(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 321 722 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.06.2003 Bulletin 2003/26

(51) Int Cl.[7]: **F24F 11/00**

(21) Application number: **02027703.4**

(22) Date of filing: **10.12.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SI SK TR
Designated Extension States:
AL LT LV MK RO

(30) Priority: **21.12.2001 JP 2001389190**

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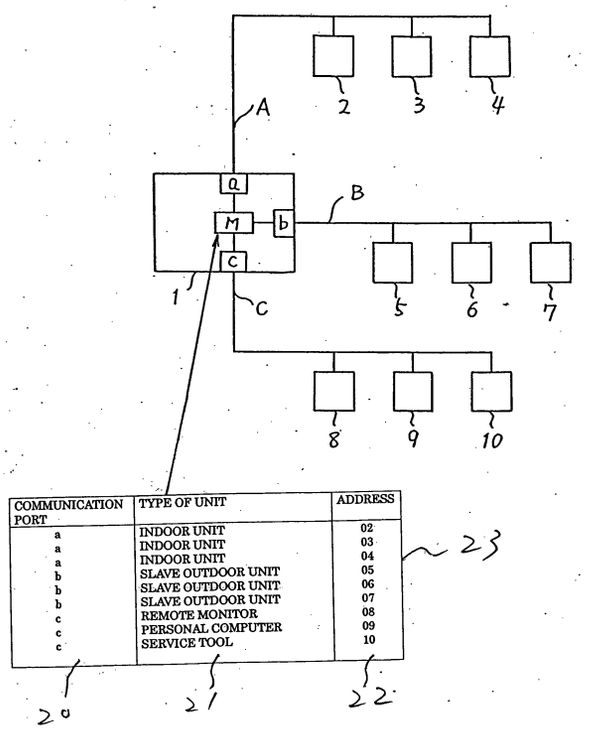
(54) Communication network system and data communication method therefor

(57) A communication network system for an air conditioner in which at least one outdoor unit, plural indoor units and other units are connected to one another through plural communication networks to perform an air-conditioning operation, including at least one master unit (1) having plural communication ports (a,b,c, d), plural communication networks (A, B, C) connected to the communication ports (a, b, c, d) of the master device (1), and at least one slave unit (2, 3, 4, 5, 6, 7, 8, 9, 10, 11) connected to each of the communication networks (A, B, C), wherein the master unit (1) has a table (23) containing information for indicating the locations of the slave units (2, 3, 4, 5, 6, 7, 8, 9, 10, 11) connected to the communication networks (A, B, C), and means (M) for selecting on the basis of the table (23) a communication network route through which communication data addressed to a prescribed unit are transmitted to the prescribed unit.

FIG.2



COMMUNICATION PORT	TYPE OF UNIT	ADDRESS
a	INDOOR UNIT	02
a	INDOOR UNIT	03
a	INDOOR UNIT	04
b	SLAVE OUTDOOR UNIT	05
b	SLAVE OUTDOOR UNIT	06
b	SLAVE OUTDOOR UNIT	07
c	REMOTE MONITOR	08
c	PERSONAL COMPUTER	09
c	SERVICE TOOL	10

20 21 22 23

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a communication network system including plural communication networks and a data communication method for use in the data communication network system, and particularly to a communication network system for an air conditioner having plural communication networks in which data communication is performed among indoor and outdoor units, and other devices through the plural communication networks to perform air-conditioning operation, and a data communication method for use in the communication network system for the air conditioner.

2. Description of the Related Art

[0002] According to a conventional network system for an air conditioner having plural devices (units) such as indoor units, outdoor units, etc., serial communications have been utilized to reduce the number of communication wires from the viewpoint of the network architecture, and the network system is constructed by various plural communication networks such as a communication network through which outdoor units are connected to one another, a communication network through which the outdoor units, indoor units, control devices, etc. are connected to one another and also a communication network through which the indoor units, remote controllers, etc. are connected to one another.

[0003] In this type of network system, communications through the respective communication networks are performed as follows. That is, a transmission-side device (i.e., transmission source) transmits communication data through a communication network to which the transmission source concerned belongs while adding both the address of the transmission source (i.e., the transmission-side device itself) and the address of a reception-side device (i.e., transmission destination) to the communication data to be transmitted.

[0004] At this time, each device which is connected to the communication network concerned, except for the transmission-side device (transmission source) itself, judges on the basis of the address of the reception-side device (transmission destination) contained in the communication data whether the communication data transmitted from the transmission source is addressed to the device itself. If it is judged that the communication data thus transmitted is addressed to the device itself, the device concerned (i.e., the reception-side device) receives the communication data. Thereafter, the reception-side device transmits reply data to the transmission-side device through the communication network concerned while the address of the transmission-side device is set as a reception destination address and the address of the reception-side device is set as a transmission-side address.

[0005] With respect to the timing at which the data communications (data transmission/reception) are started, the communications on the communication networks are monitored, and data transmission is carried out under the condition that it is confirmed that no data transmission is carried out from any other devices.

[0006] Furthermore, in the conventional communication network as described above, devices which can be connected to a prescribed communication network, for example, a communication network for connecting the indoor units and the remote controllers to one another, are limited to the indoor units, the remote controllers and some central controllers. Accordingly, if another central controller, a remote monitoring device or the like is tried to be connected to this communication network, the communications with these devices cannot be normally performed, so that the connection of these devices to this communication network is impossible.

[0007] Still furthermore, when a transmission-side device and a reception-side device exist in the same communication network, the communications on only this communication network are carried out. On the other hand, when communications are made via any device connected to this communication network with a device connected to another communication network (i.e., when the communications between a transmission-side device and a reception-side device connected to different communication networks are made), it is required that the transmission data are transmitted, every time, from the transmission-side device to all the communication networks connected to the communication network to which the transmission-side device belongs because it is unclear which device is connected to which communication network. When the transmission data are relayed by another device, the transmission data must be transmitted from the relay device to all the communication networks connected to the relay device.

[0008] Nowadays, a remote monitoring service using a telephone line or the like has been supplied. Accordingly, it is increasingly required to supply a large amount of information periodically, and also it is strongly required to increase the communication speed.

