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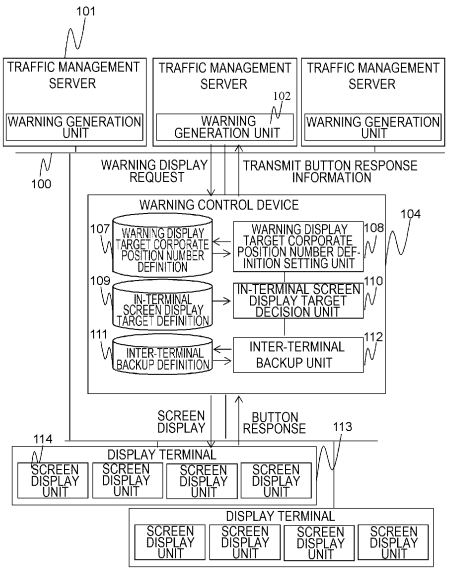
(54) NOTIFICATION CONTROL DEVICE, TRAIN TRAFFIC CONTROL SYSTEM, AND DISPLAY CONTROL METHOD

(57) A notification control device for causing a display terminal to display a notification issued by a traffic management server in a traffic management system, includes: a display target user definition holding unit which holds a display target user definition which takes correspondence between a display terminal, a user who is logged in to the display terminal, and power given to the user; and a display target user setting unit which, when a notification is received from the traffic management server, extracts a display terminal to which a user whose power covers the notification is logged in, on the basis of the display target user definition, and decides the extracted display terminal as a display target of the notification.

[FIG. 1]



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Description

Technical Field

[0001] The present invention relates to a system for managing railway traffic and outputting a warning if an abnormality has occurred.

Background Art

[0002] A traffic management system is a system in which information such as the operating state of on-site traffic signals and the positions of trains or the like is collected and in which centralized management of railway traffic is conducted on the basis of the information. Here, if a failure or certain abnormality has occurred in on-site equipment, the system, having detected abnormality information, outputs a warning to report the abnormality to a monitoring officer who is the user of the system (see PTL 1).

[0003] Also, in the traffic management system, when processing is suspended or an event that may cause an abnormality in processing has occurred during the operation of the system, a warning is outputted from a related device and the warning is displayed on a device having a display screen.

[0004] When a certain warning is displayed, the monitoring officer confirms the warning and carries out a button operation indicating that the confirmation is made. With the button operation, response information is sent to a warning generation unit. Along with this, the monitoring officer takes necessary measures in response to the warning.

Citation List

Patent Literature

[0005] PTL 1: JP-A-10-147242

Summary of Invention

Technical Problem

[0006] As a typical example of the configuration of a traffic management system for railway or the like, a plurality of traffic management servers installed in a server room or the like monitors the state of equipment and the positions of trains, and if a certain abnormality is detected, the traffic management servers output information of an image or sound indicating the abnormality to a terminal installed in a control room, and the terminal performs screen display or audio output of the received information. In this configuration, the screen display or audio output at the terminal is managed by the traffic management servers, and the information inputted to the terminal is sent to the traffic management servers and processed there.

[0007] As described in PTL 1, for example, it is conceivable that the system is configured in such way that, when an abnormality has occurred, the display of the warning screen or the output of the warning sound at the terminal installed in the control room continues until the user carries out a confirmation operation so that the monitoring officer will not fail to notice the abnormal state and hence fail to spot an accident.

[0008] By the way, recently, a management technique is desired in which a plurality of monitoring officers with different scopes of duty which they are responsible for (scopes of responsibility) and different geographical scopes (scopes of monitoring) which they are in charge of, manage railway traffic using a traffic management system. However, the conventional traffic management system is constructed on the assumption that the setting site, use and user of the terminal for displaying a warning or the like will not change. Therefore, the system has some aspects unsuitable for the monitoring technique in which a plurality of monitoring officers with different scopes of responsibility and different scopes of monitoring use the system. Here, the scopes of responsibility and the scopes of monitoring are collectively referred to as power.

[0009] Hereinafter, specific cases of the problem will be described as examples.

[0010] For example, if the user of one display terminal is replaced by another user with a different role, or if a user carries out a task using a different display terminal from the display terminal which the user has used up until then, it is desired that the display terminal should correctly output a warning corresponding to the user's power at that point. However, in the conventional traffic management system, since such forms of use are not considered, a proper warning for a proper user cannot be presented in some cases.

[0011] This not only applies to warnings but similarly applies to various notifications issued from the traffic management servers.

[0012] An object of the invention is to provide a technique which enables notifications or the like corresponding to the user's power by properly managing the user's power in a traffic management system.

Solution to Problem

[0013] A notification control device according an aspect of the invention is a notification control device for causing a display terminal to display a notification issued by a traffic management server in a traffic management system. The notification control device includes: a display target user definition holding unit which holds a display target user definition which takes correspondence between a display terminal, a user who is logged in to the display terminal, and power given to the user; and a display target user setting unit which, when a notification is received from the traffic management server, extracts a display terminal to which a user whose power covers the

notification is logged in, on the basis of the display target user definition, and decides the extracted display terminal as a display target of the notification.

Advantageous Effect of Invention

[0014] According to the invention, proper notifications or the like corresponding to the user's power are enabled in the traffic management system.

Brief Description of Drawings

[0015]

[FIG. 1] FIG. 1 is a block diagram showing the system configuration of the embodiment.
[FIG. 2A] FIG. 2A is a view showing a first display on a screen display unit 114 for setting a warning display target corporate position number definition 107.
[FIG. 2B] FIG. 2B is a view showing a second display on the screen display unit 114 for setting the warning display target corporate position number definition 107.
[FIG. 3] FIG. 3 is a view for explaining the operation of an in-terminal screen display target decision unit 110.
[FIG. 4A] FIG. 4A is a view showing an example of an inter-terminal backup definition 111.
[FIG. 4B] FIG. 4B is a view for explaining the operation of an inter-terminal backup unit 112.
[FIG. 5] FIG. 5 is a sequence diagram of user setting by a warning display target corporate position number definition setting unit 108.
[FIG. 6] FIG. 6 is a sequence diagram up to where a warning outputted from a traffic management server 101 is displayed on a display terminal 113.
[FIG. 7] FIG. 7 is a sequence diagram for setting a function limitation on manual control at the traffic management server 101.
[FIG. 8] FIG. 8 is a sequence diagram of inter-terminal backup of a warning.
[FIG. 9] FIG. 9 is a flowchart of processing to decide a warning display target corporate position number.
[FIG. 10] FIG. 10 is a flowchart showing processing of inter-terminal backup.

Description of Embodiments

[0016] An embodiment of the invention will be described, referring to the drawings.
[0017] FIG. 1 is a block diagram showing the system configuration of the embodiment. The systems according to the embodiment include a traffic management system for displaying timetables or the like and managing railway traffic to normal state, and a warning display/response system for displaying a warning generated because of a certain abnormality and for the user to cope with the warning.
[0018] The traffic management system has a plurality of traffic management servers 101. Each of the traffic management servers 101 has a warning generation unit 102. The warning display/response system has a warning control device 104 and a plurality of display terminals 113. The traffic management system and the warning display/response system are connected to each other via a LAN 100.
[0019] The warning control device 104 is provided for each area to be controlled which is a management target of the device. The warning control device 104 may be configured as a physically independent device but may also be installed within the traffic management server 101. The warning control device 104 holds a warning display target corporate position number definition 107, an in-terminal screen display target definition 109 and an inter-terminal backup definition 111 in a storage device (not shown), and also has a warning display target corporate position number definition setting unit 108, an in-terminal screen display target decision unit 110 and an inter-terminal backup unit 112. The display terminal 113 has a plurality of screen display units 114.
[0020] The display terminal 113 is a terminal device which displays a warning and which a user operates. Here, as an example, the display terminal 113 has a plurality of display screens (screen display units) 114.
[0021] First, the role of each device will be described.
[0022] The traffic management server 101 detects a warning generated by on-site equipment or another device and transmits the detected warning from the warning generation unit 102 to the warning control device 104.
[0023] The warning control device 104 decides the display terminal 113 and the display screen to be the display target at which the warning is displayed, and transmits the warning to the decided display terminal 113. At the time, in some cases, the warning control device 104 may transmit to the display terminal 113 information for displaying, with the warning, a button for the user to confirm the display of the warning on the display terminal 113 and carry out a response operation.
[0024] The display terminal 113 displays the warning received from the warning control device 104, on the display screen of the screen display unit 114.
[0025] By the above operations of the respective device, the warning generated by the warning generation unit 102 is displayed as a set of a warning message text and a response button, on the screen display unit 114 of the display terminal 113 via the warning control device 104.
[0026] Next, the role of each unit within each device will be described.
[0027] The warning generation unit 102 monitors the state of the equipment or the like, and when the generation of a warning is detected, the warning generation unit 102 notifies the warning control device 104 of a message requesting that the warning should be displayed (warning display request). The warning display request

includes a warning message number, parameters such as station name, traffic signal name and train number, which form variable parts of the warning message, the time of generation, and a position code indicating the position targeted by the warning, or the like.

[0028] The warning control device 104 prepares a warning message, using the warning message number in the received warning display request as a key.

[0029] In the preparation of the warning message, the warning display target corporate position number definition setting unit 108 decides a warning display target corporate position number 304, referring to the warning display target corporate position number definition 107 stored by user setting carried out in advance with the use of the screen display unit 114 of the display terminal 113. This warning display target corporate position number 304 indicates the user who should essentially be notified of the warning. Normally, the warning can be transmitted to the display terminal 113 to which the user is logged in. However, if the user is not logged in to any display terminal 113, or the like, the warning is transmitted to the display terminal 113 to which a user set as a backup of that user is logged in.

[0030] Also, the display terminal 113 transmitting the warning has a plurality of screen display units (display screens) 114, it is necessary to decide which screen display unit 114 where the warning is to be displayed.

[0031] The in-terminal screen display target decision unit 110 and the inter-terminal backup unit 112 ultimately decide the display terminal 113 and the screen display unit 114 on which the warning message is to be displayed, using the in-terminal screen display target definition 109 and the inter-terminal backup definition 111. The warning message is transmitted from the warning control device 104 to the decided display terminal 113. In the warning message, the screen display unit 114 on which the warning should be displayed is designated.

