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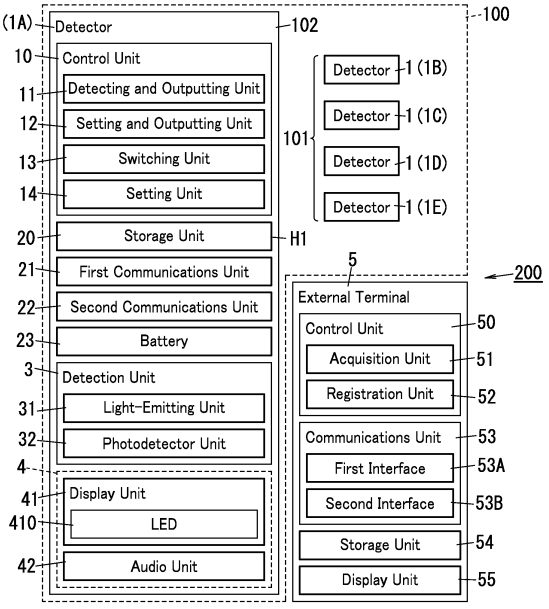
(54) DETECTOR, DETECTION SYSTEM, DETECTOR MANAGEMENT SYSTEM, CONTROL METHOD, AND PROGRAM

(57) An object of the present disclosure is to make a specific location, where an event calling for disaster prevention measures is present, much more easily determinable. A detector (1) detects the presence of any event that calls for disaster prevention measures. The detector (1) includes a holding unit (HI) to hold at least location information about an installation location (L1) where the detector (1) is installed.

FIG. 1



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Description

Technical Field

[0001] The present disclosure generally relates to a detector, a detection system, a detector management system, a control method, and a program. More particularly, the present disclosure relates to a detector for detecting the presence of any event that calls for disaster prevention measures, a detection system including a plurality of such detectors, a detector management system including the detection system, a method for controlling the detector, and a program.

Background Art

[0002] Patent Literature 1 discloses an exemplary known alarm device (residential fire alarm device). The residential fire alarm device is a wireless synchronously activated type with the capability of wirelessly transmitting and receiving synchronization signals such as fire warning signals to/from other residential fire alarm devices. A residential fire alarm device, triggering synchronized activation (hereinafter referred to as a "triggering device"), performs an alarm operation by emitting an alarm sound such as "woop woop" accompanied by a verbal warning message such as "A fire alarm device has been activated; check your surroundings!" indicating that the fire alarm device is a triggering device. Meanwhile, each of the other residential fire alarm devices, activated synchronously by the triggering device (hereinafter referred to as "triggered devices"), emits the alarm sound such as "woop woop" accompanied by a verbal warning message such as "Another fire alarm device has been activated; check your surroundings" indicating that the fire alarm device is one of the triggered devices.

[0003] There is a growing demand for determining, in the presence of a fire or any other event calling for disaster prevention measures, exactly where in the house, for example, the event is currently present, i.e., the specific location where the event has happened. Nevertheless, it could be difficult for the user to quickly determine the location where the event is currently present just by listening to the alarm sound emitted from the residential fire alarm device of Patent Literature 1.

Citation List

Patent Literature

[0004] Patent Literature 1: JP 2015-87883 A

Summary of Invention

[0005] In view of the foregoing background, it is therefore an object of the present disclosure to provide a detector, a detection system, a detector management system, a control method, and a program, all of which are configured or designed to make the specific location where such an event calling for the disaster prevention measures is present much more easily determinable.

[0006] A detector according to an aspect of the present disclosure detects presence of any event that calls for disaster prevention measures. The detector includes a holding unit to hold at least location information about an installation location where the detector is installed.

[0007] A detection system according to another aspect of the present disclosure includes a plurality of the detectors described above.

[0008] A detector management system according to still another aspect of the present disclosure includes: the detection system described above; and an external terminal to manage a plurality of the detectors.

[0009] A control method according to yet another aspect of the present disclosure is a method for controlling a detector. The control method includes the steps of: detecting presence of an event that calls for disaster prevention measures; and holding at least location information about an installation location where the detector is installed.

[0010] A program according to yet another aspect of the present disclosure is designed to cause a computer system to perform the control method described above.

