of the controller built-in clock 41.

<Operation of air conditioning system according to first embodiment>

[0035] Next, the operation of the air conditioning system 1A according to the present embodiment will be described. In the present embodiment, the user can operate the connected indoor unit 20 by using the timer function of the remote controller 30. A description will be given regarding the procedure of the timer setting operation performed by the user by using the remote controller 30 in order to operate the indoor unit 20 by using the timer function.

[0036] The display 36 of the remote controller 30 normally displays information such as the name of a place where the corresponding indoor unit 20 is installed, the current set temperature, and the like as shown in FIG. 2. When the user operates the "menu" button 322 of the remote controller 30, the display content of the display 36 is switched to an operation menu screen showing a plurality of setting items related to the connected indoor unit 20. Examples of the setting items displayed on the operation menu screen include "wind direction setting", "flap operation setting", "timer setting", and the like.

[0037] Next, suppose that the user operates the upward pointing arrow button 323 or the downward pointing arrow button 324 and selects a setting item "timer setting" on the displayed operation menu screen. In the above case, the display content of the display 36 is switched to a timer setting screen indicating a timer type that can be set by using the timer setting function. The types of setting timers displayed on the timer setting screen include an "off timer" for stopping the operation of the indoor unit 20 at a designated time and an "on timer" for starting the operation of the indoor unit 20 at a designated time, for example.

[0038] Next, suppose that the user operates the upward pointing arrow button 323 or the downward pointing arrow button 324 and selects the "on timer" on the displayed timer setting screen. In the above case, the display content of the display 36 is switched to an on-timer setting screen for inputting information related to the setting of the on timer. The on-timer setting screen includes information for inputting a time at which the operation of the indoor unit 20 is started.

[0039] Next, suppose that the user operates the upward pointing arrow button 323 or the downward pointing arrow button 324 and inputs a desired time on the displayed on-timer setting screen. In the above case, an on timer for starting the operation of the corresponding indoor unit 20 at the input time is set in the timer setter 34.

[0040] Normally, in the time specified in the timer setting operation of the indoor unit 20, the ones place value of the minutes unit is often "0" or "5". In the present embodiment, it is assumed that the time "12:00" is specified for the on timer to be set.

[0041] Next, a time correction process performed to the built-in clock of each piece of equipment in the air conditioning system 1A will be described with reference to the sequence diagram of FIG. 3.

[0042] In the present embodiment, in the time correction timing setter 43, time information indicating a timing at which a preset time correction process is to be performed is set(S1). The time correction timing information is configured such that the time can be set in units of minutes, and a time other than a time in which the ones place value of the minutes unit is "0" or "5" is set.

[0043] The time correction processor 44 receives the clocked time of the controller built-in clock 41 as the standard time. The time correction processor 44 monitors whether the time of the controller built-in clock 41 coincides with the time correction timing set in the time correction timing setter 43, that is, whether the time correction timing has arrived (S2).

[0044] If the time correction processor 44 determines that the time correction timing has arrived ("YES" in S2), the time correction processor 44 transmits a time correction instruction for correcting the clocked time of the built-in clock to the standard time from the central-outdoor unit communicator 45 to the outdoor unit 10 (S3).

[0045] The time correction instruction transmitted from the system controller 40 is received by the outdoor unit-central communicator 13 of the outdoor unit 10. Based on the received time correction instruction, the outdoor unit operation control unit 14 corrects the outdoor unit built-in clock 11 with the corresponding standard time. Further, the time correction instruction is transferred to the indoor units 20a to 20c connected to the outdoor unit-indoor unit communicator 12 from the outdoor unit-indoor unit communicator 12 (S4).

[0046] The time correction instruction transferred from the outdoor unit 10 is received by the indoor unit-outdoor unit communicator 23 of each of the indoor units 20a to 20c. Then, based on the received time correction instruction, the indoor unit operation control unit 24 corrects the indoor unit built-in clock 21 with the corresponding standard time. Further, the time correction instruction is transmitted from the indoor unit-remote controller communicator 22 to each of the connected remote controllers 30a to 30c (S5, S6, and S7).

[0047] The time correction instruction transmitted from each of the indoor units 20a to 20c is received by the remote controller-indoor unit communicator 31 of each of the remote controllers 30a to 30c. Then, based on the

received time correction instruction, the time correction execution unit 35 corrects the remote controller built-in clock 33 with the corresponding standard time.

[0048] Suppose that the time deviation of the remote controller built-in clock 33 of the remote controller 30 is less than 1 minute by performing the process as described above. In the above case, in the remote controller built-in clock 33, a correction is not made for times that span a time in which the ones place value of the minutes unit is "0" or "5". As a result, when a time in which the ones place value of the minutes unit is "0" or "5" is set in the timer setting relating to the operation of the indoor unit 20, the possibility that the time corresponds to a blank period or an overlapping period which occurs due to performing the time correction process is reduced.

