

Description

BACKGROUND OF THE INVENTION

This invention relates to a method and an apparatus for controlling terminals on a communication network, especially, the terminal control method featuring a unique address system used for transmission and reception of messages to and from terminals on the communication network.

Fig. 1 is a schematic diagram illustrating a communication network to which a transmission system of the invention is applied;

Fig. 2 illustrates a prior art address system for various devices;

Figs. 3A, 3B and 3C illustrate examples in which the prior art address system is applied to various devices shown in Fig. 1;

Fig. 4 shows allotment in a function address table based on the prior art address system;

Fig. 5 illustrates a format of a prior art control message on a home bus system control channel;

Fig. 6 illustrates an example of sequence for controlling the devices having the address formats shown in Fig. 3;

Figs. 7A and 7B illustrate examples of message format used in the sequence shown in Fig. 6;

Fig. 8 is a schematic diagram illustrating a prior art received message processor of TV;

Fig. 9 is a schematic diagram illustrating a prior art received message processor of telephone;

Fig. 10 is a schematic diagram illustrating a prior art received message processor of TV with telephone;

Fig. 11 is a schematic diagram illustrating a prior art controller; and

Figs. 12A and 12B illustrate examples of address management table for devices to be managed which are used in the prior art controller.

A prior art as shown in "Standardization of Home Bus System", pp. 137-139, June 1986, Electronic Industries Association of Japan, and in "Home Bus System", Masao Ikezaki and Hiromasa Nakatus, National Technical Report, Vol.32, No.6, Dec.1986, pp.712-721, will now be described by making reference to Figs. 1 to 12. As shown in Fig. 1, a plurality of terminals 11 to 14 are connected to a transmission line 10 to communicate mutually in a communication network, and each terminal comprises a single device or a composite device consisting of a plurality of devices. Conventionally, an address system necessary for transmission and reception of messages to and from the terminals is formatted, as shown in Fig. 2, to include a device address (DA) 21 assigned to individual terminals and function addresses (FA's) 22 respectively assigned to functions of each terminal. A value of the FA repre-

sents predetermined contents and a table as shown in Fig. 4 is built up. According to the table of Fig. 4, a FA for timer 41, for example, has specific values <FAxy>. Thus, the timer FA 41 has four values <FA00> to <FA03> and these values are effective to identify a plurality of timers possessed by a terminal comprising a composite device to be described later. According to this address system, the TV 11, telephone 12 and TV with telephone 13 have address formats as shown in Fig. 3. More particularly, the TV 11 has a TV 31 as a DA and a FA having specific values of a timer 32a (<EA00>), a monitor 32b (<EA30>) and a tuner 32C (<FA20>). The telephone 12 has a telephone 33 as a DA and a FA having specific values of a timer 34a (<FA00>), a display 34b (<FA40>) and a telephone set 34C (<FA50>).

The TV with telephone 13 standing for a composite device having integral VTR, telephone set and TV has a TV with telephone 35 as a DA and a FA having specific values of a timer for VTR or timer ① 36a (<FA00>), a deck for VTR 36b (<FA10>), a tuner for VTR or tuner ① 36c (<FA20>), a timer for TV or timer ② 36d (<FA01>), a monitor for TV 36e (<FA30>), a tuner for TV or tuner ② 36f (<FA21>), a timer for telephone or timer ③ 36g (<FA20>), a display for telephone 36h (<FA40>) and a telephone set for telephone 36i (<FA50>). There exist in the TV with telephone 13 three timers (timer ① 36a, timer ② 36d and timer ③ 36g) and two tuners (tuner ① 36c and tuner ② 36f) as viewed from outside but information concerning which device the FA is destined for is not added. Therefore, the controller 14 for controlling the terminals connected to the system has to be stored prec edently with data for the controllable terminals upon establishment of the system. Conventionally, the controller 14 is constructed as exemplified in Fig. 11. The controller 14 comprises a transmission/reception control processor 111 responsive to a request for control to perform transmission/reception control of a message in accordance with the communication scheme on the transmission line, a received message control processor 113 which performs analysis of a FA and the like of a received message to decide whether the received message is a message to be processed, a control input unit 115 for inputting a request for system control and the like, a display unit 116 for displaying outputs such as control results, a system control processing unit 114 adapted to control the controller 14 and manage and control the system, a connectable terminal address information holding unit 117 operable to control and manage the system, and a transmission message control processing unit 112 responsive to information from the system control processing unit 114 to control transmission of message.

