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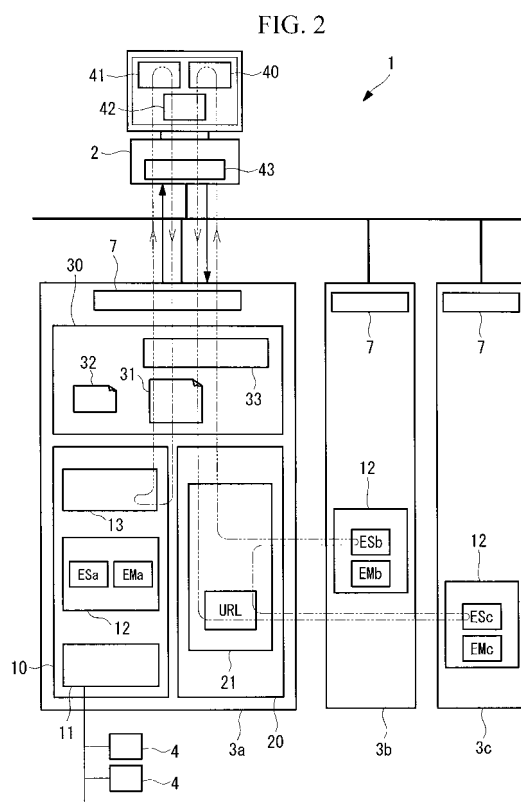
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(54) **LINK SERVER WEB-BASED AIR-CONDITIONING MONITORING SYSTEM**

(57) The load upon a client terminal is decreased, the client terminal is notified of an event in an air-conditioning machine taking place in an air-conditioning monitoring device not being monitored, and it is monitored via a web browser. Provided is an air-conditioning monitoring system (1) including a client terminal (2) having a browser; and an air-conditioning monitoring device (3a) subordinating a plurality of air-conditioning machines (4) to monitor operating states of the air-conditioning machines (4). Each air-conditioning monitoring device (3a) includes an event information collecting section (12) that collects event information of the air-conditioning machines (4) under control; an event detecting section (21) that acquires event information from the event information collecting sections (12) of the air-conditioning monitoring devices not being monitored (3b, 3c); and a first communication section (7) that sends the event information of the event detecting section (21) to the client terminal (2). The client terminal (2) displays the event information on the browser.



Description

{Technical Field}

[0001] The present invention relates to link server web-based air-conditioning monitoring systems.

{Background Art}

[0002] Air-conditioning monitoring systems for centrally monitoring the operation of air-conditioning machines installed, for example, in buildings are conventionally known. In such an air-conditioning monitoring system, the operation and the control of the air-conditioning machines provided in a building are performed by air-conditioning monitoring devices connected to the air-conditioning machines via networks.

Patent Document 1 discloses technologies for a monitoring system in which a computer on the monitoring side is connected to a data server on the monitored side via a general-purpose network, such as the Internet.

{Citation List}

{Patent Literature}

[0003]

Japanese Unexamined Patent Application, Publication No. Hei 10-254732

{Summary of Invention}

{Technical Problem}

[0004] In the air-conditioning monitoring system, pull-based communication is carried out in such a manner that a client terminal sends a query about monitored items of the air-conditioning machines being monitored at predetermined time intervals to the air-conditioning monitoring devices to acquire data on the ever-changing operating states of those air-conditioning machines. However, there has been a problem in that when the air-conditioning monitoring devices were provided in a distributed manner and pull-based communication was sent from the client terminal to each of the air-conditioning monitoring devices at predetermined time intervals, the client terminal was subjected to a processing load or it took a long time for the client terminal to receive a response to the query from each of the air-conditioning monitoring devices.

[0005] In addition, when the client terminal was acquiring the screens of the air-conditioning monitoring devices being monitored, it was not possible to notify the client terminal of changes in the states of the air-conditioning machines under control with another air-conditioning

monitoring device not being monitored.

Furthermore, there has been a demand that monitoring be possible on the client terminal without using, for example, an application dedicated for the air-conditioning monitoring system because the air-conditioning monitoring system is required to be free of maintenance once introduced.

[0006] The present invention has been conceived to solve the above-described problems, and an object thereof is to provide an air-conditioning monitoring system that is capable of reducing the load on the client terminal, notifying the client terminal of an event in an air-conditioning machine occurring in an air-conditioning monitoring device not being monitored, and allowing monitoring to be performed with a web browser.

{Solution to Problem}

[0007] To solve the above-described problems, the present invention employs the following solutions.

[0008] A first aspect according to the present invention is an air-conditioning monitoring system including a client terminal having a web browser; and an air-conditioning monitoring device subordinating a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines, wherein a plurality of the air-conditioning monitoring devices are connected via a network, the air-conditioning monitoring devices and the client terminal are connected via the network, and the air-conditioning monitoring devices provide the client terminal with information on the operating states, wherein each of the air-conditioning monitoring devices includes event information collecting means for collecting event information of the air-conditioning machines under control; event detecting means for, if being monitored from the client terminal, detecting and acquiring the event information from the event information collecting means of the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; and first communication means for, if being monitored from the client terminal, sending the event information detected by the event detecting means to the client terminal, wherein the client terminal displays the event information acquired from the first communication means via the browser.

[0009] According to such a structure, the air-conditioning monitoring device monitors operating states of the air-conditioning machines installed in the building and provides information on the operating states to the client terminal connected via the network. In each of the air-conditioning monitoring devices, events in the air-conditioning machines under control are detected by the event information collecting means to collect event information. The event detecting means of an air-conditioning apparatus being monitored by the client terminal collects event information from the event information collecting means of other air-conditioning apparatuses not being monitored connected via the network. Furthermore, the col-

lected event information is sent to the client terminal. The event information acquired by the client terminal is displayed via the web browser of the client terminal.

[0010] In this manner, the event detecting means of the air-conditioning monitoring device being monitored collects event information (e.g., a failure, abnormal non-operation, and recovery from abnormal non-operation of air-conditioning machines) about the air-conditioning machines under control with the other air-conditioning monitoring devices not being monitored and send the collected event information to the client terminal. By doing so, in the client terminal, even when an event takes place in the air-conditioning machines under control with the air-conditioning monitoring devices except the air-conditioning monitoring device being monitored, event information of the entire air-conditioning monitoring system can be reliably detected via the event detecting means of the air-conditioning monitoring device being monitored.

[0011] Furthermore, because the client terminal also receives information from the air-conditioning monitoring devices not being monitored, it can be made to look like information is pushed in the client terminal from the other air-conditioning monitoring devices not being monitored. In addition, because the information reported to the client terminal from the air-conditioning monitoring devices not being monitored is event information, the amount of information can be made smaller than when information about operation/non-operation or information about an operating state, such as cooling and heating, of the air-conditioning machines is reported. As a result, not only can the load upon the transmission media through which these data are sent/received be reduced, but the data processing load in the client terminal can be reduced.

[0012] Furthermore, such event information can be displayed on the client terminal via the web browser. As a result, because no software etc. dedicated for the air-conditioning monitoring system is required and the air-conditioning monitoring devices can be monitored using freeware such as Internet Explorer (registered trademark), events in the air-conditioning machines under control with the air-conditioning monitoring system can be found easily.

[0013] The client terminal of the air-conditioning monitoring system may notify the web browser upon receiving a response result to an acquisition request for the event information sent to the air-conditioning monitoring device, even though display of the web browser is not updated.

[0014] As a result, a response result to an acquisition request for event information can be displayed, regardless of whether display update operation of the web browser of the user who uses the client terminal is performed or not.

[0015] The air-conditioning monitoring system may include operating-state-information collecting means for collecting operating state information, which is information on operating states, of the air-conditioning machines

under control, wherein the operating state information may be sent to the client terminal via the first communication means in a case of being monitored from the client terminal.

[0016] Independently of the event detecting means, the operating state information of the air-conditioning machines under control is collected by the operating-state-information collecting means and sent to the client terminal. As a result, even in a case where there is an abnormality, for example, in the network via which the air-conditioning monitoring devices are connected to one another to cause a delay in obtaining event information by the air-conditioning monitoring device being monitored from the other air-conditioning monitoring devices, the operating-state-information collecting means can collect operating state information and send it to the client terminal, despite such a delay.

Furthermore, because operating state information and event information are sent to the client terminal in a separated manner, the times required to collect individual pieces of information or the timings to send them to the client terminal do not depend on each other, allowing independent performance.

[0017] Processing in which the operating-state-information collecting means of the air-conditioning monitoring system collects the operating state information and sends the operating state information to the client terminal may be separated from processing in which the event detecting means collects the event information and sends the event information to the client terminal.