[0009] On the other hand, the increase in communication speed has been concerned to be more negative in the air conditioning technology field in consideration of the effects of external noises from the viewpoint of set-up environment. When the air conditioner is designed to support the remote monitoring service, the frequency of communications over plural communication networks is increased and data transmission over all the communication networks is frequently carried out, so that the congestion of communications on the respective communication networks is intensified.

[0010] This causes the communications among the respective devices to be delayed, and obstructs the normal communications. Therefore, there has been strong-

ly required to develop a new communication network system and a data communication method for use in the communication network system with which information collection can be quickly performed and loads imposed on normal communications can be suppressed.

[0011] Furthermore, there occurs such a case that the driving operation of an air conditioner must be collected for maintenance services after the air conditioner is set up. At the actual set-up place of the air conditioner, the communication wires are generally embedded in the wall when they are set up indoors, or racked even when they are set up outdoors. Therefore, it is difficult to collect the driving data of the air conditioner as expected. Accordingly, it is impossible to collect the driving data of the air conditioner from any communication network of the air conditioner, and thus there has been strongly required a communication network system in which the driving data of the air conditioner can be collected from any communication network.

SUMMARY OF THE INVENTION

[0012] The present invention has been implemented in view of the foregoing description, and has an object to provide a communication system for an air conditioner having plural communication networks and making communications over plural communication networks, in which a communication network route directing to a communication network to which a device at a transmission destination is connected is selected to reduce the load of a communication relay work which is imposed on communication networks other than the communication network route and on devices other than the devices located on the communication network route concerned, and also communications with the transmission-destination device can be performed even when the device concerned is connected to any communication network.

[0013] In order to attain the above object, according to a first aspect of the present invention, there is provided a communication network system for an air conditioner in which at least one outdoor unit, plural indoor units and other units are connected to one another through plural communication networks to perform an air-conditioning operation, characterized by comprising: at least one master unit (1) having plural communication ports (a,b,c,d), plural communication networks (A, B, C) connected to the communication ports (a, b, c, d) of the master device (1); and at least one slave unit (2, 3, 4, 5, 6, 7, 8, 9, 10, 11) connected to each of the communication networks (A, B, C), wherein the master unit (1) has a table (23) containing information for indicating the locations of the slave units (2, 3, 4, 5, 6, 7, 8, 9, 10, 11) connected to the communication networks (A, B, C), and means (M) for selecting on the basis of the table (23) a communication network route through which communication data addressed to a prescribed unit are transmitted to the prescribed unit.

[0014] In the communication network system of the first aspect of the present invention, the table comprises a common table (23) in which the locations of the slave units connected to the communication networks (A, B, C) are registered collectively for all of the communication networks (A, B, C), or plural individual tables (24, 25, 26) in each of which the locations of the slave devices connected to each of the communication networks (A, B or C) are registered every communication network connected to the slave units.

[0015] In the communication network system of the first aspect of the present invention, the table (23) contains communication address information concerning the slave units (2, 3, 4, 5, 6, 7, 8, 9 , 10) existing on the communication networks (A, B, C) or slave units (11) with which communications are made through the communication networks (A, B, C).

[0016] In the communication network system of the first aspect of the present invention, the communication address information concerning each of the slave units indicates the relationship of the identity of the slave unit concerned, the address thereof and the communication network to which the slave unit is connected.

[0017] In the communication network system of the first aspect of the present invention, the table is created on the basis of transmission data which are communicated on the communication networks.

[0018] In the communication network system of the first aspect of the present invention, the table is installed in the master unit in advance.

[0019] In the communication network system of the first aspect of the present invention, any one of an outdoor unit and an indoor unit is set as the master unit.

[0020] In order to attain the above object, according to a second aspect of the present invention, there is provided a data communication method for use in a communication network system for an air conditioner in which various units containing at least outdoor and indoor units are connected to one another through plural communication networks to perform an air-conditioning operation, characterized by comprising the steps of; setting at least one of the units to a master unit; receiving, at the master unit, transmission data containing transmission source address information transmitted through communication networks connected to the master unit from units which are directly connected to the communication networks concerned and other units which are indirectly connected to the communication networks concerned through at least one of the units directly-connected to the communication networks concerned; checking address information of all the units connected directly and indirectly to the communication networks concerned on the basis of the transmission data thus received; creating an address table indicating the associating relationship of each communication network and the address of each unit directly or indirectly connected to the communication network concerned; selecting a communication route directing to a prescribed unit on

the basis of the address table when the master unit receives transmission data addressed to the prescribed unit; and transmitting the transmission data from the master unit through the communication route thus selected to the prescribed unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Fig. 1 is a schematic diagram showing an air conditioner which has plural communication networks and makes communications over the plural communications;

Fig. 2 is a schematic diagram showing that a relaying master outdoor unit 1 is equipped with a table indicating all the devices which are connected to all the communication networks in the communication network system shown in Fig. 1;

Fig. 3 is a schematic diagram showing that the relaying master outdoor unit 1 is equipped with plural tables each indicating devices which are connected to each communication network in the communication network system shown in Fig. 1;

Fig. 4 is a schematic diagram showing a table indicating communications carried out through plural devices in the communication network system shown in Fig. 1; and

Fig. 5 is a schematic diagram showing that a device connected to a communication network which is directly connected to the master outdoor unit 1 is moved and the table is changed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] A preferred embodiment according to the present invention will be described hereunder with reference to the accompanying drawings.

[0023] Fig. 1 is a schematic diagram showing a communication system according to the present invention. In the following description, the communication system of the present invention is specially applied to an air conditioner including plural indoor units, plural outdoor units, remote controllers, etc. However, the communication system of the present invention is not limited to the air conditioner, but may be applied to various equipment.

[0024] The air conditioner includes a master outdoor unit 1 which serves as a master machine and has a microcomputer M equipped with a communication table (described later). The master outdoor unit 1 has plural communication ports a, b, c, and these communication ports a, b, c are connected to communication networks A, B, C. The communication network A is connected to indoor units 2, 3, 4, the communication network B is connected to slave outdoor units 5, 6, 7 serving as slave machines, and the communication network C is connected to a remote monitoring device 8, a personal computer 9, a service tool 10 used by a service trader in a maintenance work, etc.