[0032] The designated screen display unit 114 displays the received warning message.

[0033] Also, when a confirmation response with button operation by the user is carried out in response to the displayed warning message, the screen display unit 114 transmits the confirmation response to the warning generation unit 102 of the traffic management server 101 via the warning control device 104.

[0034] Next, the description focuses on the significance of each function.

[0035] The warning display target corporate position number definition is information which takes correspondence between a display terminal 113, the corporate position number of a user who is logged in to the display terminal 113, and the power given to the user. As the warning display target corporate position number definition setting unit 108 receives a notification of a warning from the traffic management server 101, the warning display target corporate position number definition setting unit 108 extracts the display terminal 113 to which a user whose power covers the warning is logged in, on the basis of the warning display target corporate position number definition, and decides the extracted display terminal 113 as the display target of the warning. In this way, it is possible to display a proper corresponding to the user's power in the traffic management system.

[0036] Also, the power given to the user according to the warning display target corporate position number definition may be, for example, power for reference with which the user can receive notifications, and power with responsibility with which the user can carry out confirmation response to notifications. As the warning display target corporate position number definition setting unit 108 receives a warning from the traffic management server 101, the warning display target corporate position number definition setting unit 108 extracts the display terminal 113 to which a user whose power covers the warning is logged in, and which of the power for reference and the power with responsibility is given to the user with respect to the warning, on the basis of the warning display target corporate position number definition. Then, if the user is given the power with responsibility, the warning display target corporate position number definition setting unit 108 causes the display terminal 113 to display the warning and a screen for carrying out a confirmation response to the notification. Meanwhile, if the user is given the power for reference, the display terminal 113 is made to display the warning only. In this way, it is possible to grant proper power, of the power with responsibility and the power for reference, to each user, and properly apply the management of notifications. It is possible to arbitrarily set which function, such as warning display, is permitted to the user having the power for reference or the power with responsibility. The setting method will be described below.

[0037] As for the power given to the user according to the warning display target corporate position number definition 107, whether the power is given to the user or not is set for each predetermined scope of monitoring (region) to which a monitoring target, for example, a traffic signal, belongs. As the warning display target corporate position number definition setting unit 108 receives a notification from the traffic management server 101, the warning display target corporate position number definition setting unit 108 examines the scope of monitoring to which the monitoring target of the warning belongs, then extracts the display terminal 113 to which a user given the power over the scope of monitoring is logged in, and causes the extracted display terminal 113 to display the warning. In this way, the power over warnings can be set for each scope of monitoring, for example, region, and therefore it is possible to carry out management in which regions which users should be in charge of are allocated to the users.

[0038] The in-terminal screen display target definition 109 is information indicating which application is displayed on which screen display unit 114, of the plurality of screen display units 114. When causing the display terminal 113 to display a warning, the in-terminal screen

display target decision unit 110 extracts the screen display unit 114 where an application related to the warning is displayed, on the basis of the in-terminal screen display target definition 109, and decides the extracted screen display unit 114 as the screen display unit 114 where the warning is to be displayed. In this way, it is possible to display a warning on a proper display screen when the display terminal has a plurality of display screens.

[0039] The inter-terminal backup definition 111 is information which takes correspondence between a first user and a second user who, when the first user cannot conduct an action within the power given, can conduct the action within the power instead of the first user. The inter-terminal backup unit 112 extracts the second user corresponding to the first user according to the inter-terminal backup definition 111 when a notification within the power given to the first user cannot be displayed on the display terminal 113 to which the first user is logged in. The inter-terminal backup unit 112 extracts the display terminal 113 to which the second user is logged in, on the basis of the warning display target corporate position number definition 107, and decides the extracted display terminal 113 as the display target of the warning. In this way, it is possible to display a warning on the display terminal 113 to which the second user set as a backup of the first user is logged in, if the warning cannot be displayed on the display terminal 113 to which the user having the power over the warning is logged in.

[0040] Also, when the first user is not logged in to any display terminal 113, or when the display terminal 113 to which the first user is logged in has stopped, the inter-terminal backup unit 112 determines that the warning cannot be displayed on the display terminal 113 to which the first user is logged in. Thus, when the first user logs out or when the display terminal 113 to which the first user is logged in has stopped, the warning to the first user can be reported to the second user instead.

[0041] Hereinafter, the operation of each device and each unit will be described further in detail.

[0042] FIGS. 2A and 2B are views showing first and second displays, respectively, on the screen display unit 114 for setting the warning display target corporate position number definition 107. FIGS. 2A and 2B also show the information itself of the warning display target corporate position number definition 107 set with the use of the screen display. The information set on the screen display unit 114 is acquired by the warning control device 104 and held in the warning display target corporate position number definition setting unit 108 as the warning display target corporate position number definition 107.

[0043] As shown in FIG. 2A, the warning display target corporate position number definition 107 is information showing a list of warning and control power for each of the users who are logged in to the display terminals 113, over each area to be controlled. The power includes three levels of power with responsibility 312, power for reference 313, and - (no power) 314. On the screen display unit 114, a warning display target corporate position number definition setting screen 300 for setting these levels is displayed.

[0044] The warning display target corporate position number definition 107 also includes information of function limitation setting as shown in FIG. 2B. As can be seen in FIG. 2B, the function limitation by the power is applied not only to the functions related to notifications such as warning display but also to the functions related to controls such as manual control by the user. The function limitation setting is information in which the indications of items appearing on the display such as warning, button and image, and the controls on applications (APs) are set as items, corresponding to each of the power with responsibility 312, the power for reference 313, and the - (no power) 314, and in which whether each item is available or unavailable is set. That is, which AP can be controlled by each of the users to which the power with responsibility 312, the power for reference 313 and the - (no power) 314 are set, is defined. That is, in the example of the setting of FIG. 2B, it can be seen that, to the user to which the power with responsibility 312 is set, all the functions displayed in a function limitation 311 to each type of power from warning display to receiving phone calls from on-site equipment are permitted, whereas warning display with response button, manual control, and receiving phone calls from on-site equipment are not permitted to the user to which the power for reference 313 is set. Meanwhile, warning display, warning display with response button, detailed screen display, manual control, sending phone calls from on-site equipment, and receiving phone calls from on-site equipment are not permitted to the user for which the - (no power) 314 is set. In this way, in the warning display target corporate position number definition 107, power is set over various APs necessary for traffic management such as manual control and sending and receiving phone calls from on-site equipment, as well as warning displays and the like. By referring to this warning display target corporate position number definition 107, the warning control device 104 can output a warning to a proper user according to the various types of power. A function limitation setting screen 310 for such settings is displayed on the screen display unit 114, as shown in FIG. 2B, and various types of power can be set by the user.

[0045] The display on the warning display target corporate position number definition setting screen 300 includes a terminal number 301 of the display terminal 113 at which the user is logged in to the area to be controlled where the warning control device 104 is provided, a login ID 302 of the user who is logged in to the area to be controlled where the warning control device 104 is provided, a corporate position 303 of the user who is logged in to the area to be controlled where the warning control device 104 is provided, a corporate position number 304 univocally allocated to the user in the corporate position 303, and a detailed scope of monitoring 305 which defines the power of the user with the corporate position number 304 over warnings and controls.

[0046] The display on the function limitation setting screen 310 defines the limitation to each function on the AP displayed with each of the power with responsibility 312, the power for reference 313, and the - (no power) 314.

[0047] These warning display target corporate position number definitions 107 are recorded in the warning control device 104 as a file of the warning display target corporate position number definitions 107 every time user setting is carried out. By displaying the warning display target corporate position number definition setting screen 300 on the display terminal 113 and defining power for each detailed scope of monitoring 305 with the corporate position number 304 according to inputs, the warning display target corporate position number definition setting unit 108 can make the region which the user is in charge of variable, or flexibly change the region which the user is in charge of, according to the state (number of people, on-season/off-season, troubleshooting) or the like during the application.

[0048] FIG. 3 is a view for explaining the operation of the in-terminal screen display target decision unit 110.

[0049] The display terminal 113 has a plurality of screen display units 114 each corresponding to a display screen. A screen number 400 is allocated to each screen display unit 114. Here, a display AP 401 is displayed on each screen display unit 114, as shown in FIG. 3. For example, in the example shown on the left-hand side of FIG. 3, the indication (display AP(AP-A)) of an application AP-A is displayed on the screen display unit 114 with the screen number 1. In the example shown on the right-hand side of FIG. 3, an indication AP (AP-B) is displayed on the screen display unit 114 with the screen number 1. That is, FIG. 3 shows an example in which the indication AP (AP-A) currently displayed on the screen display unit 114 with the screen number 1 is switched to the indication AP(AP-B).

[0050] In the case where the screen on the screen display unit 114 with the screen number 1 is switched from the indication AP(AP-A) to the indication AP(AP-B) in this way, a warning displayed in the indication AP (AP-A) can no longer be displayed on the screen display unit 114 with the screen number 1. If the display of the warning disappears, inconvenience can occur to the railway traffic.

[0051] Therefore, in order to prevent the disappearance of the warning, the in-terminal screen display target decision unit 110 causes the warning to be displayed on the screen display unit 114 with the lowest screen number, of the screen display units 114 displaying this indication AP(AP-A) within the same display terminal 113. Thus, if there is a warning to be displayed in the indication AP(AP-A) in the circumstance illustrated in FIG. 3, the warning is displayed on the screen display unit 114 with the screen number 3 displaying the indication AP(AP-A). This function of the in-terminal screen display target decision unit 110 contributes to preventing the display of a warning from disappearing and also to displaying a warning on a proper AP screen in the case where a plurality of APs is displayed at a single terminal.

[0052] FIG. 4A is a view showing an example of the inter-terminal backup definition 111. FIG. 4B is a view for explaining the operation of the inter-terminal backup unit 112.

