

OPERATING STATE DISPLAY APPARATUS FOR BUILDING FACILITY AND  
OPERATING STATE DISPLAY METHOD FOR BUILDING FACILITY

BACKGROUND

Technical Field

[0001]

The present invention relates to an operating state display apparatus for a building facility such as an elevator and an operating state display method for a building facility.

Related Art

[0002]

Conventionally, there is a technique of, when an elevator fails, visualizing the operating state of the elevator to a customer to suppress uneasiness of a building owner or a user of the building facility. In general, information regarding the operating state of the elevator is displayed on a dashboard prepared as a part of a customer-side facility, or is distributed by e-mail.

[0003]

For example, JP 2019-116377 A describes that a screen including an elevator state display field, an estimated recovery time display field indicating a failure recovery time, and a status bar indicating a recovery work progress status is displayed on a dashboard on the customer side.

SUMMARY

[0005]

By the way, in the technique disclosed in JP 2019-116377 A, the operating state can be confirmed for each elevator, but the operating states of a plurality of facilities installed in one building or a plurality of buildings (hereinafter referred to as the "building facilities") cannot be confirmed. Therefore, the building owner or the building management company cannot intuitively grasp all the building facilities to be managed, and it takes a lot of time and cost to confirm the operating states of all the building facilities.

[0006]

In view of the above situation, there has been a demand for a method by which a user can intuitively grasp the operating states of all of the plurality of building facilities installed in one or more buildings.

[0007]

In order to solve the above problems, the operating state display apparatus for a building facility according to an aspect of the present invention is an operating state display apparatus for a building facility including: a display control unit that collects information indicating an operating state of a facility provided in one or more buildings and displays the information on a screen; and an input apparatus that accepts an operation input of a user, in which the display control unit is configured to display

a plurality of icons provided for each building facility in a row on one screen, cyclically move the plurality of icons on the screen in response to an operation input in a column direction to the input apparatus, and when the icon moves to a designated area set within a cyclic movement range, display on the screen information of the operating state of the building facility indicated by the icon in the designated area.

[0008]

According to at least one aspect of the present invention, since the operating states of all of the plurality of building facilities installed in one or more buildings are displayed on one screen, the user can intuitively grasp the operating states of all of the plurality of building facilities.

Problems, configurations, and effects other than those described above will be clarified by the description of embodiments described below.

#### BRIEF DESCRIPTION OF DRAWINGS

[0009]

FIG. 1 is a diagram illustrating an overall configuration example of an operating state display system for a building facility according to a first embodiment of the present invention;

FIG. 2 is a diagram illustrating a hardware configuration example of a calculator included in each

apparatus constituting the operating state display system for a building facility according to the first embodiment of the present invention;

FIG. 3 is a diagram illustrating an example of a customer information DB provided in a visualization apparatus of the operating state display system for a building facility according to the first embodiment of the present invention;

FIG. 4 is a diagram illustrating an example of a service menu management DB provided in the visualization apparatus of the operating state display system for a building facility according to the first embodiment of the present invention;

FIG. 5 is a diagram illustrating a display example of an operating state confirmation screen before a building facility icon operation according to the first embodiment of the present invention;

FIG. 6 is a diagram illustrating a display example of an operating state confirmation screen after a building facility icon operation according to the first embodiment of the present invention;

FIG. 7 is a diagram illustrating a display example of an operating state confirmation screen according to the first embodiment of the present invention; FIG. 8 is a diagram illustrating a display example of a plurality of types of building facility icons according to the first embodiment of the present invention;

FIG. 9 is a flowchart illustrating a procedure example of operating state confirmation screen generation processing according to the first embodiment of the present invention;

FIG. 10 is a diagram illustrating a display example of an operating state confirmation screen according to a second embodiment of the present invention; and

FIG. 11 is a flowchart illustrating a procedure example of operating state confirmation screen generation processing according to the second embodiment of the present invention.

#### DETAILED DESCRIPTION

[0010]

Hereinafter, examples of modes for carrying out the present invention will be described with reference to the accompanying drawings. In the present specification and the accompanying drawings, components having substantially the same function or configuration are denoted by the same reference numerals, and redundant description will not be repeated.

[0011]

In the description described below, an "interface apparatus" may be one or more interface devices. The one or more interface devices may be at least one of those described below.

[0012]

- One or more input/output (I/O) interface devices

The I/O interface device is an interface device for at least one of an I/O device and a remote display calculator. The I/O interface device for the display calculator may be a communication interface device. The at least one I/O device may be a user interface device, for example, any of an input device such as a keyboard and a pointing device, and an output device such as a display device.

[0013]

- One or more communication interface devices

The communication interface device may be one or more communication interface devices of the same type (for example, one or more network interface cards (NIC)), or may be two or more communication interface devices of different types (for example, an NIC and a host bus adapter (HBA)).

[0014]

Further, in the description described below, a "memory" is one or more memory devices, and may typically be a main storage device. At least one memory device in the memory may be a volatile memory device or a nonvolatile memory device.

[0015]

Further, in the description described below, a "persistent storage apparatus" is one or more persistent storage devices. The persistent storage device is typically a nonvolatile storage device (for example, an

auxiliary storage device), and is specifically, for example, a hard disk drive (HDD) or a solid state drive (SSD).

[0016]

Further, in the description described below, a "storage apparatus" may be at least the memory of the memory and the persistent storage apparatus.

[0017]

Further, in the description described below, a "processor" is one or more processor devices. At least one processor device is typically a microprocessor device such as a central processing unit (CPU), but may be another type of processor device such as a graphics processing unit (GPU). At least one processor device may be a single core or a multi-core. At least one processor device may be a processor core. At least one processor device may be a processor device in a broad sense such as a hardware circuit (for example, a field-programmable gate array (FPGA) or an application specific integrated circuit (ASIC)) that performs a part or whole of processing.

[0018]

Further, in the description described below, a function may be described using an expression "kkk unit", but the function may be realized by executing one or more computer programs by the processor, may be realized by one or more hardware devices (for example, FPGA or ASIC), or may be realized by a combination thereof. The description of each function is an example, and a plurality of

functions may be integrated into one function or one function may be divided into a plurality of functions.