Brief Description of Drawings

[0011]

FIG 1 illustrates a block configuration for a detector management system including a plurality of detectors and an external terminal according to an exemplary embodiment;

FIG 2 illustrates an exemplary application of the detector management system;

FIG 3 illustrates an external server and telecommunications device in the detector management system;

FIG 4 shows how the detector management system operates in a situation where one detector, serving as a master device, out of the plurality of detectors has detected the presence of a fire; and

FIG. 5 shows how the detector management system operates in a situation where one detector, serving as a slave device, out of the plurality of detectors has detected the presence of a fire.

Description of Embodiments

(1) Overview

[0012] Note that the drawings to be referred to in the following description of embodiments are all schematic representations. That is to say, the ratio of the dimensions (including thicknesses) of respective constituent elements illustrated on the drawings does not always reflect their actual dimensional ratio.

[0013] A detector 1 according to an exemplary embodiment detects the presence of any event that calls for disaster prevention measures. A detection system 100 according to this embodiment includes a plurality of such detectors 1 as shown in FIG 1. A detector management system 200 according to this embodiment includes the detection system 100 and an external terminal 5 for managing the plurality of detectors 1 as shown in FIG 1.

[0014] In this embodiment, the event that calls for disaster prevention measures is supposed to be a fire. That is to say, the detector 1 is supposed to be a fire detector. In particular, the detector 1 is supposed to be a fire alarm device having a detection capability of detecting the presence of a fire and an alarm capability of calling an alert when detecting the presence of a fire. In the following example, the detector 1 is supposed to be a "residential" fire alarm device. However, the detector 1 does not have to be a "residential" fire alarm device. The detector 1 emits a sound such as an alarm sound when detecting the presence of a fire, for example. Nevertheless, the event that calls for disaster prevention measures does not have to be a fire but may also be an inundation or an earthquake, for example. Alternatively, the event that calls for disaster prevention measures may also be leakage of a gas or the presence of carbon monoxide (CO) due to incomplete combustion, for example.

[0015] The detector management system 200 is applicable for use in a facility 7 (see FIG 2). Specifically, a plurality of detectors 1 are installed on the ceiling, wall, or any other building component located in their installation space inside the facility 7. In this embodiment, the plurality of detectors 1 are respectively installed in spaces E1-E5 inside the facility 7 as shown in FIG 2. The external terminal 5 of the detector management system 200 may be a home energy management system (HEMS) controller installed in the facility 7, for example.

[0016] As described above, the detector 1 may be implemented as a fire alarm device, for example, and the facility 7 is supposed to be a single-family dwelling house, for example. However, this is only an example of the present disclosure and should not be construed as limiting. The facility 7 may also be a multi-family dwelling house (condominium) (i.e., what is called a "mansion" in Japan). Alternatively, the facility 7 may also be a non-residential facility 7. Examples of such non-residential facilities include office buildings, theaters, movie theaters, public halls, amusement facilities, complex facilities, restaurants, department stores, schools, hotels, inns, hospitals, nursing homes for the elderly, kindergartens, libraries, museums, art museums, underground shopping malls, railway stations, and airports.

[0017] In this embodiment, the detector 1 includes, as shown in FIG 1, a holding unit H1 to hold at least location information about an installation location L1 (see FIG 2) where the detector 1 is installed. In the example illustrated in FIG 2, the installation location L1 corresponds to any one of the spaces E1-E5. In this embodiment, the holding unit H1 corresponds to a storage unit 20 for storing the location information as data. Specifically, the holding unit H1 may be implemented as a device selected from the group consisting of a read-only memory (ROM), a random access memory (RAM), an electrically erasable programmable read-only memory (EEPROM), and other storage devices. However, the holding unit H1 does not have to be implemented as such a device. Alternatively, the holding unit H1 may also hold the location information by turning ON and OFF the contact of a dip switch or a rotary switch, for example.

[0018] In the following description, if the detector 1 serves as a slave device, the location information held by the holding unit H1 is supposed to be information about only the installation location L1 of the detector 1 itself (its own device). In other words, the holding unit H1 of the slave device is supposed to hold only location information about the installation location L1 of its own device and no location information about the installation location L1 of any other detector 1 (another device). On the other hand, if the detector 1 serves as a master device, then the detector 1 is supposed to hold not only location information about the installation location L 1 of its own device but also location information about the installation locations L1 of other devices as well.