[0018] Because the processing from collection of the operating state information by the operating-state-information collecting means to sending it to the client terminal is independent of the processing from collection of event information by the event detecting means to sending it to the client terminal, the processing time of the operating-state-information collecting means and the processing time of the event detecting means do not affect each other. For example, even if there is a delay etc. in the network between the air-conditioning monitoring device being monitored and another air-conditioning monitoring device to cause the event detecting means to take a long time in processing, the processing time by the operating-state-information collecting means is not affected. As a result, even in a case where event information cannot be acquired in the client terminal, operating state information can be displayed first, as long as the operating state information has been acquired.

[0019] The client terminal of the air-conditioning monitoring system may notify the display unit of a change in the event information upon acquiring the event information via the first communication means.

[0020] A change in the air-conditioning machines can be checked visually by displaying event information on the screen of the client terminal. Furthermore, methods of delivering notifications on the screen include, for example, changing the color of the tab indicating the air-conditioning apparatus including the air-conditioning ma-

chine in which an event has taken place, reporting that an event has taken place with a beep sound, and so forth.

[0021] A second aspect according to the present invention is an air-conditioning monitoring device that is communicatably connected to a client terminal having a web browser and subordinates a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines such that the air-conditioning monitoring device is connected to the other air-conditioning monitoring devices via a network, including event information collecting means for collecting event information of the air-conditioning machines under control; event detecting means for, if being monitored from the client terminal, detecting and acquiring the event information from the event information collecting means of the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; and first communication means for, if being monitored from the client terminal, sending the event information detected by the event detecting means to the client terminal.

[0022] A third aspect according to the present invention is a client terminal that is used in an air-conditioning monitoring system including an air-conditioning monitoring device subordinating a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines and that is communicatably connected to a plurality of the air-conditioning monitoring devices. The client terminal includes a web browser; event information acquiring means for acquiring event state information of the air-conditioning machines under control with the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; and second communication means for sending a request to acquire the event state information from the air-conditioning monitoring device, wherein the event information is displayed via the web browser.

[0023] A fourth aspect according to the present invention provides a control method applied to an air-conditioning monitoring system including a client terminal having a web browser; and an air-conditioning monitoring device subordinating a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines, wherein a plurality of the air-conditioning monitoring devices are connected via a network, the air-conditioning monitoring devices and the client terminal are connected via the network, and the air-conditioning monitoring devices provide the client terminal with information on the operating states. The control method includes collecting event information of the air-conditioning machines under control with each of the air-conditioning monitoring devices; causing the air-conditioning monitoring device being monitored by the client terminal to detect and acquire the event information of the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; causing the air-conditioning monitoring de-

vice being monitored by the client terminal to send the acquired event information to the client terminal; and causing the client terminal to display the event information via the web browser.

{Advantageous Effects of Invention}

[0024] According to the present invention, the advantages of reducing the load upon the client terminal, notifying the client terminal of an event in air-conditioning machines that has occurred in air-conditioning monitoring devices not being monitored, and monitoring via the web browser can be afforded.

{Brief Description of Drawings}

[0025]

{Fig. 1}

Fig. 1 is an overall schematic diagram of an air-conditioning monitoring system according to an embodiment of the present invention.

{Fig. 2}

Fig. 2 is a block diagram depicting, in outline, the configuration of an air-conditioning monitoring system according to an embodiment of the present invention.

{Fig. 3}

Fig. 3 is an example of a screen of a web browser in a client terminal.

{Fig. 4}

Fig. 4 is an example of a screen of a web browser as shown when event information is received in a client terminal.

{Fig. 5}

Fig. 5 is an example of a screen of a web browser as shown when an air-conditioning monitoring device being monitored is switched.

{Fig. 6}

Fig. 6 is an example of a screen for reporting an abnormality in an air-conditioning machine.

{Fig. 7}

Fig. 7 is one example of a program for describing processing in a client terminal.

{Fig. 8}

Fig. 8 is one example of a program for describing processing in an air-conditioning monitoring device.

{Description of Embodiments}

[0026] One embodiment of an air-conditioning monitoring system according to the present invention, as well as a method and a program for controlling the same, will now be described with reference to the drawings.

[0027] Fig. 1 is a diagram depicting the overall structure of an air-conditioning monitoring system (a so-called link server web-based air-conditioning monitoring system) 1 according to an embodiment of the present inven-

tion.

As shown in Fig. 1, the air-conditioning monitoring system 1 includes, as major components, a client terminal 2 in which a web browser is installed; and air-conditioning monitoring devices 3a, 3b, and 3c that monitor the operating states of air-conditioning machines (hereinafter, referred to as "air conditioners") 4 at predetermined time intervals and report the operating states of the air conditioners 4 in response to a request by the client terminal 2. Although this embodiment is described assuming that three air-conditioning monitoring devices are provided, the number of air-conditioning monitoring devices is not limited to three. The number of air-conditioning monitoring devices should be two or more, and the maximum number of them is not limited particularly.

[0028] The client terminal 2 is connected to the air-conditioning monitoring devices 3a, 3b, and 3c via a building management communication network 5. The building management communication network 5 is a network using a standardized communication protocol (e.g., TCP/IP), such as the Internet. Furthermore, the air-conditioning monitoring devices 3a, 3b, and 3c are connected to the air conditioners 4 via an air-conditioning control network 6. The air-conditioning control network 6 is a network using a communication protocol standardized for controlling and monitoring the air conditioners 4.

Each of the air-conditioning monitoring devices 3a, 3b, and 3c includes a plurality of air conditioners 4 under control, and the air conditioners 4 corresponding to each of the air-conditioning monitoring devices 3a, 3b, and 3c are connected via the air-conditioning control network 6.

[0029] More specifically, the client terminal 2 and each of the air-conditioning monitoring devices 3a, 3b, and 3c are communicably connected via the network, and the air-conditioning monitoring devices 3a, 3b, and 3c are communicably connected to one another via the network.

[0030] Fig. 2 is a block diagram depicting, in outline, the configuration of the air-conditioning monitoring system 1 according to this embodiment.

Although the air-conditioning monitoring devices 3a, 3b, and 3c have the same function, this embodiment is described by way of an example where the air-conditioning monitoring device 3a is selected by the client terminal 2 as an air-conditioning monitoring device to be monitored.

[0031] As shown in Fig. 2, the air-conditioning monitoring device 3a being monitored by the client terminal 2 includes, as major components, a first monitoring section 10 that collects operating states and events in the air conditioners 4 under control at predetermined time intervals; a second monitoring section 20 that collects events in the air conditioners 4 under control with the other air-conditioning monitoring devices 3b and 3c at predetermined time intervals; and a web server 30 that notifies the client terminal 2 of information collected by the first monitoring section 10 and the second monitoring section 20.

[0032] The first monitoring section 10 includes an air-

conditioning communication section 11 that communicates with the air conditioners 4 at predetermined time intervals; an event information collecting section (event information collecting means) 12 that collects event information of each of the air conditioners 4 from operating state information acquired via the air-conditioning communication section 11; and an operating-state-information collecting section (operating-state-information collecting means) 13 that collects operating state information acquired via the air-conditioning communication section 11. Here, the term "operating state information" refers to various types of information associated with the operating state: e.g., operation/non-operation information indicating operation or non-operation; operating mode information indicating cooling, heating, drying, etc.; and temperature information indicating the set temperature.

[0033] The event information collecting section 12 includes an event detecting module EMa and an event state file ESa.

The event detecting module EMa (here, the event detecting module of the air-conditioning monitoring device 3x (x=a, b, c) is referred to as EMx) detects the presence of events in the air conditioners 4 under control based on the acquired operating state information and, if an event is detected, writes event information into the event state file ESa (here, the event state file of the air-conditioning monitoring device 3x (x=a, b, c) is referred to as ESx). Here, the term "event" refers to, for example, a failure, abnormal non-operation, and recovery from abnormal non-operation of an air conditioner 4.

[0034] The event state file ESa, for example, is an HTML file. For the event state file ESa, its URL (Uniform Resource Locator) is determined based on its own HTML file name and the address (e.g. IP address, domain information) of the air-conditioning monitoring device 3a. By doing so, the event information of the event state file ESx can be read out as a result of the HTTP GET request being sent from an event detecting section 21, which will be described below.

[0035] The operating-state-information collecting section 13 collects operating state information and outputs it to the web server 30.

[0036] The second monitoring section 20 includes the event detecting section (event detecting means) 21.