[0049] Further, a detailed description will be given with reference to FIG. 4. Suppose that the time correction timing is set to 11:56 and a time delay of less than 1 minute occurs in the remote controller built-in clock 33, for example. In the above case, in the remote controller 30, the clocked time is corrected as shown by arrow P1 by means of the time correction process. Similarly, suppose that the time correction timing is set to 11:57 while a time delay of less than 1 minute occurs in the built-in clock. In the above case, the clocked time is corrected as shown by arrow P2. If the time correction timing is set to 11:58, the clocked time is corrected as shown by arrow P3. If the time correction timing is set to 11:59, the clocked time is corrected as shown by arrow P4. If the time correction timing is set to 12:01, the clocked time is corrected as shown by arrow P5.

[0050] Further, suppose that the time correction timing is set to 11:56 and the remote controller built-in clock 33 advances by less than 1 minute. In the above case, in the remote controller 30, the clocked time is corrected by means of the time correction process as shown by arrow Q1. Similarly, suppose that the time correction timing is set to 11:57 while the built-in clock advances by less than 1 minute. In the above case, the clocked time is corrected as shown by arrow Q2. If the time correction timing is set to 11:58, the clocked time is corrected as shown by arrow Q3. If the time correction timing is set to 11:59, the clocked time is corrected as shown by arrow Q4. If the time correction timing is set to 12:01, the clocked time is corrected as shown by arrow Q5.

[0051] By performing the time correction as described above, the operation specified in the timer setting can be properly and surely performed.

<<Second embodiment>>

[0052] The configuration of an air conditioning system 1B using a central control device according to a second embodiment of the present invention is the same as the configuration of the air conditioning system 1A shown in FIG. 1 described in the first embodiment. Therefore, a detailed description of parts having the same functions will be omitted.

[0053] In the present embodiment, the time specified in the timer setting operation of the indoor unit 20 can be set in units of minutes, and any one of "0" to "59" can be input as a value of the minutes unit. In the system controller 40, the time correction timing information can be set in units of seconds. Further, in the time correction timing setter 43, a time in which the value of the seconds unit is "30" is set as the time correction timing information.

[0054] Suppose that the time correction process is performed similarly to the process described in the first embodiment while the time correction timing information is set in this way. In the above case, if the time deviation of the remote controller built-in clock 33 of the remote controller 30 is less than 30 seconds, in the remote controller built-in clock 33, a correction is not made for times that span a time in which the value of the seconds unit is "0".

[0055] As a result, even if a time in which a value of the minutes unit is any one of "0" to "59" is set in the timer setting relating to the operation of the indoor unit 20, the time does not correspond to a blank period or an overlapping period which occurs due to performing the time correction process.

[0056] Further, a detailed description will be given with reference to FIG. 5. Suppose that the time correction timing is set to 11 :55:30 and the time delay of less than 30 seconds occurs in the remote controller built-in clock 33, for example. In the above case, in the remote controller 30, the clocked time is corrected as shown by arrow P11 by means of the time correction process. Similarly, suppose that the time correction timing is set to 11:56:30 while a time delay of less than 30 seconds occurs in the built-in clock. In the above case, the clocked time is corrected as shown by arrow P12. If the time correction timing is set to 11 :57:30, the clocked time is corrected as shown by arrow P13. If the time correction timing is set to 11:58:30, the clocked time is corrected as shown by arrow P14. If the time correction timing is set to 11 :59:30, the clocked time is corrected as shown by arrow P15. If the time correction timing is set to 12:00:30, the clocked time is corrected as shown by arrow P16.

[0057] Further, suppose that the time correction timing is set to 11:55:30 and the remote controller built-in clock 33 advances by less than 30 seconds. In the above case, in the remote controller 30, the clocked time is corrected by means of the time correction process as shown by arrow Q11. Similarly, suppose that the time correction timing is set to 11:56:30 while the built-in clock advances by less than 30 seconds. In the above case, the clocked time is corrected as shown by arrow Q12. If the time correction timing is set to 11:57:30, the clocked time is corrected as shown by arrow Q13. If the time correction timing is set to 11 :58:30, the clocked time is corrected as shown by arrow Q14. If the time correction timing is set to 11:59:30, the clocked time is corrected as shown by arrow Q15. If the time correction timing is set to 12:00:30, the clocked time is corrected as shown by arrow Q16.

[0058] By performing the time correction as described above, even if the time is specified by using a minute numerical value such as the time of 11:58:00 in the timer setting, the corresponding operation can be properly and surely performed, for example.

<<Third embodiment>>

[0059] The configuration of an air conditioning system 1C using a central control device according to a third embodiment of the present invention is the same as the configuration of the air conditioning system 1A shown in FIG. 1 described in the first embodiment. Therefore, a detailed description of parts having the same functions is omitted.

[0060] In the present embodiment, it is assumed that the time specified in the timer setting operation of the indoor unit 20 can be set in units of minutes, and that the ones place value of the minutes unit is often "0" or "5" as in the first embodiment.