[0025] As not shown in Fig. 1, each of the indoor units 2 to 4 and the slave outdoor units 5 to 7 is equipped with plural communication ports like the master outdoor unit 1, and has a table including information on the addresses, etc. of devices connected to communication networks to which the communication ports of each indoor unit (slave outdoor unit) are connected.

[0026] These tables may be set in each unit in advance or created through data communications in each unit. In a case where it is determined which communication port is connected to which communication network (connected to which devices), it is better for an application supplier to preset the tables in the respective units because the application supplier can be avoided from being confused with a cumbersome work of determining which device should be connected to which communication network.

[0027] As described above, the tables may be created through data communications without special setting. In this case, the format of communication (transmission/reception) data contain at least the address of a data transmission source and the address of a data reception destination, and each device (unit) temporarily receives all the transmission data to confirm whether the transmission data is addressed to the device concerned or not. Therefore, when a communication network to which a data transmission source (device) is connected is connected to the communication port of the device concerned and the data transmission source starts to transmit data, the device concerned can recognize which type of device (data transmission source) is connected to which communication network and which address is used for the data transmission source (device). Accordingly, each device (unit) can recognize the associating relationship of any data transmission source (any device), the address thereof and the communication network connected to the data transmission source, that is, can create a table by checking the communication data transmitted from any device (unit) through any communication network connected to the communication port of the device (unit) concerned.

[0028] The table may be a table in which the associating relationship of the communication networks, the devices connected to the communication networks and the addresses of the devices is collectively indicated for all the communication ports of the microcomputer M, or a table in which the associating relationship of the communication networks, the devices connected to the communication networks and the addresses of the devices is indicated every communication port of the microcomputer M.

[0029] Fig. 2 shows a case where the master outdoor unit 1 is equipped with a single table in which the associating relationships of the communication networks, the devices connected to the communication network and

the addresses of the devices for all the communication ports are collectively shown. As shown in Fig. 2, the table is a single list table 23 indicating the associating relationship of the communication ports 20, the devices (device types) 21 connected to the communication ports 20 and the addresses 22 of the devices 21.

[0030] Fig. 3 shows a case where the master outdoor unit 1 is equipped with plural tables each of which is provided every the communication port. As shown in Fig. 3, the table comprises plural (three) list tables 24 to 26 each of which indicates the associating relationship of only the devices (device types) 21 connected to each communication port a (b, c) and the addresses 22 of the devices 21.

[0031] For example, in the communication network A of Fig. 1, communications are made among the indoor and outdoor units. In the communication network B, master and slave communications are made among the outdoor units. In the communication network C, status monitoring communications are made by the remote monitoring device 8, the personal computer 9 and the service tool 10.

[0032] The communications carried out in each communication network contain a periodical communication in which transmission/reception is carried out every fixed time (several tens seconds), an urgent communication carried out when some abnormality occurs, transmission of data request from some device, data transmission carried out in response to a data request from some device, etc.

[0033] Here, it is assumed that the remote monitoring device 8 connected to the communication network C is operated to make a data request to monitor the operation state of the indoor unit 2. First, the remote monitoring device 8 sets the transmission source address to "08" which indicates the remote monitoring device 8 itself, also sets the reception destination address to "02" which indicates the indoor unit 2, and further adds a type code "20" indicating "data request" to construct transmission data. Then, it transmits the transmission data through the communication network C to the master outdoor unit 1.

[0034] The master outdoor unit 1 receiving the transmission data from the remote monitoring device 8 confirms on the basis of the installed table 23 that the indoor unit 2 is connected to the communication network A to which the communication port a of the master outdoor unit 1 is connected, and transmits the data request transmitted from the remote monitoring device 8 through the communication port a to the communication network A.

[0035] Likewise, the personal computer 9 and the service tool 10 connected to the communication network C receive the transmission data from the remote monitoring device 8. However, the personal computer 9 and the service tool 10 judge that the transmission data from the remote monitoring device 8 is not addressed to them, and also temporarily transmit the transmission data from the remote monitoring device 8 to their other communication ports than the communication ports connected to the communication network C because the address "0" indicating the indoor unit 2 is not registered in the tables of the personal computer 9 and the service tool 10. However, no communication network other than the communication network C exists, and also there is no reply, so that the personal computer 9 and the service tool 10 recognize the transmission from the remote monitoring device 8 to the indoor unit 2, however, they neglect this transmission and have neither an action of replaying to the master outdoor unit 1 nor an operation of new transmission.

[0036] The indoor unit 2 receiving the transmission data from the master outdoor unit 1 sets the transmission source address to "02" indicating the indoor unit 2 itself, sets the reception destination address to "08" indicating the remote monitoring device 8 making the data request, constructs reply data by a type code indicating the reply of the data request and data for reply, and then transmits the reply data to the master outdoor unit 1 through the communication network A.

[0037] At this time, the indoor units 3 and 4 connected to the communication network A temporarily receives the transmission data form the master outdoor unit 1 as in the case of the foregoing description on the communication network C. However, they can recognize it on the basis of the tables installed therein that the transmission data is not addressed to them and also the indoor unit 2 serving as the reception destination exists on the communication network A to which the transmission data are transmitted, and thus they neglect the transmission data concerned.

[0038] The same is satisfied when reply data are transmitted from the indoor unit 2 connected to the communication network A. That is, the reply data of the indoor unit 2 are neglected by the indoor units 3 and 4, and only the master outdoor unit 1 receives the reply data. On the basis of the table 23, the master outdoor unit 1 selects the communication port c and transmit the reply data through the communication network C to the remote monitoring device 8. Accordingly, the communications through the plural communication networks between the remote monitoring device 8 connected to the communication network C and the indoor unit 2 connected to the communication network A can be performed without carrying out the communications to the communication network B which does not pertain to the communications between the remote monitoring device 8 and the indoor unit 2.