[0019]

Furthermore, in the description described below, information with which an output is obtained with respect to an input may be described by an expression such as "xxx DB". The information may be data having any structure (for example, it may be structured data or unstructured data), or may be a learning model such as a neural network that generates an output with respect to an input. Therefore, "xxx DB" can be referred to as "xxx information". Further, in the description described below, the configuration of each DB is an example, and one DB may be divided into two or more DBs, or all or a part of two or more DBs may be one DB. Note that "DB" is an abbreviation for database.

[0020]

<First embodiment>

The first embodiment of the present invention will be described below with reference to the drawings.

Hereinafter, in the present specification, those having the same function are denoted by the same reference numerals unless otherwise specified, and repeated description will not be given.

[0021]

As the building facility, an elevator facility, an electric facility, and an air-conditioning facility will be described, but the same applies to other facilities such as

a water supply and discharge facility. The elevator facility includes an elevator and an escalator. Further, the electric facility includes a crime prevention/disaster prevention facility, a lighting facility, and the like, and the air-conditioning facility includes a refrigerator and the like. Note that description of a main rope, a counterweight, an elevator car, hoisting machine, and the like constituting the elevator will be omitted. Further, description of configurations of other building facilities will be omitted similarly to the configuration of the elevator.

[0022]

[Overall configuration of operating state display system for building facility]

FIG. 1 illustrates an overall configuration example of an operating state display system for a building facility according to the first embodiment of the present invention. In an operating state display system 100 illustrated in FIG. 1, an elevator facility control apparatus 2, an air-conditioning facility control apparatus 3, and an electric facility control apparatus 4 are connected via a communication network 6 to a visualization apparatus 1 that performs visualization processing on information indicating the operating states of building facilities provided in one or more buildings. Further, a customer operation terminal 5 is connected to the visualization apparatus 1 through a communication network 7.

[0023]

The elevator facility control apparatus 2 is an apparatus provided in an elevator or an escalator, which is not illustrated. The elevator facility control apparatus 2 constantly monitors and stores the operating state (for example, the presence or absence of a failure and a change in state from operation to inspection) of the elevator or the escalator, and transmits information indicating the operating state to the visualization apparatus 1. A plurality of elevator facility control apparatuses 2 exists for a plurality of elevators or escalators.

[0024]

The air-conditioning facility control apparatus 3 is an apparatus provided in a refrigerator or the like, which is not illustrated. The air-conditioning facility control apparatus 3 constantly monitors and stores the operating state (for example, the presence or absence of a failure and a change in state from operation to inspection) of the refrigerator, and transmits information indicating the operating state to the visualization apparatus 1. A plurality of air-conditioning facility control apparatuses 3 exists for a plurality of refrigerators.

[0025]

The electric facility control apparatus 4 is an apparatus provided in a crime prevention/disaster prevention facility, a lighting facility, or the like, which is not illustrated. The electric facility control

apparatus 4 constantly monitors and stores the operating state (for example, the presence or absence of a failure and a change in state from operation to inspection) of the crime prevention/disaster prevention facility or the lighting facility, and transmits information indicating the operating state to the visualization apparatus 1. A plurality of electric facility control apparatuses 4 exists for a plurality of crime prevention/disaster prevention facilities or lighting facilities.

[0026]

Each of the communication networks 6 and 7 is, for example, the Internet, a mobile communication network, a wired LAN, a wireless LAN, a dedicated line, or a combination thereof. Further, the communication network 6 and the communication network 7 may be a single communication network (for example, the Internet). In the present embodiment, when a serious event such as an earthquake or a fire occurs in a building facility, it is also possible to directly make an emergency call from the building facility to the visualization apparatus 1 via the communication network.

[0027]

Further, the customer operation terminal 5 is an information processing terminal possessed by a customer, and includes a display apparatus, an input apparatus, and an interface apparatus. The input apparatus may be a touch panel integrated with the display apparatus in addition to

a keyboard and a mouse. A specific example of such customer operation terminal 5 is not particularly limited, and corresponds to, for example, a personal computer, a tablet, a smartphone, and the like. Further, the number of customer operation terminals 5 is not limited to one, but may be plural.

[0028]

The visualization apparatus 1 may be an apparatus including an interface apparatus, which is not illustrated, a storage apparatus 12, and a processor connected thereto, or may be an apparatus implemented on a system (for example, a cloud infrastructure) that remotely uses computer resources via a communication network. The interface apparatus is connected to the communication networks 6 and 7. The visualization apparatus 1 includes a customer information input unit 11, the storage apparatus 12, a collection processing unit 13, and a visualization processing unit 14.

[0029]

The storage apparatus 12 includes a persistent storage apparatus such as a hard disk drive (HDD) in addition to a ROM and a RAM, and stores a customer information DB 12a, an operating state DB 12b, and a service menu management DB 12c.

[0030]

The customer information DB 12a holds information regarding a customer. The operating state DB 12b holds

information regarding the operating state of a building facility such as an elevator. The service menu management DB 12c holds information regarding services that can be provided for a building facility indicated by a building facility icon displayed on an operating state confirmation screen 200, which will be described later.

[0031]

The customer information input unit 11 registers information regarding a customer input from the input apparatus in the customer information DB 12a. For example, a salesperson performing sales activities registers information of a customer who has concluded a maintenance contract in the customer information DB 12a through the customer information input unit 11.

[0032]

The collection processing unit 13 is connected to the elevator facility control apparatus 2, the air-conditioning facility control apparatus 3, and the electric facility control apparatus 4 through the communication network 6 for each building facility such as an elevator indicated by the customer information DB 12a, and periodically collects information indicating the operating state of the elevator, the escalator, the refrigerator, the crime prevention/disaster prevention facility, and the lighting facility. Then, the collection processing unit 13 registers the collected information in the operating state DB 12b. For example, the collection processing unit 13

collects information indicating the operating state once every 30 minutes. Note that it is assumed that the information indicating the operating state of the building facility includes information based on which it can be determined whether the building facility is in operation or in stoppage, and whether, when the building facility is in stoppage, it is due to a failure or due to an inspection. The visualization processing unit 14 will be described later.

[0033]

[Hardware configuration of calculator]

Next, a hardware configuration of each apparatus constituting the operating state display system 100 for a building facility will be described. Here, a hardware configuration example of a calculator included in the visualization apparatus 1, the elevator facility control apparatus 2, the air-conditioning facility control apparatus 3, the electric facility control apparatus 4, and the customer operation terminal 5 will be described.