When its own air-conditioning monitoring device 3a is monitored by the client terminal 2, the event detecting section 21 detects and acquires event information from the event information collecting sections 12 of the air-conditioning monitoring devices 3b and 3c, which are the air-conditioning monitoring devices not being monitored.

[0037] More specifically, in a case where each of the air-conditioning monitoring devices is installed, for example, in a building, the URLs of the other air-conditioning monitoring devices connected via a network are set at each of the air-conditioning monitoring devices, so that the event detecting section 21 of each of the air-conditioning monitoring devices has these set URLs of the

other air-conditioning monitoring devices. The event detecting section 21 refers to the event state files ESb and ESd possessed by the other air-conditioning monitoring devices 3b and 3c in accordance with the URLs of the event state files ESb and ESd of the other air-conditioning monitoring devices 3b and 3c and acquires event information based on the responses returned from the event state files ESb and ESd.

[0038] Upon receiving from the client terminal 2 requests to acquire the operating state information of the air-conditioning monitoring device 3a being monitored and event information of the other air-conditioning monitoring devices 3b and 3c not being monitored, the web server 30 offers information and screens corresponding to these requests to the client terminal 2.

More specifically, the web server 30 includes a first screen file 31, a second screen file 32, and an application 33.

[0039] The first screen file 31 is a file constituting a screen for displaying the operating states of the air conditioners 4 under control on the screen of a web browser 42. The first screen file 31 is a file (e.g., HTML file) for displaying the operating state information of each of the air conditioners 4 (refer to PD1 in Fig. 3).

[0040] The second screen file 32 is a screen that differs from the screen offered by the first screen file 31 and is, for example, a file constituting a screen for displaying a menu showing each of the air-conditioning monitoring devices (refer to M1 in Fig. 3). More specifically, the second screen file 32 is a file (e.g., HTML file) that offers a screen for displaying the names of the other air-conditioning monitoring devices in the form of tabs on the web browser.

[0041] The application 33 stores a plurality of files. More specifically, the application 33 stores a script file (e.g., PHP file) for executing processing in accordance with a request from the client terminal 2.

[0042] If being monitored by the client terminal 2, a first communication section 7 carries out communication processing with the client terminal 2 and, when receiving an acquisition request from the client terminal 2, sends event information and operating state information. The first communication section 7 also carries out transmission and reception of event information between the event detecting section 21 and the event information collecting section 12 in each of the air-conditioning monitoring devices 3a, 3b, and 3c.

[0043] The client terminal 2 requests the acquisition of operating state information and event state information from the air-conditioning monitoring device 3a to be monitored and also uses the web browser 42 to display the operating state information and the event state information received from the air-conditioning monitoring device 3a on, for example, a display. For this purpose, the client terminal 2 includes a CPU (Central Processing Unit), a ROM (Read Only Memory), a RAM (Random Access Memory), an input device, and a display unit such as a monitor, not shown in the figure.

[0044] More specifically, the client terminal 2 includes an event information acquiring section (event information acquiring means) 40, an operating-state-information acquiring section 41, the web browser 42, and a second communication section (second communication means) 43.

[0045] The second communication section 43 is communicably connected to the first communication section 7 of each of the air-conditioning monitoring devices 3a, 3b, and 3c via the building management communication network 5.

[0046] The event information acquiring section 40 acquires the event information of the air conditioners 4 under control with the air-conditioning monitoring devices 3b and 3c not being monitored and displays the acquired event information on the display unit of the client terminal 2. More specifically, the event information acquiring section 40 displays the screen constructed by the second screen file 32 sent from the air-conditioning monitoring device 3a being monitored on the display unit and also outputs the event information acquired via the first communication section 7 to the display unit.

[0047] The operating-state-information acquiring section 41 acquires, from the air-conditioning monitoring device 3a being monitored, the operating state information of the air conditioners 4 under control with the air-conditioning monitoring device 3a. More specifically, the operating-state-information acquiring section 41 displays the screen constructed by the first screen file 31 sent from the air-conditioning monitoring device 3a being monitored on the display unit and also outputs the operating state information acquired via the first communication section 7 to the display unit.

[0048] The operation of the air-conditioning monitoring system 1 with the above-described structure will now be described. The current description assumes that the client terminal 2 monitors the air-conditioning monitoring device 3a as an air-conditioning monitoring device being monitored.

[0049] When a user is to monitor the operating state of the air conditioners 4 under control with the air-conditioning monitoring device 3a using the client terminal 2, he or she enters the URL of the air-conditioning monitoring device 3a in the web browser 42 installed in the client terminal 2. When the URL of the air-conditioning monitoring device 3a is input in the web browser 42, a file acquisition request for the first screen file 31 and the second screen file 32 is sent from the client terminal 2 to the air-conditioning monitoring device 3a. The web server 30, which has received the file acquisition request, acquires the operating state information from the operating-state-information collecting section 13 and sends the acquired operating state information and the first screen file 31 to the client terminal 2. The web server 30 also sends the second screen file 32 to the client terminal 2.

[0050] The web browser 42 of the client terminal 2, which has received the operating state information, the first screen file 31, and the second screen file 32, displays

a screen for displaying the operating state information of the air-conditioning monitoring device 3a, as shown in Fig. 3. Here, PD1 is an area displayed by the first screen file 31, and M1 is an area displayed by the second screen file 32.

[0051] When the information of the first screen file 31 and the second screen file 32 is displayed on the client terminal 2, screen updating takes place at respective predetermined time intervals. As a result of screen updating, an acquisition request for operating state information and an acquisition request for event information of the other air-conditioning monitoring devices 3b and 3c are sent from the client terminal 2 to the air-conditioning monitoring device 3a being monitored.

[0052] In the air-conditioning monitoring device 3a being monitored, upon receiving the acquisition request for operating state information from the client terminal 2, the web server 30 acquires operating state information from the operating-state-information collecting section 13 and outputs it to the client terminal 2.

[0053] Furthermore, in the air-conditioning monitoring device 3a being monitored, upon receiving an acquisition request for event information from the client terminal 2, the web server 30 sends an acquisition request for event information from the event detecting section 21 of the air-conditioning monitoring device 3a being monitored to the event information collecting sections 12 of the other air-conditioning monitoring devices 3b and 3c. Subsequently, when an event takes place, for example, in the air conditioners 4 under control with the other air-conditioning monitoring device 3b not being monitored, event information including the fact that an event has occurred in the air conditioners 4 under control with the air-conditioning monitoring device 3b is sent from the event information collecting section 12 of the air-conditioning monitoring device 3b, which has received the acquisition request for event information.

[0054] When a response to the acquisition request for event information has been received successfully in the event detecting section 21, information about the response is sent to the client terminal 2. When a response stating that an event has taken place in the air conditioners 4 under control with the air-conditioning monitoring device 3b has been received in the client terminal 2, event information is displayed on the display unit. The tab, indicating the air-conditioning monitoring device 3b, of the second screen file 32 is displayed in a color different from the color during a normal time (e.g., gray to yellow), as shown, for example, in Fig. 4.

[0055] Furthermore, notification may be realized, for example, by providing an alarm buzzer ("Buzzer STOP" in Fig. 4) button on the screen indicating the operating state information of, for example, the air-conditioning monitoring device 3a currently being monitored and displaying it in a color indicating an alert (e.g., red), or by emitting sound on the client terminal 2. In this manner, when event information is detected, the display unit on the client terminal 2 is notified of it by a predetermined

script.

[0056] Furthermore, the screen is shifted by clicking the tab, indicating "the air-conditioning monitoring device 3b," of the second screen file 32 (area M1) (refer to Fig. 5). By doing so, the air-conditioning monitoring device being monitored is switched to the air-conditioning monitoring device 3b informed of the event information.

Also, the air-conditioning monitoring device 3a that was being monitored previously becomes an air-conditioning monitoring device not being monitored after such tab switching.

[0057] In this manner, when the air-conditioning monitoring device being monitored is switched to the air-conditioning monitoring device 3b, an acquisition request for the operating state information of the air-conditioning monitoring device 3b and the event information of the other air-conditioning monitoring devices 3a and 3c is sent from the client terminal 2 to the air-conditioning monitoring device 3b at predetermined time intervals.

[0058] Furthermore, a screen can be popped up to display detailed information of the air conditioner 4 of interest by selecting (clicking) the air conditioner 4 of interest from the first screen file 31 (PD1 area), as shown in Fig. 6.

[0059] As described above, because the second screen file 32 that reports event information of each of the air-conditioning monitoring devices is provided separately from the first screen file 31 indicating operating state information, acquisition of event information can be performed concurrently with acquisition of the operating state information of the air-conditioning monitoring device being monitored as separate processing.