[0053] As shown in FIG. 4A, corporate position numbers 304 and corresponding backup target corporate position numbers 501 are recorded in the inter-terminal backup definition 111. In the circumstance where the display terminal 113 used by a user indicated by one corporate position number 304 has stopped, is logged out of, or has no identical AP screens within the terminal, the warning control device 104 detects the stop state, the logout state, or the state of having no identical APs within the terminal. As the inter-terminal backup unit 112 refers to the inter-terminal backup definition 111, the power is shifted to the backup target corporate position number 501 corresponding to the corporate position number 304, and the warning is displayed on the display terminal 113 used by the user with the backup target corporate position number 501.

[0054] In the example of FIG. 4B, since the user with the corporate position D-1 has switched the indication AP displayed on the No. 1 screen display unit 114 (screen number 1) is switched from the indication AP(AP-A) to the indication AP(AP-B), the warning is displayed on the No.3 screen display unit 114 displaying the indication AP (AP-A), of the display terminal 113 used by the user with the corporate position M-1, which is the backup target of the corporate position D-1.

[0055] The warning control device 104 refers to the warning display target corporate position number definition 107, when examining the display terminal 113 used by the user with the backup target corporate position number 501. In order to decide which screen display unit 114 of which display terminal 113 the warning should be displayed on, the warning control device 104 refers to the in-terminal screen display target definition 109.

[0056] The inter-terminal backup definition 111 can be set by the user using the screen display unit 114. Every time a setting is carried out, the setting is recorded in the warning control device 104 as a file of the inter-terminal backup definition 111.

[0057] With the above functions of the inter-terminal backup unit 112, the absence of a user having the power to view a warning displayed on the display terminal 113 due to the stop of the display terminal, can be prevented. Also, the absence of user having the power to view a warning displayed on the display terminal 113 of the user due to a logout operation or the like by the user, can be prevented. Moreover, the lack of the function limitation on each AP in the above circumstances can be prevented.

[0058] FIG. 5 is a sequence diagram of the user setting by the warning display target corporate position number definition setting unit 108. A description is given below in order of the sequence of steps.

[0059] S1101: The warning display target corporate position number definition setting screen 300 is called from the screen display unit 114 of the display terminal 113.

[0060] S1102: The warning control device 104 acquired information of the login ID 302 of the user who is logged in to the area to be controlled by this warning control device 104, the corporate position 303 of the user who is logged in to the area to be controlled by this warning control device 104, and the corporate position number 304 univocally allocated to each corporate position 303.

[0061] S1103: Information about power such as the power with responsibility 312, the power for reference 313, or the - (no power) 314 over each of the current detailed scopes of monitoring 305 is acquired, corresponding to each corporate position number 304.

[0062] S1104: The display information of the warning display target corporate position number definition setting screen 300 is transmitted from the warning control device 104 to the display terminal 113.

[0063] S1105: The warning display target corporate position number definition setting screen 300 is displayed on the screen display unit 114 of the display terminal 113.

[0064] S1106: On the warning display target corporate position number definition setting screen 300, power such as the power with responsibility 312, the power for reference 313 or the - (no power) 314 is set by the user, corresponding to each corporate position 303.

[0065] S1107: The contents set in S1106 are transmitted from the display terminal 113 to the warning control device 104.

[0066] S1108: The warning control device 104 saves the setting contents.

[0067] FIG. 6 is a sequence diagram up to where a warning outputted from the traffic management server 101 is displayed on the display terminal 113. It is assumed that the user with the "corporate position D-1" as the corporate position number 304 is logged in to the display terminal 113.

[0068] A description is given below in order of the sequence of steps.

[0069] S1201: The traffic management server 101 outputs a warning.

[0070] S1202: The warning control device 104 acquires a warning message based on the information of the warning acquired from the traffic management server 101.

[0071] S1203: The position code attached to the warning message acquired in S1202 is acquired.

[0072] S1204: Which detailed scope of monitoring 305 the position code acquired in S1203 belongs to, is determined.

[0073] S1205: Power such as the power with responsibility 312, the power for reference 313 or the - (no power) 314 over the detailed scope of monitoring 305 determined in S1204 is referred to.

[0074] S1206: Based on the correspondence according to the function limitation setting 310 for each type of power over the detailed scope of monitoring 305 referred to in S1205, whether the display of the warning for each type of power is available or unavailable is acquired.

[0075] S1207: The corporate position number 304 for which the display of the warning is available according to the function limitation setting for each type of power, is decided as the warning display target.

[0076] S1208: The display terminal 113 used by the user having the corporate position number 304 decided as the display target is searched for, and the display terminal 113 as the warning display target is decided. Here, it is considered that each condition in the steps S1203 to S1207 is satisfied and that the display terminal 113 to which the user with the corporate position D-1 is logged in is decided as the warning display target.

[0077] S1209: The in-terminal screen display target decision unit 110 decides which screen display unit 114 the warning should be displayed on, of the decided display terminal 113.

[0078] S1210: The display information of the warning is transmitted from the warning control device 104 to the display terminal 113 to which the user with the corporate position D-1 is logged in.

[0079] S1211: The display terminal 113 to which the user with the corporate position D-1 is logged in, displays the warning.

[0080] FIG. 7 is a sequence diagram for setting function limitation to manual control at the traffic management server 101. A description is given below in order of the sequence of steps.

[0081] S1301: Whether control is available or unavailable with each type of power is acquired on the basis of the correspondence between each user' s power over the detailed scope of monitoring 305 and the function limitation to each type of power, referring to the warning display target corporate position number definition setting in the warning control device 104 from the traffic management server 101.

[0082] S1302: The manual control menu on the AP screen is masked according to the information of whether control is available or unavailable, acquired in S1301. If manual control is unavailable, the manual control menu can be masked.

[0083] S1303: The display information of the screen where the manual control menu is masked according to need in S1302 is transmitted from the traffic management server 101 to the display terminal 113.

[0084] S1304: The display terminal 113 transmits the received display information of the screen.

[0085] S1305: In the display on the display terminal 113, manual control operation is possible only within the range where the masking of the manual control menu carried out in S1302 to S1303 is not carried out.

[0086] S1306: In the case of carrying out the possible manual operation in S1305, the information of the manual control is transmitted from the display terminal 113 to the traffic management server 101.

[0087] FIG. 8 is a sequence diagram of inter-terminal

backup of a warning. It is assumed that the user with the "corporate position D-1" as the corporate position number 304 is logged in to one display terminal 113 and that the user with the "corporate position M-1" as the corporate position number 304 is logged in to the other display terminal 113. A description is given below in order of the sequence of steps.

[0088] S1401: The corporate position M-1 is set as the inter-terminal backup target of the corporate position D-1, according to the setting of inter-terminal backup targets by the inter-terminal backup unit 112.

[0089] S1402: The traffic management server 101 outputs a warning.

[0090] S1403 to S1404: The warning is displayed on the display terminal 113 to which the user with the corporate position D-1 is logged in, as in the steps S1202 to S1211.

[0091] S1405: The user with the corporate position D-1 carries out an operation to log out of the display terminal 113.

[0092] S1406: The warning control device 104 is notified that the user with the corporate position D-1 is logged out.

[0093] S1407: The inter-terminal backup unit 112 of the warning control device 104 determines whether inter-terminal back is needed or not.

[0094] S1408: If it is determined in S1407 that backup is needed, the corporate position 304 of the user who is currently logged in to the display terminal 113 is acquired.

[0095] S1409: The inter-terminal backup definition 111 is acquired.

[0096] S1410: Based on the inter-terminal backup definition 111, the inter-terminal backup target of the corporate position D-1 is determined. Hereinafter, the case where the inter-terminal backup target of the corporate position D-1 is determined as the corporate position M-1 will be described.

[0097] S1411: The power of the corporate position D-1 over each detailed scope of monitoring is shifted to the corporate position M-1, referring to the function limitation setting 310 by the warning display target corporate position number definition setting unit 108.

[0098] S1412: The warning display target corporate position number definition 107 is updated.

[0099] S1413: The screen number 400 where the warning is to be displayed is decided, using the in-terminal screen display target decision unit 110.

[0100] S1414: The display information of the warning displayed on the display terminal 113 to which the user with the corporate position D-1 was logged in until logout, is transmitted to the display terminal 113 to which the user with the corporate position M-1 as the backup target is currently logged in.

[0101] S1415: The warning is displayed on the display terminal 113 to which the user with the corporate position M-1 is currently logged in.

[0102] Similarly, inter-terminal backup is possible using the inter-terminal backup unit 112 in the case of the function limitation setting 310 on items other than warning display, such as manual control.

[0103] By thus carrying out inter-terminal backup, it is possible to shift the power over warning and controls to the display terminal 113 used by the user with proper power. Therefore, proper function limitation can be imposed on an AP used by a user and a warning can be displayed to a proper user, without fixing the installing site and use of the display terminal 113, and the user using the display terminal 113.

[0104] FIG. 9 is a flowchart of processing to decide a warning display target corporate position number. The flow of the processing is described below in order of the steps of the processing flow. The agent of this processing is the warning display target corporate position number definition setting unit 108.

[0105] Warning display target decision processing

[0106] S801: The warning message is acquired on the basis of information of a warning received from the traffic management server 101.

[0107] S802: The position code attached to the warning message acquired in S801 is acquired.

[0108] S803: The warning display target corporate position number definition 107 is referred to.

[0109] S804: Whether the position code acquired in S802 belongs to the detailed scope of monitoring 305 is determined, referring to the detailed scope of monitoring 305 according to the warning display target corporate position number definition 107. If the position code acquired in S802 belongs to the detailed scope of monitoring 305, the processing shifts to S805. If the position code acquired in S802 does not belong to the detailed scope of monitoring 305, the processing ends.

[0110] S805: The function limitation setting to each type of power, of the power with responsibility 312, the power for reference 313 and the - (no power) 314, is acquired.

[0111] S806: The corporate position number 304 with which the position code acquired in S802 belongs to the detailed scope of monitoring 305 and which has such power that the warning display is available according to the setting in S805 over the detailed scope of monitoring, is returned.

[0112] FIG. 10 is a flowchart showing processing of inter-terminal backup. A description is given below in order of the steps of the processing flow.

Inter-terminal backup processing

[0113] S1001: The startup or stop state and the login or logout state of the display terminal 113, and the corporate position number of the user logging in there, are acquired.