[0034]

FIG. 2 is a block diagram illustrating a hardware configuration example of a calculator 20 included in each apparatus constituting the operating state display system 100 for a building facility. Each block is selected according to the function or purpose of use of each apparatus. As the calculator 20, for example, a personal computer can be used.

[0035]

The calculator 20 includes a central processing unit (CPU) 21, a read only memory (ROM) 22, a random access memory (RAM) 23, a display apparatus 25, an input apparatus 26, a nonvolatile storage 27, and a communication interface 28. The units in the calculator 20 are connected to be able to transmit and receive data to and from each other via a system bus.

[0036]

The CPU 21, the ROM 22, and the RAM 23 constitute a control unit 24. The CPU 21 reads a program code of software for implementing each function according to the present embodiment from the ROM 22, loads the program code into the RAM 23, and executes the program code. In the visualization apparatus 1, the CPU 21 reads and executes the program code stored in the ROM 22, thereby implementing functions such as the customer information input unit 11, the collection processing unit 13, and the visualization processing unit 14 in cooperation with software and hardware. In the calculator 20 provided in the customer operation terminal 5, the control unit 24 implements a function as a display control unit.

[0037]

The ROM 22 may be a rewritable nonvolatile memory such as an electrically erasable and programmable ROM (EEPROM). Variables, parameters, and the like generated during arithmetic processing of the CPU 21 are temporarily

written to the RAM 23, and these variables, parameters, and the like are appropriately read by the CPU 21. Although the CPU 21 is used as the arithmetic processing apparatus, another processor such as a micro processing unit (MPU) may be used.

[0038]

The display apparatus 25 is a monitor such as a liquid crystal display, and displays a GUI screen, a result of processing performed by the CPU 21, and the like. As the input apparatus 26, a pointing device such as a mouse or a touch panel, a keyboard, or the like is used, and the user can input information and instructions by operating the input apparatus 26. The input apparatus 26 generates an input signal according to a user's operation and supplies the input signal to the CPU 21.

[0039]

Note that the display apparatus 25 and the input apparatus 26 may not be provided depending on the configuration of the apparatus in which the calculator 20 is provided. For example, the display apparatus 25 and the input apparatus 26 may be unnecessary in the elevator facility control apparatus 2, the air-conditioning facility control apparatus 3, and the electric facility control apparatus 4. Further, when the visualization apparatus 1 has a function of remotely inputting customer information, the visualization apparatus 1 may not include the display apparatus 25 or the input apparatus 26.

[0040]

Moreover, the customer operation terminal 5 may be provided separately from the display apparatus 25 and the input apparatus 26. That is, the customer operation terminal 5 may be configured by an information processing apparatus including the control unit 24, the nonvolatile storage 27, and the communication interface 28. In this case, the information processing apparatus communicates with the visualization apparatus 1, and the operating state confirmation screen received by the information processing apparatus from the visualization apparatus 1 is displayed on the display apparatus 25 connected to the information processing apparatus. The user operates the input apparatus 26 connected to the information processing apparatus to perform an input to the information processing apparatus.

[0041]

In addition to an operating system (OS) and various parameters, a program for causing the calculator 20 to function is recorded in the nonvolatile storage 27. The ROM 22 and the nonvolatile storage 27 permanently record programs, data, and the like necessary for the operation of the CPU 21, and are used as an example of a computer-readable non-transitory recording medium that stores a program executed by the calculator 20. For example, an HDD, an SSD, or the like is used as the nonvolatile storage 27.

[0042]

For example, a network interface card (NIC), a modem, or the like is used as the communication interface 28. The communication interface 28 can transmit and receive various data to and from an external apparatus via a communication network such as a LAN connected to a terminal, a dedicated line, or the like.

[0043]

[Customer information DB]

FIG. 3 illustrates an example of the customer information DB 12a provided in the visualization apparatus 1 of the operating state display system 100 for a building facility. The customer information DB 12a stores, for example, a customer ID, a contractor ID, a building ID, a building address, a building facility, and a building facility ID in association with each other. The IDs are information (identifiers) with which each piece of information can be uniquely identified. Generally, alphanumeric characters are used for the identifier, but a name is indicated in FIG. 3 for ease of description.

[0044]

In FIG. 3, "△△ real estate" is registered as the customer ID for identifying the user. The contractor ID is information for identifying a contractor (or business establishment) managed by the user. "A branch" and "B branch" are registered as the contractor IDs corresponding to "△△ real estate". The building ID is information for identifying a building managed by the user. Here,

"building A" is registered as the building ID corresponding to "A branch", and "building B" is registered as the building ID corresponding to "B branch".

The building address is information indicating the location of a building managed by the user. For example, as the building address of the building ID "building A", "1-2-3, OO, □□-shi, Ibaraki" is registered.

[0045]

The building facility is information indicating a building facility managed by a user, which is (the type of) the building facility for which the user has concluded a maintenance contract.

The building facility ID is information for identifying the building facility. For example, in FIG. 3, for "building A", "elevator A" is registered as the building facility ID of "elevator", and "crime prevention/disaster prevention facility A" is registered as the building facility ID of "crime prevention/disaster prevention facility". Further, for "building B", "elevator B" is registered as the building facility ID of "elevator", "escalator A" is registered as the building facility ID of "escalator", and "refrigerator A" is registered as the building facility ID of "refrigerator". Moreover, for "building Z", "elevator Z" is registered as the building facility ID of "elevator".

[0046]

Further, a user ID, a password, and a customer ID are

stored in a user DB (not illustrated) of the storage apparatus 12 in association with each other. The user ID and the password are information (identifiers) for identifying a user who can access the visualization apparatus 1.

[0047]

[Service menu management DB]

FIG. 4 illustrates an example of the service menu management DB 12c provided in the visualization apparatus 1 of the operating state display system 100 for a building facility. The service menu management DB 12c stores, for example, a building facility and a service menu in association with each other. The service menu is shown to be a list of services (functions) that can be provided for the building facility. For example, "function A", "function B", "function C", and "function D" are stored as service menus of the building facility "elevator".

[0048]

Note that the service menu for each building facility (in FIG. 4, an elevator, a refrigerator, and a crime prevention/disaster prevention facility) is registered in advance in the service menu management DB 12c by the administrator of a maintenance company. Further, each piece of information of the customer information DB 12a and the service menu management DB 12c is configured to be associated with each other in the building facility.