[0039] As described above, by equipping the microcomputer installed in each device (unit) with a table containing the contents of devices connected to each communication network to which each communication port of the device (unit) concerned is connected, a communication network route for communications which should be performed through plural communication networks can be selected, so that the congestion of communica-

tions on each communication network can be moderated. Furthermore, only devices needed for the desired communications relay the communications concerned, so that the load imposed on devices other than the devices needed for the communications can be reduced.

[0040] Here, it is assumed that the indoor unit 2 of the air conditioner shown in Fig. 1 has a microcomputer m having a communication port e connected to the communication network A to carry out the communications with the master outdoor unit 1 and a communication port d connected to a communication network D to which a remote controller 11 is connected as shown in Fig. 4. The remote controller 11 normally carries out communications with only the indoor unit 2, and also it is a device other than the devices equipped on the communication networks A, B and C which are directly connected to the master outdoor unit 1. Therefore, not only the remote controller 11 is not registered in the table 23 of the master outdoor unit 1, but also the master outdoor unit 1 does not recognize even existence of the remote controller 11.

[0041] Here, it is assumed that under the above state, the remote monitoring device 8 makes a data request for the operation status of the remote controller 11. When transmission data is transmitted from the remote monitoring device 8 to the communication network C while the reception destination address is set to the remote controller 11, the personal computer 9 and the service tool 10 connected onto the communication network C receives the transmission data from the remote monitoring device 8 as described above, and recognize it on the basis of the tables installed therein that the remote controller 1 is not registered in the tables. At this time, the personal computer 9 and the service tool 10 transmit the transmission data from the remote monitoring device 8 through the communication ports other than the communication ports connected to the communication network C. However, no reply data are returned through these communication ports to the personal computer 9 and the service tool 10, and thus they recognize only the presence or absence of the transmission data of the remote monitoring device 8.

[0042] The master outdoor unit 1 also receives the transmission data from the remote monitoring device 8 to check on the basis of the table 23 that the remote controller 11 is registered or not. In this case, the remote controller 11 is not registered (does not exist) in the table 23, and thus transmits the transmission data from the remote monitoring device 8 to the communication networks A and B through the communication ports a and b other than the communication port c connected to the communication network C.

[0043] The outdoor units 5 to 7 connected to the communication network B temporarily receive the transmission data which are transmitted from the remote monitoring device 8 through the master outdoor unit 1. However, as in the case of the personal computer 9 and the service tool 10, the remote controller 11 is not registered in the tables installed in the outdoor units 5 to 7 and also there is no reply even when they transmit the transmission data from the remote monitoring device 8 to their communication networks other than the communication network B, so that they recognize only the transmission data from the remote monitoring device 8. The same as described above is satisfied in the indoor units 3 and 4.

[0044] On the other hand, the indoor unit 2 which is connected to the communication network A and also to which the remote controller 11 is directly connected transmits the data request signal transmitted from the remote monitoring device 8 through the master outdoor unit 1. The remote controller 11 connected to the indoor unit 2 through the communication network D generates the reply data corresponding to the data request from the remote monitoring device 8, sets the reception destination address to "08" indicating the remote monitoring device 8, sets the transmission source address to "11" indicating the remote controller 11 and then transmits the reply data to the indoor unit 2.

[0045] The indoor unit 2 receives the reply data transmitted from the remote controller 11, and transmits the reply data through the communication network A to the master outdoor unit 1.

[0046] The master outdoor unit 1 recognizes that the reply data of the remote controller 11 are transmitted from the communication network A and also the remote controller 11 exists on some communication network connected to the communication network A, and adds information such as the address of the remote controller 11, etc. to the table 23. Furthermore, the master outdoor unit 1 recognizes on the basis of the table 23 that the remote monitoring device 8 corresponding to the reception destination of the transmission data transmitted through the communication network A exists on the communication network C. Therefore, the master outdoor unit 1 transmits the transmission data from the reply data of the remote controller 11 to the communication network C connected to the communication port c. The remote monitoring device 8 receives the reply data from the remote controller 11, thereby completing the transmission of the data request from the remote monitoring device 8 to the remote controller 11.

[0047] Through the communications between the remote monitoring device 8 and the remote controller 11, it is registered in the table 23 of the master outdoor unit 1 that the remote controller 11 exists on some communication network pertaining to the communication network A. Therefore, when the communications through the master outdoor unit 1 to the remote controller 11 are afterwards carried out, the communications through only the communication network A is carried out without transmission to the communication network B.

[0048] In the foregoing descriptions are made on the case where the communications are made via the master outdoor unit 1 to a communication network directly-connected to the master outdoor unit 1 and the case where the communications are made via the master out-

door unit 1 to a communication network which is not directly connected to the master outdoor unit 1. In the communications which are carried out over plural communication networks connected to one another, the microcomputer of each device which relays the communications is equipped with a table containing information such as the addresses of devices connected to each communication network to which the device concerned is connected, or the addresses of devices connected to other communication networks connected to each communication network to which the device concerned is connected, whereby communication networks associated with transmission data transmitted from some device can be selected (i.e., a communication network route containing these communication networks can be selected). Therefore, the communications concerned can be performed without being passed through non-associated communication networks and non-associated devices, and thus the load imposed on these communication networks and devices can be eliminated.

[0049] Fig. 5 shows a case where some device (unit) is moved from some communication network to another communication network in the communication system of the present invention.

[0050] For example, it is assumed that the remote monitoring device 8 out of the respective devices (units) existing on the communication networks A, B and C which are directly connected to the master outdoor unit 1 is moved from the communication network C to the communication network A. In this case, it is needless to say that no transmission data in which the transmission source is set to the remote monitoring device 8 exists in the communication network C.

[0051] Normally, the master outdoor unit 1 carries out a periodical communication every fixed time (for example, at time intervals of at least several tens seconds), and there is no such situation that the communications are interrupted for a prescribed time (for example, several minutes) which is greatly beyond the above fixed time. Accordingly, after the prescribed time for example, several minutes) have passed, the master outdoor unit 1 judges that the remote monitoring device 8 is removed from the communication network C, or carries out transmission from the communication port c to the remote monitoring device 8 connected to the communication network C to finally check whether the remote monitoring device 8 is removed and then checks whether there is no reply from the remote monitoring device 8. Thereafter, the master outdoor unit 1 deletes the registration content of the remote monitoring device 8 from the table 23.

