



(11)

EP 2 351 971 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.08.2011 Bulletin 2011/31

(51) Int Cl.:
F24F 11/00 (2006.01)

(21) Application number: **10180152.0**

(22) Date of filing: **27.09.2010**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
BA ME RS

- **Hirao, Toyotaka**
Minato-ku
Tokyo 108-8215 (JP)
- **Maeno, Masashi**
Minato-ku
Tokyo 108-8215 (JP)
- **Hiramatsu, Seiji**
Minato-ku
Tokyo 108-8215 (JP)

(30) Priority: **07.01.2010 JP 2010001996**

(71) Applicant: **Mitsubishi Heavy Industries, Ltd.**
Tokyo 108-8215 (JP)

(72) Inventors:
• **Watanabe, Satoshi**
Minato-ku
Tokyo 108-8215 (JP)

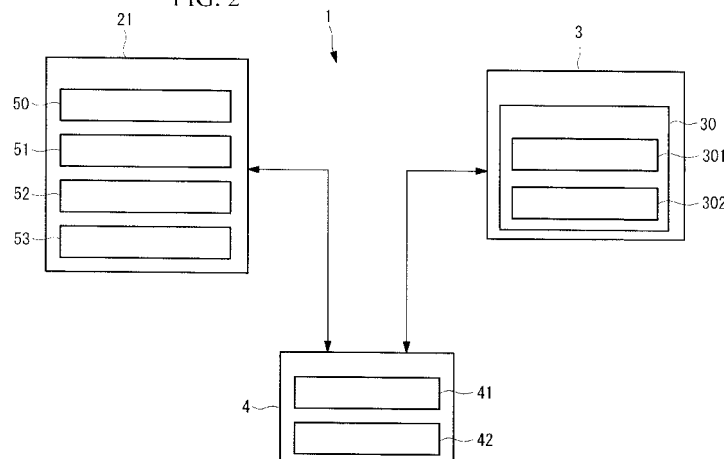
(74) Representative: **Intès, Didier Gérard André et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cedex 07 (FR)

(54) **Air-conditioning monitoring system, control method therefor, air conditioner, and centralized monitoring apparatus**

(57) An air-conditioning monitoring system (1) includes an air conditioner that shifts to a normal operation after a test operation is executed and that is controlled by a remote controller; and a centralized monitoring apparatus (3) that collects operating information of the air conditioner, the air conditioner and the centralized monitoring apparatus (3) being connected via a network. The air conditioner includes a test operation data collecting section (52) that collects and outputs test operation data

that indicates an operating condition obtained when the test operation is executed; and a switching section (53) that switches the air conditioner to a state where control through the remote controller is permitted, when permission data for permitting control through the remote controller is received. The centralized monitoring apparatus (3) includes a permission data output section (30) that outputs the permission data to the air conditioner, when there is no abnormality in the test operation data obtained from the air conditioner.

FIG. 2



EP 2 351 971 A2

Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to an air-conditioning monitoring system, a control method therefor, an air conditioner, and a centralized monitoring apparatus. This application is based on Japanese Patent Application No. 2010-001996, the content of which is incorporated herein by reference.

2. DESCRIPTION OF RELATED ART

[0002] A multi-type air conditioner in which a plurality of indoor units are connected to one outdoor unit is known. The multi-type air conditioner is formed of one outdoor unit and a plurality of indoor units that are connected using shared refrigerant piping. In a building or a factory, a plurality of such multi-type air conditioners are installed as needed. Conventionally, after installation of a multi-type air conditioner, a test operation is executed by an on-site worker, and then upon completion of the test operation, the multi-type air conditioner is provided to customers for use.

Japanese Unexamined Patent Application, Publication No. 2009-14233 discloses a technology of acquiring operating information of an air conditioner by using a cellular phone unit to monitor the operational status of the air conditioner through the cellular phone.

[0003] However, the processes of installation and test operation depend on the experience of on-site workers. For example, if on-site workers who execute the test operation change frequently, the techniques involved in the test operation are not shared among the on-site workers, and thus the test operation is not properly executed in some cases. Also, because data obtained from the test operation is not evaluated, and a problem cannot be found before installation, there is a problem in that a failure occurs within a very short period of time after the installation.

BRIEF SUMMARY OF THE INVENTION

[0004] The present invention has been made in view of such circumstances, and an object thereof is to provide an air-conditioning monitoring system, a control method therefor, an air conditioner, and a centralized monitoring apparatus that allow control through a remote controller when there is no abnormality in a test operation.

[0005] In order to solve the above-described problem, the present invention employs the following solutions. According to one aspect, the present invention provides an air-conditioning monitoring system including: an air conditioner that shifts to a normal operation after a test operation is executed and that is controlled by a remote controller; and a centralized monitoring apparatus that

collects operating information of the air conditioner, the air conditioner and the centralized monitoring apparatus being connected via a network so as to be able to communicate with each other, in which the air conditioner includes test operation data collecting for collecting and outputting test operation data that indicates an operating condition obtained when the test operation is executed; and switching means for switching the air conditioner to a state where control through the remote controller is permitted, when permission data for permitting control through the remote controller is received; and the centralized monitoring apparatus includes permission data output means for outputting the permission data to the air conditioner, that has output the test operation data, when there is no abnormality in the test operation data obtained from the air conditioner.

[0006] According to this configuration, when there is no abnormality in the test operation data that indicates an operating condition collected when the test operation of the air conditioner is executed, the centralized monitoring apparatus outputs permission data for permitting control through the remote controller to the air conditioner, which has output this test operation data having no abnormality, and, upon reception of the permission data, the air conditioner is switched to a state in which control through the remote controller is permitted. The test operation data includes the compressor discharge temperature, the compressor suction temperature, the heat exchanger temperature, the fan rotation speed, the degree of opening of an expansion valve, the pressure, etc. obtained at the time of the test operation.