[0060] Processing in the client terminal 2 and processing in the air-conditioning monitoring devices 3a, 3b, and 3c will now be described in more detail with reference to the drawings.

[Processing in the client terminal]

[0061] First, processing from the viewpoint of the client terminal 2 will be described with reference to Fig. 7.

Upon acquiring the first screen file 31, the web browser 42 analyzes and executes the Java (registered trademark) Script of the first screen file 31 and updates the screen at predetermined time intervals (e.g., 20 seconds) set in the first screen file 31 to acquire operating state information. The screen is updated using, for example, the refresh method.

[0062] Furthermore, the web browser 42 analyzes and executes Java (registered trademark) Script of the second screen file 32. More specifically, at predetermined time intervals (e.g., 10 seconds) (the timing may differ from that of screen updating of the first screen file 31), the second screen file 32 queries the other air-conditioning monitoring devices 3b and 3c via the client terminal 2 as to whether an event occurs in the air conditioners 4 under control. Fig. 7 shows part of one example of request information sent from the client terminal 2 to the air-conditioning monitoring device 3a in this case.

[0063] A predetermined script (e.g., `getstatusofall.php`) is read out ((a) in Fig. 7) from the application 33 of the air-conditioning monitoring device 3a, for example, by executing the Java (registered trademark) Script of the second screen file 32 at predetermined time intervals ((c) in Fig. 7). The predetermined script is, for example, a script for detecting event information of the event information collecting sections 12 of other air-conditioning monitoring devices 3b and 3c not being monitored. Next, the above-described script is executed by a predetermined function (e.g., `getStatus()`) in the read-out script ((b) in Fig. 7).

[0064] Here, the above-described predetermined script (e.g., `getstatusofall.php`) is started by the `XMLHttpRequest` (asynchronous request processing) function, which is an asynchronization read-out function of the AJAX technology, to cause all air-conditioning monitoring devices to sequentially detect the presence of event information. By doing so, for example, after the air-conditioning monitoring device 3a has sent a query to the air-conditioning monitoring device 3b about the presence of an event in the air conditioners 4, the air-conditioning monitoring device 3a proceeds to sending a query about the presence of an event in the air-conditioning monitoring device 3c, even though a response from the air-conditioning monitoring device 3b has not yet arrived and screen transition has not taken place on the client terminal 2. The AJAX technology is a known technology, and a detailed description thereof will be omitted.

[0065] As described above, a query about the presence of an event in the other air-conditioning monitoring devices 3b and 3c not being monitored becomes possible asynchronously with screen display (screen updating) of the second screen file 32 in the web browser 42. As a result, because a predetermined script is executed continuously regardless of screen transitions, the user of the client terminal 2 is relieved of the need to be conscious of the wait time while a query about the presence of an event is in progress.

[0066] In addition, when `XMLHttpRequest` processing of the air-conditioning monitoring device 3a being monitored is completed normally, the function that was set at that time in `onreadystatechange` (an event handler called, for example, when the state changes) of the client terminal 2 is called by means of callback. With this function, the color of the second screen file 32 can be changed on the screen of the client terminal 2 or a buzzer may be emitted depending on the presence of event information received from the other air-conditioning monitoring devices.

[Processing in the air-conditioning monitoring device being monitored]

[0067] Processing in the air-conditioning monitoring device 3a being monitored will now be described with reference to Fig. 8.

In the air-conditioning monitoring device 3a being mon-

itored, a startup request of a predetermined script (`getstatusofall.php`) that checks for the presence of event information of the other air-conditioning monitoring devices 3b and 3c is acquired from the client terminal 2.

[0068] When a predetermined script startup request (`getstatusofall.php`) is acquired in the air-conditioning monitoring device 3a, the predetermined script (`getstatusofall.php`) is started from the application 33. Reference is made to a loop for querying the other air-conditioning monitoring devices 3b and 3c, communicatably connected to the air-conditioning monitoring device 3a being monitored, as to whether there is event information ((a) in Fig. 8).

[0069] For example, `connectToURL()`, as a function for sending the HTTP GET request from the event detecting section 21 to each of the other air-conditioning monitoring devices 3b and 3c, is called from the application 33 ((b) in Fig. 8).

The event detecting section 21, which stores the URL necessary for acquisition of event information collected by the event information collecting section 12 of each of the air-conditioning monitoring devices 3b and 3c, sends the HTTP GET request based on the above-described function (`connectToURL()`) and this URL and waits for a response ((c) in Fig. 8).

[0070] Upon receiving a response from a predetermined file (e.g., `recentstatus.php`) possessed by another air-conditioning monitoring device 3b or 3c that has received the HTTP GET request, the event detecting section 21 detects event information using this response.

[0071] The above-described predetermined function (`connectToURL()`) is communication in PHP on TCP/IP using, for example, the `fsock` function. By doing so, communication will be made possible because HTTP communication (a port number etc. used in HTTP communication) is permitted in many cases even in a case where a proxy server etc. limiting the port numbers etc. of an application exists on the network between, for example, the air-conditioning monitoring devices.

[0072] As described so far, according to the air-conditioning monitoring system 1 of the present invention, the event detecting section 21 of the air-conditioning monitoring device 3a being monitored collects event information about the air conditioners 4 under control with the other air-conditioning monitoring devices 3b and 3c not being monitored and sends the collected event information to the client terminal 2. By doing so, in the client terminal 2, even though an event takes place in the air conditioners 4 under control with the air-conditioning monitoring devices 3b and 3c other than the air-conditioning monitoring device 3a being monitored, event information of the entire air-conditioning monitoring system 1 can be reliably detected via the event detecting section 21 of the air-conditioning monitoring devices being monitored.

[0073] Furthermore, despite the client terminal 2 being connected to the air-conditioning monitoring device 3a being monitored via a network and performing monitor-

ing, information from the air-conditioning monitoring devices 3b and 3c not being monitored is also received. By doing so, in the client terminal 2, behavior such as information being pushed from the other air-conditioning monitoring devices not being monitored is seen on the web browser 42.

[0074] In addition, because information reported from the air-conditioning monitoring devices 3b and 3c not being monitored to the client terminal 2 is event information, the amount of information becomes smaller than when information about operation/non-operation or information about an operating state, such as cooling and heating, of the air conditioners 4 is reported. As a result, not only can the load applied to the network (e.g., the Internet) via which transmission and reception of these data are carried out be reduced, but the load upon data processing of the client terminal 2 can be reduced.

[0075] Furthermore, the content of the event information received by the client terminal 2 can be displayed via the web browser 42. By doing so, because no software etc. dedicated for the air-conditioning monitoring system is required and the air-conditioning monitoring devices can be monitored using freeware, such as Internet Explorer (registered trademark), an event in the air conditioners 4 under control with the air-conditioning monitoring system can be captured easily.

[0076] Although this embodiment assumes that the client terminal 2 is connected to each of the air-conditioning monitoring devices 3a, 3b, and 3c via the Internet, the connecting network is not limited to the Internet. For example, a network standardized for building management or a LAN (Local Area Network) may be used.

{Reference Signs List}

[0077]

- 1 Air-conditioning monitoring system
- 2 Client terminal
- 3a, 3b, 3c Air-conditioning monitoring devices
- 10 First monitoring section
- 12 Event information collecting section
- 13 Operating-state-information collecting section
- 20 Second monitoring section
- 21 Event detecting section
- 30 Web server
- 31 First screen file
- 32 Second screen file
- 40 Event information acquiring section
- 41 Operating-state-information acquiring section
- ESa, ESb, ESc Event state file
- EMa, EMb, EMc Event detecting module

Claims

1. An air-conditioning monitoring system comprising a client terminal having a web browser; and an air-

conditioning monitoring device subordinating a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines, wherein a plurality of the air-conditioning monitoring devices are connected via a network, the air-conditioning monitoring devices and the client terminal are connected via the network, and the air-conditioning monitoring devices provide the client terminal with operating state information, which is information on the operating states, wherein each of the air-conditioning monitoring devices comprises:

event information collecting means for collecting event information of the air-conditioning machines under control;

event detecting means for, if being monitored from the client terminal, detecting and acquiring the event information from the event information collecting means of the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; and first communication means for, if being monitored from the client terminal, sending the event information detected by the event detecting means to the client terminal, wherein the client terminal displays the event information acquired from the first communication means via the web browser.