As an example, consider a case where the controller 14 changes, pursuant to sequence as shown in

Fig. 6, setting of timer in order to effect time correction for TV in the system which is a home bus system using a control message as shown in Fig. 5 for controlling terminals. It will be appreciated from Figs. 1 and 3 that two terminals, TV 11 and TV with telephone 13, have a timer for TV. Upon start-up of the system, it is necessary for the connectable terminal address information holding unit 117 of controller 14 to hold in advance the following information:

(I) Information about the value of DA 31 of the TV 11 and the value (<FA00>) of the timer FA 32a.
 (II) Information about the value of DA 35 of the TV with telephone 13 and the value (<FA01>) of the timer ② FA 36d. In the controller 14, the connectable terminal address information holding unit 111 holds the above information as a table shown at (12-2) in Fig. 12. Referring to Fig. 5, the message on a home bus control channel as shown in Fig. 6 has a format including a priority code PR 51 for determining priority of communications on the transmission line, a field SA 52 indicative of an address of an originator, a field DA 53 indicative of an address of a destination, a field CC 54 of a message control code indicative of the kind of information in a DATA field 56 containing the contents of the message, a DATA field length code BC 55 indicative of the size of the DATA field 56, and a frame check code FCC 57 used to effect frame check of the message by utilizing two's complement of the sum of bits ranging from the SA 52 to the final byte of DATA 56. To detail the DATA field 56, it has a sub-bus originator address SA' 56b indicative of an originator address in the event that a message is issued from a terminal connected to a different transmission line, a destination address DA' 56c indicative of a destination address in the event that a message is destined for a terminal connected to a different transmission line, an originator function address SFA 56d indicative of an originator (FA) in the originator terminal, a destination function address DFA 56e indicative of a destination (FA) in the destination terminal, an operation code OPC 56f for designating a command for control, an operand code OPR 56g for designating details of the contents of the control command, a termination code TC 56h, and a header HD 56a having information for designating the presence or absence of the SFA 56d, DFA 56e, DA' 56c and SA' 56b and a table (service group, of the command designated by the OPC 56f.

In the controller 14, when a request for simultaneous change of timers for TV in the system is inputted from the control input unit 115, the system processing unit 114 decides the inputted request, builds up a transmission message A as shown at (7-1) in Fig. 7 destined for the TV 11 on the basis of a management table as shown at (12-2) in Fig. 12 stored in the

connectable terminal address information holding unit 117, and transfers the message A to the transmission message control processing unit 112. At that time, in the message A, a field DA 53 indicates a code 71 indicative of a DA of the TV 11 and a field DFA 56e indicates a code 72, <FA00>, indicative of a FA of the timer 32a. The transmission message control processing unit 112 then performs a transmission processing of the message A sent from the system control processing unit 114 and transmits the message to the TV 11 through the transmission/reception control processor 111, as indicated at 61 in Fig. 6.

In the TV 11 constructed as shown in Fig. 8, a transmission/reception control processor 81 receives the message A and a DFA decision processing unit 83 of a received message control processor 82 decides the field DFA. Since the DFA in this message A indicates the timer code 72 <FA00>, the DFA decision processing unit 83 actuates a timer <FA00> destined message control processing unit 85 to carry out a processing of change of timer. Subsequently, the controller 14 builds up a message B as shown at (7-2) in Fig. 7, as in the case of the message A, and transmits the message B to the TV with telephone 13, as indicated at 62 in Fig. 6. At that time, DA 53 of the message B indicates a code 73 indicative of a DA of the TV with telephone 13 and DFA 56e indicates a code 74, <FA01>, indicative of a FA of the TV timer 36d. In the TV with telephone 13 constructed as shown in Fig. 10, a transmission/reception control processor 101 receives the message B and a DFA decision processing unit 103 of a received message control processor 102 decides the DFA. Since the DFA in this message B indicates the timer ② code 74 <FA01>, the DFA decision processing unit 103 actuates a timer <FA01> destined message control processing unit 107 to carry out a processing of change of TV timer. In the prior art, the value of the message destined address DA 53 and the value of the code DFA 56e in the message A shown at (7-1) in Fig. 7 and the message B shown at (7-2) in Fig. 7 are different for terminals and therefore the TV 11 and TV with telephone 13 can not be controlled at a time. This leads to such potential danger that transmission/reception of a plurality of messages occur between the messages A and B and concurrence of the messages A and B is lost. Especially, this disadvantage is serious when a plurality of terminals are desired to be controlled simultaneously in order to effect, for example, time correction of timers. Further, in comparison with the received message control processor 82 of the TV 11 constructed as shown in Fig. 8 and a received message control processor 92 of the telephone 12 constructed as shown in Fig. 9 by comparing components 93 to 97 corresponding to components 83 to 87 of the TV 11, the received message control processor 102 of the TV with telephone 13 having additional function of VTR is differently con-

structed and has values of FA, different from those of the processing units of the TV 11 and telephone 12, in order to handle differently destined plural timers, i.e., timer ① 36a, timer ② 36d and timer ③ 36g shown in Fig. 3, so that alternation is required to permit the processor 102 to take the part of the processor 82 and 92.

As described above, the prior art has the following disadvantages:

(i) Even when functions which are the same for a plurality of terminals are desired to be controlled simultaneously, different address are sometimes assigned to the same function in the individual terminals and consequently simultaneous control of transmission of control messages can not be achieved using a multi-address message destined for the individual terminals. As a result, separate control data must be transmitted to each terminal, thus making the control processing in the communication system complicated and the number of devices to be controlled is increased to increase traffic.