[0007] In this way, since control through the remote controller is permitted only when the test operation is normally executed and there is no abnormality therein, and control through the remote controller is not permitted when there is an abnormality in the test operation, it is possible to reduce the number of cases in which, even though there is an abnormality in the test operation, the air conditioner for which control through the remote controller is permitted is delivered to a customer.

Since the centralized monitoring apparatus determines whether there is an abnormality in test operation data for each air conditioner and outputs permission data only to an air conditioner whose test operation data has no abnormality, the use of the remote controller of the air conditioner is not permitted based on permission data for another air conditioner.

[0008] The above-described air-conditioning monitoring system may further include a communication terminal that is interposed between the air conditioner and the centralized monitoring apparatus, that is connected to the air conditioner and to the centralized monitoring apparatus via a network so as to be able to communicate with the air conditioner and with the centralized monitoring apparatus, and that includes a notification device, in which the air conditioner may further include precheck determining means for determining whether a precheck has been executed in the communication terminal before

execution of the test operation; and test operation starting means for starting the test operation when the precheck determining means determines that the precheck has been executed.

[0009] For example, the precheck is executed to check the electricity to see whether the air conditioner has been powered on; instrumentation to see whether a signal line has been connected between an indoor unit and an outdoor unit of the air conditioner; piping to see whether an service valve that connects the outdoor unit and the indoor unit has been opened; and whether, when a plurality of outdoor units are provided, a valve of an oil equalizing pipe provided between the outdoor units has been opened.

In this way, since the test operation is executed after it is determined that the precheck has been executed, it is possible to reduce human errors and to reduce installation errors. The communication terminal is a cellular phone, a personal computer, a PDA (Personal Digital Assistant), or a game machine having a communication function, for example, and is a terminal through which information required for the precheck for the air conditioner is provided to the user using the communication terminal.

[0010] In the above-described air-conditioning monitoring system, the communication terminal may output the test operation data obtained from the air conditioner to the centralized monitoring apparatus; the centralized monitoring apparatus may further include a shipping-list storage section that stores shipping information about shipping of the air conditioner; and the permission data output means may output the permission data based on the shipping information stored in the shipping-list storage section and the test operation data.

[0011] For example, when information about power consumption obtained through a precheck result for an air conditioner disposed at a location A is input to the centralized monitoring apparatus, the centralized monitoring apparatus compares a shipping list (shipping information) for the location A with the input information about the power consumption. When there is a large difference between power consumption obtained from information about the type and the number of air conditioners (outdoor units and indoor units) based on the shipping list for the location A and the input information about the power consumption, it is estimated that the air conditioner was not properly installed, and the permission data is not output. The shipping list (shipping information) is compared with obtained information about the number of connected indoor units, and, when there is a difference therebetween, it is also estimated that the air conditioner was not properly installed. In this way, since it is determined whether to output permission data, based on not only whether the precheck has been executed but also the precheck result, it is possible to prevent problems caused by a recognition failure occurring when an indoor unit is mistakenly not powered on, an outdoor-unit setting failure, or other failures.

[0012] In the above-described air-conditioning monitoring system, the permission data output means of the centralized monitoring apparatus may include: test operation data storage means for storing the obtained test operation data for each the air conditioner; and determination means for determining a criterion used to determine whether there is an abnormality in the test operation data, based on the test operation data stored in the test operation data storage means and for making the determination based on the criterion.

In this way, since the collected test operation data is stored for each air conditioner, and it is determined whether there is an abnormality in the test operation data based on the stored test operation data, the determination is made according to the external environment in which the air conditioner is installed, thus improving the accuracy of the centralized monitoring apparatus.

[0013] In the above-described air-conditioning monitoring system, when there is an abnormality in the test operation data obtained from the air conditioner, the centralized monitoring apparatus may notify the communication terminal of information used for removing the abnormality.

For example, in some cases, a failure occurs when saturated liquid refrigeration is directly suctioned to the compressor, and examples of the cause thereof include an EEV (Electric Expansion Valve) leakage, an SV (Solenoid Valve) leakage, and a fan operation failure. In such a case, information for identifying the cause of the failure (that is, information for removing the failure) is notified to the communication terminal, and therefore, the operator of the communication terminal identifies the cause of the failure more easily when executing an operation based on the information for removing the failure, notified to the communication terminal.

[0014] In the above-described air-conditioning monitoring system, the air conditioner may include a temperature sensor, and a temperature measured by the temperature sensor may be included in the test operation data.

For example, when a service valve (used for refrigeration or oil) is mistakenly not opened, temperature information is collected by a temperature sensor, thereby detecting the occurrence of the abnormality. In this way, when the temperature information is collected from the temperature sensor as test operation data, the accuracy of detection of an abnormality can be improved.

[0015] According to another aspect, the present invention provides an air conditioner that shifts to a normal operation after a test operation is executed, that is controlled by a remote controller, and that is connected to a centralized monitoring apparatus that collects operating information, via a network so as to be able to communicate with each other, the air conditioner including: test operation data collecting for collecting and outputting test operation data that indicates an operating condition obtained when the test operation is executed; and switching means for switching the air conditioner to a state where

control through the remote controller is permitted, when there is no abnormality in the test operation data and when permission data for permitting control through the remote controller is received from the centralized monitoring apparatus.

[0016] According to still another aspect, the present invention provides a centralized monitoring apparatus that collects operating information of an air conditioner and that is connected to the air conditioner via a network so as to be able to communicate with each other, the air conditioner shifting to a normal operation after a test operation is executed and being controlled by a remote controller, the centralized monitoring apparatus including permission data output means for outputting, when there is no abnormality in test operation data that is collected in and output from the air conditioner and that indicates an operating condition obtained when the test operation is executed, permission data for permitting control through the remote controller to the air conditioner, that has output the test operation data, in which the permission data makes the air conditioner switch to a state where control through the remote controller is permitted.