[0114] S1002: Whether the state of the display terminal 113 is the stop or logout state or not is determined. If the state of the display terminal 113 is the stop or logout state, the processing shifts to S1003 as inter-terminal backup is considered necessary. If the state of the display

terminal is not the stop or logout state, the processing ends as inter-terminal backup is considered unnecessary.

[0115] S1003: The corporate position number 304 of the backup source is acquired.

[0116] S1004: The corporate position number of the user who is currently logged in is acquired, referring to the warning display target corporate position number definition 107.

[0117] S1005: The inter-terminal backup definition 111 is acquired and the backup target corporate position number 501 is acquired.

[0118] S1006: If the display terminal 113 belongs to the backup target corporate position number 501, the processing shifts to S1007. If the display terminal 113 does not belong to the backup target corporate position number 501, the processing ends.

[0119] S1007: The power is shifted to the backup target corporate position number 501.

[0120] S1008: The in-terminal screen display target screen number is acquired via the processing by the in-terminal screen display target decision unit 110.

[0121] S1009: A warning is displayed.

[0122] As described above, according this embodiment, the following specific problems can be solved.

(1) If the user of one display terminal is replaced by another user with a different role, or if a user carries out a task using a different display terminal from the display terminal which the user has used up until then, it is desired that the display terminal should correctly output a warning corresponding to the user's power at that point. However, in the conventional traffic management system, since such forms of use are not considered, a proper warning for a proper user cannot be presented in some cases.

(2) The traffic management system has a plurality of applications (APs) such as a traffic display screen which shows the positions of trains on lines to allow manual control and a rescheduling screen which shows timetables to allow rescheduling. In the case where users have different types of power, as described above, it is desired that centralized management of functions that can be used by each user should be conducted by the system and that limitation should be imposed thereon according to the users' power, in order to prevent any user from conducting control beyond their power. However, in the conventional traffic management system, such function limitation to the users cannot be set.

(3) In the traffic management task, a technique in which a target region is divided into a plurality of regions to split the task to is employed in many cases. It is also desired that a region which each user is in charge of is set and that the region which each user is in charge of can be flexibly changed according to the state (number of people, on-season/off-season, troubleshooting) or the like during the application. However, in the conventional traffic management system, a region cannot be variably set to each user in this way.

(4) In the traffic management task carried out by a user, there are cases where the user carries out the task while viewing both the traffic display screen and the rescheduling screen, as in the case of checking the display of the positions of trains on lines while viewing the display of timetables. In such cases, it is desired that both the traffic display screen and the rescheduling screen are displayed on one display terminal. However, in the conventional traffic management system, if a plurality of AP screens is displayed on one display terminal, there is a risk that a warning from the traffic management server cannot be displayed on a proper AP screen decided in view of the user's power.

(5) In cases such as where the display on the display terminal in the traffic management system has stopped for some reasons, for example, the user may log out of the display terminal. In the traffic management system, it is desired that, even in such cases, a warning displayed on the display terminal until then will not disappear. However, in the conventional traffic management system, there is a risk that the management of a warning displayed cannot be properly continued in view of the user's power, in such cases as where the user logs out.

[0123] Against these problems, the embodiment can achieve the following effects and advantages.

(1) With the above-described functions of the warning display target corporate position number definition setting unit 108 and the inter-terminal backup unit 112, a warning can be displayed on a proper display terminal 113 according to the user's power even if the user changes the display terminal 113 used.

(2) With the above-described functions of the warning display target corporate position number definition setting unit 108 and the inter-terminal backup unit 112, function limitation can be imposed on APs according to the user's power.

(3) With the above-described functions of the warning display target corporate position number definition setting unit 108, regions which users are in charge of can be made variable and the regions which the user are in charge of an be flexibly changed according to the state (number of people, on-season/off-season, troubleshooting) or the like during the application. Also, the warning display target and the function limitation to the users can be changed in response to the change to the regions which the users are in charge of.

(4) With the above-described functions of the in-terminal screen display target decision unit 110, even if a plurality of APs is displayed on a plurality of

screen display units 114 of one display terminal 113, a warning can be displayed on a proper AP screen. (5) With the above-described functions of the inter-terminal backup unit 112, when the display terminal 113 has stopped or when a logout operation is carried out by the user, the disappearance of a currently displayed warning and the lack of function limitation to the user can be prevented.

[0124] Also, based on the above (1) to (5), improvement in flexibility in personnel deployment for the traffic management task and improvement in certainty of warning recognition are achieved.

[0125] The embodiment describes an example where the warning control device 104 is an independent device, as a matter of convenience for explanation. However, the invention is not limited to this example. Depending on the use of the system, the warning control device 104 may be installed within the same hardware as the traffic management server 101 or the display terminal 113.

[0126] Also, the above embodiment of the invention is the description of an example for explaining the invention and is not intended to limit the scope of the invention to the embodiment. A person skilled in the art can carry out the invention in various forms without departing from the essential features of the invention.

Reference Signs List

[0127] 100 ... LAN, 101 ... traffic management server, 102 ... warning generation unit, 104 ... warning control device, 107 ... warning display target corporate position number definition, 108 ... warning display target corporate position number definition setting unit, 109 ... in-terminal screen display target definition, 110 ... in-terminal screen display target decision unit, 111 ... inter-terminal backup definition, 112 ... inter-terminal backup unit, 113 ... display terminal, 114 ... screen display unit, 300 ... warning display target corporate position number definition setting screen, 301 ... terminal number, 302 ... login ID, 303 ... corporate position, 304 ... corporate position number, 305 ... detailed scope of monitoring, 310 ... function limitation setting screen, 312 ... power with responsibility, 313 ... power for reference, 400 ... screen number, 401 ... display AP, 501 ... backup target corporate position number

Claims

1. A notification control device for causing a display terminal to display a notification issued by a traffic management server in a traffic management system, the device comprising:

   a display target user definition holding unit which holds a display target user definition which takes correspondence between a display terminal, a user who is logged in to the display terminal, and power given to the user; and

   a display target user setting unit which, when a notification is received from the traffic management server, extracts a display terminal to which a user whose power covers the notification is logged in, on the basis of the display target user definition, and decides the extracted display terminal as a display target of the notification.

2. The notification control device according to claim 1, wherein

   the power given to the user according to the display target user definition includes reference power with which the user can receive notifications and power with responsibility with which the user can carry out confirmation response to notifications, and

   the display target user setting unit, when a notification is received from the traffic management server, extracts a display terminal to which a user whose power covers the notification is logged in, and which of the power for reference and the power with responsibility is given to the user over the notification, on the basis of the display target user definition, and the display target user setting unit causes the display terminal to display the notification and a screen for carrying out confirmation response to the notification if the user is given the power with responsibility, and causes the display terminal to display the notification only, if the user is given the power for reference.

3. The notification control device according to claim 1, wherein the notification is a warning.

4. The notification control device according to claim 3, wherein

   as for the power given to the user according to the display target user definition, whether the power is given to the user or not is set for each predetermined scope of monitoring to which a monitoring target belongs, and

   the display target user setting unit, when a notification is received from the traffic management server, examines the scope of monitoring to which the monitoring target of the warning belongs, then extracts a display terminal to which a user given the power over the scope of monitoring is logged in, and causes the extracted display terminal to display the warning.

5. The notification control device according to claim 1, wherein

   the display terminal has a plurality of display screens, and

   the device further comprises:

   an in-terminal screen display target definition holding unit which holds an in-terminal screen display target definition indicating which appli-

cation is displayed on which display screen, of the plurality of display screens; and
an in-terminal screen display target decision unit, when causing the display terminal to display the notification, extracts a display screen where an application related to the notification is displayed, on the basis of the in-terminal screen display target definition, and decides the extracted display screen as a display screen where the notification is to be displayed.

6. The notification control device according to claim 1, further comprising:

an inter-terminal backup definition holding unit which holds an inter-terminal backup definition which takes correspondence between a first user and a second user who, when the first user cannot conduct an action within the power given, can conduct the action within the power instead of the first user; and
an inter-terminal backup unit which extracts the second user corresponding to the first user according to the inter-terminal backup definition when a notification within the power given to the first user cannot be displayed on the display terminal to which the first user is logged in, and which extracts the display terminal to which the second user is logged in, on the basis of the display target user definition, and decides the extracted display terminal as a display target of the notification.

7. The notification control device according to claim 6, wherein the inter-terminal backup unit determines that it is a state where the notification cannot be displayed on the display terminal to which the first user is logged in, when the first user is not logged in to any display terminal, or when the display terminal to which the first user is logged in has stopped.

8. A traffic management system comprising:

a display terminal which displays a screen related to railway traffic;
a control device which holds a display target user definition which takes correspondence between the display terminal, a user who is logged in to the display terminal, and power given to the user; and
a traffic management server which grasps the correspondence between the display terminal and the power given to the user who is logged in to the display terminal, referring to the display target user definition in the control device, and transmits, to the display terminal, information of a display screen for permitting manual control within the power given to the user who is logged in to the display terminal.