(ii) In order to control a function of a terminal in the system, a control terminal (controller) has to hold precedently data of the internal construction of the controlled terminal. Accordingly, when a new terminal is connected to the system or an existing terminal is connected to the system or an existing terminal is removed, information registered in the controller must always be updated, in particular, information concerning the newly connected terminal must be registered and this degrades extensibility of the system.

(iii) When developing composite devices, the control processing units of devices constituting the existing terminal can not be utilized without alternation. This impairs versatility of the control processing unit of the terminal.

SUMMARY OF THE INVENTION

A first object of this invention is to provide a communication method and apparatus capable of facilitating control processings of a plurality of terminals.

A second object of this invention is to provide a communication apparatus and method of high extensibility which can readily deal with connection of a new terminal to the apparatus and removal of an existing terminal from the apparatus.

A third object of this invention is to facilitate designing of construction and development of composite devices.

According to the invention, to accomplish the above objects, an address system used for transmission/reception of messages between terminals connected on a communication network comprises a device address (DA) assigned to the individual terminals, a sub-device address (SDA) assigned to respec-

tive devices constituting each terminal, and a function address (FA) assigned to respective functions possessed by each device, and a command is provided which enables a communication means to collect the SDA and FA belonging to each DA, each terminal having ability to process the command.

Thus, the present invention features a unique address system used for transmission and reception of messages to and from terminals connected on the communication network to ensure that even when a terminal to be controlled comprises a composite device, only a desired function can be controlled readily and that extensibility of the system can be improved to facilitate control processings through communications in the system.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram illustrating a communication network to which a transmission system of the invention is applied;

Fig. 2 illustrates a prior art address system for various devices;

Figs. 3A and 3B illustrate examples in which the prior art address system is applied to various devices shown in Fig. 1;

Fig. 4 shows allotment in a function address table based on the prior art address system;

Fig. 5 illustrates a format of a prior art control message on a home bus system control channel;

Fig. 6 illustrates an example of sequence for controlling the devices having the address formats shown in Fig. 3;

Figs. 7A and 7B illustrate examples of message format used in the sequence shown in Fig. 6;

Fig. 8 is a schematic diagram illustrating a prior art received message processor of TV;

Fig. 9 is a schematic diagram illustrating a prior art received message processor of telephone;

Fig. 10 is a schematic diagram illustrating a prior art received message processor of TV with telephone;

Fig. 11 is a schematic diagram illustrating a prior art controller;

Figs. 12A and 12B illustrate examples of address management table for devices to be managed which are used in the prior art controller;

Fig. 13 is a diagram showing an address system for various terminals in accordance with the invention;

Figs. 14A, 14B and 14C illustrate examples in which the address system according to the invention is applied to various terminals or devices shown in Fig. 3;

Fig. 15 illustrates a format of a control message on a control channel which is used when the invention is applied to the home bus system;

Fig. 16 illustrates an example of sequence for

controlling the terminals having the address formats shown in Fig. 14;

Figs. 17A, 17B and 17C illustrate examples of message format according to the invention used in the sequence shown in Figs. 6 and 16;

Fig. 18 is a schematic diagram illustrating a received message control processor 182 of TV 11 in accordance with the invention;

Fig. 19 is a schematic diagram illustrating a received message control processor 192 of telephone 12 in accordance with the invention;

Fig. 20 is a schematic diagram illustrating a received message control processor 202 of TV with telephone 13 in accordance with the invention;

Fig. 21 is a schematic diagram illustrating a controller in accordance with the invention;

Fig. 22 illustrates an example of a command for control based on the address system of the invention;

Fig. 23 is a schematic diagram illustrating a system in accordance with the invention;

Figs. 24 and 25 are diagrams illustrating examples of DA information displayed on a display unit of the controller 14;

Figs. 26A and 26B illustrate examples of sequence for information collection in accordance with the invention which are adapted to perform display shown in Figs. 24 and 25;

Fig. 27 illustrates examples of command format in messages used for execution of the sequence shown in Fig. 26;

Fig. 28 is a diagram illustrating an example of FA information displayed on the display unit of the controller 14;

Fig. 29 illustrates an example of sequence for information collection in accordance with the invention which is adapted to perform display shown in Fig. 28;

Fig. 30 illustrates examples of command format in message used for execution of the sequence shown in Fig. 29; and

Fig. 31 is a flow chart useful to explain the operation for display of device status on the display unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will now be described by way of example with reference to the accompanying drawings, particularly, Figs. 13 to 30.