[0061] Further, in the system controller 40, as in the second embodiment, the time correction timing information can be set in units of seconds. Further, in the time correction timing setter 43, as the time correction timing information, a time is set in which the ones place value of the minutes unit is "2" or "7" and the value of the seconds unit is "30".

[0062] Suppose that the time correction process is performed similarly to the process described in the first embodiment while the time correction timing information is set in this way. In the above case, if the time deviation of the remote controller built-in clock 33 of the remote controller 30 is less than 2 minutes and 30 seconds, in the remote controller built-in clock 33, a correction is not made for times that span a time in which the ones place value of the minutes unit is "0" or "5".

[0063] As a result, when a time in which the ones place value of the minutes unit is "0" or "5" is set in the timer setting relating to the operation of the indoor unit 20, the possibility that the time corresponds to a blank period or an overlapping period which occurs due to performing the time correction process is further reduced.

[0064] Further, a detailed description will be given with reference to FIG. 6. Suppose that the time correction timing is set to 11:57:30 and the time delay of less than 2 minutes and 30 seconds occurs in the remote controller built-in clock 33, for example. In the above case, in the remote controller 30, the clocked time is corrected as shown by arrow P21 by means of the time correction process.

[0065] Further, suppose that the time correction timing is set to 11:57:30 and the remote controller built-in clock 33 advances by less than 2 minutes and 30 seconds. In the above case, in the remote controller 30, the clocked time is corrected as shown by arrow Q21 by means of the time correction process.

[0066] By performing the time correction as described above, the corresponding operation can be properly and surely performed with high accuracy in the timer setting.

[0067] According to the first to third embodiments described above, the time correction process of the remote controller built-in clock 33 of each of the remote controllers 30 is performed by avoiding a time at which a timer relating to the operation of the indoor unit 20 is highly likely to be set. Accordingly, when the timer setting operation is performed in the remote controller 30, the possibility that the time specified in the timer setting corresponds to a blank period or an overlapping period which occurs due to performing the time correction process is reduced. Further, it is possible to avoid as much as possible a situation where an operation specified by the user is not appropriately performed.

[0068] In the embodiments described above, descriptions have been given by taking an example where the built-in clocks 11 and 21 are provided in each outdoor unit and each indoor unit respectively. However, suppose that all timer operations for instructing timer setting and starting/stopping are instructed by using the remote controller 30. In the above case, it is possible to eliminate the built-in clocks 11 and 21, and provide only the remote controller built-in clock 33 of the remote controller 30.

[0069] Further, in the above-described embodiments, the case has been described where the system controller 40 as the central control device and the remote controllers 30 are connected in a communicable manner via the outdoor units 10 and the indoor units 20. However, the connection mode is not limited thereto.

[0070] The system controller 40 may be directly connected to all of the outdoor units 10, the indoor units 20, and the remote controllers 30 individually, for example. Alternatively, all pieces of equipment, namely the system controller 40, the remote controllers 30, the outdoor units 10, and the indoor units 20, may be communicatively connected to a single bus line. Further, each piece of equipment may be connected by means of wireless communication.

[0071] Embodiments of the present invention have been described, but these embodiments are presented as examples and are not intended to limit the scope of the invention. These novel embodiments can be implemented in various other ways, and various omissions, substitutions, and modifications can be made without departing from the spirit of the invention. These embodiments and modified examples thereof are included in the scope and gist of the invention, and are also included in the invention recited in the claims and the scope of the equivalents thereof.

Claims

1. A central control device in an air conditioning system, the central control device being communicatively connected to a remote controller including a remote controller built-in clock and including a timer function based on clocking performed by the remote control-

ler built-in clock, the central control device comprising:

a central built-in clock configured to clock a time;
a time correction timing setter in which time correction timing information indicating a time other than a time in which a ones place value of a minutes unit is "0" or "5" is set as a timing at which a time correction process of the remote controller built-in clock is performed; and
a time correction processor configured to, upon determining that the time of the central built-in clock has reached the time indicated by the time correction timing information set in the time correction timing setter, transmit a correction instruction for correcting a clocked time of the remote controller built-in clock to a corresponding time, to the remote controller.

2. A central control device in an air conditioning system, the central control device being communicatively connected to a remote controller including a remote controller built-in clock and including a timer function based on clocking performed by the remote controller built-in clock, the central control device comprising:

a central built-in clock configured to clock a time;
a time correction timing setter in which time correction timing information indicating a time in which a value of a seconds unit is "30" is set as a timing at which a time correction process of the remote controller built-in clock is performed; and
a time correction processor configured to, upon determining that the time of the central built-in clock has reached the time indicated by the time correction timing information set in the time correction timing setter, transmit a correction instruction for correcting a clocked time of the remote controller built-in clock to the time of the central built-in clock, to the remote controller.

3. The central control device in the air conditioning system according to claim 2, wherein in the time correction timing setter, time correction timing information indicating a time in which a ones place value of a minutes unit is "2" or "7" and a value of a seconds unit is "30" is set as the timing at which the time correction process of the remote controller built-in clock is performed.