[0049]

The user operates the customer operation terminal 5 to request connection to the visualization apparatus 1 through the communication network 7. Upon receiving the connection request from the customer operation terminal 5, the visualization processing unit 14 of the visualization apparatus 1 requests the customer operation terminal 5 for the user ID and the password. When the user inputs the user ID and the password to the customer operation terminal 5, the visualization processing by the visualization processing unit 14 enables information acquired from the customer information DB 12a, the operating state DB 12b, and the service menu management DB 12c to be displayed on the customer operation terminal 5.

[0050]

[Operating state confirmation screen]

FIG. 5 illustrates a display example of the operating state confirmation screen before a building facility icon operation on the customer operation terminal 5.

FIG. 6 illustrates a display example of the operating state confirmation screen after a building facility icon operation on the customer operation terminal 5.

In the present embodiment, the operating state confirmation screen 200 illustrated in FIGS. 5 and 6 displays at least "operating state of building facility" and "service menu".

[0051]

The operating state of building facility includes a

building facility operating state summary display field 201, building facility icons 202 to 206, and a building facility operating state breakdown display field 207.

[0052]

The building facility operating state summary display field 201 displays an aggregate result regarding the operating states of all the building facilities to be managed for which the maintenance contract has been concluded. In the example of FIG. 5, an example is illustrated in which the control unit 24 of the customer operation terminal 5 displays the aggregate result regarding the operating states of all the building facilities for which the maintenance contract has been made at a central portion of the plurality of building facility icons 202 to 206 arranged in the circumferential direction.

[0053]

The building facility icons 202 to 206 are icons identified for each building facility such as an elevator and an escalator. The plurality of building facility icons 202 to 206 provided for each building facility are arranged in a row. The building facility icons 202 to 206 are configured to cyclically move in response to an operation input in a column direction to the input apparatus 26. In the example of FIG. 5, the control unit 24 of the customer operation terminal 5 arranges the plurality of building facility icons 202 to 206 on the circumference, receives an operation (scrolling) in the circumferential direction

(arrow direction) with respect to an arbitrary building facility icon via the input apparatus 26, and cyclically moves the plurality of building facility icons 202 to 206 on the circumference.

[0054]

The building facility operating state breakdown display field 207 displays the operating state of the building facility corresponding to the building facility icon as a breakdown. The building facility operating state breakdown display field 207 is an example of a designated area set within the cyclic movement range. In the present embodiment, various displays and processing are performed on the building facility icon that has moved to the building facility operating state breakdown display field 207. By setting such building facility operating state breakdown display field 207 (designated area), it is possible to clearly display which building facility icon is selected among a plurality of building facility icons that move cyclically. Note that the building facility operating state breakdown display field 207 is desirably arranged at the center of the cyclic movement range from the viewpoint of improving the visibility for the user.

[0055]

The service menu is displayed in a service menu display area 210 on a lower side of the operating state confirmation screen 200. In the service menu display area 210, a list of service menus related to the building

facility indicated by the building facility icon arranged in the building facility operating state breakdown display field 207 is displayed. In the example of FIG. 5, function icons 211 and 212 are displayed as service menus related to the building facility indicated by the building facility icon 204. For example, when the building facility is an elevator, function icons such as "operation control (various settings)", "in-car display setting", "work report", "camera image download", "contact with a sales representative", and "notice to customers" are displayed as service menus.

[0056]

In FIGS. 5 and 6, a building facility icon indicating a building facility for which a maintenance contract is not concluded may be displayed in an inactive state, such as the building facility icon 206. For example, the building facility icon 206 may be shaded (grayed out or the like) by halftone dots, grids, diagonal lines, or the like. At this time, it is desirable that the corresponding dedicated function icon is also in an inactive state.

[0057]

Thus, the user recognizes that there is a service (function) that is available for a building facility when a contract is concluded although the maintenance contract is not currently concluded, and thus, it is possible to achieve an effect of stimulating the user's willingness to make a contract.

[0058]

Note that, in the present embodiment, by arranging the building facility icons 202 to 206 on a semicircular circumference, it is easy for the user to identify the building facility, and the building facility icons 202 to 206 can be operated in a dial manner (using a rotation operation panel).

[0059]

Further, when the user performs an operation of moving the building facility icons 202 to 206 arranged on the semicircular circumference in a dial manner, the building facility icons 202 to 206 circle on the semicircular circumference so that all the building facility icons 202 to 206 are always displayed.

[0060]

In the display of the service menu, a dedicated function icon is displayed for the building facility indicated by the building facility icon that has moved to the building facility operating state breakdown display field 207.

[0061]

When the building facility icon 204 is displayed in the building facility operating state breakdown display field 207 (see FIG. 5), the function icon 211 and the function icon 212 are displayed as dedicated service menus of the building facility corresponding to the building facility icon 204.

[0062]

When the user performs an operation of moving the building facility icon in a dial manner to cause the building facility icon 202 to be displayed in the building facility operating state breakdown display field 207 (see FIG. 6), a function icon 213 and a function icon 214 are displayed in the service menu display area 210 in conjunction with this operation.

[0063]

Note that, in the present embodiment, the aspect in which the plurality of building facility icons is arranged on the semicircular circumference has been described, but they may be arranged on an elliptical circumference. Further, the plurality of building facility icons may be arranged on a straight line or a curve, and the building facility icons may be cyclically moved on the straight line or the curve. That is, the plurality of building facility icons may be arranged in a horizontal direction, a vertical direction, or an oblique direction with respect to the screen.

[0064]

[Display example of operating state confirmation screen]

A case where the user of the customer ID "△△ real estate" confirms the operating state confirmation screen 200 will be described below with reference to FIG. 7.

[0065]

FIG. 7 illustrates a display example of the operating

state confirmation screen 200. It is desirable to provide a customer ID display field 220 on the operating state confirmation screen 200 to display the customer ID such as "△△ real estate" so that the user can easily identify it. As described with reference to FIG. 3, the building facilities to be managed by the user of the customer ID "△△ real estate" are the building facility IDs "elevator A", "crime prevention/disaster prevention facility A", "elevator B", "escalator A", and "refrigerator A". Note that, in FIG. 7, display of the service menu display area 210 is omitted.