[0052] In subsequent communications, the master outdoor unit 1 recognizes that such communications that the transmission source address is set to the remote monitoring device 8 (which has not existed in the communication network A until now) exist in the communication network A. After the above recognition, or after the master outdoor unit 1 carries out transmission (in which the reception destination address is set to the remote monitoring device 8) to the communication network A connected to the communication port a of thereof and then confirms reply from the remote monitoring device 8, the master outdoor unit 1 registers into the table 23 the information concerning the remote monitoring device 1 in the communication network A.

[0053] Here, with respect to the deletion or addition (registration) of a device (unit) from the table, it is the best way to make communications with the device to be deleted or added and then check the reply from the device concerned. However, it may be used as another way to check the presence or absence of the periodical communications from each device (unit) because the periodical communications are carried out every fixed time (several tens seconds) so that it is judged whether the device (unit) concerned is deleted or added.

[0054] As described above, by checking existence of devices (units) directly-connected to the communication networks to which each communication port is connected or checking transmission data transmitted from the devices (units), the deletion or addition of the devices from or to the communication networks can be recognized. Accordingly, the deletion from the table 23 or the addition into the table 23 can be performed, Therefore, even when any device is newly connected to any communication network, the subsequent communications with the device concerned can be performed.

[0055] In the-above described embodiment, the master outdoor unit 1 is set as a relay device which is equipped with a table and has plural communication ports connected to different communication networks, and it relays communications carried out over the communication networks. However, each of the devices (units) other than the master outdoor unit 1 is equipped with a table and plural communication ports, and thus the relay device is not limited to the master outdoor unit 1. That is, any device (unit) may serve as a relay device by changing the construction of the communication network system.

[0056] Furthermore, in the above-described embodiment, the table is installed in the original microcomputer (for example, M, m) equipped to each device (containing the master outdoor unit 1), however, the present invention is not limited to this embodiment. For example, a microcomputer other than the original microcomputer (M, m) and a memory are further equipped to each device (unit) so as to perform various processing and storage operation needed for registering (deletion, addition, etc.) data into the table.

[0057] As described above, in the communication network system having plural communication networks for performing communications over the communication networks, at least one table indicating devices (units) connected to each of the communication networks is prepared, and a communication network route to a communication network to which a transmission destination device is connected is selected on the basis of the table

and perform communications through the communication network route thus selected. Accordingly, the load imposed on the other communication networks making no contribution to the communications concerned and the devices relaying the communications can be reduced. Furthermore, when the connection of devices connected to the communication networks is changed (added, deleted, etc.), the change is identified on the basis of the presence or absence of transmission data transmitted from the communication networks concerned, and the table is renewed in accordance with the change. Accordingly, a new communication network route (containing new communication networks) needed for communications is selected on the basis of the renewed table again, so that even when any device is connected to any communication network, the communications can be surely performed.

Claims

1. A communication network system for an air conditioner in which at least one outdoor unit, plural indoor units and other units are connected to one another through plural communication networks to perform an air-conditioning operation, **characterized by** comprising:

at least one master unit (1) having plural communication ports (a,b,c, d);
plural communication networks (A, B, C) connected to said communication ports (a, b, c, d) of said master device (1); and
at least one slave unit (2, 3, 4, 5, 6, 7, 8, 9, 10, 11) connected to each of said communication networks (A, B, C), wherein said master unit (1) has a table (23) containing information for indicating the locations of said slave units (2, 3, 4, 5, 6, 7, 8, 9, 10, 11) connected to said communication networks (A, B, C), and means (M) for selecting on the basis of said table (23) a communication network route through which communication data addressed to a prescribed unit are transmitted to the prescribed unit.

2. The communication network system as claimed in claim 1, wherein said table comprises a common table (23) in which the locations of said slave units connected to said communication networks (A, B, C) are registered collectively for all of said communication networks (A, B, C), or plural individual tables (24, 25, 26) in each of which the locations of said slave devices connected to each of said communication networks (A, B or C) are registered every communication network connected to said slave units.

3. The communication network system as claimed in claim 1, wherein said table (23) contains communication address information concerning said slave units (2, 3, 4, 5, 6, 7, 8, 9 , 10) existing on said communication networks (A, B, C) or slave units (11) with which communications are made through said communication networks (A, B, C).

4. The communication network system as claimed in claim 3, wherein the communication address information concerning each of said slave units indicates the relationship of the identity of the slave unit concerned, the address thereof and the communication network to which said slave unit is connected.

5. The communication network system as claimed in claim 1; wherein said table is created on the basis of transmission data which are communicated on said communication networks.

6. The communication network system as claimed in claim 1, wherein said table is installed in said master unit in advance.

7. The communication network system as claimed in claim 1, wherein any one of an outdoor unit and an indoor unit is set as said master unit.

8. A data communication method for use in a communication network system for an air conditioner in which various units containing at least outdoor and indoor units are connected to one another through plural communication networks to perform an air-conditioning operation, **characterized by** comprising: the steps of:

setting at least one of the units to a master unit;
receiving, at the master unit, transmission data containing transmission source address information transmitted through communication networks connected to the master unit from units which are directly connected to the communication networks concerned and other units which are indirectly connected to the communication networks concerned through at least one of the units directly-connected to the communication networks concerned;
checking address information of all the units connected directly and indirectly to the communication networks concerned on the basis of the transmission data thus received;
creating an address table indicating the associating relationship of each communication network and the address of each unit directly or indirectly connected to the communication network concerned;
selecting a communication route directing to a prescribed unit on the basis of the address table

when the master unit receives transmission data addressed to the prescribed unit; and

transmitting the transmission data from the master unit through the communication route thus selected to the prescribed unit.