As shown in Fig. 23, a plurality of terminals 321, 322, 231, 323 and 324 are connectable to a transmission line 10 to communicate mutually in a communication network, and each terminal comprises a single device or a composite device consisting of a plurality of devices. Referring to Fig. 13, an address apparatus and method for the terminal is respectively formatted

in accordance with the invention to include a device address (hereinafter called DA) 131 assigned to the individual terminals and which is a physical address related to link establishment, a sub-device address (hereinafter called SDA) 132 assigned to respective devices constituting each terminal, and a function address (hereinafter called FA) 133 assigned to respective functions possessed by each device. Because the SDA 132 intends to definitely designate a component of the device and the FA 133 intends to definitely designate a function, the contents of each of the SDA and FA is definitely determined by a value and is related to the value through a table. According to the address method and apparatus of the present invention, addresses of the TV 321, telephone 322 and TV with telephone 323 are formatted as shown in Figs. 14A, 14B and 14C respectively. The TV 321 has a TV 141 as a DA, a TV 142 as a SDA and a FA having values of a timer 143a (<FA00>), a monitor 143b (<FA30>) and a tuner 143c (<FA20>). The telephone 322 has a telephone set 144 as a DA, a telephone set 145 as a SAD and a FA having values of a timer 146a (<FA00>), a display 146b (<FA40>) and a telephone set 146c (<FA50>). The TV with telephone 323 standing for a composite device having integral VTR, telephone set and TV has a TV with telephone 147 as a DA, and a SDA having a VTR 148a as SDA1, a TV 148b as SDA2 and a telephone 148c as SDA3. The TV with telephone 323 has a FA of the following values. More specifically, a FA of the VTR 148a has values of a timer 149a (<FA00>), a deck 149b (<FA10>) and a tuner 149c (<FA20>), a FA of the TV 148b has values of a timer 149d (<FA00>), a monitor 149e (<FA30>) and a tuner 149f (<FA20>), and a FA of the telephone 148c has values of a timer 149g (<FA00>), a display 149h (<FA40>) and a telephone set 149i (<FA50>). When the invention is applied to the home bus system, the message (instruction codes) has a format as shown in Fig. 15 wherein the conventional SFA 56d is changed to an originator subdevice address (hereinafter called SSDA) 152, the conventional DFA 56e is changed to a destination subdevice address (hereinafter called DSDA) 153, and a destination function (F) 154 is newly added.

The change of setting of timer carried out with the prior art as described previously will be done by the present invention as will be described below. In accordance with the invention, the controller 324 can complete the change of setting of timer for the TV of a terminal on the transmission line in accordance with sequence shown in Fig. 16, without resort to the connectable terminal address information holding unit 117 of the prior art controller. As is clear from Fig. 14, the TV 321 and TV with telephone 323 have different DA's but for the SDA and FA desired to be controlled, have the same value of TV <SDA2> and the same value of timer <FA00>. Therefore, the controller 324 builds up a message C as shown in Fig. 16 and trans-

mits the message C on the transmission line by using a simultaneous multi-address, as indicated at 161. In the TV 321 constructed as shown in Fig. 18, a transmission/reception control processor 181 receives the message C and a SDA decision processing unit 183 decides the SDA. Since the SDA in this message C indicates the TV <SDA2>, the SDA decision processing unit 183 actuates a TV <SDA2> destined message control processing unit 185. The <SDA2> destined message control processing unit 185 is also operable to decide the FA. Since the F 154 indicates the timer 173 <FA00>, the <SDA2> destined message control processing unit 185 actuates a timer <FA00> destined message control processing unit 186 to carry out a processing of change of timer. Similarly, in the TV with telephone 323 constructed as shown in Fig. 20, a transmission/reception control processor 201 receives the message C and a SDA decision processing unit 203 decides the SDA. Since the SDA in this message C indicates the TV <SDA2>, the SDA decision processing unit 203 actuates a <SDA2> destined message control processing unit 185. The <SDA2> destined message control processing unit 185 is also operable to decide the FA. Since the F 154 indicates the timer 173 <FA00>, the <SDA2> destined message control processing unit 185 actuates a timer <FA00> destined message control processing unit 186 to carry out a processing of change of timer. In this manner according to the invention, the same function of the TV 321 and TV with telephone 323 can be controlled simultaneously and especially when a plurality of terminals are desired to be controlled at a time to effect time correction for timer, the simultaneous control is very effective and complexity in control can be mitigated remarkably.

When comparing the TV 321 constructed as shown in Fig. 18 and telephone 322 constructed as shown in Fig. 19 with a received message control processor 202 of the TV with telephone 323 constructed as shown in Fig. 20 and having additional function of VTR, it is clear from Figs. 18 to 20 that the SDA destined message control processor (FA control processor) of the TV 321 and telephone 322 be transferred to the TV with telephone 323 without alternation. Thus, the contents of control for existing developed devices can advantageously be utilized without alternation in order to control the terminals of the invention.