[0019] According to this configuration, the holding unit H1 holds the location information. Thus, having either the detector 1 itself or another device call an alert in accordance with the location information of the detector 1, for example, may make the specific location where an event that calls for disaster prevention measures (such as a fire) is currently present more easily determinable.

(2) Details

(2.1) Overall configurations

[0020] Next, overall configurations for the detector 1, detection system 100, and detector management system 200 according to this embodiment will be described in detail. In this embodiment, the detector 1 may be implemented as a battery-driven fire alarm device, for example. However, this is only an example of the present disclosure and should not be construed as limiting. Alternatively, the detector 1 may also be electrically connected to an external power supply (such as a commercial power supply) and may be driven by converting AC power (having an effective value of 100 V, for example) supplied from the external power supply into DC power.

[0021] As shown in FIGS. 1 and 2, the detection system 100 includes a plurality of (e.g., five in the example illustrated in FIGS. 1 and 2) detectors 1. The plurality of detectors 1 are implemented as so-called "synchronous fire alarm devices." That is to say, the detection system 100 is configured such that no matter which of the plurality of detectors 1 detects the presence of a fire, the detector 1 emits an alarm sound in synch with (i.e., along with) the other detectors 1. In this embodiment, a network is established between the plurality of detectors 1 to make

each detector 1 ready to communicate with the other detectors 1. In this embodiment, out of the five detectors 1, a detector 1A serves as a master device, the other detectors 1B-1E serve as slave devices, and communication is readily established between the master device and the slave devices (see FIG. 2). In the following description, the four detectors 1B-1E serving as slave devices will be hereinafter collectively referred to as "slave devices 101" (first detectors) and the detector 1A serving as a master device will be hereinafter referred to as a "master device 102" (second detector).

[0022] In the following description, each of the plurality of detectors 1 is supposed to be installed on the ceiling surface of one of the rooms or the staircase inside the facility 7 (e.g., single-family dwelling house in this example) as shown in FIG 2. Specifically, the detectors 1A, 1B, 1C, 1D, and 1E are arranged in spaces E1, E2, E3, E4, and E5, respectively. The space E1 may be a living room, for example. The space E2 may be a bedroom, for example. The space E3 may be staircase, for example. The space E4 may be a kid's room, for example. The space E5 may be a kitchen, for example. FIG 2 illustrates an exemplary situation where a fire is present in the space E1 used as a living room. The respective detectors 1 will be described in detail later in the "(2.2) Detector" section.

[0023] As shown in FIG 1, the detector management system 200 includes the detection system 100 and the external terminal 5. The detector management system 200 may further include a telecommunications device 6 and an external server 8 (see FIG 3). The external terminal 5 is configured to manage the plurality of detectors 1. In the example illustrated in FIG 2, the external terminal 5 is installed beside the flight of stairs on the first floor in the space E3. The external terminal 5, the telecommunications device 6, and the external server 8 will be described in detail later in the "(2.3) External terminal" section.

(2.2) Detector

(2.2.1) Master device (second detector)

[0024] First, a configuration for the master device 102 (detector 1A), which is one of the plurality of detectors 1, will be described.

[0025] The master device 102 is configured to detect the presence of an event (e.g., a fire in this example) that calls for disaster prevention measures. The master device 102 has a detection capability of detecting the presence of a fire in the facility 7 and an alarm capability of calling an alert when detecting the presence of the fire in the facility 7. As shown in FIG. 1, the master device 102 includes a control unit 10, a storage unit 20, a first communications unit 21, a second communications unit 22, a battery 23, a detection unit 3, and an alert unit 4. In addition, the master device 102 further includes circuit modules such as an audio circuit and a lighting circuit. The battery 23 may be a lithium battery, for example, and the master device 102 is driven by power supplied from the battery 23.

[0026] Furthermore, the master device 102 includes the holding unit H1 for holding location information about at least the installation locations L1 where the detectors 1 are installed. As described above, the holding unit H1 corresponds to the storage unit 20, for example. The holding unit H1 of the master device 102 holds not only the location information about the installation location L1 where its own device is installed but also location information about the respective installation locations L1 where the four slave devices 101 are installed.