2. The air-conditioning monitoring system according to Claim 1, wherein upon receiving a response result to an acquisition request for the event information sent to the air-conditioning monitoring device, the client terminal notifies the web browser, even though display of the web browser is not updated.
3. The air-conditioning monitoring system according to Claim 1 or 2, comprising operating-state-information collecting means for collecting the operating state information of the air-conditioning machines under control, wherein the operating state information is sent to the client terminal via the first communication means in a case of being monitored from the client terminal.
4. The air-conditioning monitoring system according to one of Claims 1 to 3, wherein processing in which the operating-state-information collecting means collects the operating state information and sends the operating state information to the client terminal is separated from processing in which the event detecting means collects the event information and sends the event information to the client terminal.
5. The air-conditioning monitoring system according to one of Claims 1 to 4, wherein upon acquiring the event information via the first communication means,

the client terminal notifies the browser of a change in the event information.

6. An air-conditioning monitoring device that is communicatably connected to a client terminal having a web browser and subordinates a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines such that the air-conditioning monitoring device is connected to the other air-conditioning monitoring devices via a network, comprising:

event information collecting means for collecting event information of the air-conditioning machines under control;
 event detecting means for, if being monitored from the client terminal, detecting and acquiring the event information from the event information collecting means of the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; and
 first communication means for, if being monitored from the client terminal, sending the event information detected by the event detecting means to the client terminal.

7. A client terminal that is used in an air-conditioning monitoring system including an air-conditioning monitoring device subordinating a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines and that is communicatably connected to a plurality of the air-conditioning monitoring devices, the client terminal comprising:

a web browser;
 event information acquiring means for acquiring event state information of the air-conditioning machines under control with the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored; and
 second communication means for sending a request to acquire the event state information from the air-conditioning monitoring device, wherein the event information is displayed via the web browser.

8. A control method applied to an air-conditioning monitoring system including a client terminal having a web browser; and an air-conditioning monitoring device subordinating a plurality of air-conditioning machines installed in a building to monitor operating states of these air-conditioning machines, wherein a plurality of the air-conditioning monitoring devices are connected via a network, the air-conditioning monitoring devices and the client terminal are connected via the network, and the air-conditioning mon-

itoring devices provide the client terminal with information on the operating states, comprising:

collecting event information of the air-conditioning machines under control with each of the air-conditioning monitoring devices;
 causing the air-conditioning monitoring device being monitored by the client terminal to detect and acquire the event information of the other air-conditioning monitoring devices, which are the air-conditioning monitoring devices not being monitored;
 causing the air-conditioning monitoring device being monitored by the client terminal to send the acquired event information to the client terminal; and
 causing the client terminal to display the event information via the web browser.