[0017] According to still another aspect, the present invention provides a control method for an air-conditioning monitoring system that includes: an air conditioner that shifts to a normal operation after a test operation is executed and that is controlled by a remote controller; and a centralized monitoring apparatus that collects operating information of the air conditioner, the air conditioner the centralized monitoring apparatus being connected via a network so as to be able to communicate with each other, the control method including: a test operation data collecting step, performed by the air conditioner, of collecting and outputting test operation data that indicates an operating condition obtained when the test operation is executed; a switching step, performed by the air conditioner, of switching the air conditioner to a state where control through the remote controller is permitted, when permission data for permitting control through the remote controller is received; and a permission data outputting step, performed by the centralized monitoring apparatus, of outputting the permission data to the air conditioner, that has output the test operation data, when there is no abnormality in the test operation data obtained from the air conditioner.

[0018] According to the present invention, an advantage is afforded in that, when there is no abnormality in a test operation, control through a remote controller is allowed.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0019]

FIG. 1 is a diagram showing the overall configuration of an air-conditioning monitoring system according to a first embodiment of the present invention.

FIG. 2 is a block diagram showing, in outline, the configuration of the air-conditioning monitoring system according to the first embodiment of the present invention.

FIG. 3 is a block diagram showing, in outline, the configuration of an air-conditioning monitoring system according to a second embodiment of the present invention.

10 EXAMPLE OF REFERENCE

[0020]

- 1' air-conditioning monitoring system
- 2 air conditioner
- 3 centralized monitoring apparatus
- 4 communication terminal
- 5 network
- 23 remote controller
- 30 permission data output section
- 31 shipping-list storage section
- 41 notification section
- 42 storage section
- 50 precheck determining section
- 51 test operation starting section
- 52 test operation data collecting section
- 53 switching section
- 301 test operation data storage section
- 302 determination section

DETAILED DESCRIPTION OF THE INVENTION

[0021] An air-conditioning monitoring system, a control method therefor, an air conditioner, and a centralized monitoring apparatus according to embodiments of the present invention will be described below with reference to the drawings.

First Embodiment

[0022] A first embodiment of the present invention will be described below using FIG. 1.

FIG. 1 shows the overall configuration of an air-conditioning monitoring system 1 according to this embodiment. As shown in FIG. 1, the air-conditioning monitoring system 1 includes air conditioners 2a and 2b, a centralized monitoring apparatus 3, and a communication terminal 4. Hereinafter, the air conditioners are collectively described as air conditioners 2 unless otherwise specified. The communication terminal 4 is interposed between the air conditioners 2 and the centralized monitoring apparatus 3 and is connected to the air conditioners 2a and 2b and to the centralized monitoring apparatus 3 so as to enable mutual communication therebetween via a network 5.

[0023] The network 5 uses a communication line that is compatible with the air conditioners 2a and 2b, the communication terminal 4, and the centralized monitor-

ing apparatus 3; and it may provide wired communication using general telephone lines, dedicated lines, etc., or wireless communication using a mobile communication system etc. Alternatively, it may provide communication via a LAN, such as Ethernet or a wireless LAN.

In this embodiment, a description will be given of a case where two air conditioners are provided; however, the number of air conditioners is not particularly limited, and there is no particular upper limit to the number thereof.

[0024] The air conditioner 2a includes an outdoor unit 21a, a plurality of indoor units 22 connected to the outdoor unit 21a, and a remote controller 23 for operating the indoor units 22. The air conditioner 2b also includes an outdoor unit 21b, a plurality of indoor units 22 connected to the outdoor unit 21b, and a remote controller 23 for operating the indoor units 22. Hereinafter, unless otherwise specified, the air conditioners are collectively described as air conditioners 2 and the outdoor units are collectively described as outdoor units 21.

The air conditioners 2 shift to a normal operation after execution of a test operation and are controlled by a customer (operator) with the use of the remote controller 23. The air conditioners 2 are set in advance to a state where control through the remote controller 23 is not permitted.

[0025] FIG. 2 is a block diagram showing, in outline, the configuration of the air-conditioning monitoring system 1 according to this embodiment.

As shown in FIG. 2, the outdoor units 21 each include a precheck determining section (precheck determining means) 50, a test operation starting section (test operation starting means) 51, a test operation data collecting section (test operation data collecting means) 52, and a switching section (switching means) 53.

[0026] The precheck determining section 50 determines whether a precheck has been executed in the communication terminal 4 (to be described in detail later) prior to execution of a test operation. Specifically, when the operator of the communication terminal 4 has executed a precheck, the precheck determining section 50 determines the state of execution of the precheck based on whether a precheck result (for example, information that includes a flag indicating that the precheck has been executed) input by the operator through the communication terminal 4 has been obtained. If it is determined that the precheck has been executed, the precheck determining section 50 outputs information indicating that the precheck has been executed to the test operation starting section 51.

[0027] The precheck is work for confirming the state of each air conditioner 2 in order to execute a test operation properly and is executed by the operator of the communication terminal 4. For example, the precheck is executed to check the electricity to see whether the air conditioner 2 has been powered on; instrumentation to see whether a signal line has been connected between the indoor units 22 and the outdoor unit 21 of the air conditioner 2; piping to see whether a service valve that connects the outdoor unit 21 and the indoor units 22 has

been opened; and information indicating whether, when a plurality of outdoor units 21 are provided, a valve of an oil equalizing pipe provided between the outdoor units 21 has been opened.

[0028] When the precheck determining section 50 determines that the precheck has been executed, the test operation starting section 51 starts a test operation of the air conditioner 2. In this way, since the test operation is executed after it is confirmed that the precheck has been executed, prior to starting the test operation, it is possible to reduce situations in which a problem occurs in the test operation due to human procedural error etc.