4. The central control device in the air conditioning system according to any one of claims 1 to 3, wherein the central built-in clock has a higher time clocking accuracy than the remote controller built-in clock.

5. The central control device in the air conditioning system according to any one of claims 1 to 4, wherein the central built-in clock adjusts a time clocked by the central built-in clock to externally acquired standard time information.

6. A time correction method of an air conditioning system, the time correction method comprising:

using a central control device that is communicatively connected to a remote controller including a remote controller built-in clock and including a timer function based on clocking performed by the remote controller built-in clock, and includes a central built-in clock configured to clock a time,
setting time correction timing information indicating a time other than a time in which a ones place value of a minutes unit is "0" or "5", as a timing at which a time correction process of the remote controller built-in clock is performed; and
upon determining that the time of the central built-in clock has reached the time indicated by the set time correction timing information, transmitting a correction instruction for correcting a clocked time of the remote controller built-in clock to the time of the central built-in clock, to the remote controller.

7. A time correction method of an air conditioning system, the time correction method comprising:

using a central control device that is communicatively connected to a remote controller including a remote controller built-in clock and including a timer function based on clocking performed by the remote controller built-in clock, and includes a central built-in clock configured to clock a time,
setting time correction timing information indicating a time in which a value of a seconds unit is "30", as a timing at which a time correction process of the remote controller built-in clock is performed; and
upon determining that the time of the central built-in clock has reached the time indicated by the set time correction timing information, transmitting a correction instruction for correcting a clocked time of the remote controller built-in clock to the time of the central built-in clock, to the remote controller.

8. The time correction method of the air conditioning system according to claim 7, wherein time correction timing information indicating a time in which a ones place value of a minutes unit is "2" or "7" and a value of a seconds unit is "30" is set as the timing at which the time correction process of the remote controller built-in clock is performed.