[0066]

Therefore, building facility icons 221 and 223 to 225 of the elevator, the escalator, the crime prevention/disaster prevention facility, and the refrigerator are arranged in an active state on the semicircular circumference. Further, since the maintenance contract of the lighting facility has not been concluded, a building facility icon 222 of the lighting facility is arranged in an inactive state (for example, displayed in gray) on the semicircular circumference.

[0067]

Note that, at the time of initial display of the operating state confirmation screen 200, the building facility icon in the inactive state may have the lowest arrangement priority so as to be arranged at the position farthest from the building facility operating state

breakdown display field 207. Conversely, at the time of initial display, a building facility icon indicating a building facility having a high priority or having a maintenance contract concluded depending on the user (customer ID) may be arranged in the building facility operating state breakdown display field 207. Further, a function may be provided in which the user can arbitrarily change the priority of a designated building facility icon or select display and non-display of the building facility icon corresponding to the building facility for which the maintenance contract is not concluded. Alternatively, the building facility icons in the active state may be sequentially arranged from one side (for example, the upper side).

[0068]

As described above, in the present embodiment, the display control unit (the control unit 24) of the customer operation terminal 5 is configured to arrange the icon (building facility icon) indicating the building facility corresponding to the setting conditions (priority, presence or absence of maintenance contract, and the like) depending on the user in the designated area (the building facility operating state breakdown display field 207) in the initial display on the basis of screen data (the operating state confirmation screen 200) received from the visualization apparatus 1. Thus, the icon that satisfies the setting conditions depending on the user is displayed in the

designated area or in the vicinity within a predetermined distance from the pointed area, and the visibility of the building facility that the user wants to pay attention to in the initial display is improved.

[0069]

Note that the display control unit (the control unit 24) may arrange a plurality of icons indicating building facilities (building facility icons) outside the designated area (the building facility operating state breakdown display field 207) in the initial display on the basis of the screen data received from the visualization apparatus 1. For example, the display position of the icon in the initial display and the original display position of the icon are shifted by a half pitch. Referring to FIG. 7 as an example, the building facility icons 221 to 225 are shifted by a half pitch so that the building facility icons are not arranged in the building facility operating state breakdown display field 207 in the initial display. Thus, when the user intentionally moves the building facility icon to the building facility operating state breakdown display field 207, the breakdown of the operating state of the building facility corresponding to the building facility icon can be displayed.

[0070]

In the building facility operating state summary display field 201, the operating states of all the building facilities, that is, the number of failures being responded

and the number of inspection works being performed within the building facility IDs "elevator A", "crime prevention/disaster prevention facility A", "elevator B", "escalator A", and "refrigerator A" are aggregated and displayed. In the description of FIG. 7, there are two building facilities responding to failure, and there is one building facility under inspection work.

[0071]

Further, in FIG. 7, in order to make it easy to intuitively understand in which building facility a failure is responded and inspection work is performed, badge icons 221b and 223b are displayed in the upper right of the corresponding building facility icon. The badge icon displays at least a total value of the number of failures being responded and the number of inspection works being performed included in the breakdown of the operating state of the building facility. In FIG. 7, when the failure is not being responded and the inspection work is not being performed, the badge icon is not displayed in the upper right of the building facility icon, but the badge icon may be provided to display 0.

[0072]

In the description of FIG. 7, the badge icon 221b of the building facility icon 221 of the crime prevention/disaster prevention facility displays that the total value of the number of failures being responded and the number of inspection works being performed is 1.

Further, a badge icon 223b of the building facility icon 223 of the elevator displays that the total value of the number of failures being responded and the number of inspection works being performed is 2.

[0073]

Further, when the user operates the input apparatus 26 to move the building facility icon 223 of the elevator to the building facility operating state breakdown display field 207, the breakdown of the operating state of the elevator is displayed in the building facility operating state breakdown display field 207. That is, the number of failures being responded and the number of inspection works being performed within the building facility IDs "elevator A" and "elevator B" are aggregated and displayed. In the description of FIG. 7, the number of failures being responded is 1 and the number of inspection works being performed is 1 within all the elevators. With such a display, the user can intuitively grasp all the building facilities to be managed.

[0074]

In this way, by displaying the breakdown of the operating state of the building facility moved to the designated area, the user can grasp the details of the operating state of the target building facility. Note that, in the present embodiment, it is desirable to display the number of failures being responded and the number of inspection works being performed as the breakdown of the

operating state of the building facility, but at least one of the number of failures being responded and the number of inspection works being performed is displayed. Further, other items (for example, a telephone inquiry being performed) may be displayed as a breakdown of the operating state of the building facility.

[0075]

[Display example of plurality of types of building facility icons]

Here, a display example of a plurality of types of building facility icons indicating a building facility will be described.

FIG. 8 illustrates a display example of a plurality of types of building facility icons indicating a building facility. That is, FIG. 8 is an example in which whether a building facility managed by the user is a target or a non-target of a maintenance service for which the maintenance contract has been concluded is displayed in an easy-to-understand manner by a method other than shaded display.

[0076]

For example, a building facility icon 226 on the left side in FIG. 8 is different in shape from other building facility icons. The building facility icons 221 to 225 in FIG. 7 have a rectangular shape with rounded corners, whereas the building facility icon 226 has a hexagonal shape. It is conceivable to set the building facility icon 226 having a hexagonal shape as a building facility icon

corresponding to a building facility for which a maintenance contract is not concluded.

[0077]

Further, a building facility icon 227 in the center of FIG. 8 has a circular shape and has a notch (cut, indentation) in a part thereof. For example, although the position of the notch is arbitrary, it may be an upper right of the building facility icon 227 (a position corresponding to a badge icon display portion). Note that the basic shape of the building facility icon 227 is not limited to a circle, but may be any shape such as a rectangle.

[0078]

Moreover, a building facility icon 228 on the right side in FIG. 8 displays a badge icon 228g in gray in a part thereof. The badge icon 228g does not display the numbers of failures being responded and inspection works being performed. Note that the color of the badge icon 228g is not limited to gray.

[0079]

As described above, in the present embodiment, the display of the information regarding the operating state of the building facility is intended for the building facility for which the maintenance contract has been made. For example, when displaying an icon (building facility icon) indicating a building facility for which a maintenance contract has not been made on the basis of screen data

received from the visualization apparatus 1, the display control unit (control unit 24) of the customer operation terminal 5 displays that the icon is in an inactive state (for example, shaded display). Alternatively, when displaying an icon (building facility icon) indicating a building facility for which a maintenance contract has not been made, the display control unit displays the icon with a feature (shape, notch, badge icon, or the like) indicating that a maintenance contract has not been made.