FIG: 1

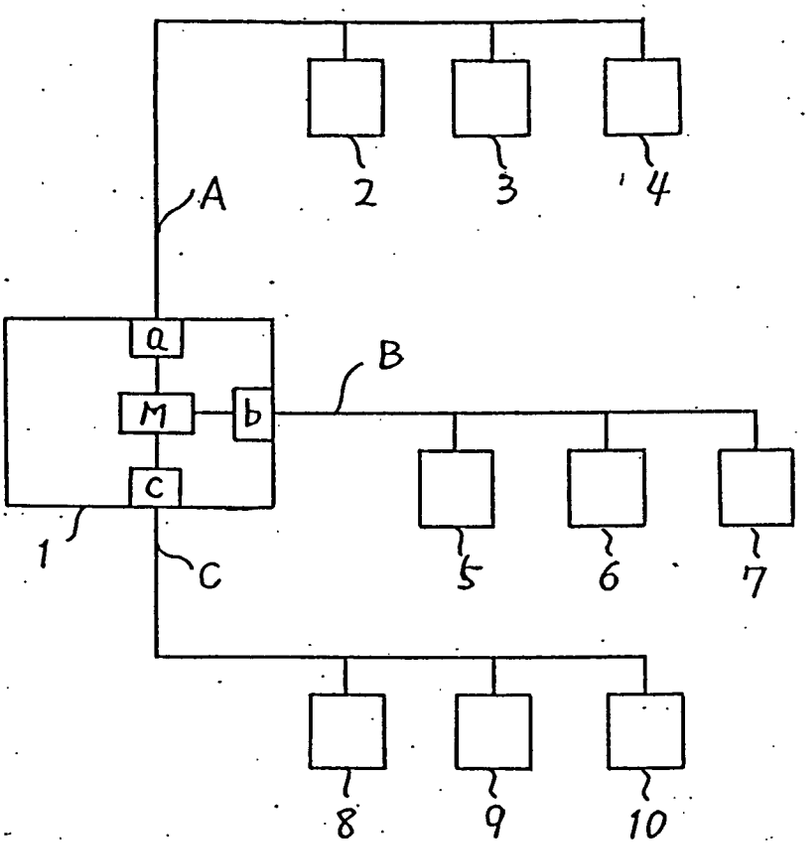
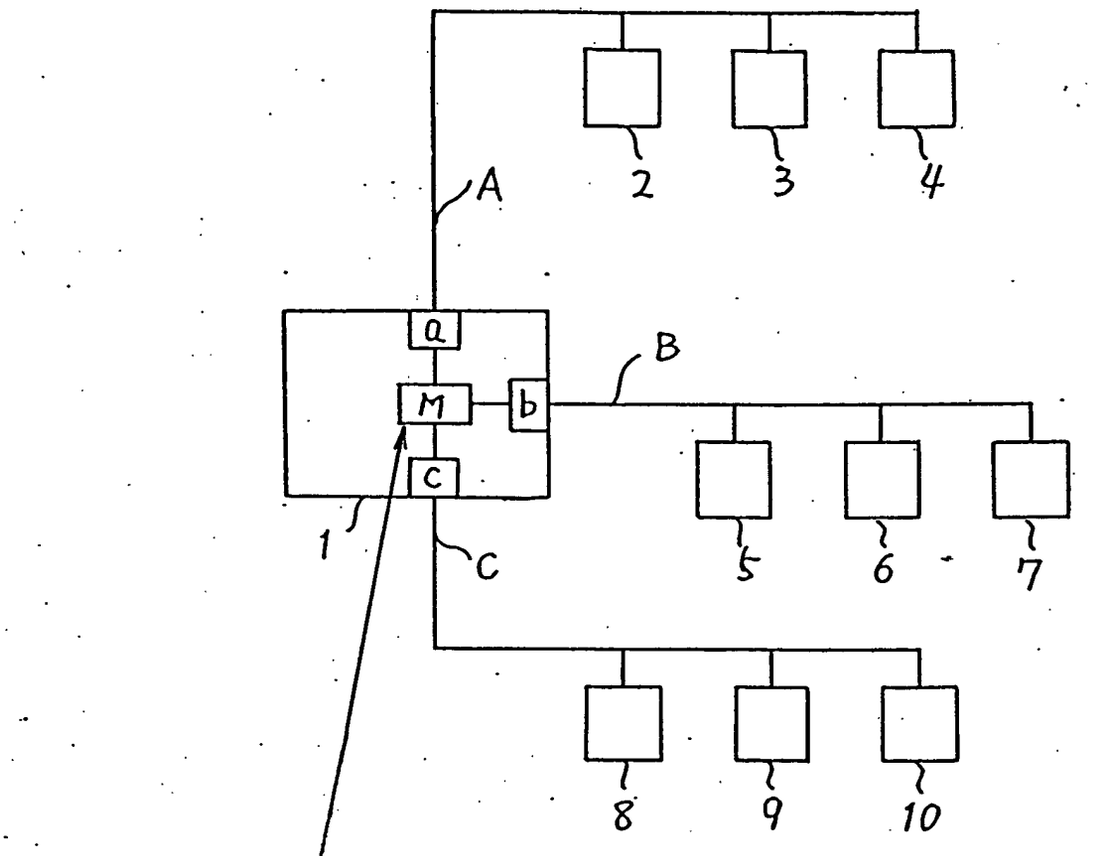


FIG.2



COMMUNICATION PORT	TYPE OF UNIT	ADDRESS
a	INDOOR UNIT	02
a	INDOOR UNIT	03
a	INDOOR UNIT	04
b	SLAVE OUTDOOR UNIT	05
b	SLAVE OUTDOOR UNIT	06
b	SLAVE OUTDOOR UNIT	07
c	REMOTE MONITOR	08
c	PERSONAL COMPUTER	09
c	SERVICE TOOL	10