The controller 324 according to the invention is constructed as shown in Fig. 21 wherein the connectable device address information holding unit 117 of the prior art controller shown in Fig. 11 can be eliminated. With the controller 324 having the construction shown in Fig. 21, however, when information about SDA's of connectable terminals is desired to be displayed on a display unit 216 in a manner as shown in Fig. 24, the controller 324 has to know the terminal information in some form. Accordingly, commands for

collecting information about SDA and FA are introduced as shown in Fig. 22. Then, a SDA undesignated message processing unit of each terminal has a SDA request command processor which, upon receipt of a message due to a SDA request command 221, returns a message due to a SDA response command 222, and the SDA destined message control processing unit of each terminal has a FA request command processor which, upon receipt of a message due to a FA request command 223, returns a message due to a FA response command 224. According to the invention, even when a telephone 231 is newly added to the Fig. 1 system to construct a method and an apparatus as shown in Fig. 23, the information can be collected and displayed in accordance with sequence as shown in Fig. 26 without requiring that as in the prior art, pieces of the information be registered in the connectable terminal address information holding unit 117 of the controller 324. More particularly, the controller 324 builds up a message D 271 due to the SDA request command 221 as shown in Fig. 27 and transmits the message D onto the transmission line by using a simultaneous multi-address, as indicated at 261 in Fig. 26. All the terminals on the transmission line build up messages E 272, F 273, G 274 and H 275 which are due to the SDA response command 222 and return these messages to the controller 324 in accordance with the communication scheme of the transmission line, as indicated at 262, 263, 264 and 265 in Fig. 26.

The controller 324 responds to the returned information to perform display of Fig. 24. For example, when the TV 321 and telephone 322 are disconnected from the transmission line as indicated at CASE 2 in Fig. 26, the command can be used effectively to cause the controller to respond to the latest information so as to perform display. In another example shown in Fig. 28, FA information possessed by, for example, the TV and telephone standing for the SDA is displayed using the command as will be described below. After completion of the information collection processing shown in Fig. 26, the controller 14 transmits a message I 301, as shown in Fig. 30, containing a FA request command 223 possessed by the SDA of TV by using a simultaneous multi-address, as indicated at 291 in Fig. 29. This causes the devices TV 321 and TV with telephone 323 each having the TV as the SDA to return messages due to a FA response command 224 as messages J 302 and K 303, respectively, as indicated at 292 and 293 in Fig. 29. Subsequently, the controller 324 transmits a message L 304 containing a FA request command 223 possessed by the SDA of telephone by using a simultaneous multi-address, as indicated at 294 in Fig. 29. This causes the terminals telephone 322, telephone 231 and TV with telephone 323 each having the telephone as the SDA to return messages due to a FA response command 224 as messages N 306, O 307 and

M 305, respectively, as indicated at 296, 297 and 295 in Fig. 29.

At that time, the system control processing unit 214 of the controller 324 according to the invention can cause a microcomputer to perform, for example, a processing as will be described below with reference to Fig. 31. When receiving control information from the control input unit 215 in step 311, the system control processing unit 214 of the controller 324 decides in step 312 whether the information is a request for displaying device status. If "NO", the procedure proceeds to step 313b where control based on designated contents is carried out. If "YES", the procedure proceeds as follows. Firstly, a message due to the SDA request command is set up in step 313a, this message is then transferred as a transmission request signal to the transmission message control processing unit 212 in step 314, a timer value for awaiting reception of a message due to the SDA response command is set in step 315, and the time is started in step 316. After start of the timer, the following processing is repeated until the set timer value expires. More particularly, the presence of a message from the received message control processing unit 212 is first decided in step 317. If the answer is "NO", the procedure proceeds to step 320 where the expiration of the set timer value is checked and if the answer is "YES", the procedure proceeds to step 318 where it is decided whether the message is due to the SDA response command. If the answer from step 318 is "NO", a processing pursuant to the contents of the received message is carried out in step 319b and if "YES", display information prepared in accordance with the contents of the SDA response command is transferred to the display unit 216 in step 319a and thereafter the expiration of the set timer value is checked in step 320. The above steps 317 to 319 are repeated until the set timer value expires and at the expiration of the set timer value, completion of display data is informed to the display unit in step 330 and the inputted control processing ends. Using the thus collected information, display of Fig. 28 can be effected.

As described above, according to the invention, the controller 324 can know a specific address system for terminals at a time point after installation of the terminals to facilitate control of individual functions of the terminals and to grasp the construction of the overall apparatus and method, thereby improving extensibility of the apparatus and method control and service.