[0080]

With such display, the user recognizes that a designated building facility becomes a target of the management when a contract is concluded although the maintenance contract is not currently concluded, and thus, it is possible to achieve an effect of stimulating the user's willingness to make a contract.

[0081]

[Operating state confirmation screen generation processing]

Next, generation processing of the operating state confirmation screen 200 according to the first embodiment will be described with reference to FIG. 9.

FIG. 9 is a flowchart illustrating a procedure example of the operating state confirmation screen generation processing according to the first embodiment.

[0082]

In the present embodiment, the following description will be given assuming that the visualization apparatus 1

functions as a web server and a web browser is installed in the customer operation terminal 5. However, the visualization apparatus 1 and the customer operation terminal 5 may constitute a client server type system, and a dedicated program may be installed in the customer operation terminal 5.

[0083]

First, the user of the customer operation terminal 5 inputs a user ID assigned to the user and a password to a login page (illustration omitted) through the input apparatus 26. Then, the control unit 24 of the customer operation terminal 5 transmits the user ID and the password input by the user to the visualization apparatus 1 through the communication network 7 in order to request login (S1).

[0084]

Next, upon receiving the user ID and the password from the customer operation terminal 5, the visualization processing unit 14 of the visualization apparatus 1 collates the received user ID and password with a user ID and a password of a user DB (not illustrated). Then, when the collation can be made, the visualization processing unit 14 reads the customer ID associated with the user ID and the password from the customer information DB 12a, and confirms the building facility (building facility ID to be managed) associated with the customer ID in the customer information DB 12a.

[0085]

Further, the visualization processing unit 14 reads the operating state of the building facility managed in association with the building facility ID of the customer information DB 12a from the operating state DB 12b, and aggregates the operating states of all the building facilities displayed in the building facility operating state summary display field 201, i.e., the number of failures being responded and the number of inspection works being performed. Further, the visualization processing unit 14 aggregates the number of failures being responded and the number of inspection works being performed within the building facilities displayed in the building facility operating state breakdown display field 207. Moreover, the visualization processing unit 14 acquires, from the service menu management DB 12c, a service menu related to a building facility displayed in the building facility operating state breakdown display field 207. Then, the visualization processing unit 14 generates the operating state confirmation screen 200 on the basis of the aggregate result of the operating states and the service menu (S2).

[0086]

Next, the visualization processing unit 14 transmits the generated operating state confirmation screen 200 to the customer operation terminal 5 via the communication network 7 (S3).

[0087]

Next, in response to receiving the operating state

confirmation screen 200 from the visualization apparatus 1, the control unit 24 of the customer operation terminal 5 causes the display apparatus 25 to display the operating state confirmation screen 200 (S4). The user can confirm the operating state of all the building facilities managed in the building facility operating state summary display field 201 to confirm the number of failures being responded and the number of inspection works being performed within the building facilities indicated by the building facility icon displayed in the building facility operating state breakdown display field 207.

[0088]

Next, when the user confirms the breakdown of the operating state of a building facility different from the building facility indicated by the building facility icon displayed in the building facility operating state breakdown display field 207, the user moves the building facility icon corresponding to the building facility for which the breakdown of the operating state is to be confirmed from a building facility icon group to the building facility operating state breakdown display field 207 (S5).

[0089]

When the user moves a desired building facility icon to the building facility operating state breakdown display field 207, the control unit 24 of the customer operation terminal 5 requests the visualization apparatus 1 through

the communication network 7 to display the operating state of the building facility indicated by the building facility icon that has moved to the building facility operating state breakdown display field 207 (S6).

[0090]

Next, the visualization processing unit 14 of the visualization apparatus 1 refers to the customer information DB 12a and the operating state DB 12b in response to reception of the request from the customer operation terminal 5 to display the operating state of the building facility indicated by the building facility icon that has moved to the building facility operating state breakdown display field 207. Then, the visualization processing unit 14 aggregates the operation information of the building facility indicated by the building facility icon that has been moved to the building facility operating state breakdown display field 207 by the user from the operating state DB 12b (S7).

[0091]

Next, the visualization processing unit 14 acquires a service menu corresponding to the building facility from the service menu management DB 12c (S8). Then, the visualization processing unit 14 transmits the aggregate result of the operating state of the building facility indicated by the building facility icon that has been moved by the user to the building facility operating state breakdown display field 207 and the service menu

information to the customer operation terminal 5 through the communication network 7 (S9).

[0092]

The control unit 24 of the customer operation terminal 5 displays the operating state of the building facility in the building facility operating state breakdown display field 207 and updates the display of the function icon of the service menu in response to the reception of the aggregate result of the operating state of the building facility and the service menu information from the visualization apparatus 1 (S10).

[0093]

Thus, the user can confirm the number of failures being responded and the number of inspection works being performed for the building facility indicated by the building facility icon that has moved to the building facility operating state breakdown display field 207.

[0094]

Moreover, when the user clicks the function icon of the service menu with the input apparatus 26 (S11), the control unit 24 of the customer operation terminal 5 transmits a request to display a function operation screen (not illustrated) to the visualization apparatus 1 via the communication network 7 (S12).

[0095]

The visualization processing unit 14 of the visualization apparatus 1 generates the function operation

screen of the service menu in response to the request to display the function operation screen received from the customer operation terminal 5 (S13), and transmits the generated function operation screen to the customer operation terminal 5 via the communication network 6 (S14).  
[0096]

In response to receiving the function operation screen from the visualization apparatus 1, the control unit 24 of the customer operation terminal 5 causes the display apparatus 25 to display the function operation screen (S15). Thus, the user can use the function of the service menu related to the building facility indicated by the building facility icon that has moved to the building facility operating state breakdown display field 207.  
[0097]

As described above, the operating state display apparatus for a building facility (customer operation terminal 5) according to the first embodiment includes the display control unit (control unit 24) that collects the information indicating the operating state of a facility (building facility) provided in one or more buildings and displays the information on the screen, and the input apparatus (input apparatus 26) that receives the operation input of the user.