[0027] The control unit 10 includes a computer system including a processor and a memory, for example. The computer system performs the function of the control unit 10 by making the processor execute a program stored in the memory. In this embodiment, the program to be executed by the processor is stored in advance in the memory of the computer system. However, this is only an example and should not be construed as limiting. The program may also be distributed after having been stored in a non-transitory storage medium such as a memory card or downloaded via a telecommunications line such as the Internet.

[0028] The detection unit 3 has the capability of detecting information about a fire, against which an alarm sound needs to be emitted (i.e., has the detection capability). In this embodiment, the detection unit 3 may be implemented as a photoelectric sensor for detecting smoke, for example. Therefore, the information about the fire includes information about smoke, for example. However, this is only an example of the present disclosure and should not be construed as limiting. Alternatively, the detection unit 3 does not have to be a photoelectric sensor but may also be a fixed temperature sensor for detecting heat, for example. As shown in FIG 1, the detection unit 3 includes a light-emitting unit 31 such as a light-emitting diode (LED) and a photodetector unit 32 such as a photodiode, for example. The light-emitting unit 31 and the photodetector unit 32 are arranged in the labyrinth of the housing of its own device such that the photosensitive plane of the photodetector unit 32 is off the optical axis of the light emitted from the light-emitting unit 31. In the presence of a fire, smoke may flow into the labyrinth through holes provided through the housing.

[0029] If there is no smoke in the labyrinth of the housing, then the light emitted from the light-emitting unit 31 hardly reaches the photosensitive plane of the photodetector unit 32. On the other hand, if there is any smoke in the labyrinth of the housing, then the light emitted from the light-emitting unit 31 is scattered by the smoke, thus causing some of the scattered light to impinge on the photosensitive plane of the photodetector unit 32. That is to say, the detection unit 3 makes the photodetector unit 32 receive the light emitted from the light-emitting unit 31 which has been scattered by the smoke. The detection unit 3 outputs an electrical signal (detection signal), representing a voltage level corresponding to the

quantity of light received at the photodetector unit 32, to the control unit 10.

[0030] The alert unit 4 includes a display unit 41 and an audio unit 42 as shown in FIG 1. The alert unit 4 has the capability of alerting, when the presence of a fire is detected in the facility 7, the user to the presence of the fire (i.e., an alert capability). In this embodiment, the alert unit 4 alerts the user with light and sound.

[0031] The audio unit 42 has the capability of alerting the user to the presence of a fire. The audio unit 42 emits a sound (i.e., an acoustic wave). When the control unit 10 decides that a fire should be present in the facility 7, the audio unit 42 emits an alarm sound to alert the user to the presence of the fire.

[0032] The audio unit 42 may be implemented as a loudspeaker that transduces an electrical signal into a sound. The loudspeaker includes a diaphragm and emits an alarm sound by mechanically vibrating the diaphragm in accordance with the electrical signal. The audio unit 42 emits an alarm sound (such as a beep) under the control of the control unit 10. The audio unit 42 suitably emits an alarm sound, of which the loudness (i.e., the sound pressure level) is variable. For example, the alarm sound may include a sweep sound that is swept from a low-frequency sound to a high-frequency sound.

[0033] Note that the alarm sound according to this embodiment is emitted under the control of the control unit 10 with at least the location information about the installation location L1 of the detector 1 that has detected the fire included in a verbal warning message. In other words, when detecting the presence of a fire (as a particular event), the alert unit 4 according to this embodiment calls an alert in accordance with the location information of the detector 1 that has detected the fire. Examples of the "location information" about the installation location L1 include name information representing the name of the installation location L1 (such as "living room," "staircase," "bedroom," "kid's room," and "kitchen") and code information for use to identify the installation location L1 (such as "A1" "A2," or "A3"). In this embodiment, the alarm sound is emitted with the name information included in the verbal warning message. The alarm sound is made up of the sweep sound and the verbal warning message continuous with the sweep sound.

[0034] The installation location L1 of the master device 102 is the living room (space E1). If the presence of a fire is detected by the master device 102, then the audio unit 42 of the master device 102 emits a verbal warning message "Fire in living room! Fire in living room!" In that case, concerning the synchronized alarm emission operation between the plurality of detectors 1, the triggering device of the synchronized alarm emission (indicating the origin of the fire) is the master device 102. In response, each of the other detectors 1 serving as triggered devices also emits the same verbal warning message "Fire in living room! Fire in living room!" Alternatively, the detector 1 at the origin of the fire may also emit a simpler verbal warning message such as "Fire! Fire!" In other words, the detector 1 at the origin of the fire may emit a verbal warning message with the location information omitted.