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

Claims

1. A method for controlling a plurality of terminals (321, 322, 323, 324, 231) on a communication network which are connectable to a transmission line (10) to communicate mutually and each of which includes a single device or a composite device essentially consisting of a plurality of devices, wherein transmission and reception of messages to and from said plurality of terminals on said communication network is performed using an address code assigned to each terminal, said address code comprising a device address or DA (131) assigned to the individual terminals and a function address or FA (133) assigned to respective functions possessed by each device and having a single or a plurality of values of FA, characterized in that further a sub-device address or SDA (132) assigned to respective devices constituting each terminal and having a single or a plurality of values of SDA is used.
2. A terminal control method according to Claim 1, wherein a terminal uses a command system to know through communication the contents of said address code possessed by another terminal connectable to said transmission line said command system comprising a SDA request command (221) for collecting information about SDA's of the respective devices essentially constituting each terminal, a SDA response command (222) indicative of a response to said SDA request command, a FA request command (223) for collecting information about FA's of functions of a device for the SDA, and a FA response command (224) indicative of a response to said FA request command, each of said response commands having an operation code part indicative of the contents of the response to the request and an operand part containing information about the SDA or FA.
3. A communication apparatus having a plurality of terminals (321, 322, 323, 324, 231) on a communication network which are connectable to a transmission line (10) to communicate mutually and each of which includes a single device or a composite device essentially consisting of a plurality of devices, wherein each terminal is assigned with an address code used for transmission and reception of messages to and from said plurality of terminals on said communication network, said address code comprising a device address or DA (131) assigned to the individual terminals and a function address or FA (133) assigned to respective functions possessed by each device, and wherein each terminal comprises a transmission/reception control processor



M 305, respectively, as indicated at 296, 297 and 295 in Fig. 29.

At that time, the system control processing unit 214 of the controller 324 according to the invention can cause a microcomputer to perform, for example, a processing as will be described below with reference to Fig. 31. When receiving control information from the control input unit 215 in step 311, the system control processing unit 214 of the controller 324 decides in step 312 whether the information is a request for displaying device status. If "NO", the procedure proceeds to step 313b where control based on designated contents is carried out. If "YES", the procedure proceeds as follows. Firstly, a message due to the SDA request command is set up in step 313a, this message is then transferred as a transmission request signal to the transmission message control processing unit 212 in step 314, a timer value for awaiting reception of a message due to the SDA response command is set in step 315, and the time is started in step 316. After start of the timer, the following processing is repeated until the set timer value expires. More particularly, the presence of a message from the received message control processing unit 212 is first decided in step 317. If the answer is "NO", the procedure proceeds to step 320 where the expiration of the set timer value is checked and if the answer is "YES", the procedure proceeds to step 318 where it is decided whether the message is due to the SDA response command. If the answer from step 318 is "NO", a processing pursuant to the contents of the received message is carried out in step 319b and if "YES", display information prepared in accordance with the contents of the SDA response command is transferred to the display unit 216 in step 319a and thereafter the expiration of the set timer value is checked in step 320. The above steps 317 to 319 are repeated until the set timer value expires and at the expiration of the set timer value, completion of display data is informed to the display unit in step 330 and the inputted control processing ends. Using the thus collected information, display of Fig. 28 can be effected.

As described above, according to the invention, the controller 324 can know a specific address system for terminals at a time point after installation of the terminals to facilitate control of individual functions of the terminals and to grasp the construction of the overall apparatus and method, thereby improving extensibility of the apparatus and method control and service.

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

Claims

1. A method for controlling a plurality of terminals (321, 322, 323, 324, 231) on a communication network which are connectable to a transmission line (10) to communicate mutually and each of which includes a single device or a composite device essentially consisting of a plurality of devices, wherein transmission and reception of messages to and from said plurality of terminals on said communication network is performed using an address code assigned to each terminal, said address code comprising a device address or DA (131) assigned to the individual terminals and a function address or FA (133) assigned to respective functions possessed by each device and having a single or a plurality of values of FA, characterized in that further a sub-device address or SDA (132) assigned to respective devices constituting each terminal and having a single or a plurality of values of SDA is used.
2. A terminal control method according to Claim 1, wherein a terminal uses a command system to know through communication the contents of said address code possessed by another terminal connectable to said transmission line said command system comprising a SDA request command (221) for collecting information about SDA's of the respective devices essentially constituting each terminal, a SDA response command (222) indicative of a response to said SDA request command, a FA request command (223) for collecting information about FA's of functions of a device for the SDA, and a FA response command (224) indicative of a response to said FA request command, each of said response commands having an operation code part indicative of the contents of the response to the request and an operand part containing information about the SDA or FA.
3. A communication apparatus having a plurality of terminals (321, 322, 323, 324, 231) on a communication network which are connectable to a transmission line (10) to communicate mutually and each of which includes a single device or a composite device essentially consisting of a plurality of devices, wherein each terminal is assigned with an address code used for transmission and reception of messages to and from said plurality of terminals on said communication network, said address code comprising a device address or DA (131) assigned to the individual terminals and a function address or FA (133) assigned to respective functions possessed by each device, and wherein each terminal comprises a transmission/reception control processor



(181; 191; 201; 211) and a received message control processor (182; 192; 202), at least one FA decision processing unit (185; 195; 204) and at least one FA destined message control processing unit (186-188; 196-199; 205-207), said transmission/ reception control processor being operable to detect and compare a DA in a message on said transmission line with a DA of its own terminal and upon occurrence of coincidence of DA, transfer the received message to said received message control processor, said designated FA destined message control processing unit being operable to analyze the message received from said FA decision processing unit, characterized in that

said address code further comprises a sub-device address or SDA (132) assigned to respective devices constituting each terminal,

said received message control processor (182; 192; 202) includes a SDA decision processing unit (183; 193; 203) and

said SDA decision processing unit is operable to detect and compare a SDA in the message received from said transmission/reception control processor with its own SDA and transfer the message to said FA decision processing unit, said FA decision processing unit being operable to detect and compare a FA in the message received from said SDA decision processing unit with its own FA and transfer the message to a designated FA destined message control processing unit.