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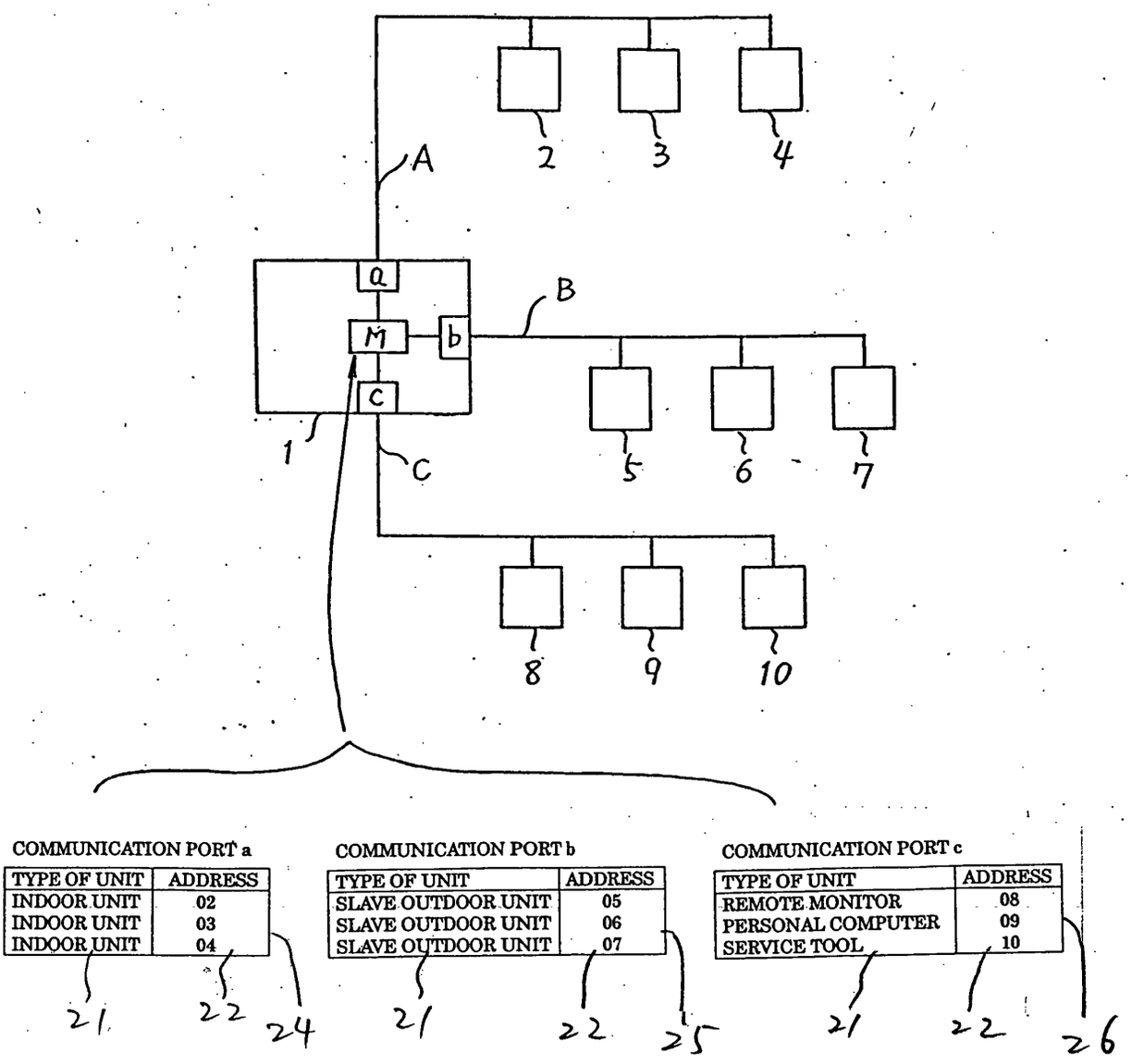
FIG. 3



COMMUNICATION PORT a

TYPE OF UNIT	ADDRESS
INDOOR UNIT	02
INDOOR UNIT	03
INDOOR UNIT	04

COMMUNICATION PORT b

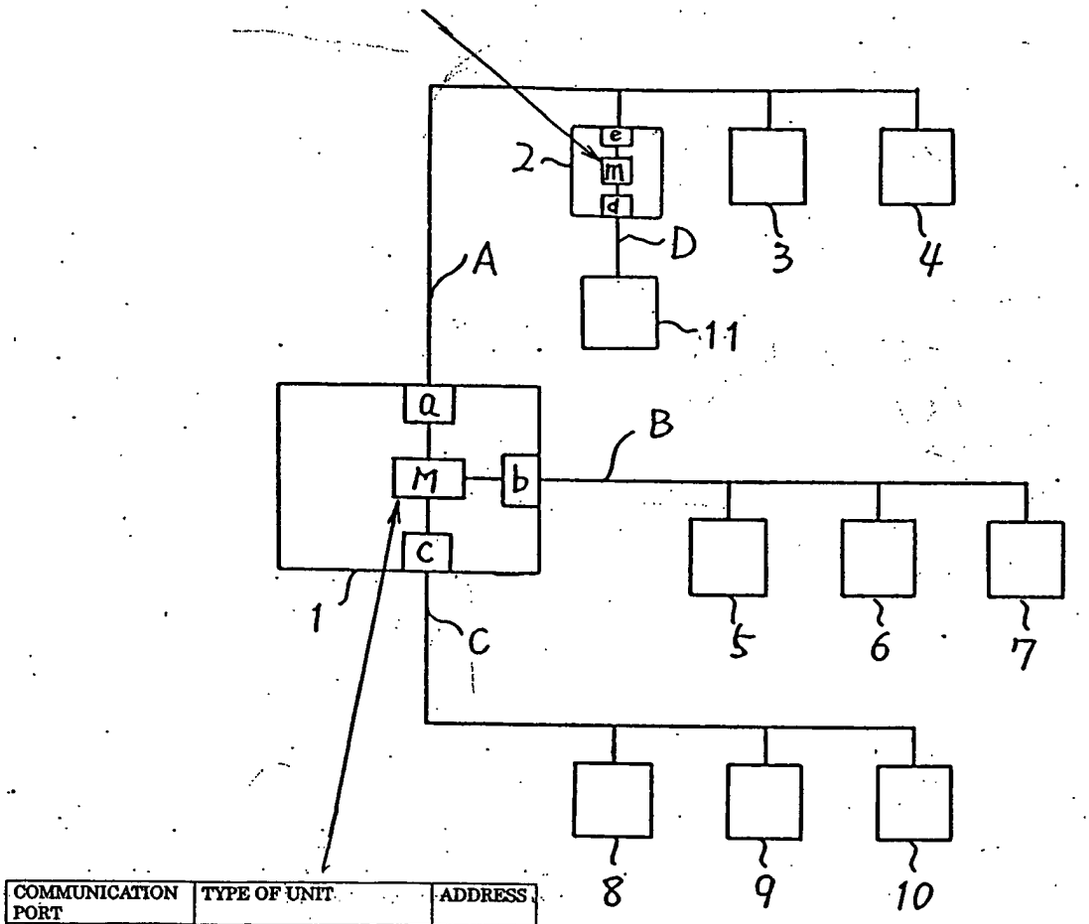
TYPE OF UNIT	ADDRESS
SLAVE OUTDOOR UNIT	05
SLAVE OUTDOOR UNIT	06
SLAVE OUTDOOR UNIT	07