The display control unit is configured to display a plurality of icons (building facility icons 202 to 206 and 221 to 225) provided for each building facility in a row on

one screen (operating state confirmation screen 200), cyclically move the plurality of icons on the screen in response to an operation input to the input apparatus in a column direction, and display, on the screen, the information (building facility operating state breakdown) regarding the operating state of the building facility indicated by an icon in a designated area when the icon moves to the designated area (building facility operating state breakdown display field 207) set within the cyclic movement range.

[0098]

According to the first embodiment configured as described above, the operating states of all of the plurality of building facilities installed in one or more buildings are displayed on one screen. Therefore, the user can intuitively grasp the operating state of all of the plurality of building facilities. The user can confirm the operating states of all the building facilities on one screen, and can easily confirm the breakdown of each building facility by moving the icon of the building facility to the designated area.

[0099]

Further, in the operating state display apparatus for a building facility (customer operation terminal 5) according to the present embodiment, the display control unit (control unit 24) is configured to display a function icon indicating a service that can be provided in

association with the building facility indicated by the icon (building facility icon) in the designated area (building facility operating state breakdown display field 207) on the screen (operating state confirmation screen 200) in conjunction with the movement of the icon to the designated area. This can save the user from searching for an effective function for each building facility.

[0100]

As described above, the operating state display apparatus for a building facility (customer operation terminal 5) according to the present embodiment has the building facility operating state display function and the function icon display function related to the designated building facility (corresponding to the building facility icon moved to the designated area), and has an effect of reducing the time and cost required for managing the building facility.

[0101]

<Second embodiment>

Next, display of the operating state confirmation screen when a serious event such as an earthquake or a fire occurs will be described. In the present embodiment, the basic configuration of the operating state display system for a building facility for displaying the operating state confirmation screen is similar to that of the first embodiment.

[0102]

[Display example of operating state confirmation screen]

FIG. 10 illustrates a display example of an operating state confirmation screen 200E according to a second embodiment. When an earthquake or a fire occurs in a building, the building facility (or each control apparatus) makes an emergency call to the visualization apparatus 1. When receiving an emergency call from the building facility (or each control apparatus), the visualization apparatus 1 displays a message corresponding to the received emergency call in an emergency call display field 230 of the operating state confirmation screen 200E.

[0103]

For example, when the operating state confirmation screen 200 described with reference to FIG. 7 is in a displayed state, in cases where the crime prevention/disaster prevention facility detects smoking or a fire and an emergency call is made, the visualization processing unit 14 of the visualization apparatus 1 displays a message "a notification of fire occurrence has been received" in the emergency call display field 230 of the operating state confirmation screen 200E. Further, since it is an emergency call from the crime prevention/disaster prevention facility, the visualization processing unit 14 automatically moves the building facility icon 221 of the crime prevention/disaster prevention facility to the building facility operating state breakdown display field 207, and updates the number

of failures being responded from 1 to 2. Further, the visualization processing unit 14 updates the numerical value of the badge icon 221b of the building facility icon 221 of the crime prevention/disaster prevention facility from 1 to 2. Moreover, the visualization processing unit 14 updates the number of failures being responded in the building facility operating state summary display field 201 from 2 to 3.

[0104]

With such a configuration, when there is an emergency call from the building facility (or each control apparatus) managed, the user can immediately confirm the operating state of the building facility without operating the operating state confirmation screen 200. Note that, in the present embodiment, occurrence of a serious event such as an earthquake or a fire is included in the "failures being responded", but the display name may be changed to "abnormalities being responded" or the like. Further, for a serious event such as an earthquake or a fire, new items such as "occurrence of serious event", "earthquakes being responded", and "fires being responded" may be separately set.

[0105]

[Operating state confirmation screen generation processing]

Next, generation processing of the operating state confirmation screen 200E according to the second embodiment will be described with reference to FIG. 11.

FIG. 11 is a flowchart illustrating a procedure example of the operating state confirmation screen generation processing according to the second embodiment.

[0106]

As a premise, the control unit 24 of the customer operation terminal 5 displays the operating state confirmation screen 200 (see, for example, FIG. 7) transmitted from the visualization apparatus 1 on the display apparatus 25 (S21).

[0107]

When a serious event such as an earthquake or a fire occurs in this state, the building facility (or the control apparatus) makes an emergency call to the visualization apparatus 1. Upon receiving this emergency call (S22), the visualization processing unit 14 of the visualization apparatus 1 specifies the customer ID managing the building facility that has transmitted the emergency call on the basis of the customer information DB 12a, confirms all the building facilities managed by the user of the customer ID, and aggregates the operating states (S23).

[0108]

Next, the visualization processing unit 14 aggregates the operating state of the building facility that has transmitted the emergency call (S24). Further, the visualization processing unit 14 acquires a service menu of the corresponding building facility from the service menu management DB 12c (S25).

[0109]

Next, the visualization processing unit 14 selects words of a message to be displayed in the emergency call display field 230 (S26). The message is registered (managed) in advance by the administrator of the maintenance company, and an emergency message management DB (not illustrated) that manages a message to be displayed for each type of emergency call may be provided in the storage apparatus 12.

[0110]

Next, the visualization processing unit 14 confirms whether the building facility icon corresponding to the building facility that has transmitted the emergency call is displayed in the building facility operating state breakdown display field 207 of the operating state confirmation screen 200 confirmed by the user in step S21 (S27).

[0111]

When the corresponding building facility icon is displayed in the building facility operating state breakdown display field 207 (YES in S27), the visualization processing unit 14 generates the operating state confirmation screen 200E by updating each display information in the emergency call display field 230, the building facility operating state summary display field 201, and the building facility operating state breakdown display field 207 without changing the arrangement of the building

facility icon on the operating state confirmation screen or the function icon of the service menu (S29). Then, the visualization processing unit 14 of the visualization apparatus 1 transmits the generated operating state confirmation screen 200E to the customer operation terminal 5 via the communication network 7 (S30).

[0112]

On the other hand, when the corresponding building facility icon is not displayed in the building facility operating state breakdown display field 207 (NO in S27), the visualization processing unit 14 updates the arrangement of the corresponding building facility icon and the function icon of the service menu such that the corresponding building facility icon is displayed in the building facility operating state breakdown display field 207 (S28).

[0113]

Next, the visualization processing unit 14 updates each display information in the emergency call display field 230, the building facility operating state summary display field 201, and the building facility operating state breakdown display field 207 to generate the operating state confirmation screen 200E (S29). Then, the visualization processing unit 14 of the visualization apparatus 1 transmits the generated operating state confirmation screen 200E to the customer operation terminal 5 via the communication network 7 (S30).