FIG. 1

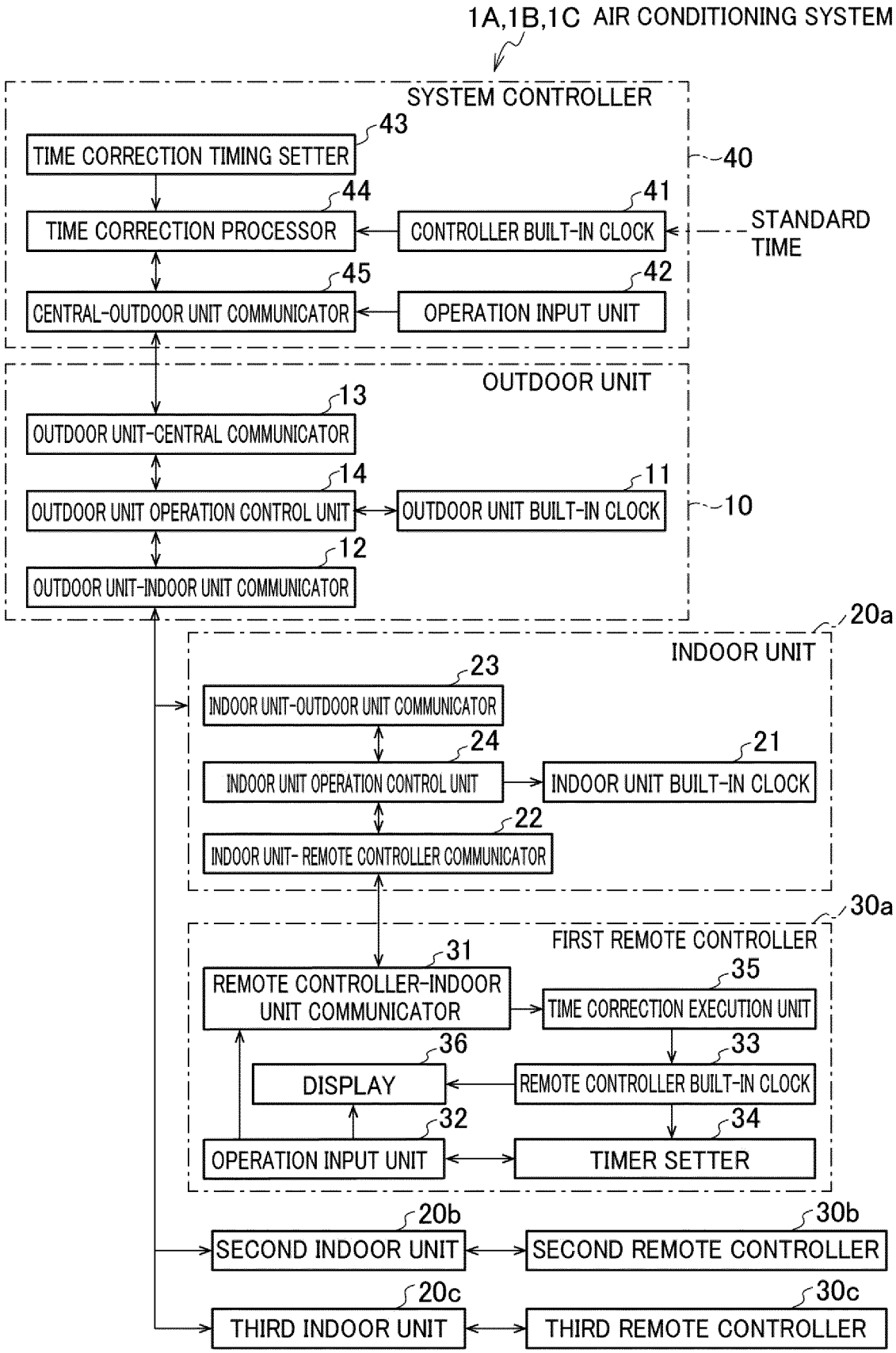

1A,1B,1C AIR CONDITIONING SYSTEM
SYSTEM CONTROLLER
43
TIME CORRECTION TIMING SETTER
40
44
41
TIME CORRECTION PROCESSOR
CONTROLLER BUILT-IN CLOCK
STANDARD TIME
45
42
CENTRAL-OUTDOOR UNIT COMMUNICATOR
OPERATION INPUT UNIT
OUTDOOR UNIT
13
OUTDOOR UNIT-CENTRAL COMMUNICATOR
14
11
OUTDOOR UNIT OPERATION CONTROL UNIT
OUTDOOR UNIT BUILT-IN CLOCK
10
12
OUTDOOR UNIT-INDOOR UNIT COMMUNICATOR
20a
INDOOR UNIT
23
INDOOR UNIT-OUTDOOR UNIT COMMUNICATOR
24
21
INDOOR UNIT OPERATION CONTROL UNIT
INDOOR UNIT BUILT-IN CLOCK
22
INDOOR UNIT- REMOTE CONTROLLER COMMUNICATOR
30a
FIRST REMOTE CONTROLLER
31
35
REMOTE CONTROLLER-INDOOR UNIT COMMUNICATOR
TIME CORRECTION EXECUTION UNIT
36
33
DISPLAY
REMOTE CONTROLLER BUILT-IN CLOCK
32
34
OPERATION INPUT UNIT
TIMER SETTER
20b
30b
SECOND INDOOR UNIT
SECOND REMOTE CONTROLLER
20c
30c
THIRD INDOOR UNIT
THIRD REMOTE CONTROLLER

FIG. 2

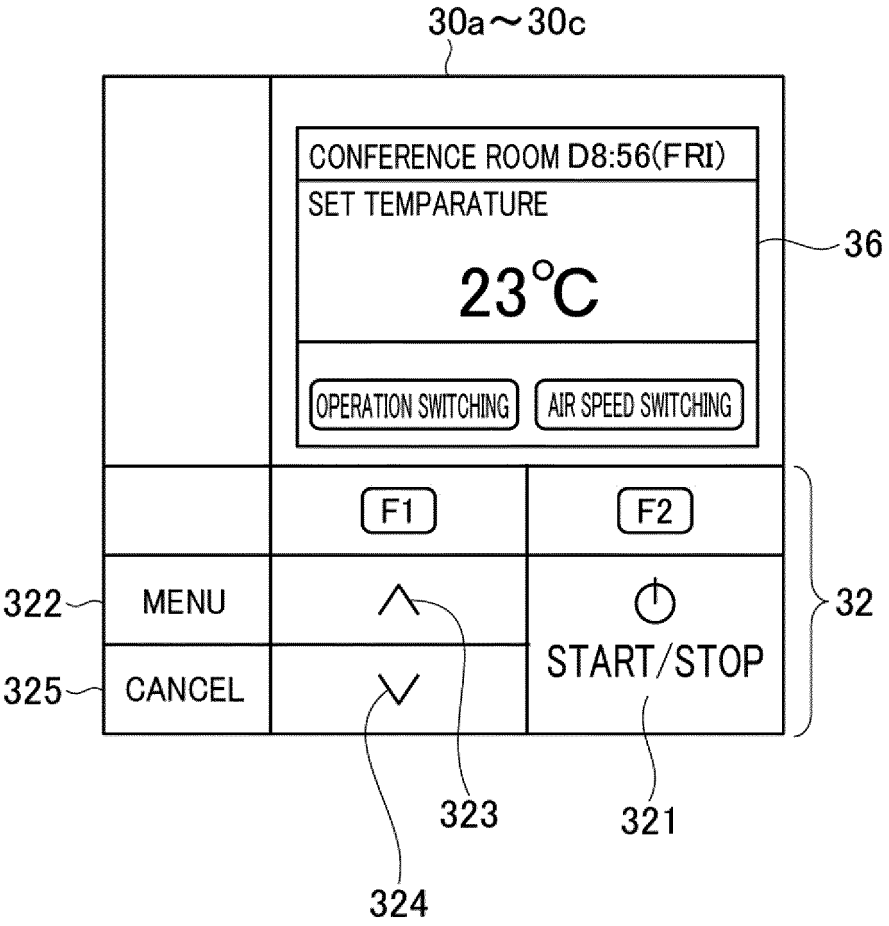

30a～30c
CONFERENCE ROOM D8:56(FRI)
SET TEMPARATURE
23℃
36
OPERATION SWITCHING
AIR SPEED SWITCHING
F1
F2
322
MENU
325
CANCEL
START/STOP
32
323
321
324