Patentansprüche

1. Verfahren zum Überwachen einer Anzahl Stationen (321, 322, 323, 324, 231) in einem Kommunikationsnetz, die an eine Übertragungsleitung (10) zur Kommunikation miteinander anschließbar sind und von denen jede ein einzelnes Gerät oder ein zusammengesetztes Gerät beinhaltet, das sich im wesentlichen aus einer Anzahl Geräte zusammensetzt, wobei das Senden und Empfangen von Nachrichten zu der bzw. von der Anzahl Stationen in dem Kommunikationsnetz unter Verwendung eines jeder Station zugeordneten Adreßcodes ausgeführt wird, der Adreßcode eine Geräteadresse oder DA (131), die den einzelnen Stationen zugeordnet ist, sowie eine Funktionsadresse oder FA (133) aufweist, die jedem Gerät jeweils eigenen Funktionen zugeordnet ist und einen einzigen oder mehrere Werte der FA hat, dadurch gekennzeichnet, daß ferner eine Untergeräteadresse oder SDA (132) verwendet wird, die den jeweiligen, jeweils die Station darstellenden Geräten zugeordnet ist und einen einzelnen oder mehrere Werte von SDA hat.

2. Stationsüberwachungsverfahren nach Anspruch 1, bei dem eine Station ein Befehlssystem verwendet, um durch Kommunikation die Inhalte des einer an die Übertragungsleitung anschließbaren anderen Station eigenen Adreßcodes zu kennen, wobei das Befehlssystem einen SDA-Anfragebefehl (221) zum Sammeln von Informationen über SDAs der jeweils im wesentlichen jede Station darstellenden Geräte, einen SDA-Antwortbefehl (222), der eine Antwort auf den SDA-Anfragebefehl darstellt, einen FA-Anfragebefehl (223) zum Sammeln von Informationen über FAs von Funktionen eines Gerätes für die SDA sowie einen FA-Antwortbefehl (224) aufweist, der eine Antwort auf den FA-Anfragebefehl darstellt, wobei die Antwortbefehle jeweils einen Betriebscodeteil, der die Inhalte der Antwort auf die Anfrage darstellt, sowie einen Operandenteil haben, der Informationen über die SDA oder FA beinhaltet.

3. Kommunikationsvorrichtung mit einer Anzahl Stationen (321, 322, 323, 324, 231) in einem Kommunikationsnetz, die an eine Übertragungsleitung (10) anschließbar sind, um miteinander zu kommunizieren, und von denen jede ein einzelnes Gerät oder ein zusammengesetztes Gerät beinhaltet, das sich im wesentlichen aus einer Anzahl Geräte zusammensetzt, wobei jeder Station ein Adreßcode zugeordnet ist, der für das Senden und das Empfangen von Nachrichten zu der bzw. von der Anzahl Stationen in dem Kommunikationsnetz verwendet wird, wobei der Adreßcode eine Geräteadresse oder DA (131), die den einzelnen Stationen zugeordnet ist, sowie eine Funktionsadresse oder FA (133) aufweist, die jedem Gerät jeweils eigenen Funktionen zugeordnet ist, und wobei jede Station einen Senden/Empfangs-Überwachungsprozessor (181; 191; 212; 211) und einen Empfangsnachrichtüberwachungsprozessor (182; 192; 202), mindestens eine FA-Entscheidungsverarbeitungseinheit (185; 195; 204) sowie mindestens eine FA-Bestimmungsnachrichtenüberwachungsverarbeitungseinheit (186 - 188; 196 - 199; 205 - 207) aufweist, wobei der Senden/Empfangs-Überwachungsprozessor betrieben werden kann, um eine DA in einer Nachricht auf der Übertragungsleitung zu erfassen und mit einer DA seiner eigenen Station zu vergleichen und die empfangene Nachricht bei Auftreten von DA-Übereinstimmung an den Empfangsnachrichtenüberwachungsprozessor zu geben, wobei die designierte FA-Bestimmungsnachrichtenüberwachungsverarbeitungseinheit betrieben werden kann, um die von der FA-Entscheidungsverarbeitungseinheit empfangene Nachricht zu analysieren, dadurch gekennzeichnet, daß

der Adreßcode ferner eine Untergeräteadresse oder SDA (132) aufweist, die den jewei-



liger, jeweils die Station darstellenden Geräten zugeordnet ist,

der Empfangsnachrichtenüberwachungsprozessor (182; 192; 202) eine SDA-Entscheidungsverarbeitungseinheit (183; 193; 203) beinhaltet und