The test operation data collecting section 52 collects and outputs test operation data indicating the operating conditions obtained when the test operation was executed. For example, the test operation data collecting section 52 collects, as test operation data, the compressor discharge temperature, the compressor suction temperature, the heat exchanger temperature, the fan rotation speed, the degree of opening of an expansion valve, the pressure, etc. and outputs the test operation data to the communication terminal 4.

[0029] A temperature sensor 24 may be additionally provided, and the temperature measured by the temperature sensor 24 may be included in the test operation data, in addition to information from a sensor provided in advance in the air conditioner 2. For example, if a service valve (used for refrigeration or oil, for example) is mistakenly not opened at an installation site of the air conditioner 2, it is difficult for the sensor provided therein in advance to judge whether the service valve is mistakenly not opened. In such a case, when the temperature sensor 24 is provided at a location where a change in temperature corresponding to the opening/closing of the service valve can be detected, and temperature information obtained by the temperature sensor 24 is included in the test operation data, it is possible to determine whether the test operation data (temperature information) is normal by comparing the temperature expected to be measured when the service valve is opened with the current temperature measured by the temperature sensor 24. In this way, when the temperature sensor 24 is used, an abnormality in the test operation data can be detected more accurately.

[0030] Upon reception of "permission data" for permitting control through the remote controller 23, the switching section 53 switches to a state where the control through the remote controller 23 is permitted. As described above, in this embodiment, the air conditioner 2 is set in advance to the state where the control through the remote controller 23 is not permitted, and, upon reception of the permission data, it is switched from the not-permitted state to the permitted state; however, the switching of the switching section 53 is not limited thereto. For example, when a rejection command is received in the state where the control through the remote controller 23 is permitted, the air conditioner 2 is switched from the permitted state to the not-permitted state.

[0031] The centralized monitoring apparatus 3 includes a permission data output section (permission data output means) 30 that outputs, when there is no abnormality in the test operation data obtained from the air conditioner 2, "permission data" to the air conditioner 2 which has output the test operation data. Specifically, the permission data output section 30 includes a test operation data storage section (test operation data storage means) 301 and a determination section (determination means) 302.

The test operation data storage section 301 stores, for each air conditioner 2, reference test operation data obtained when a test operation is normally executed. The test operation data storage section 301 stores test operation data for each air conditioner 2 by associating the test operation data with the device information (for example, the device's serial number etc.) obtained together with the test operation data.

[0032] The determination section 302 determines whether there is an abnormality in the test operation data (in other words, whether there is an abnormality in the status of the test operation) by comparing the reference test operation data with the obtained test operation data and, if it is determined that there is no abnormality in the test operation data, outputs "permission data" to the communication terminal 4. If it is determined that there is an abnormality in the test operation data, "abnormality notification data" is sent to the communication terminal 4. The abnormality notification data is information used for removing the abnormality and includes an operating method to identify the location of the abnormality and the cause of the abnormality, for example.

[0033] For example, a description will be given of an example case in which the centralized monitoring apparatus 3 detects a state where saturated liquid refrigeration is directly suctioned into the compressor, based on the test operation data. It is considered that this state is caused by any of a plurality of causes, such as an EEV leakage, an SV leakage, and a fan operation failure, and it is difficult to find the cause through the test operation. In such a case, an operating method to identify the cause of the abnormality is notified to the communication terminal 4. Then, the operator of the communication terminal 4 operates the air conditioner 2 based on the information of the operating method notified to the communication terminal 4, thus making it easy to identify the cause of the abnormality.

[0034] The communication terminal 4 is connected to the air conditioner 2 and to the centralized monitoring apparatus 3 via the network 5. The communication terminal 4 allows the operator to execute the precheck before the execution of the test operation of the air conditioner 2 and to execute the test operation, receives test operation data and device information from the outdoor unit 21 of the air conditioner 2, and sends them to the centralized monitoring apparatus 3. Further, the communication terminal 4 sends permission data or abnormality notification data received from the centralized monitoring

apparatus 3 to the air conditioner 2. The communication terminal 4 is, for example, a cellular phone, a personal computer, a PDA (personal Digital Assistant), or a game machine having a communication function.

Specifically, as shown in FIG. 2, the communication terminal 4 has a notification section 41 and a storage section 42.

[0035] For example, when the data, which permits control through the controller 23, for air conditioner 2a is received from the centralized monitoring apparatus 3, communication terminal 4 notifies the notification section 41 that there is no abnormality in the test operation of the conditioner 2a and outputs the permission data to the air conditioner 2a via a communication section (not shown). When abnormality notification data for the air conditioner 2b is obtained from the centralized monitoring apparatus 3, the communication terminal 4 notifies the notification section 41 that there is an abnormality in the test operation data of the air conditioner 2b and also notifies the notification section 41 of information for removing the abnormality included in the abnormality notification data (an operating method to identify the location of the abnormality and the cause of the abnormality). In this way, the determination result of the test operation data of each air conditioner 2 is displayed in the notification section 41 of the communication terminal 4.

[0036] The storage section 42 stores a precheck list serving as an operation procedure used for reliably executing a precheck before executing the test operation of the air conditioner 2. Specifically, when the operator executes an operation prior to the test operation (for example, an operation of pushing a dedicated switch for the test operation if the dedicated switch is provided) in the communication terminal 4 before starting the test operation, the precheck list is read from the storage section 42.

[0037] Information of the precheck list read from the storage section 42 is notified to the notification section 41, thus being provided to the operator of the communication terminal 4 as information required for the precheck executed before the test operation. After confirming the information of the precheck list, when the operator inputs "a precheck result" as information indicating that the precheck has been executed, the precheck result is sent to the air conditioner 2 for which the precheck has been executed, via the communication section of the communication terminal 4.

[0038] Next, the operation of the air-conditioning monitoring system 1, having the above-described configuration, will be described using FIG. 2.