FIG. 1

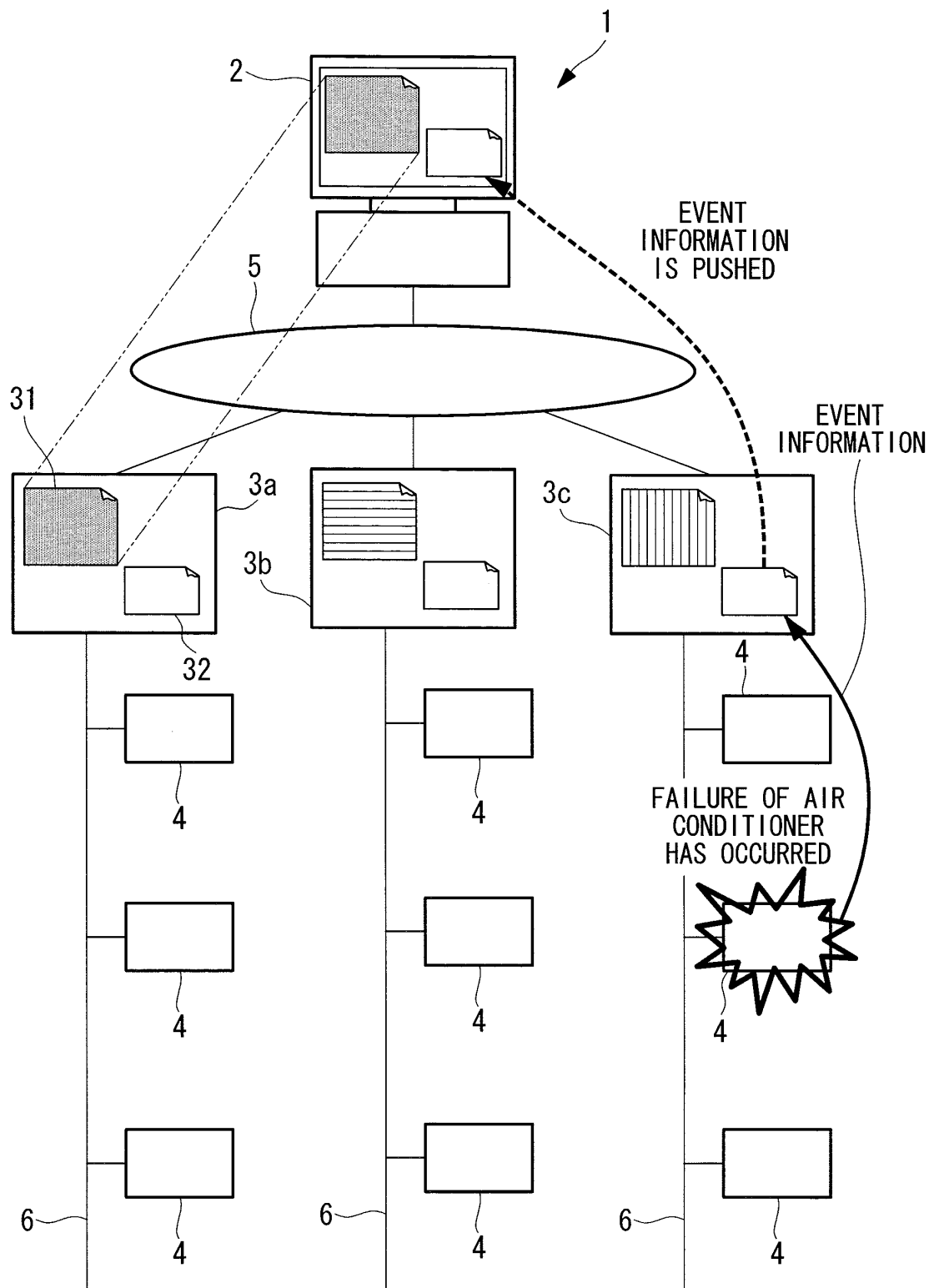


FIG. 2

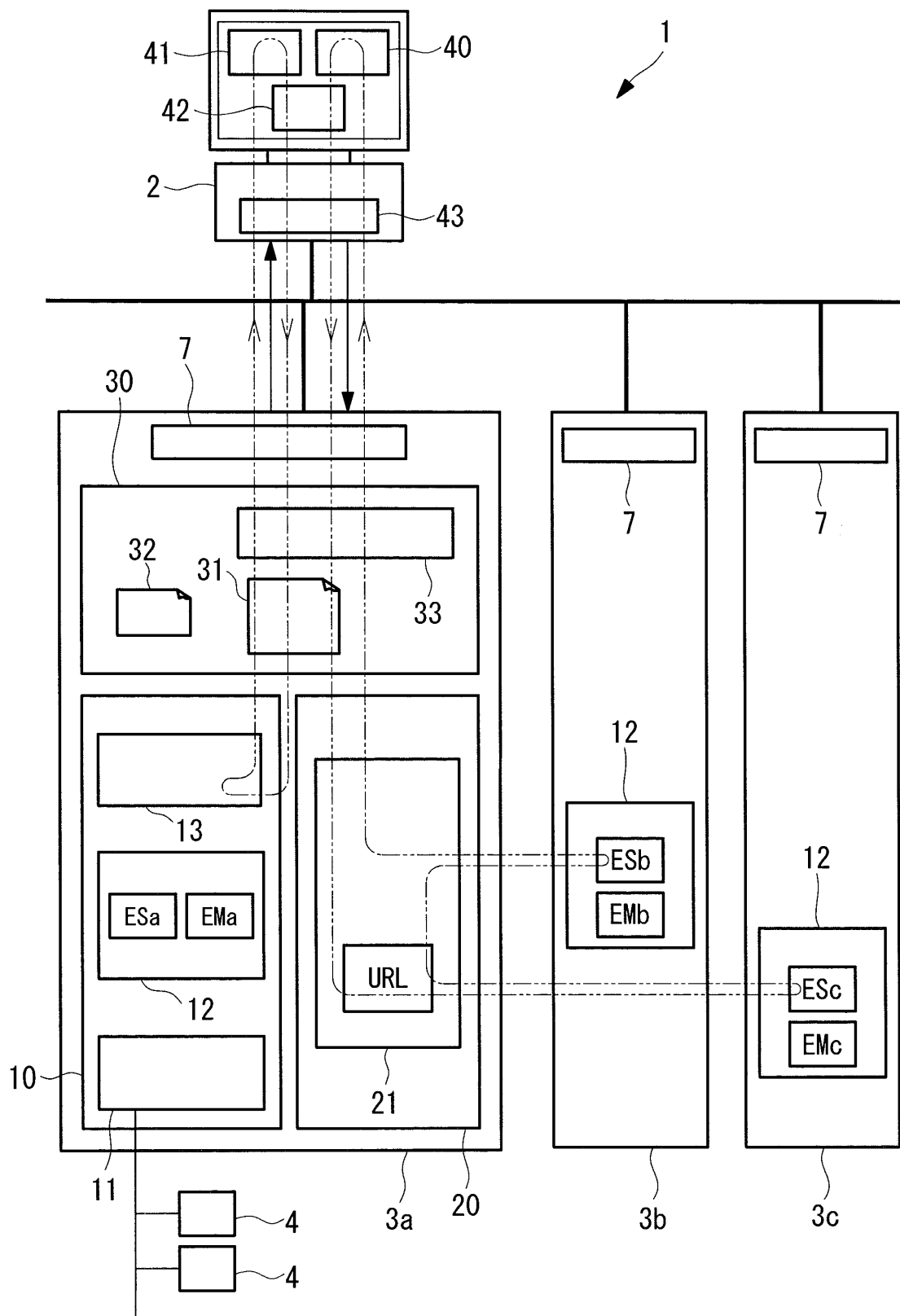


FIG. 3

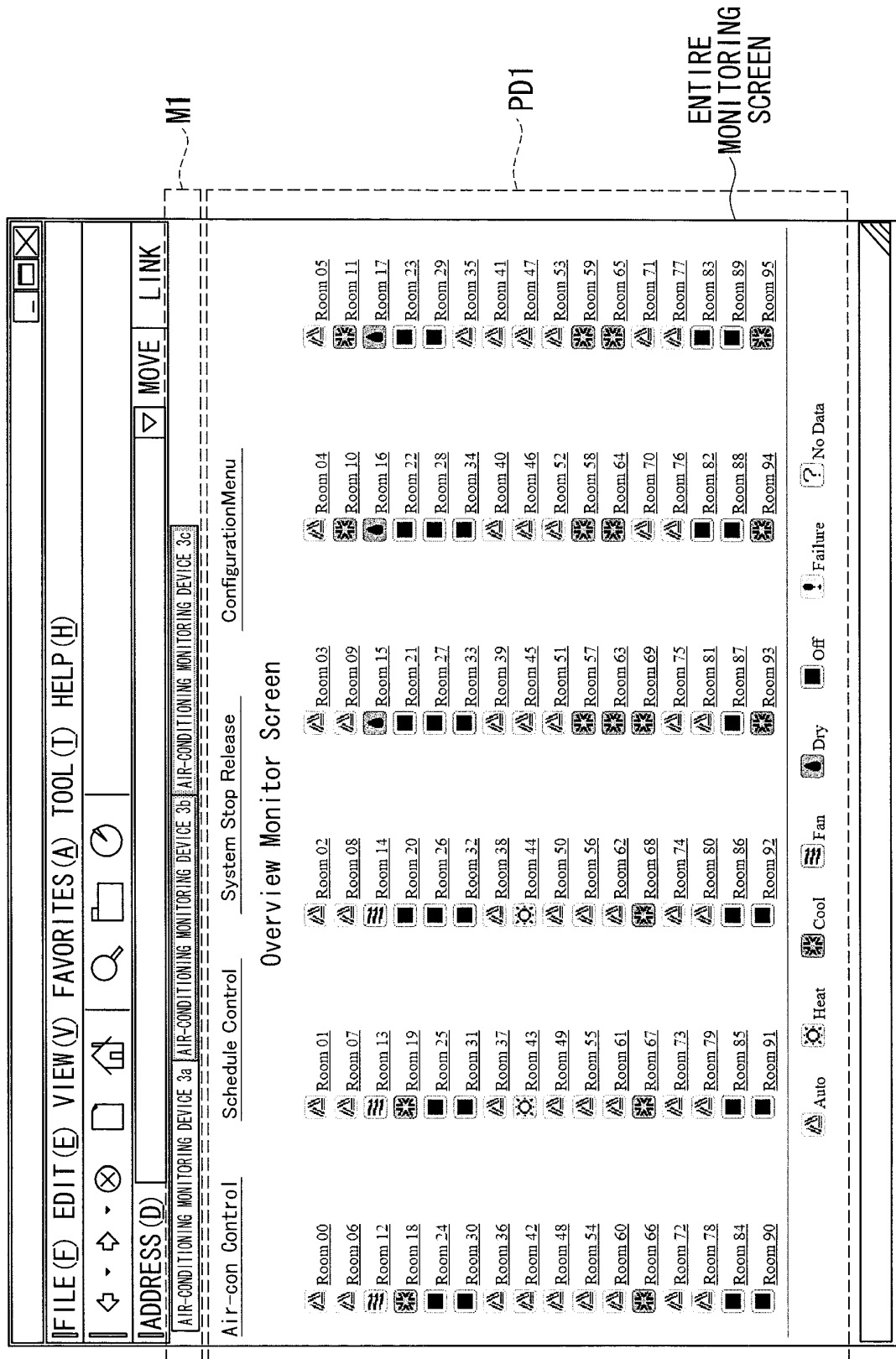


FIG. 4
COLOR OF TAB CHANGES (FROM GRAY TO YELLOW, FOR EXAMPLE)