[0035] When the detector 1 receives an operating command externally at an operating member such as a press button (i.e., when subjected to a press operation) while the fire alarm device is activated (i.e., while the alarm sound is being emitted), the audio unit 42 stops emitting the alarm sound.

[0036] The display unit 41 has the capability of alerting the user to the presence of the fire. The display unit 41 may be implemented as an indicating lamp including a red LED 410 as a light source. The display unit 41 is OFF normally (i.e., while monitoring for any fire) and starts flashing (or lighting) when the control unit 10 decides that a fire should be present. When the alarm sound stops being emitted, flashing is stopped under the control of the control unit 10.

[0037] The storage unit 20 corresponds to the holding unit H1 as described above and is implemented as a device selected from the group consisting of a ROM, a RAM, an EEPROM, and other storage devices. The storage unit 20 stores a unique identifier (identification information) assigned to itself (its own device). Examples of the "identifier (identification information)" include the IP address, the Mac address, and the name of the detector 1, for example. In addition, the storage unit 20 also stores verbal warning message data about the verbal warning message to be emitted as a part of the alarm sound. Optionally, the storage unit 20 may be a memory of the control unit 10.

[0038] In particular, the storage unit 20 (holding unit HI) of the master device 102 stores the location information about the installation location L1 where its own device is installed and the location information about the installation locations L1 where the other detectors 1 are installed as described above. In this embodiment, the storage unit 20 stores, as the location information, multiple pieces of code information to identify the respective installation locations L1 of the plurality of detectors 1, including its own device, in association with the identifiers of their corresponding detectors 1. In this case, the location information is any one of five pieces of code information "A1" to "A5," for example.

[0039] The storage unit 20 (holding unit HI) further holds association information. As used herein, the "association information" refers to information that associates the name information, representing the respective names of the plurality of installation locations L1, with the multiple pieces of code information to identify the plurality of installation locations L1. Specifically, the holding unit H1 may hold association information that associates the name information "living room" with the code "A1." Likewise, the holding unit H1 may also hold association information that associates the name information "bedroom" with the code "A2," association information that associates the name information "staircase" with the code "A3," association information that associates the

name information "kid's room" with the code "A4," and association information that associates the name information "kitchen" with the code "A5." The code information is not limited to any particular type of information. To say the least, the data length of each piece of code information is suitably shorter than that of an associated piece of name information.

[0040] The first communications unit 21 includes a communications interface for communicating wirelessly with the other detectors 1 by using a radio wave falling within a first frequency band. The first frequency band may correspond to a radio frequency band in accordance with the regulations of the Fire Service Act in the country of Japan, for example. The first frequency band may correspond, for example, to the wireless station of the low-power security system, namely, the 420 MHz band. However, the first frequency band does not have to be the 420 MHz band but may also be changed as appropriate in accordance with applicable regulations of the Radio Act or Fire Service Act defined in any of various other countries. The first communications unit 21 receives detection information from the other detectors 1. In addition, on receiving the detection information from one detector 1 (e.g., the detector 1B), the first communications unit 21 transmits an alarm emission instruction to the other detectors 1 (such as the detectors 1C-1E).

[0041] As used herein, the "detection information" refers to notification information that a fire has been detected in the facility 7 and may include, for example, location information (code information), an identifier, and a result of detection (indicating whether or not a fire is actually present).

[0042] The second communications unit 22 includes a communications interface for communicating wirelessly with the external terminal 5 by using a radio wave falling within a second frequency band, which is different from the first frequency band. The second frequency band may be, for example, the 920 MHz band compliant with the Wi-SUN® standard (which is an international wireless communication standard IEEE 802.15.4g). However, the second frequency band does not have to be the 920 MHz band but may also be changed as appropriate in accordance with applicable regulations of the Radio Act or Fire Service Act defined in any of various other countries. For example, when its own device detects a fire, for example, the second communications unit 22 transmits the detection information acquired by its own device to the external terminal 5. When the first communications unit 21 receives the detection information from any of the four slave devices 101 (i.e., the detectors 1B-1E), the second communications unit 22 transmits the detection information to the external terminal 5.