COMMUNICATION PORT c

TYPE OF UNIT	ADDRESS
REMOTE MONITOR	08
PERSONAL COMPUTER	09
SERVICE TOOL	10

FIG. 4

COMMUNICATION PORT	TYPE OF UNIT	ADDRESS
e	MASTER OUTDOOR UNIT	01
e	INDOOR UNIT	03
e	INDOOR UNIT	04
d	REMOTE CONTROLLER	11
e	REMOTE MONITOR	08



COMMUNICATION PORT	TYPE OF UNIT	ADDRESS
a	INDOOR UNIT	02
a	INDOOR UNIT	03
a	INDOOR UNIT	04
b	SLAVE OUTDOOR UNIT	05
b	SLAVE OUTDOOR UNIT	06
b	SLAVE OUTDOOR UNIT	07
c	REMOTE MONITOR	08
c	PERSONAL COMPUTER	09
c	SERVICE TOOL	10
a	REMOTE CONTROLLER	11

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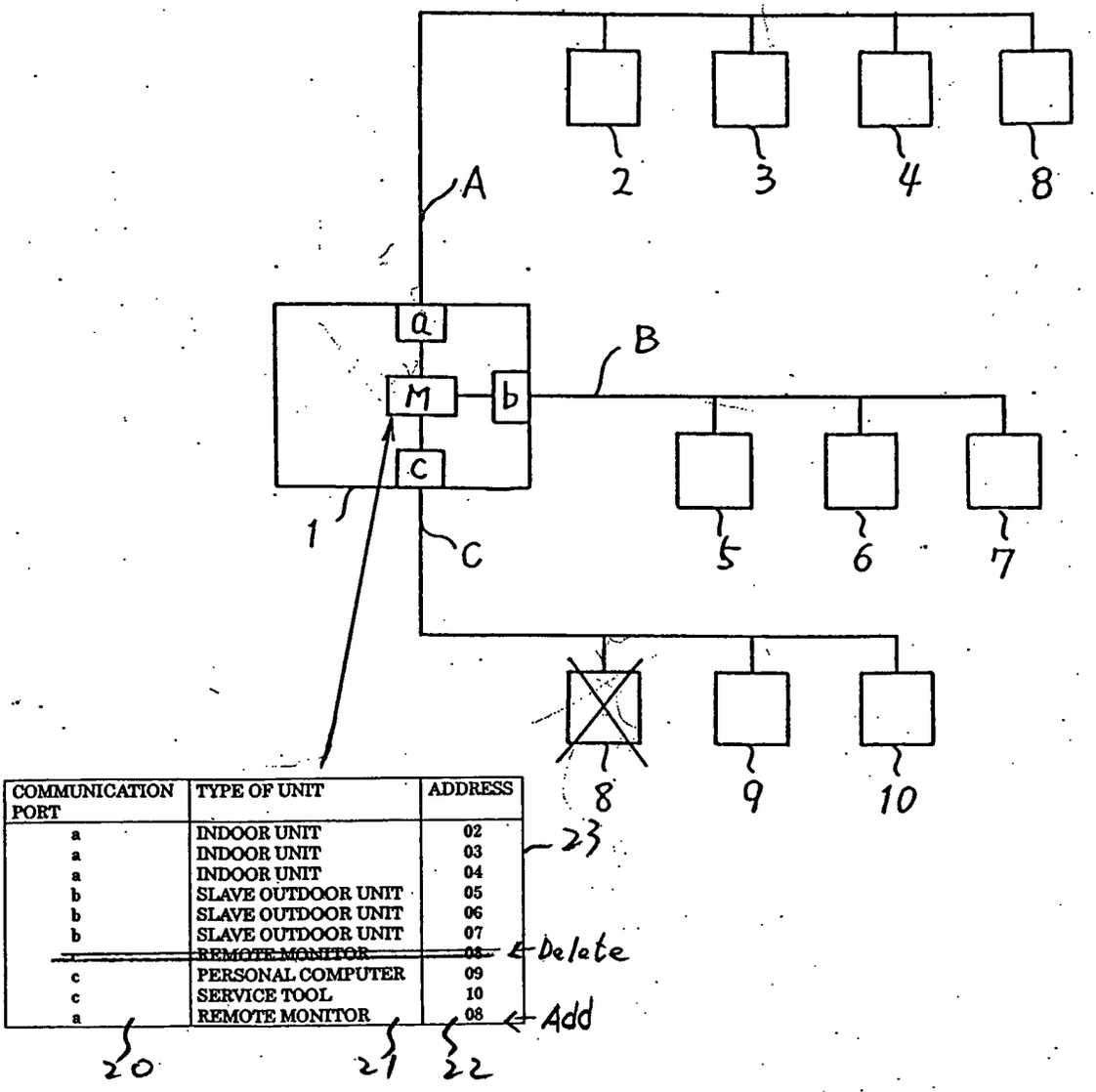
20 21 22

FIG. 5



COMMUNICATION PORT	TYPE OF UNIT	ADDRESS
a	INDOOR UNIT	02
a	INDOOR UNIT	03
a	INDOOR UNIT	04
b	SLAVE OUTDOOR UNIT	05
b	SLAVE OUTDOOR UNIT	06
b	SLAVE OUTDOOR UNIT	07
~~a~~	~~REMOTE MONITOR~~	~~08~~ ← Delete
c	PERSONAL COMPUTER	09
c	SERVICE TOOL	10
a	REMOTE MONITOR	08 ← Add

23

20 21 22