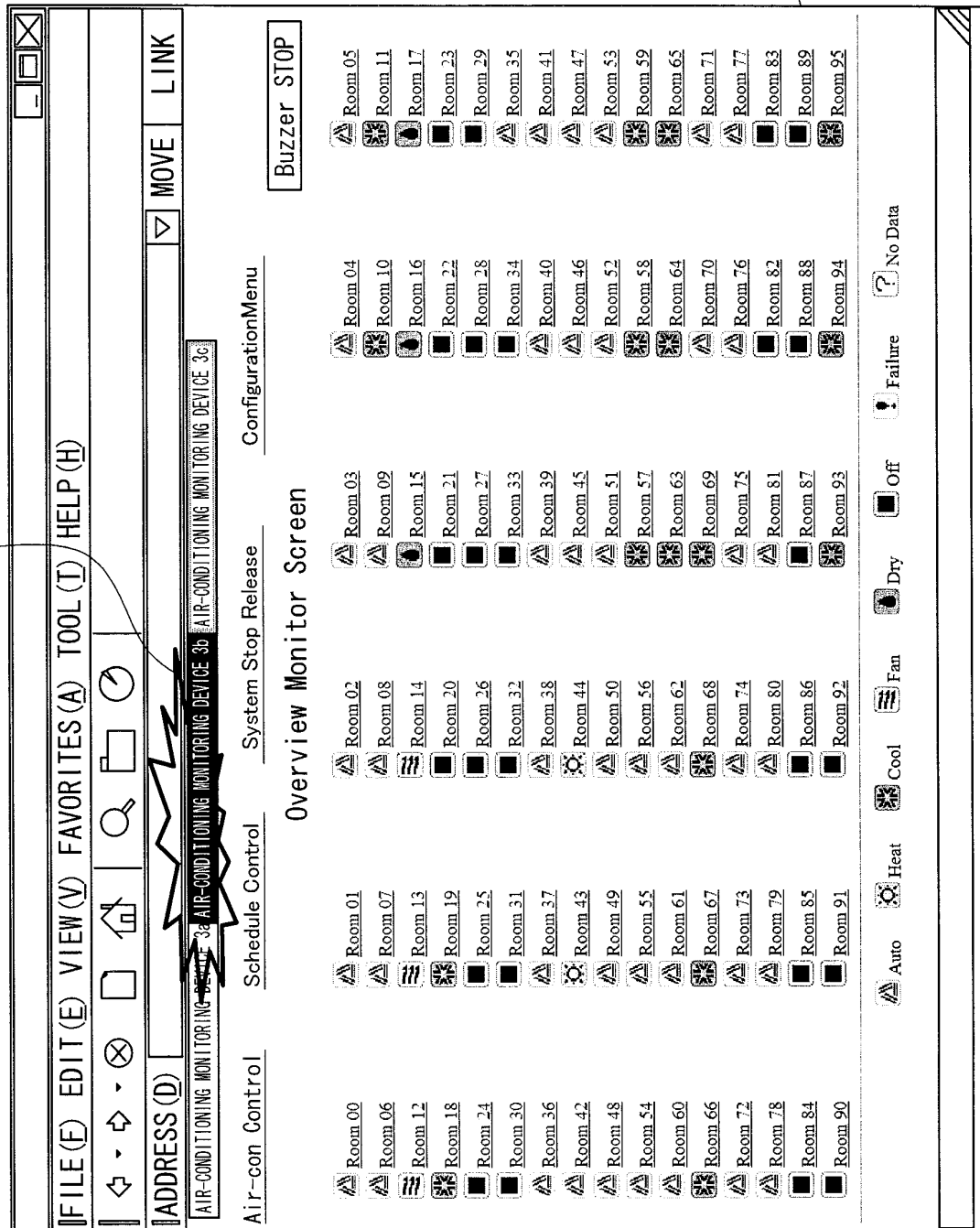


FIG. 5

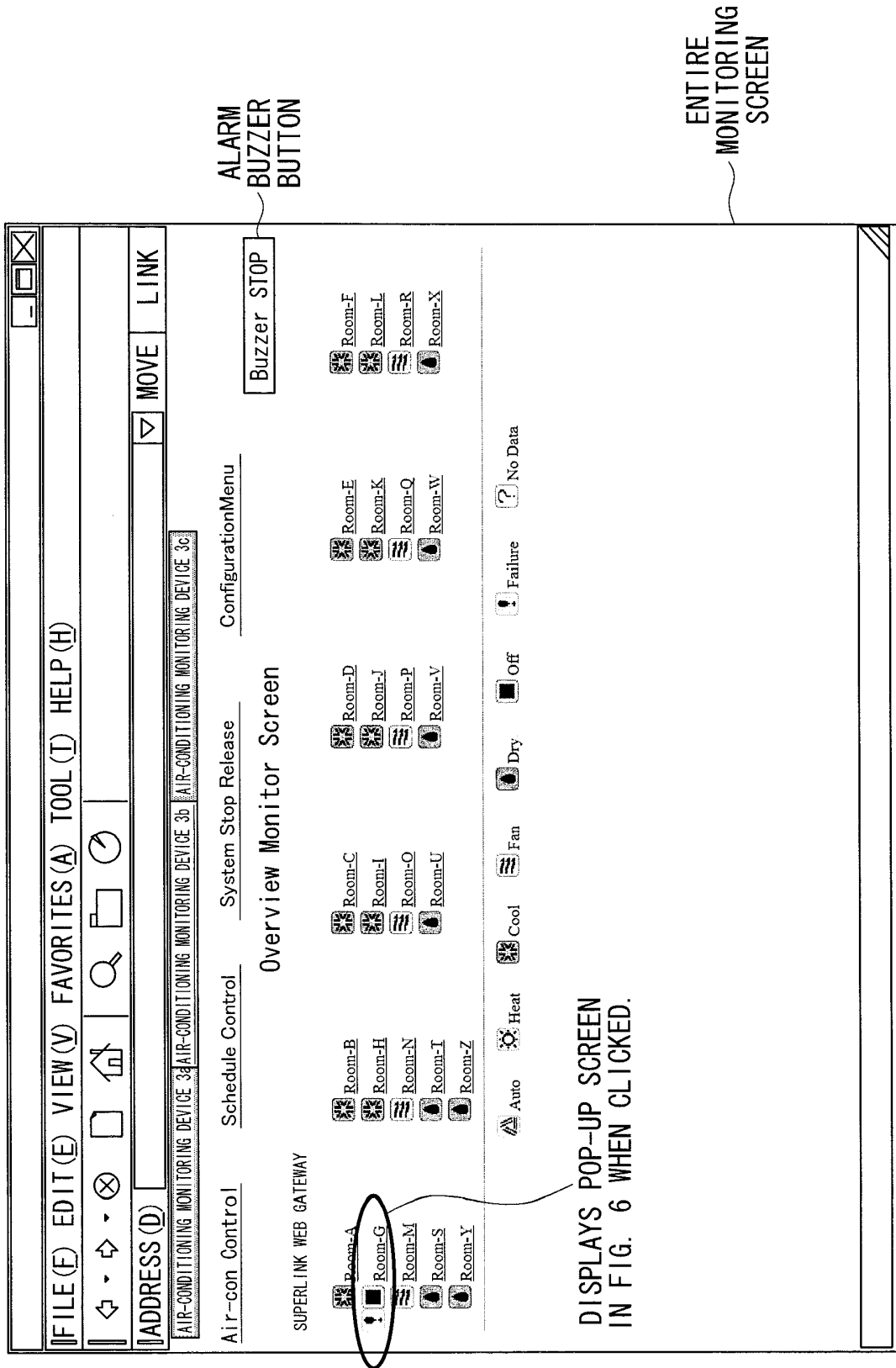
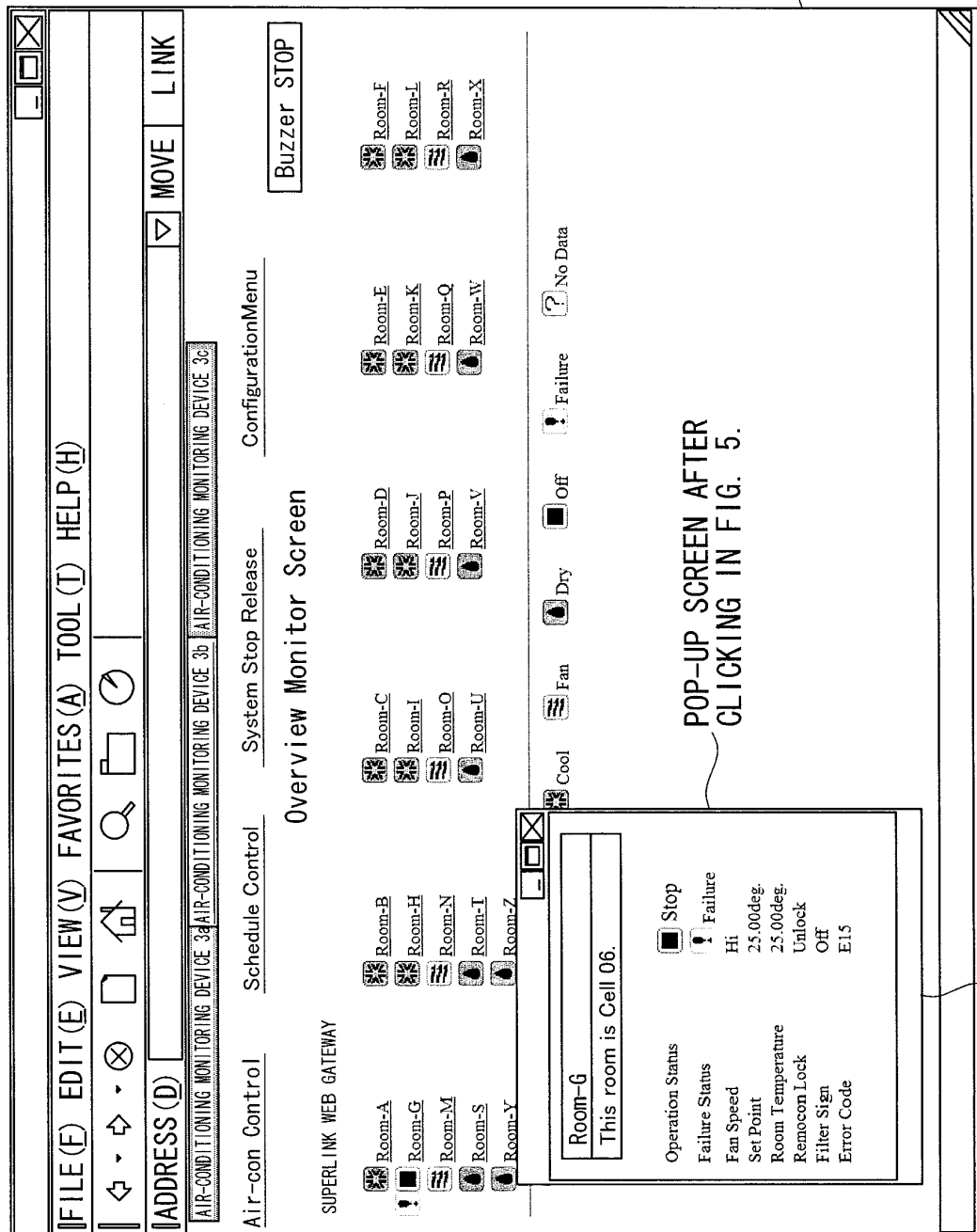


FIG. 6



ENTIRE
MONITORING
SCREEN

POP-UP SCREEN AFTER
CLICKING IN FIG. 5.