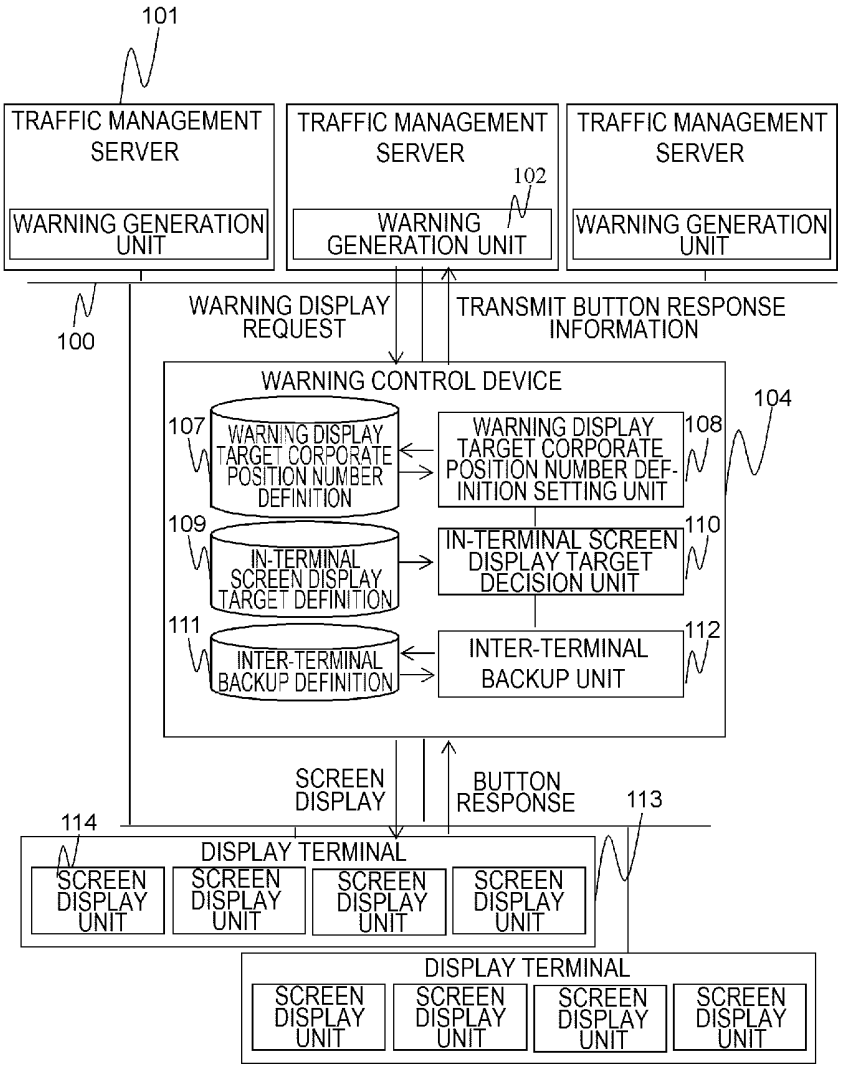
9. The traffic management system according to claim 8, wherein
the traffic management server transmits information of a display screen where a display part for allowing a user to execute the manual control is masked, to a display terminal to which a user whose power does not cover the manual control is logged in.

10. A display control method for causing a display terminal to display a notification issued by a traffic management server in a traffic management system, the method comprising:

holding a display target user definition which takes correspondence between a display terminal, a user who is logged in to the display terminal, and power given to the user;
extracting a display terminal to which a user whose power covers a notification to be displayed is logged in, on the basis of the display target user definition; and
deciding the extracted display terminal as a display target of the notification.

11. The display control method according to claim 10, further comprising
transmitting, to a display terminal, information of a display screen for permitting manual control within the power given to a user who is logged in to the display terminal, on the basis of the display target user definition.

[FIG. 1]



[FIG. 2A]

AREA TO BE CONTROLLED 1

301 302 303 304 305

TERMINAL NUMBER	LOGIN ID	CORPORATE POSITION	DETAILED SCOPE OF MONITORING/ CORPORATE POSITION NUMBER	DETAILED SCOPE OF MONITORING 1	DETAILED SCOPE OF MONITORING 2	DETAILED SCOPE OF MONITORING 3	...	DETAILED SCOPE OF MONITORING16
TERMINAL 1	123456789	CORPORATE POSITION D	CORPORATE POSITION D-1	POWER WITH RESPONSIBILITY	POWER WITH RESPONSIBILITY	-		-
TERMINAL 2	789123456	CORPORATE POSITION D	CORPORATE POSITION D-2	-	-	POWER WITH RESPONSIBILITY		-
TERMINAL 3	abc123456	CORPORATE POSITION S	CORPORATE POSITION S-1	-	-	-		-
TERMINAL 4	cde234567	CORPORATE POSITION I	CORPORATE POSITION I-1	POWER FOR REFERENCE	POWER FOR REFERENCE	POWER FOR REFERENCE		POWER FOR REFERENCE
TERMINAL 5	345678abc	CORPORATE POSITION M	CORPORATE POSITION M-1	-	-	-		-
TERMINAL 6	11222234	CORPORATE POSITION L	CORPORATE POSITION L-1	-	-	-		-

300

[FIG. 2B]

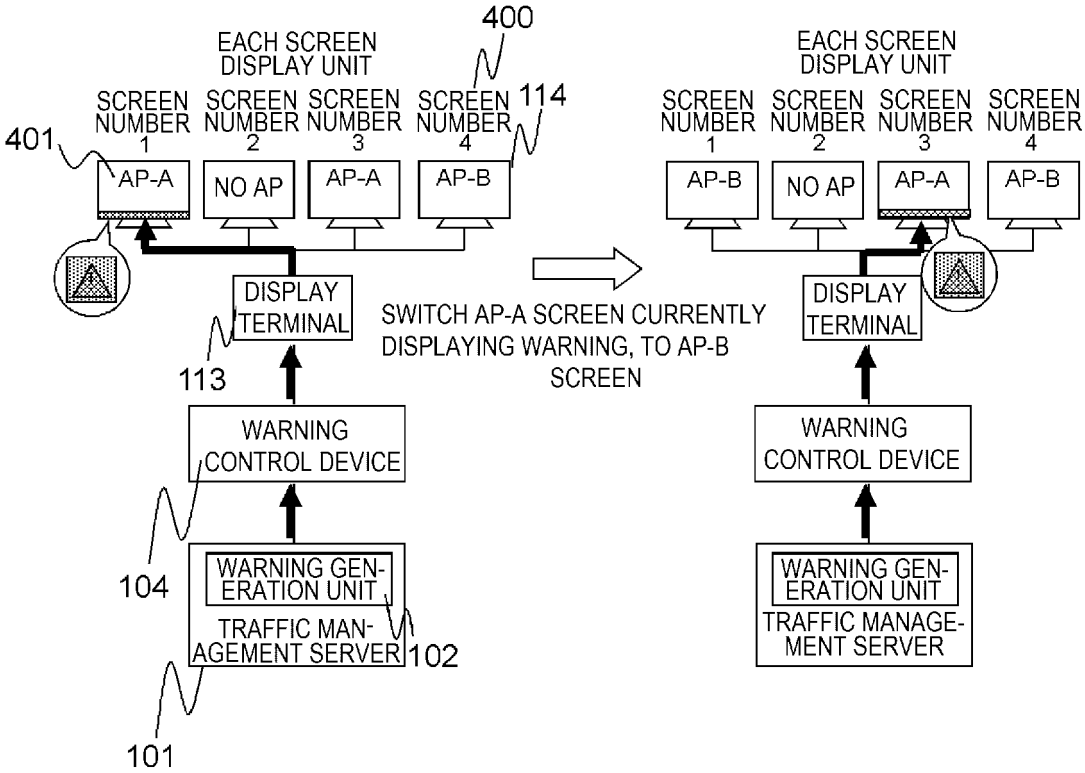
FUNCTION LIMITATION TO EACH TYPE OF POWER

311 312 313 314

POWER / WARNING AND CONTROL	POWER WITH RESPONSIBILITY	POWER FOR REFERENCE	-
WARNING DISPLAY	AVAILABLE	AVAILABLE	UN-AVAILABLE
WARNING DISPLAY WITH RESPONSE BUTTON	AVAILABLE	UN-AVAILABLE	UN-AVAILABLE
WIDE-AREA SCREEN DISPLAY	AVAILABLE	AVAILABLE	AVAILABLE
DETAILED SCREEN DISPLAY	AVAILABLE	AVAILABLE	UN-AVAILABLE
MANUAL CONTROL	AVAILABLE	UN-AVAILABLE	UN-AVAILABLE
SENDING PHONE CALLS FROM ON-SITE EQUIPMENT	AVAILABLE	AVAILABLE	UN-AVAILABLE
RECEIVING PHONE CALLS FROM ON-SITE EQUIPMENT	AVAILABLE	UN-AVAILABLE	UN-AVAILABLE

310

[FIG. 3]



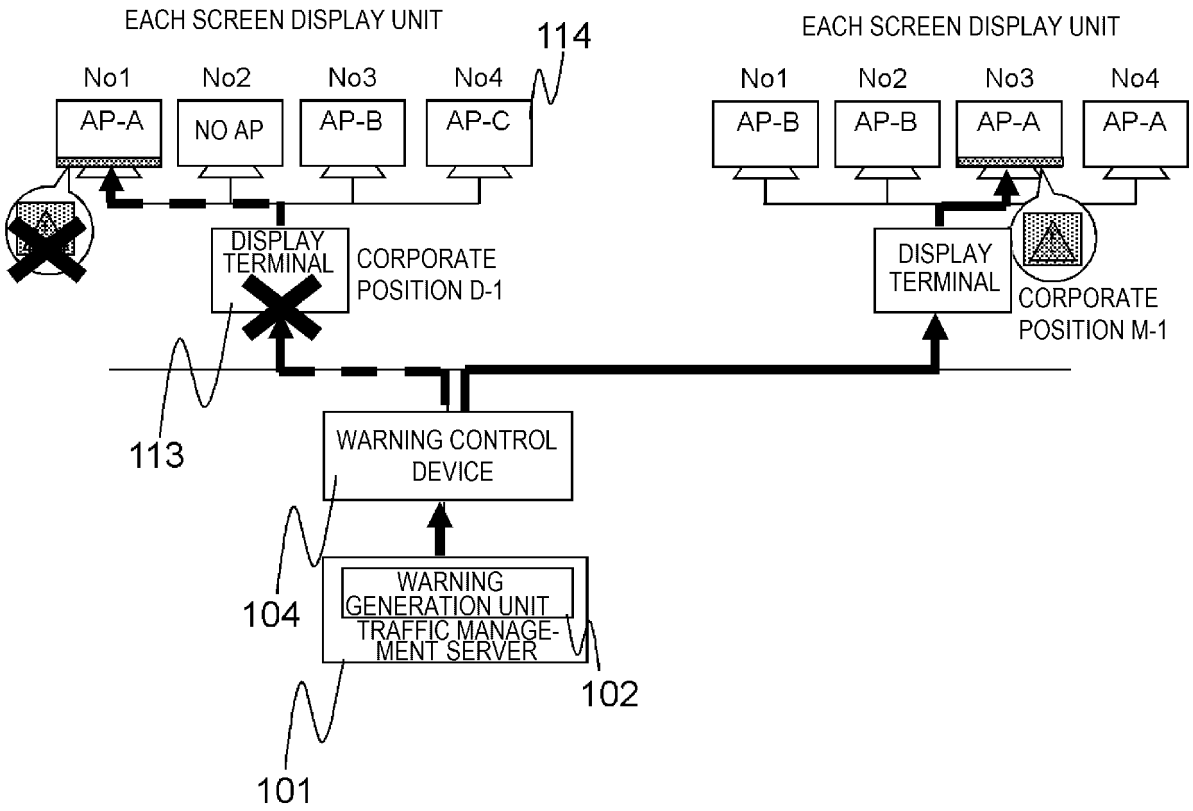
[FIG. 4A]