die SDA-Entscheidungsverarbeitungseinheit betrieben werden kann, um eine SDA in der von dem Sende/Empfangs-Überwachungsprozessor empfangenen Nachricht zu erfassen und mit ihrer eigenen SDA zu vergleichen und die Nachricht an die FA-Entscheidungsverarbeitungseinheit zu geben, wobei die FA-Entscheidungsverarbeitungseinheit betrieben werden kann, um eine FA in der von der SDA-Entscheidungsverarbeitungseinheit empfangenen Nachricht zu erfassen und mit ihrer eigenen FA zu vergleichen und die Nachricht an eine designierte FA-Bestimmungsnachrichtenüberwachungsverarbeitungseinheit zu geben.

Revendications

1. Procédé pour commander, sur un réseau de transmission, plusieurs terminaux (321, 322, 323, 324, 231) qui peuvent être raccordés à une ligne de transmission (10) pour communiquer entre eux et dont chacun comprend un appareil unique ou un appareil composite essentiellement constitué de plusieurs appareils, procédé selon lequel la transmission et la réception de messages en direction et en provenance des différents terminaux sur ledit réseau de transmission sont effectuées à l'aide d'un code d'adresse affecté à chaque terminal, ledit code d'adresse comprenant une adresse d'appareil ou DA (131) affectée aux terminaux individuels et une adresse de fonction ou FA (133) affectée aux fonctions respectives que possède chacun des appareils et comportant une seule valeur ou plusieurs valeurs de FA, caractérisé en ce que l'on utilise en outre une adresse d'appareil secondaire ou SDA (132) affectée aux appareils respectifs constituant chacun des terminaux et comportant une seule valeur ou plusieurs valeurs de SDA.
2. Procédé de commande de terminaux selon la revendication 1, dans lequel un terminal utilise un système d'instructions pour connaître, par communication, le contenu dudit code d'adresse que possède un autre terminal qui peut être raccordé à ladite ligne de transmission, ledit système d'instructions comprenant une instruction de demande SDA (221) pour recueillir des informations relatives aux SDA des appareils respectifs dont est essentiellement constitué chaque terminal, une instruction de réponse SDA (222) indica-

trice d'une réponse à ladite instruction de demande SDA, une instruction de demande FA (223) pour recueillir des informations relatives aux FA des fonctions d'un appareil correspondant à la SDA, et une instruction de réponse FA (224) indicatrice d'une réponse à ladite instruction de demande FA, chacune desdites instructions de réponse comportant une partie code d'opération, indicatrice du contenu de la réponse à la demande, et une partie opérande contenant les informations relatives à la SDA ou à la FA.

3. Dispositif de communication comportant plusieurs terminaux (321, 322, 323, 324, 231), sur un réseau de transmission, qui peuvent être raccordés à une ligne de transmission (10) pour communiquer entre eux et dont chacun comprend un appareil unique ou un appareil composite constitué essentiellement de plusieurs appareils, dans lequel chaque terminal est doté d'un code d'adresse utilisé pour l'émission et la réception de messages en direction et en provenance des différents terminaux sur ledit réseau de transmission, ledit code d'adresse comprenant une adresse d'appareil ou DA (131) affectée aux terminaux individuels et une adresse de fonction ou FA (133) affectée à des fonctions respectives que possède chaque appareil, et dans lequel chaque terminal comprend un processeur pilote d'émission/réception (181; 191; 201; 211) et un processeur de gestion des messages reçus (182; 192; 202), au moins une unité de traitement (185; 195; 204) pour la détermination des FA et au moins une unité de traitement (186 à 188; 196 à 199; 205 à 207) pour la gestion des messages destinés aux FA, ledit processeur pilote d'émission/réception pouvant agir pour détecter une DA dans un message présent sur ladite ligne de transmission et la comparer à une DA de son propre terminal et, en cas d'apparition d'une coïncidence entre les DA, transférer le message reçu audit processeur de gestion des messages reçus, ladite unité désignée de traitement pour la gestion des messages destinés aux FA pouvant agir pour analyser le message reçu de ladite unité de traitement pour la détermination des FA, caractérisé en ce que

ledit code d'adresse comprend en outre une adresse d'appareil secondaire ou SDA (132), affectée à des appareils respectifs constituant chacun des terminaux;

ledit processeur de gestion des messages reçus (182; 192; 202) comprend une unité de traitement (183; 193; 203) pour la détermination des SDA, et

ladite unité de traitement pour la détermination des SDA peut agir pour détecter une SDA dans le message reçu dudit processeur pilote



d'émission/réception et la comparer à sa propre SDA et transférer le message à ladite unité de traitement pour la détermination des FA, ladite unité de traitement pour la détermination des FA pouvant agir pour détecter une FA dans le message reçu de ladite unité de traitement pour la détermination des SDA et la comparer à sa propre FA et transférer le message à une unité désignée de traitement pour la gestion des messages destinés aux FA.

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