Although the air conditioners 2a and 2b have the same functions, a description will be given of the operation of the air conditioner 2a as an example in this embodiment, on the assumption that the communication terminal 4 focuses on the air conditioner 2a.

[0039] The communication terminal 4 is connected to the air conditioners 2a and 2b via the network 5 (via a cellular phone line, for example). When the operator of

the communication terminal 4 confirms the contents of the precheck list according to the operation procedure notified to the notification section 41 and inputs a precheck result to the communication terminal 4, the precheck result input to the communication terminal 4 is sent to the air conditioner 2a. In the precheck determining section 50, it is determined whether the precheck prior to the test operation was executed based on whether the precheck result has been obtained, and, if it is determined that the precheck was executed, the determination result is notified to the test operation starting section 51. If it is determined that the precheck was not executed, the above-described determination is repeated until the precheck is executed.

[0040] When the test operation starting section 51 obtains information indicating that the precheck was executed, it starts the test operation of the air conditioner 2a, collects test operation data obtained from the air conditioner 2a, and sends the test operation data and the device information to the communication terminal 4. Upon reception of the test operation data and the device information, the communication terminal 4 sends them to the centralized monitoring apparatus 3 via the network 5. Then, the reference test operation data for the air conditioner 2a which has sent the obtained test operation data is read from the test operation data storage section 301 of the centralized monitoring apparatus 3 and is output to the determination section 302. Also, the obtained test operation data is stored in the test operation data storage section 301 together with the device information of the air conditioner 2a.

[0041] In the determination section 302, it is determined whether there is an abnormality in the test operation data, and, if it is determined that there is no abnormality in the test operation data, permission data for the air conditioner 2a is sent to the communication terminal 4. When the communication terminal 4 receives the permission data, the notification section 41 of the communication terminal 4 is notified that there is no abnormality in the test operation, and the permission data is sent to the air conditioner 2a. If it is determined that there is an abnormality in the test operation data, abnormality notification data for the air conditioner 2a is sent to the communication terminal 4. In this case, the notification section 41 of the communication terminal 4 is notified that there is an abnormality in the test operation of the air conditioner 2a and is also notified of information for removing the abnormality. The operator can trace the cause of the notified abnormality by confirming the abnormality notification data notified to the notification section 41.

[0042] When the switching section 53 of the air conditioner 2a receives the permission data, it is recognized that the use of the remote controller 23 is permitted, the state of the switching section 53 is switched from the not-permitted state to the permitted state, and the outdoor unit 21 of the air conditioner 2a is permitted to be controlled through the remote controller 23. When the air

conditioner 2a obtains the permission data, this processing ends. In a case where the air conditioner 2a does not receive permission data, the above-described processing is repeated until permission data is received (until permission is given).

[0043] As described above, according to the air-conditioning monitoring system 1, the control method therefor, the air conditioner 2, and the centralized monitoring apparatus 3 of this embodiment, since the communication terminal 4 executes the precheck before the start of the test operation, the test operation can be reliably executed. Test operation data that is collected when the test operation was executed is compared with expected test operation data that would be collected when the test operation is normally executed, to determine whether the test operation was normally executed. Only when the test operation was normally executed, the air conditioner 2 that has sent the normal test operation data is permitted to be controlled through the remote controller 23.

In this way, the test operation data collected at the time of the test operation is used to determine whether the air conditioner 2 is permitted to be controlled through the remote controller 23, and, only when there is no abnormality in the test operation, the air conditioner 2 is permitted to be operated through the remote controller 23. Accordingly, it is possible to prevent a problem that may occur after the installation of an air conditioner that is delivered to a customer even though an abnormality is included therein.

Modification

[0044] In this embodiment, it is determined whether there is an abnormality in the test operation data based on reference test operation data stored in advance in the test operation data storage section 301; however, the determination method is not limited thereto. For example, a criterion may be determined based on the test operation data stored in the test operation data storage section 301 together with the device information, and it may be determined whether there is an abnormality in obtained test operation data based on this criterion and the obtained test operation data. In this way, when a criterion is determined using test operation data of each air conditioner 2 accumulated in the test operation data storage section 301, the criterion is determined according to an environment (for example, according to each country or weather) in which the air conditioner 2 is installed. Accordingly, the accuracy of a threshold serving as a criterion for determination can be improved.

[0045] A description has been given of a case where the air conditioner used in this embodiment is a multi-type air conditioner; however, the type thereof is not limited thereto. For example, an air conditioner in which one indoor unit is provided for one outdoor unit may be used.

Second Embodiment

[0046] Next, a second embodiment of the present invention will be described using FIG. 3.

An air-conditioning monitoring system 1' according to this embodiment differs from that of the first embodiment in that a shipping-list storage section (shipping-list storage means) 31 that stores shipping information about each air conditioner 2 is provided. The air-conditioning monitoring system 1' of this embodiment will be described below mainly in terms of the differences from that of the first embodiment, and a description of similarities will be omitted.

[0047] The shipping-list storage section 31 stores information about shipping (hereinafter, referred to as "shipping information") of an air conditioner 2 shipped to each location, as information for each air conditioner 2. Specifically, the shipping destination of the air conditioner 2 can be found out from the shipping information. For example, in the shipping information, the shipping destination (shipping destination identifying information such as the address and the telephone number), the shipping date and time, the delivery date and time, information about the number of air conditioners (outdoor units and indoor units), and information about the type and the model number are associated with one another.

The permission data output section 30 determines whether permission data is output, based on the shipping information stored in the shipping-list storage section 31 and obtained test operation data.

[0048] For example, in a case where the shipping-list storage section 31 stores shipping information indicating that the air conditioner 2a to be shipped (delivered) to a location A has a model number X, when the centralized monitoring apparatus 3 obtains, from the air conditioner 2a, the device information that includes a model number Y, since the shipping information of the air conditioner 2a differs from the device information obtained from the air conditioner 2a, the determination section 302 determines that there is an abnormality and sends abnormality notification data regarding the air conditioner 2a to the communication terminal 4.