111

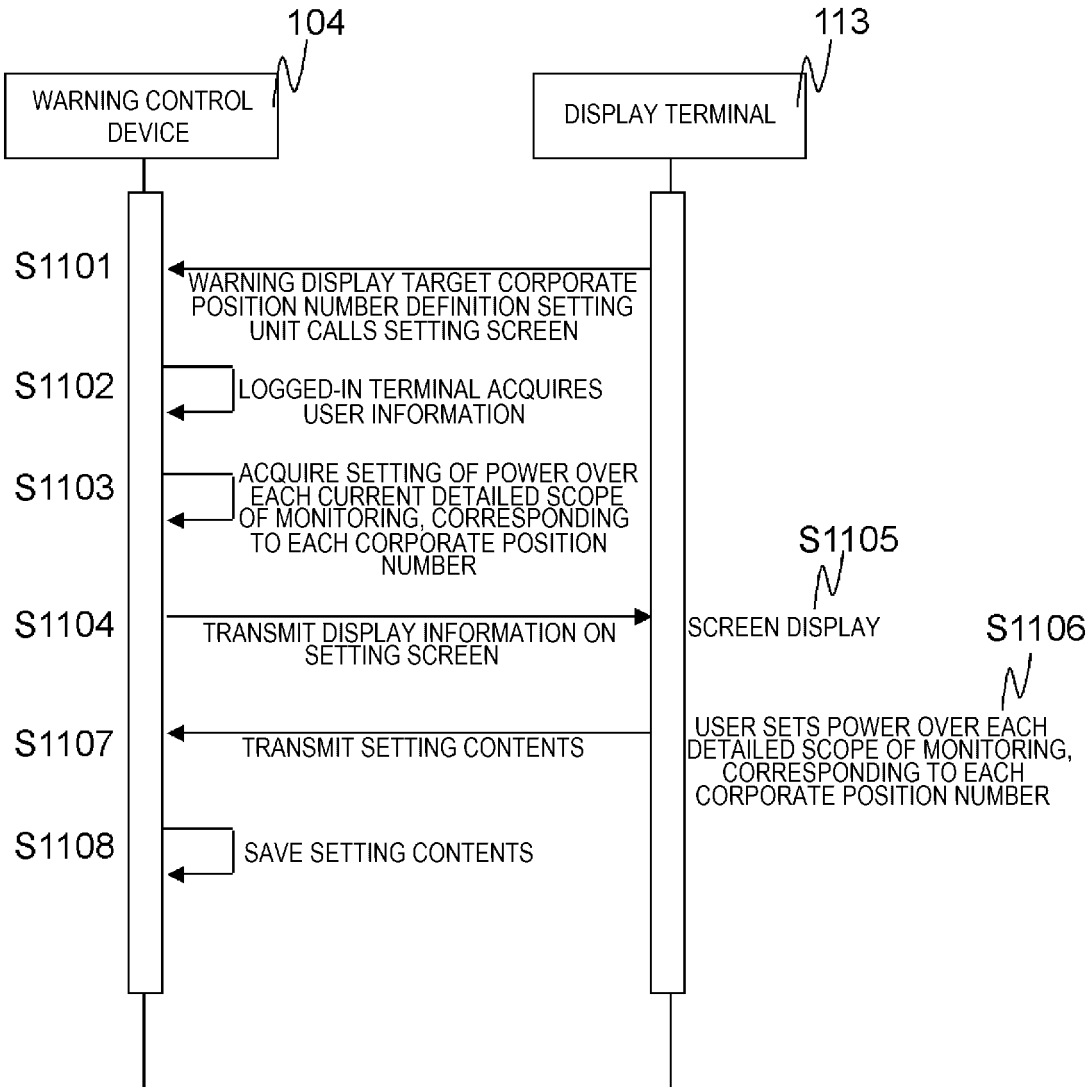
304 502

CORPORATE POSITION NUMBER	BACKUP TARGET CORPORATE POSITION NUMBER
CORPORATE POSITION D-1	CORPORATE POSITION M-1
CORPORATE POSITION D-2	CORPORATE POSITION M-1
CORPORATE POSITION S-1	CORPORATE POSITION L-1
CORPORATE POSITION I-1	CORPORATE POSITION L-1
CORPORATE POSITION M-1	CORPORATE POSITION I-1

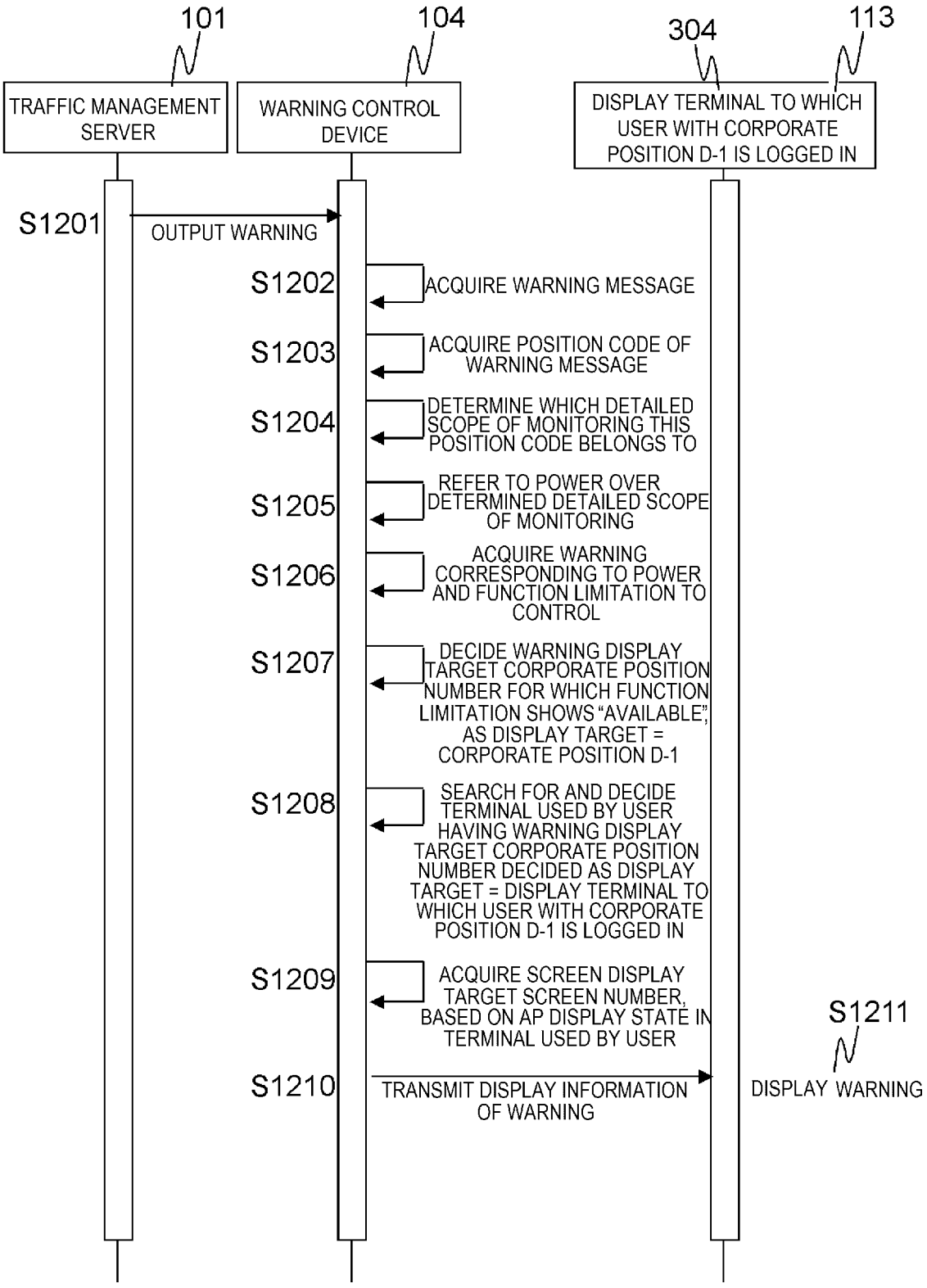
[FIG. 4B]