FIG. 3

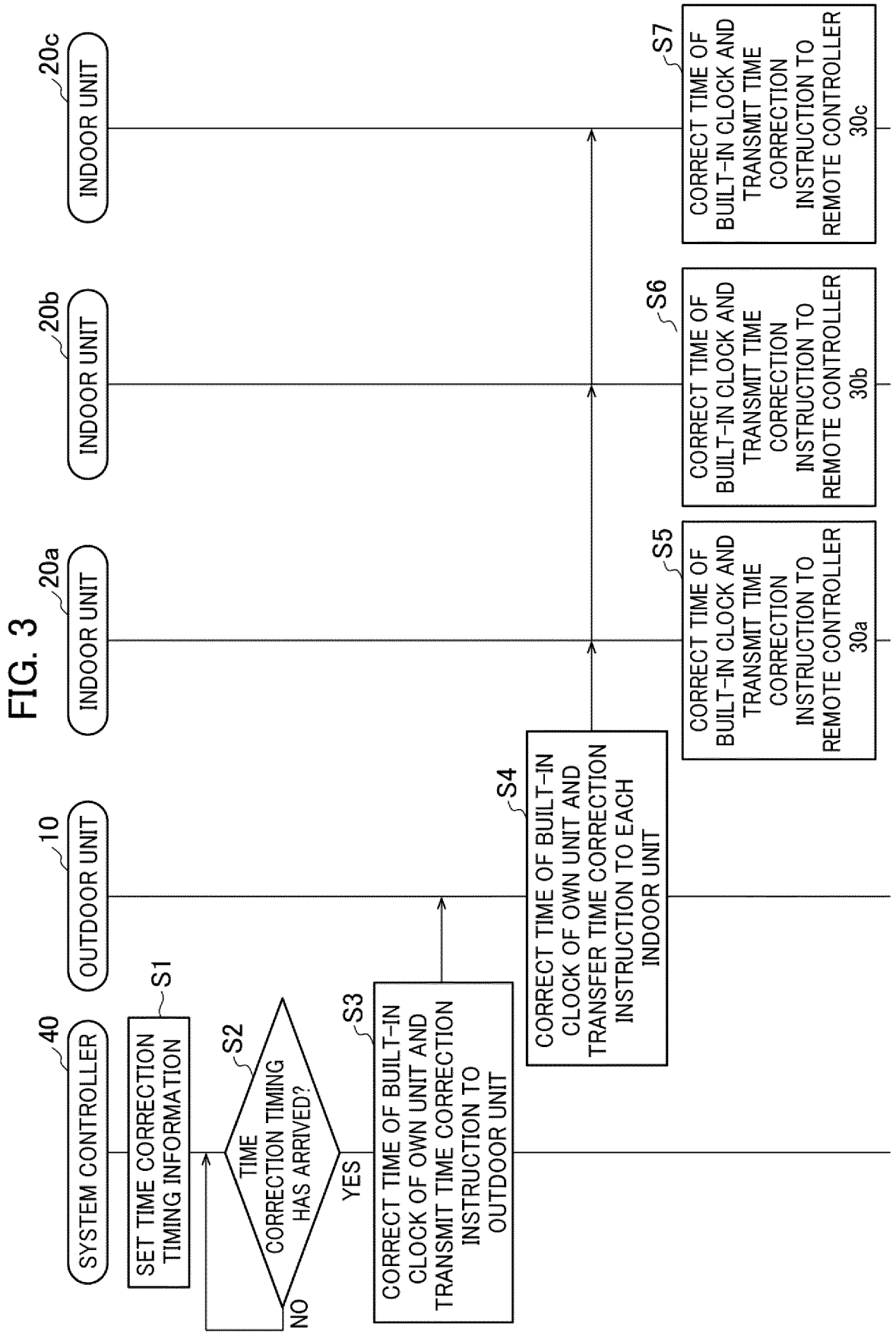

40
SYSTEM CONTROLLER
10
OUTDOOR UNIT
20a
INDOOR UNIT
20b
INDOOR UNIT
20c
INDOOR UNIT
S1
SET TIME CORRECTION TIMING INFORMATION
S2
TIME CORRECTION TIMING HAS ARRIVED?
YES
NO
S3
CORRECT TIME OF BUILT-IN CLOCK OF OWN UNIT AND TRANSMIT TIME CORRECTION INSTRUCTION TO OUTDOOR UNIT
S4
CORRECT TIME OF BUILT-IN CLOCK OF OWN UNIT AND TRANSFER TIME CORRECTION INSTRUCTION TO EACH INDOOR UNIT
S5
CORRECT TIME OF BUILT-IN CLOCK AND TRANSMIT TIME CORRECTION INSTRUCTION TO REMOTE CONTROLLER 30a
S6
CORRECT TIME OF BUILT-IN CLOCK AND TRANSMIT TIME CORRECTION INSTRUCTION TO REMOTE CONTROLLER 30b
S7
CORRECT TIME OF BUILT-IN CLOCK AND TRANSMIT TIME CORRECTION INSTRUCTION TO REMOTE CONTROLLER 30c