[0049] For example, in a case where the shipping-list storage section 31 stores shipping information indicating that the air conditioner 2b at a location B has one outdoor unit and eight indoor units, when the test operation data obtained from the air conditioner 2b has information (for example, the power consumption value etc.) indicating that there are one outdoor unit and six indoor units, the shipping information of the air conditioner 2b differs from the test operation data obtained from the air conditioner 2b. In this case, the determination section 302 determines that there is an abnormality in the air conditioner 2b at the location B and sends abnormality notification data regarding the air conditioner 2b to the communication terminal 4.

[0050] In this way, it is determined whether there is an abnormality in the test operation by comparing the test

operation data with the shipping information or by comparing the device information with the shipping information. Thus, it is possible to detect a recognition failure caused when an indoor unit is mistakenly not powered on, an outdoor-unit setting failure etc. and to prevent a problem from occurring after installation of the air conditioner.

Claims

1. An air-conditioning monitoring system **characterized by** comprising:

an air conditioner (2) that shifts to a normal operation after a test operation is executed and that is controlled by a remote controller (23); and a centralized monitoring apparatus (3) that collects operating information of the air conditioner, the air conditioner and the centralized monitoring apparatus being connected via a network (5) so as to be able to communicate with each other, wherein

the air conditioner (2) comprises test operation data collecting means (52) for collecting and outputting test operation data that indicates an operating condition obtained when the test operation is executed; and switching means (53) for switching the air conditioner to a state where control through the remote controller (23) is permitted, when permission data for permitting control through the remote controller is received; and the centralized monitoring apparatus (3) comprises permission data output means (30) for outputting the permission data to the air conditioner (2), that has output the test operation data, when there is no abnormality in the test operation data obtained from the air conditioner.

2. An air-conditioning monitoring system according to claim 1, further comprising a communication terminal (4) that is interposed between the air conditioner (2) and the centralized monitoring apparatus (3), that is connected to the air conditioner and to the centralized monitoring apparatus via a network (5) so as to enable mutual communication therebetween, and that includes a notification device (41), wherein the air conditioner (2) further comprises precheck determining means (50) for determining whether a precheck has been executed in the communication terminal (4) before execution of the test operation; and test operation starting means (51) for starting the test operation when the precheck determining means (50) determines that the precheck has been executed.

3. An air-conditioning monitoring system according to claim 1 or 2, wherein:

the communication terminal (4) outputs the test operation data obtained from the air conditioner (2) to the centralized monitoring apparatus (3); the centralized monitoring apparatus (3) further comprises a shipping-list storage section (31) that stores shipping information about shipping of the air conditioner (2); and the permission data output means (30) outputs the permission data based on the shipping information stored in the shipping-list storage section (31) and the test operation data.

4. An air-conditioning monitoring system according to any one of claims 1 to 3, wherein the permission data output means (30) of the centralized monitoring apparatus (3) comprises:

test operation data storage means (301) for storing the obtained test operation data for each the air conditioner; and determination means (302) for determining a criterion used to determinate whether there is an abnormality in the test operation data, based on the test operation data stored in the test operation data storage means and for making the determination based on the criterion.

5. An air-conditioning monitoring system according to any one of claims 2 to 4, wherein, when there is an abnormality in the test operation data obtained from the air conditioner (2), the centralized monitoring apparatus (3) notifies the communication terminal (4) of information used for removing the abnormality.

6. An air-conditioning monitoring system according to any one of claims 1 to 5, wherein the air conditioner (2) includes a temperature sensor, and a temperature measured by the temperature sensor is included in the test operation data.

7. An air conditioner **characterized in that** it shifts to a normal operation after a test operation is executed, **in that** it is controllable by a remote controller (23), and **in that** it is connectable to a centralized monitoring apparatus (3) that collects operating information, via a network (5) so as to be able to communicate with each other, the air conditioner (2) comprising:

test operation data collecting means (52) for collecting and outputting test operation data that indicates an operating condition obtained when the test operation is executed; and switching means (53) for switching the air conditioner to a state where control through the re-

mote controller (23) is permitted, when there is no abnormality in the test operation data and when permission data for permitting control through the remote controller is received from the centralized monitoring apparatus (3).