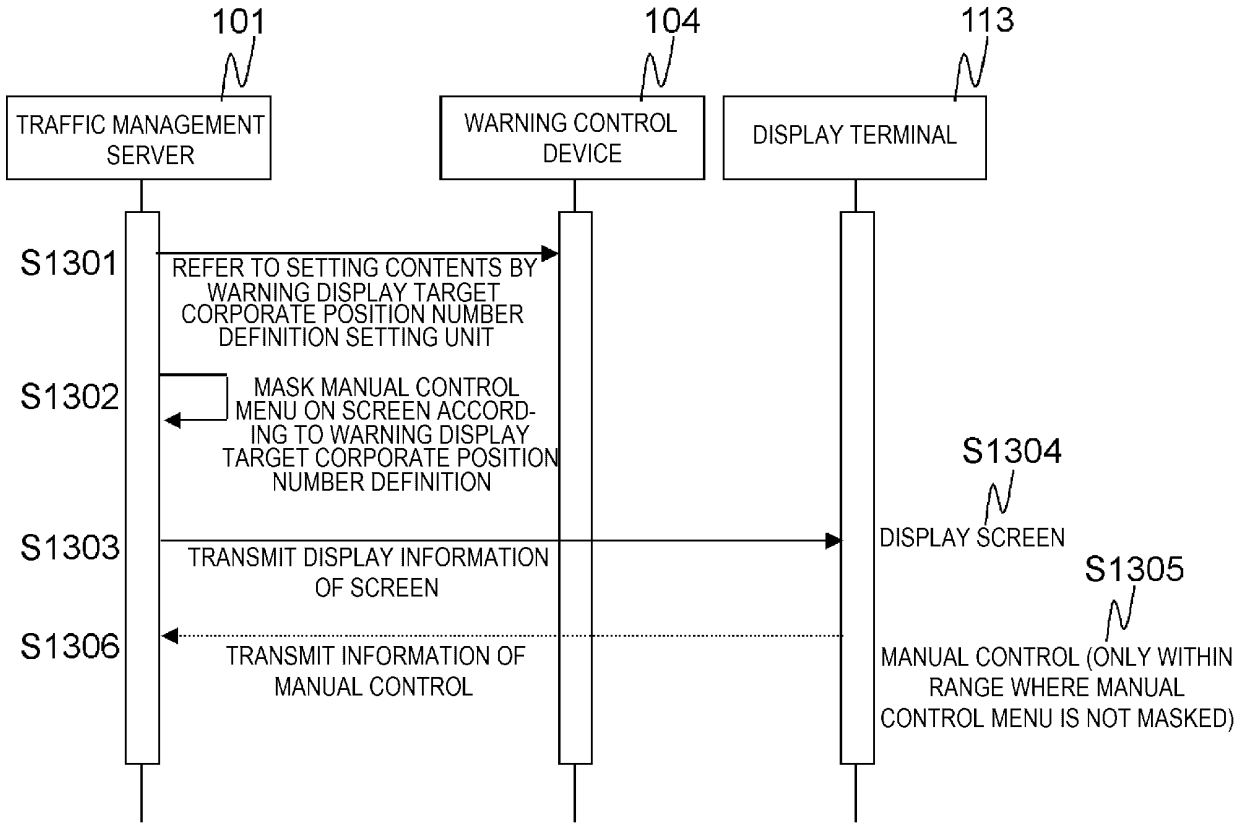
[FIG. 5]


104
113
WARNING CONTROL DEVICE
DISPLAY TERMINAL
S1101
WARNING DISPLAY TARGET CORPORATE POSITION NUMBER DEFINITION SETTING UNIT CALLS SETTING SCREEN
S1102
LOGGED-IN TERMINAL ACQUIRES USER INFORMATION
S1103
ACQUIRE SETTING OF POWER OVER EACH CURRENT DETAILED SCOPE OF MONITORING, CORRESPONDING TO EACH CORPORATE POSITION NUMBER
S1105
S1104
TRANSMIT DISPLAY INFORMATION ON SETTING SCREEN
SCREEN DISPLAY
S1106
S1107
TRANSMIT SETTING CONTENTS
USER SETS POWER OVER EACH DETAILED SCOPE OF MONITORING, CORRESPONDING TO EACH CORPORATE POSITION NUMBER
S1108
SAVE SETTING CONTENTS

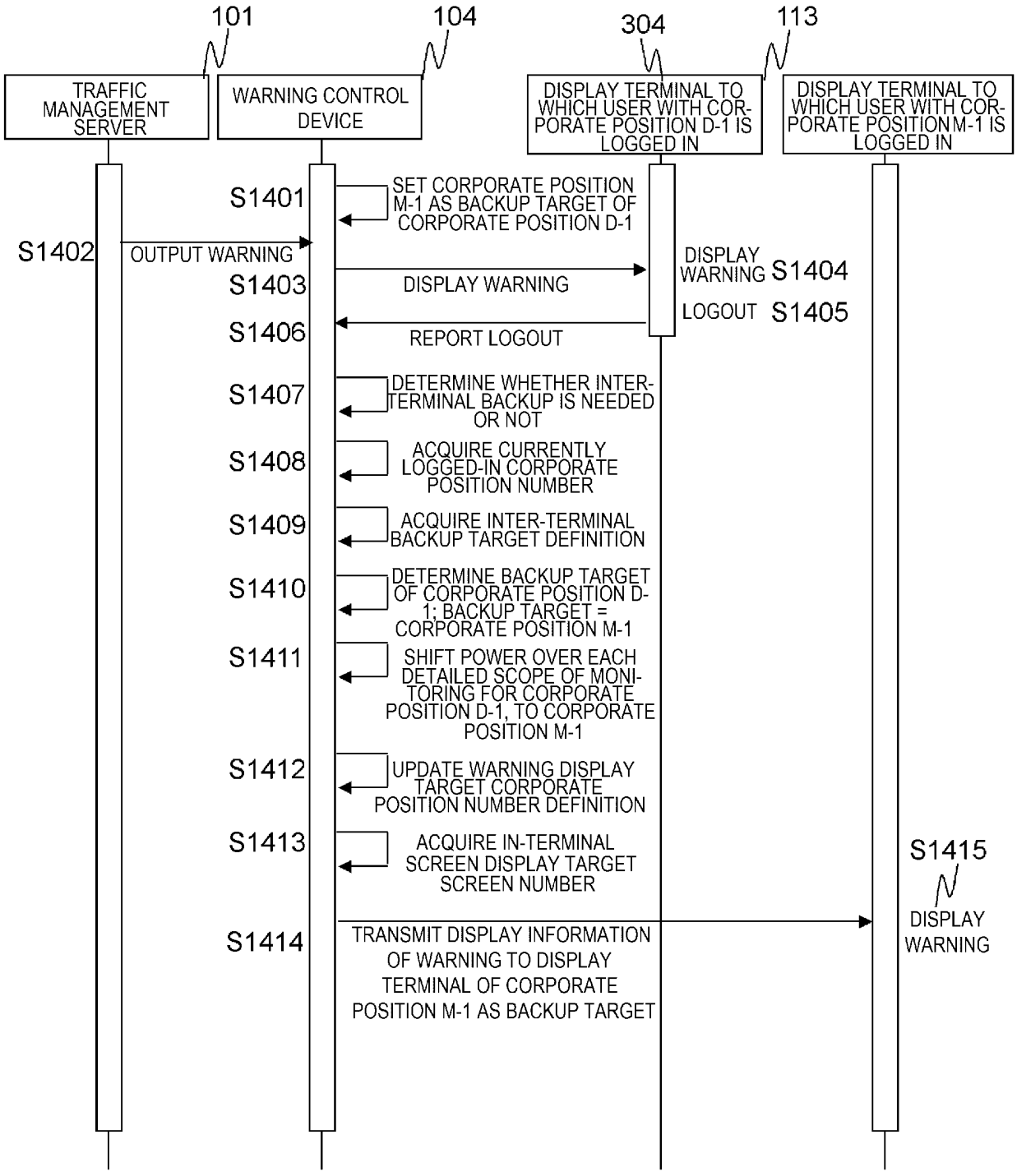
[FIG. 6]


101
104
304
113
TRAFFIC MANAGEMENT SERVER
WARNING CONTROL DEVICE
DISPLAY TERMINAL TO WHICH USER WITH CORPORATE POSITION D-1 IS LOGGED IN
S1201
OUTPUT WARNING
S1202
ACQUIRE WARNING MESSAGE
S1203
ACQUIRE POSITION CODE OF WARNING MESSAGE
S1204
DETERMINE WHICH DETAILED SCOPE OF MONITORING THIS POSITION CODE BELONGS TO
S1205
REFER TO POWER OVER DETERMINED DETAILED SCOPE OF MONITORING
S1206
ACQUIRE WARNING CORRESPONDING TO POWER AND FUNCTION LIMITATION TO CONTROL
S1207
DECIDE WARNING DISPLAY TARGET CORPORATE POSITION NUMBER FOR WHICH FUNCTION LIMITATION SHOWS "AVAILABLE", AS DISPLAY TARGET = CORPORATE POSITION D-1
S1208
SEARCH FOR AND DECIDE TERMINAL USED BY USER HAVING WARNING DISPLAY TARGET CORPORATE POSITION NUMBER DECIDED AS DISPLAY TARGET = DISPLAY TERMINAL TO WHICH USER WITH CORPORATE POSITION D-1 IS LOGGED IN
S1209
ACQUIRE SCREEN DISPLAY TARGET SCREEN NUMBER, BASED ON AP DISPLAY STATE IN TERMINAL USED BY USER
S1210
TRANSMIT DISPLAY INFORMATION OF WARNING
S1211
DISPLAY WARNING