FIG. 4

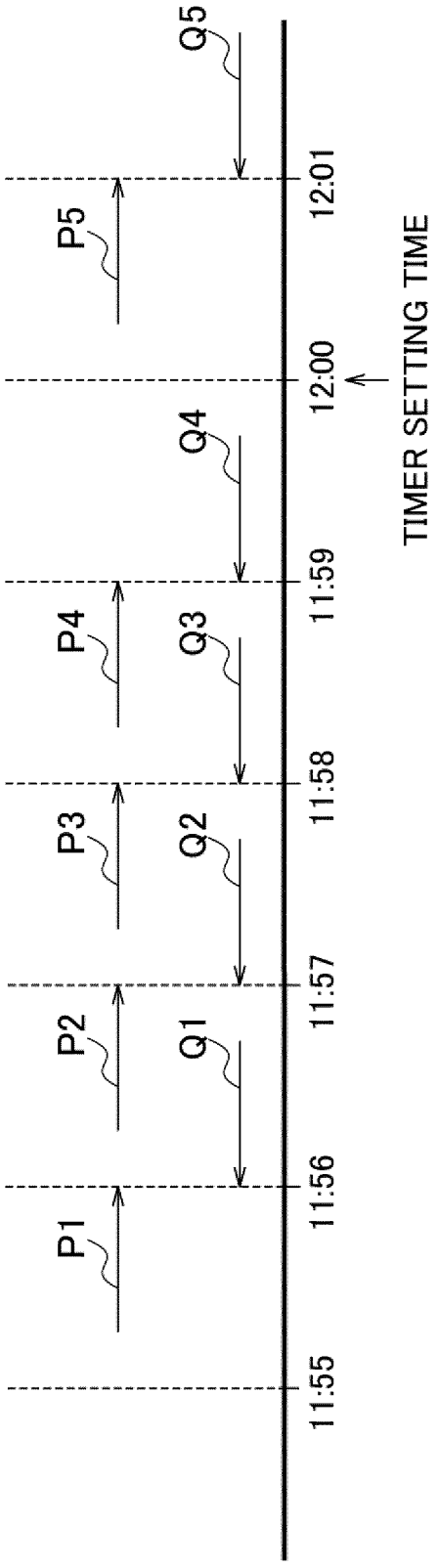
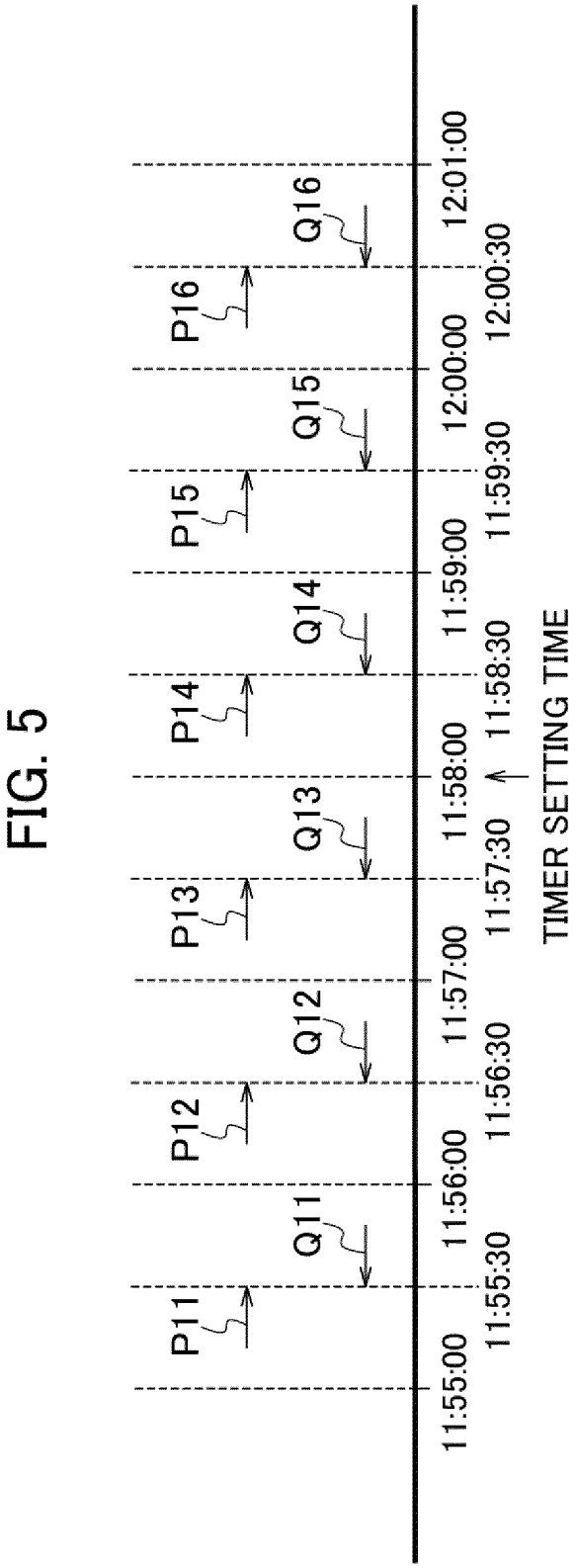