[0114]

In response to receiving the operating state confirmation screen 200E from the visualization apparatus 1, the control unit 24 of the customer operation terminal 5 causes the display apparatus 25 to display the operating state confirmation screen 200E (S31).

[0115]

As described above, in the operating state display apparatus for a building facility (customer operation terminal 5) according to the second embodiment, when the building facility makes an emergency call, the display control unit (control unit 24) is configured to move an icon (for example, the building facility icon 221) indicating the building facility that has made the emergency call into the designated area (the building facility operating state breakdown display field 207), and display the operating state of the building facility that has made the emergency call on the screen (the operating state confirmation screen 200E).

[0116]

According to the present embodiment configured as described above, when a highly urgent call is made from a building facility, an emergency call message is displayed on the operating state confirmation screen 200E (emergency call display field 230) of the customer operation terminal 5 used by the user. Thus, the user can immediately notice the message (emergency call) in the emergency call display

field 230 displayed on the operating state confirmation screen 200E and confirm the operating state of the building facility.

[0117]

Moreover, the present invention is not limited to each of the above-described embodiments, and it goes without saying that various other application examples and modifications can be taken without departing from the gist of the present invention described in the claims.

[0118]

For example, each of the above-described embodiments describes the configuration of the operating state display system for a building facility in detail and specifically in order to describe the present invention in an easy-to-understand manner, and is not necessarily limited to those including all the components described above. Further, with respect to a part of the configuration of each embodiment, another component may be added, replaced, or deleted.

[0119]

Further, some or all of the above-described configurations, functions, processing units, and the like may be realized by hardware, for example, by designing with an integrated circuit. A processor device in a broad sense such as a field programmable gate array (FPGA) or an application specific integrated circuit (ASIC) may be used as the hardware.

[0120]

Further, each component of the operating state display system 100 for a building facility according to the first and second embodiments of the present disclosure described above may be implemented in any hardware as long as the hardware can transmit and receive information to and from each other via a network. Furthermore, the processing performed by a certain processing unit may be realized by one piece of hardware or may be realized by distributed processing by a plurality of pieces of hardware.

[0121]

Furthermore, in the flowcharts illustrated in FIGS. 9 and 11, a plurality of pieces of processing may be executed in parallel or the processing order may be changed within a range not affecting the processing result.

## **CLAIMS**

1. An operating state display apparatus for a plurality of building facilities in one or more buildings comprising:

a display control unit that collects information indicating an operating state of each building facility and displays the information on a screen; and an input apparatus that accepts an operation input of a user, wherein

the display control unit is configured to display a plurality of icons, each icon associated with one building facility of the building facilities, along a circumference of a cyclic movement arc on the screen,

cyclically move the plurality of icons on the screen in response to an operation input in a circumferential direction along the cyclic movement arc to the input apparatus,

when the icon moves to a designated area set within the cyclic movement arc, display on the screen information of the operating state of the one building facility indicated by the icon in the designated area, and

the display control unit arranges the icon indicating the building facility that falls under setting conditions depending on the user in the designated area in initial display.

2. The operating state display apparatus according to claim 1, wherein the designated area:

is at a midpoint of the cyclic movement arc; and  
constitutes a building facility operating state  
breakdown display field on the screen.

3. The operating state display apparatus according to claim 1, wherein

the display control unit arranges the plurality of  
icons outside the designated area in initial display.

4. The operating state display apparatus according to claim 1, wherein

the display control unit displays, as a breakdown of  
the operating state of one building facility indicated by  
the icon in the designated area, at least one of a number  
of failures being responded and a number of inspection  
works being performed.

5. The operating state display apparatus according to claim 4, wherein

the display control unit displays on the screen an  
aggregate result regarding the operating states of all the  
building facilities subject to a maintenance contract.

6. The operating state display apparatus according to claim 4, wherein

the display control unit displays a badge icon indicating a total number including at least the number of failures being responded and the number of inspection works being performed included in the breakdown of the operating state of the one building facility indicated by the icon in the designated area.

7. The operating state display apparatus according to claim 1, wherein

the display control unit displays information of the operating state of the building facility for which a maintenance contract has been made.

8. The operating state display apparatus according to claim 7, wherein

the display control unit displays that the icon is in an inactive state when displaying the icon indicating the building facility for which the maintenance contract has not been made.

9. The operating state display apparatus according to claim 7, wherein

the display control unit displays the icon indicating the building facility for which the maintenance contract has not been made with a feature indicating that the maintenance contract has not been made.

10. The operating state display apparatus according to claim 1, wherein

the display control unit displays on the screen a function icon indicating a service that can be provided for the one building facility indicated by the icon in the designated area in conjunction with movement of the icon to the designated area.

11. The operating state display apparatus according to claim 1, wherein

the display control unit arranges the plurality of icons on a circumference and accepts an operation in a circumferential direction to the icon via the input apparatus.

12. The operating state display apparatus according to claim 5, wherein

the display control unit arranges the plurality of icons on a circumference, accepts an operation in a circumferential direction to the icon via the input apparatus, and displays at a central portion of the plurality of icons arranged in the circumferential direction the aggregate result regarding the operating states of all the building facilities subject to the maintenance contract.

13. The operating state display apparatus according to

any one of claims 1 to 12, wherein

the display control unit, when the building facility makes an emergency call, moves the icon indicating the building facility that has made the emergency call into the designated area and displays the operating state of the building facility that has made the emergency call on the screen.

14. An operating state display method for a plurality of building facilities in an operating state display apparatus including: a display control unit that collects information indicating an operating state of each building facility and displays the information on a screen; and an input apparatus that accepts an operation input of a user, the method comprising:

processing of displaying a plurality of icons, each icon associated with one building facility, along a circumference of a cyclic movement arc on the screen with the display control unit,

processing of cyclically moving the plurality of icons on the screen in response to an operation input in a circumferential direction along the cyclic movement arc to the input apparatus with the display control unit,

processing of displaying, when the icon moves to a designated area set within a cyclic movement arc, on the screen information of the operating state of the one building facility indicated by the icon in the designated

area, and

arranging the icon indicating the building facility that falls under setting conditions depending on the user in the designated area in initial display.