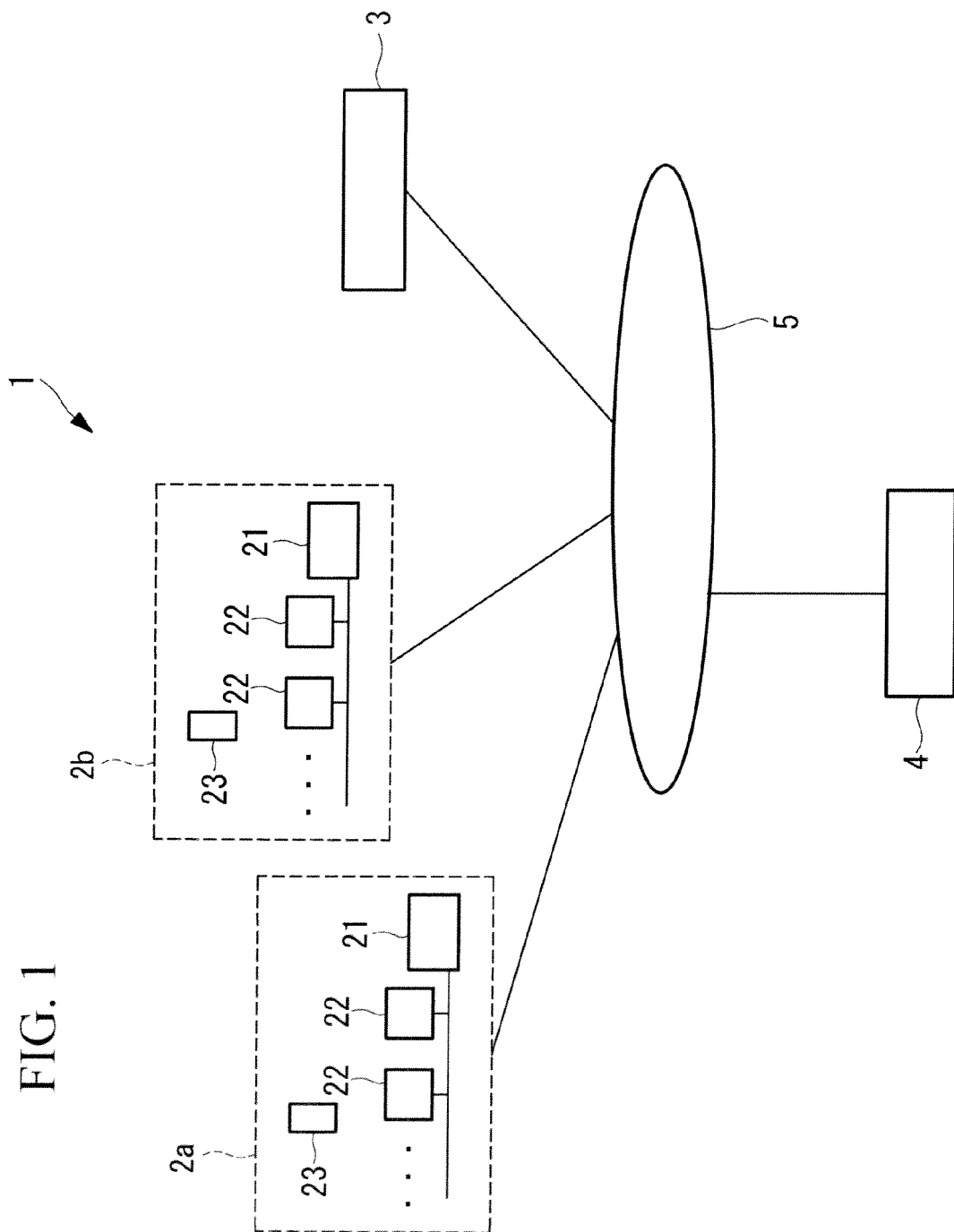
8. A centralized monitoring apparatus **characterized in that** it collects operating information of an air conditioner (2) and **in that** it is connectable to the air conditioner via a network (5) so as to be able to communicate with each other, the air conditioner (2) shifting to a normal operation after a test operation is executed and being controlled by a remote controller (23), the centralized monitoring apparatus (3) comprising permission data output means (30) for outputting, when there is no abnormality in test operation data that is collected in and output from the air conditioner and that indicates an operating condition obtained when the test operation is executed, permission data for permitting control through the remote controller (23) to the air conditioner (2), that has output the test operation data, wherein the permission data causes the air conditioner (2) to switch to a state where control through the remote controller is permitted.

9. A control method for an air-conditioning monitoring system that includes: an air conditioner (2) that shifts to a normal operation after a test operation is executed and that is controlled by a remote controller (23); and a centralized monitoring apparatus (3) that collects operating information of the air conditioner, the air conditioner and the centralized monitoring apparatus being connected via a network (5) so as to be able to communicate with each other, the control method comprising:

a test operation data collecting step, performed by the air conditioner (2), of collecting and outputting test operation data that indicates an operating condition obtained when the test operation is executed;

a switching step, performed by the air conditioner (2), of switching the air conditioner to a state where control through the remote controller is permitted, when permission data for permitting control through the remote controller is received; and

a permission data outputting step, performed by the centralized monitoring apparatus (3), of outputting the permission data to the air conditioner, that has output the test operation data, when there is no abnormality in the test operation data obtained from the air conditioner (2).