Q5
12:01
P5
12:00
TIMER SETTING TIME
Q4
11:59
P4
Q3
11:58
P3
Q2
11:57
P2
Q1
11:56
P1
11:55

FIG. 5


11:55:00
11:55:30
11:56:00
11:56:30
11:57:00
11:57:30
11:58:00
11:58:30
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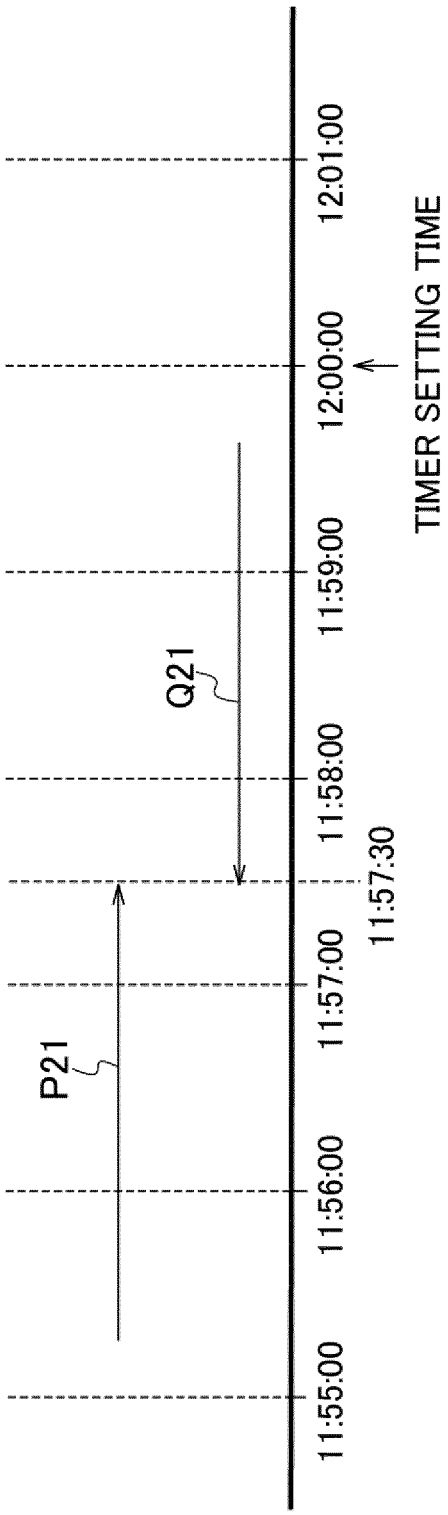
11:59:30
12:00:00
12:00:30
12:01:00
P11
Q11
P12
Q12
P13
Q13
P14
Q14
P15
Q15
P16
Q16
TIMER SETTING TIME

FIG. 6


11:55:00
11:56:00
11:57:00
11:57:30
11:58:00
11:59:00
12:00:00
12:01:00
TIMER SETTING TIME
P21
Q21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/013313

A. CLASSIFICATION OF SUBJECT MATTER
F24F 11/61(2018.01)i; H04Q 9/00(2006.01)i
FI: F24F11/61; H04Q9/00 301Z
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)
F24F11/61; H04Q9/00

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

Published examined utility model applications of Japan	1922–1996
Published unexamined utility model applications of Japan	1971–2020
Registered utility model specifications of Japan	1996–2020
Published registered utility model applications of Japan	1994–2020

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 2005-337614 A (DAIKIN INDUSTRIES, LTD.) 08 December 2005 (2005-12-08) paragraphs [0033]-[0048], fig. 1-4	1-8
Y	JP 2013-238341 A (NORITZ CORPORATION) 28 November 2013 (2013-11-28) paragraph [0043]	1-8
Y	JP 2007-46885 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 22 February 2007 (2007-02-22) paragraphs [0020]-[0022], fig. 1	5
A	JP 2017-78583 A (NORITZ CORPORATION) 27 April 2017 (2017-04-27) entire text, all drawings	1-8

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 June 2020 (11.06.2020)	23 June 2020 (23.06.2020)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/013313

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2005-337614 A	08 Dec. 2005	(Family: none)	
JP 2013-238341 A	28 Nov. 2013	(Family: none)	
JP 2007-46885 A	22 Feb. 2007	(Family: none)	
JP 2017-78583 A	27 Apr. 2017	(Family: none)	

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP HEI01265398 A **[0006]**