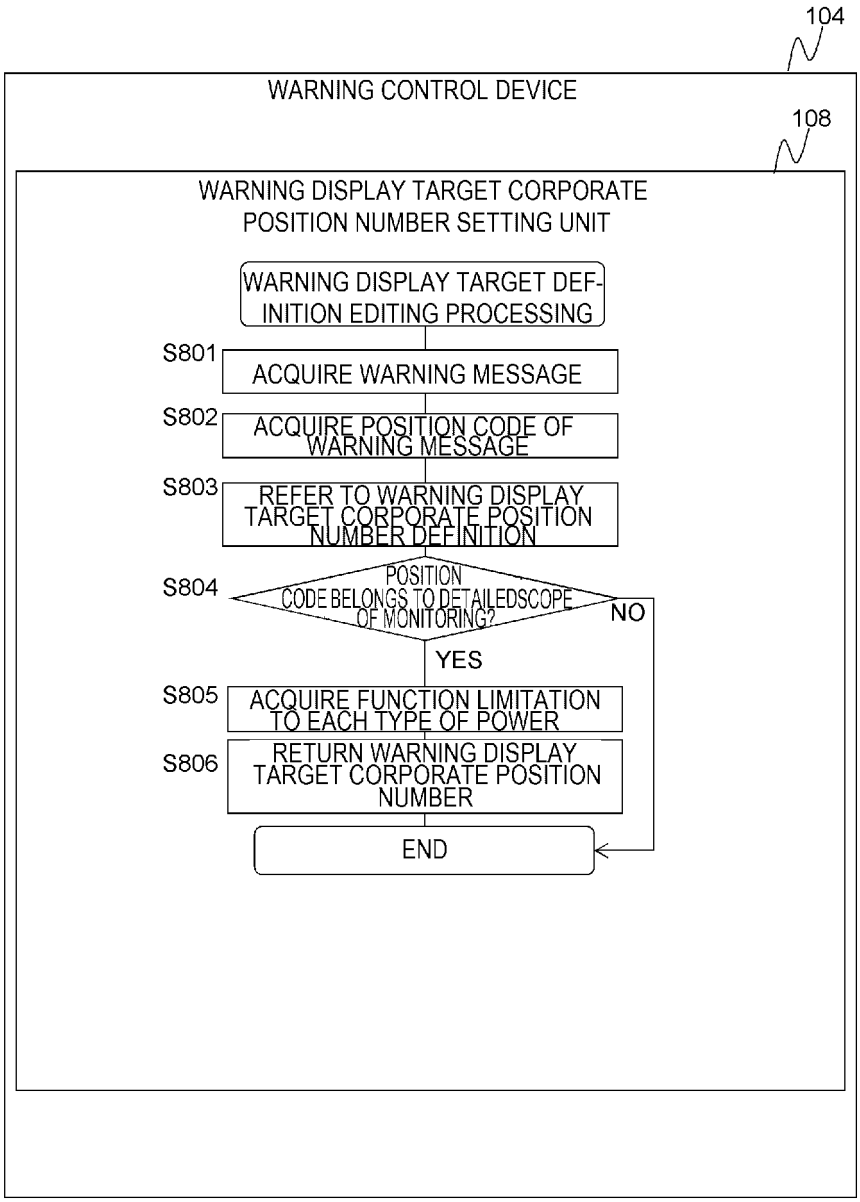
[FIG. 7]


101
104
113
TRAFFIC MANAGEMENT SERVER
WARNING CONTROL DEVICE
DISPLAY TERMINAL
S1301
REFER TO SETTING CONTENTS BY WARNING DISPLAY TARGET CORPORATE POSITION NUMBER DEFINITION SETTING UNIT
S1302
MASK MANUAL CONTROL MENU ON SCREEN ACCORDING TO WARNING DISPLAY TARGET CORPORATE POSITION NUMBER DEFINITION
S1304
DISPLAY SCREEN
S1303
TRANSMIT DISPLAY INFORMATION OF SCREEN
S1305
MANUAL CONTROL (ONLY WITHIN RANGE WHERE MANUAL CONTROL MENU IS NOT MASKED)
S1306
TRANSMIT INFORMATION OF MANUAL CONTROL

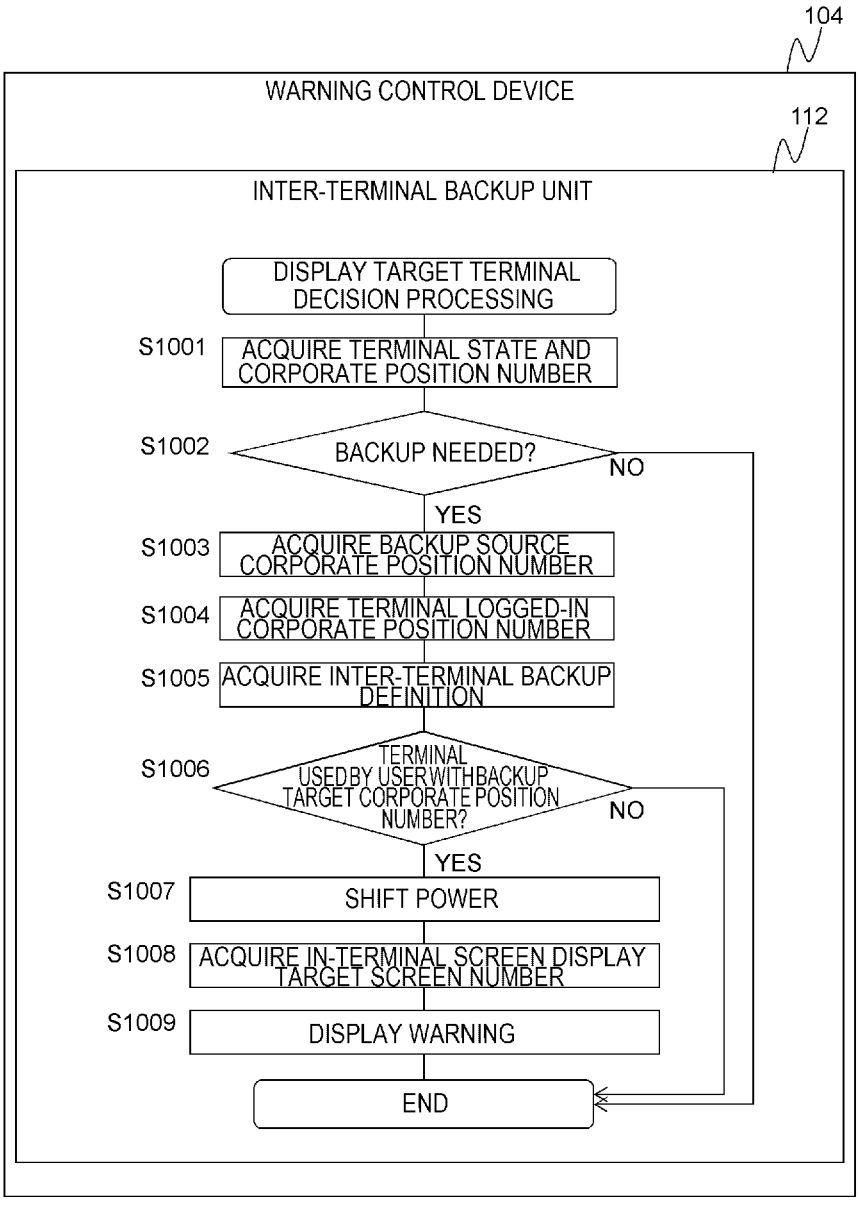
[FIG. 8]


101
104
304
113
TRAFFIC MANAGEMENT SERVER
WARNING CONTROL DEVICE
DISPLAY TERMINAL TO WHICH USER WITH CORPORATE POSITION D-1 IS LOGGED IN
DISPLAY TERMINAL TO WHICH USER WITH CORPORATE POSITION M-1 IS LOGGED IN
S1401
SET CORPORATE POSITION M-1 AS BACKUP TARGET OF CORPORATE POSITION D-1
S1402
OUTPUT WARNING
S1403
DISPLAY WARNING
DISPLAY WARNING S1404
LOGOUT S1405
S1406
REPORT LOGOUT
S1407
DETERMINE WHETHER INTER-TERMINAL BACKUP IS NEEDED OR NOT
S1408
ACQUIRE CURRENTLY LOGGED-IN CORPORATE POSITION NUMBER
S1409
ACQUIRE INTER-TERMINAL BACKUP TARGET DEFINITION
S1410
DETERMINE BACKUP TARGET OF CORPORATE POSITION D-1; BACKUP TARGET = CORPORATE POSITION M-1
S1411
SHIFT POWER OVER EACH DETAILED SCOPE OF MONITORING FOR CORPORATE POSITION D-1, TO CORPORATE POSITION M-1
S1412
UPDATE WARNING DISPLAY TARGET CORPORATE POSITION NUMBER DEFINITION
S1413
ACQUIRE IN-TERMINAL SCREEN DISPLAY TARGET SCREEN NUMBER
S1414
TRANSMIT DISPLAY INFORMATION OF WARNING TO DISPLAY TERMINAL OF CORPORATE POSITION M-1 AS BACKUP TARGET
S1415
DISPLAY WARNING

[FIG. 9]


104
WARNING CONTROL DEVICE
108
WARNING DISPLAY TARGET CORPORATE POSITION NUMBER SETTING UNIT
WARNING DISPLAY TARGET DEF-INITION EDITING PROCESSING
S801
ACQUIRE WARNING MESSAGE
S802
ACQUIRE POSITION CODE OF WARNING MESSAGE
S803
REFER TO WARNING DISPLAY TARGET CORPORATE POSITION NUMBER DEFINITION
S804
POSITION CODE BELONGS TO DETAILEDSCOPE OF MONITORING?
NO
YES
S805
ACQUIRE FUNCTION LIMITATION TO EACH TYPE OF POWER
S806
RETURN WARNING DISPLAY TARGET CORPORATE POSITION NUMBER
END

[FIG. 10]


104
WARNING CONTROL DEVICE
112
INTER-TERMINAL BACKUP UNIT
DISPLAY TARGET TERMINAL DECISION PROCESSING
S1001
ACQUIRE TERMINAL STATE AND CORPORATE POSITION NUMBER
S1002
BACKUP NEEDED?
NO
YES
S1003
ACQUIRE BACKUP SOURCE CORPORATE POSITION NUMBER
S1004
ACQUIRE TERMINAL LOGGED-IN CORPORATE POSITION NUMBER
S1005
ACQUIRE INTER-TERMINAL BACKUP DEFINITION
S1006
TERMINAL USED BY USER WITH BACKUP TARGET CORPORATE POSITION NUMBER?
NO
YES
S1007
SHIFT POWER
S1008
ACQUIRE IN-TERMINAL SCREEN DISPLAY TARGET SCREEN NUMBER
S1009
DISPLAY WARNING
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/065013

A. CLASSIFICATION OF SUBJECT MATTER
B61L23/02(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)
B61L23/02

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 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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.
X Y	JP 2013-86682 A (Toshiba Corp.), 13 May 2013 (13.05.2013), paragraphs [0003], [0011] to [0032], [0036], [0046] & WO 2013/057875 A1	1-4,6-8, 10-11 5,9
Y	JP 3-232062 A (Hitachi, Ltd.), 16 October 1991 (16.10.1991), claim 1 (Family: none)	5
Y	JP 2008-4026 A (Yokogawa Electric Corp.), 10 January 2008 (10.01.2008), paragraph [0033] & US 2008/0010042 A1 & EP 1881430 A1	9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 June, 2014 (25.06.14)	08 July, 2014 (08.07.14)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

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Patent documents cited in the description

- JP 10147242 A **[0005]**