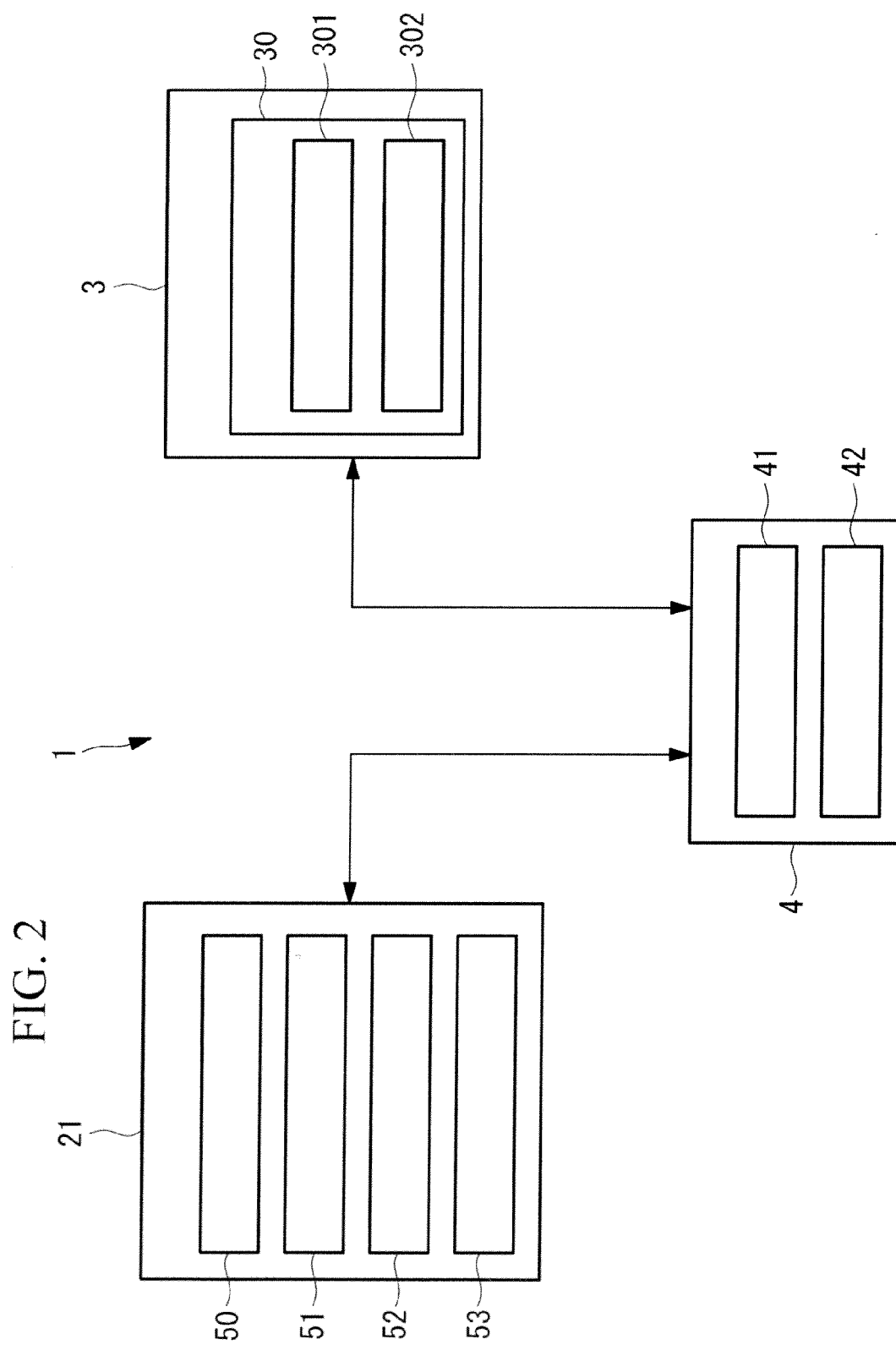
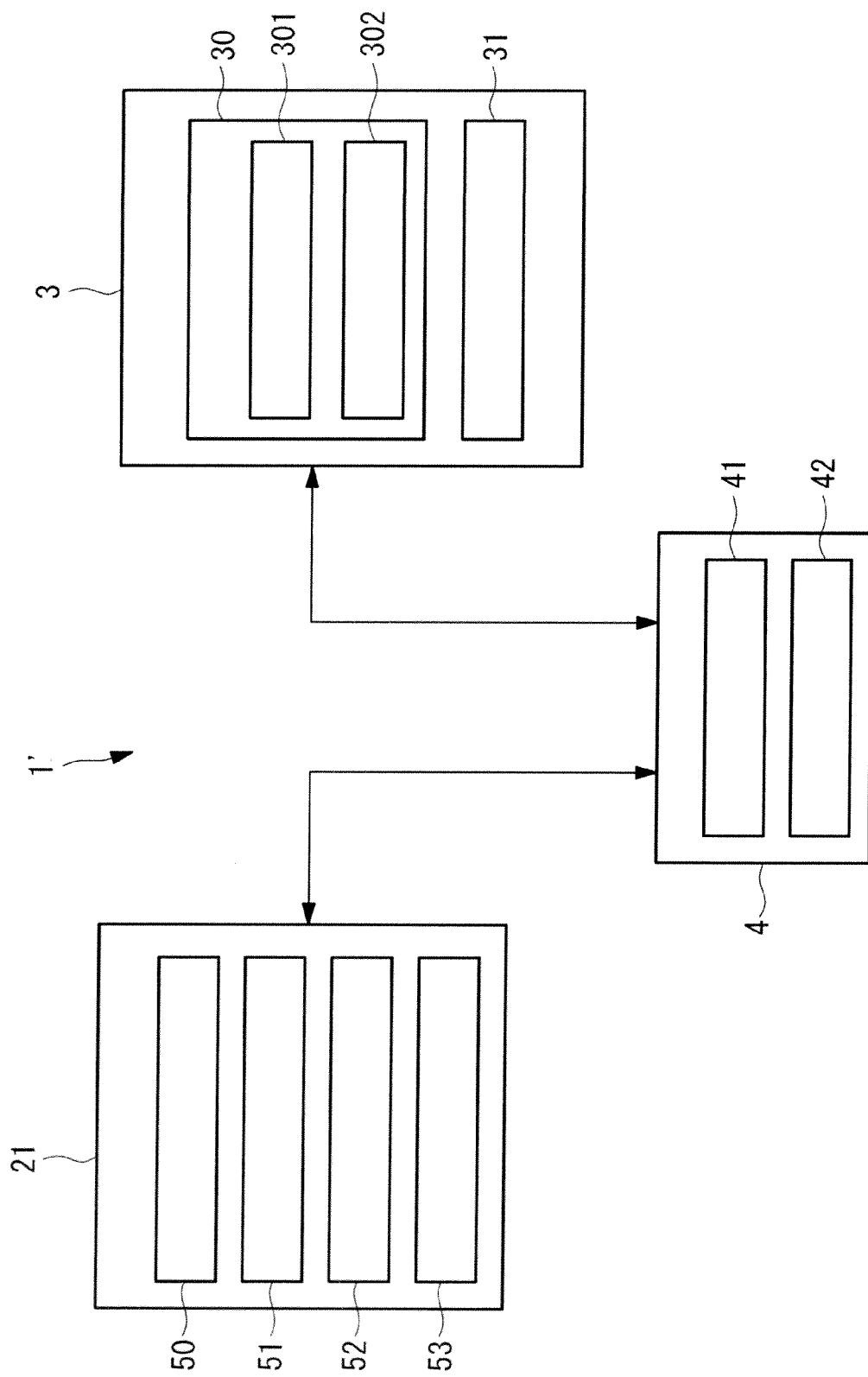


FIG. 3



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2010001996 A [0001]
- JP 2009014233 A [0002]