DISPLAYS DETAILS OF AIR
CONDITIONER ABNORMALLY NON-OPERATED.

FIG. 7

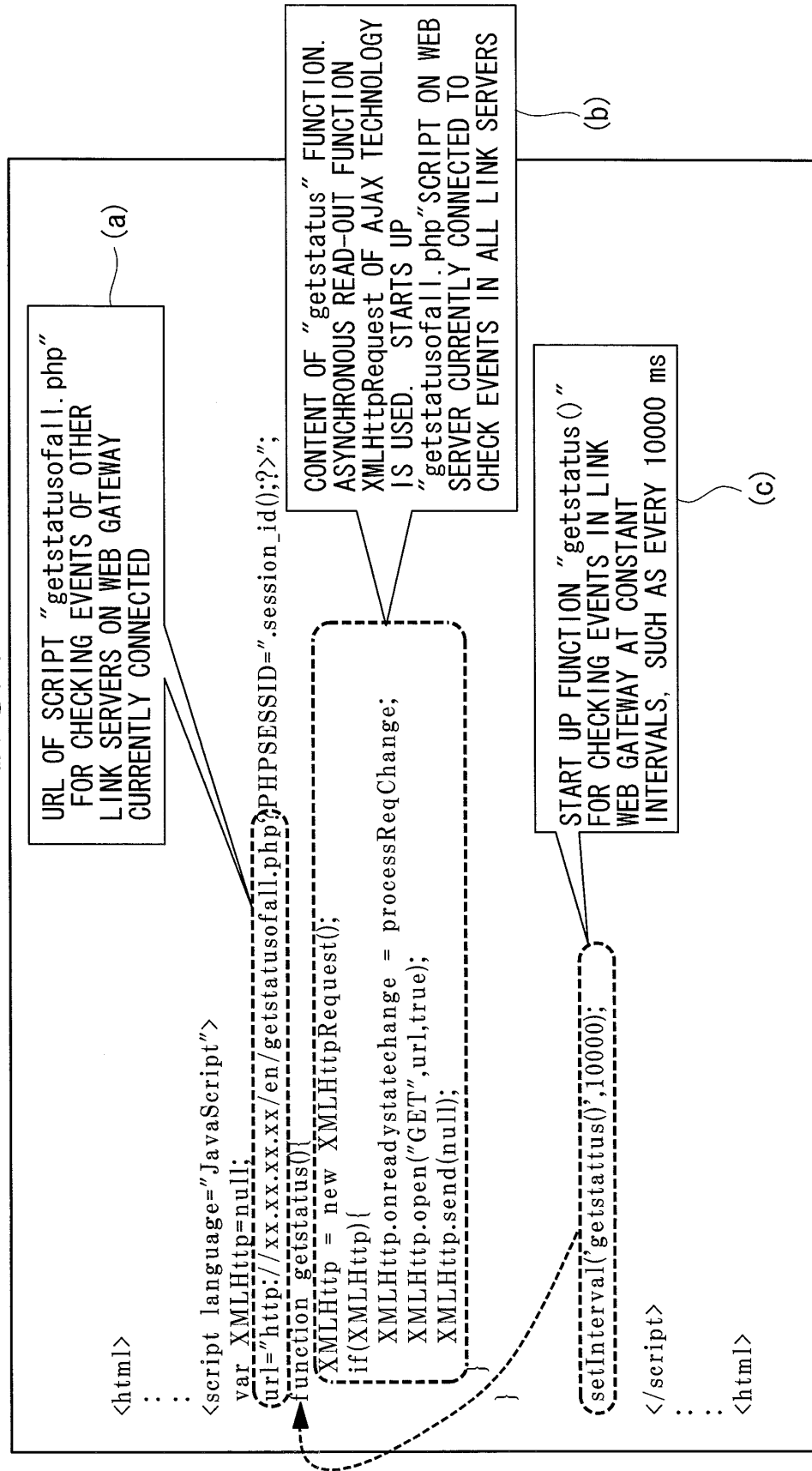
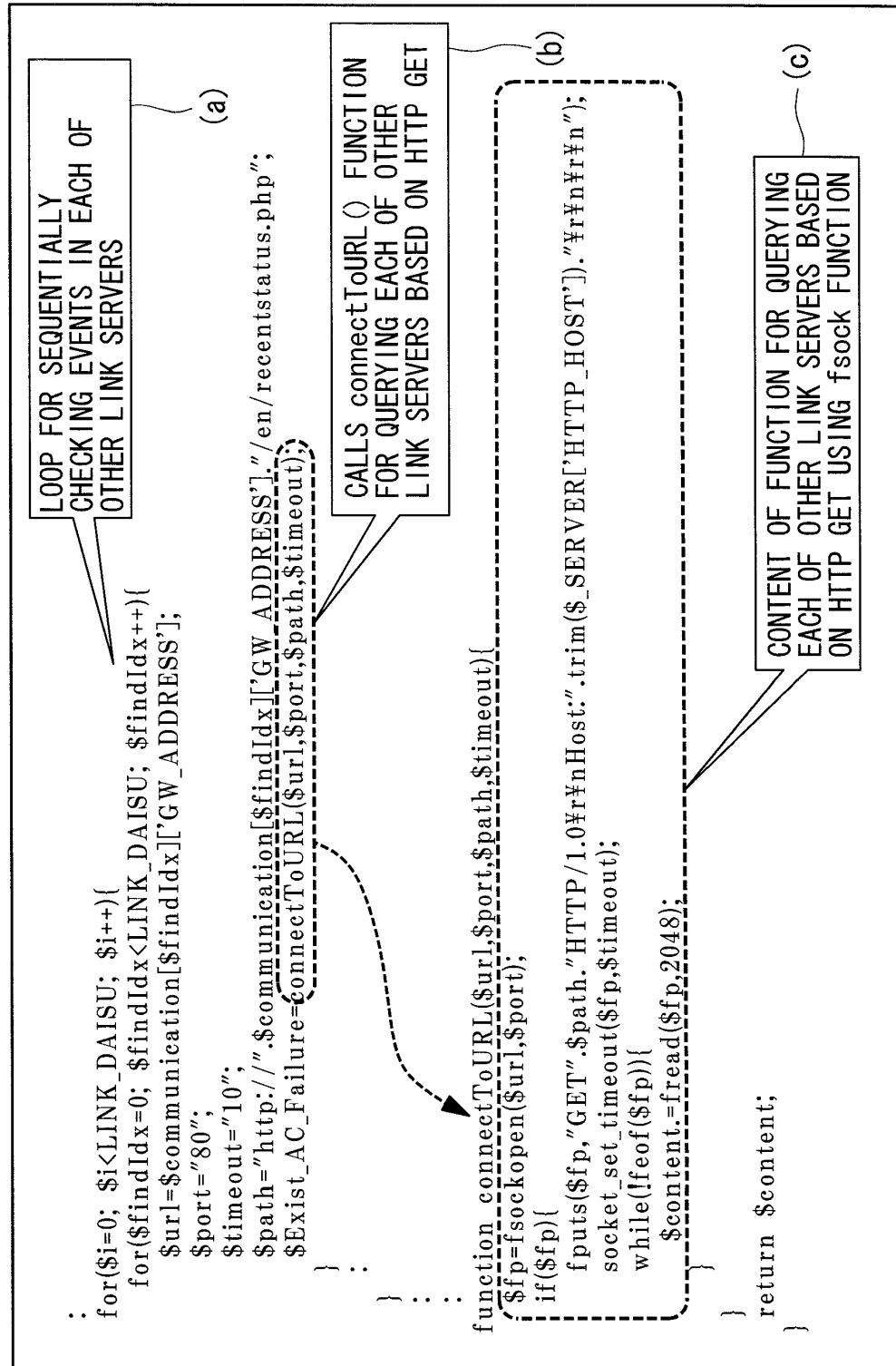


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/059360

A. CLASSIFICATION OF SUBJECT MATTER

F24F11/02 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F11/02

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 07-133949 A (Sanyo Electric Co., Ltd.), 23 May 1995 (23.05.1995), entire text; all drawings (Family: none)	1-8
A	JP 2003-083589 A (Toshiba Corp.), 19 March 2003 (19.03.2003), entire text; all drawings (Family: none)	1-8
A	JP 2008-075990 A (Toshiba Carrier Corp.), 03 April 2008 (03.04.2008), entire text; all drawings (Family: none)	1-8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search

27 July, 2010 (27.07.10)

Date of mailing of the international search report

17 August, 2010 (17.08.10)

Name and mailing address of the ISA/
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP HEI10254732 B [0003]