[0043] The control unit 10 determines, based on the detection signal provided by the detection unit 3, whether or not a fire is actually present. For example, when finding the voltage level of the detection signal equal to or greater than a predetermined threshold value, the control unit 10 may decide that a fire should be present.

[0044] In addition, the control unit 10 includes a detecting and outputting unit 11, a setting and outputting unit 12, a switching unit 13, and a setting unit 14 as shown in FIG 1. In other words, the control unit 10 performs the respective functions of the detecting and outputting unit 11, setting and outputting unit 12, switching unit 13, and setting unit 14. The setting and outputting unit 12, switching unit 13, and setting unit 14 will be described in detail later in the "(2.5) Setting location information" section.

[0045] When its own device detects the presence of a fire (as a particular event), the detecting and outputting unit 11 outputs at least the location information to destination devices to make the destination devices call an alert in accordance with the location information of its own device. As used herein, the "destination devices" include the four slave devices 101 and the external terminal 5. That is to say, the detecting and outputting unit 11 outputs detection information, including the code information "A1" of its own device, to the four slave devices (detectors 1B-1E) to make the four slave devices 101 deliver the verbal warning message "Fire in living room! Fire in living room!" In addition, the detecting and outputting unit 11 also outputs the detection information to the external terminal 5.

[0046] Specifically, when its own device detects the presence of a fire, the detecting and outputting unit 11 transmits notification information that the fire has been detected (in other words, the detection information acquired by its own device) to the external terminal 5 via the second communications unit 22. In addition, when its own device detects the presence of the fire, the detecting and outputting unit 11 also transmits the detection information acquired by its own device to the four slave devices 101 via the first communications unit 21 to trigger the synchronized alarm emission by all of the five detectors 1.

[0047] Furthermore, when its own device detects the presence of a fire, the control unit 10 further makes the audio unit 42 start emitting an alarm sound. For example, to make the audio unit 42 deliver a verbal warning message as the alarm sound, the control unit 10 generates, based on message data stored in the storage unit 20, an audio signal representing the verbal warning message. Then, the audio unit 42 delivers the verbal warning message (as an alarm sound) based on the audio signal generated by the control unit 10. Furthermore, when its own device detects the presence of a fire, the control unit 10 further controls the display unit 41 to make the display unit 41 emit flashing light.

[0048] In this embodiment, when its own device detects the presence of a fire, the control unit 10 searches the association information stored in the storage unit 20 for name information (e.g., "living room" in this example) associated with the code information "A1" of its own device. Then, the control unit 10 generates an audio signal including the name information "living room" and makes the audio unit 42 call an alert.

[0049] Meanwhile, on acquiring, from any one of the

four slave devices 101 (that serves as the triggering device), notification information that a fire has been detected in the facility 7 as the detection information via the first communications unit 21, the control unit 10 transmits the detection information acquired from the triggering device to the external terminal 5 via the second communications unit 22. In addition, to make all of the five detectors 1 emit the alarm sound in synch with each other, the control unit 10 further transmits the detection information, acquired from the triggering device, to the other slave devices 101 via the first communications unit 21. Furthermore, on receiving, as the detection information, notification information that a fire has been detected in the facility 7 from the slave device 101, the control unit 10 also makes the audio unit 42 start emitting the alarm sound. Besides, the control unit 10 further controls the display unit 41 to make the display unit 41 emit flashing light.

[0050] In this case, when acquiring detection information from any of the four slave devices 101, the control unit 10 extracts code information (which is supposed to be "A2," for example) from the detection information. The control unit 10 searches the association information in the storage unit 20 for name information (e.g., "bedroom" in this example) associated with "A2" as the code information of the triggering device. Then, the control unit 10 generates an audio signal, including the name information "bedroom," and makes the audio unit 42 call an alert.

[0051] The detection information does not have to include the result of detection separately from the location information. Optionally, the control unit 10 may also decide, on detecting, as a trigger, the reception of the location information (code information), that a fire should have been detected by another detector 1. Furthermore, the detection information does not have to include the identifier. In other words, the detection information needs to include at least the location information.

[0052] In addition, the code information is different from the identifier (identification information) unique to each detector 1. Thus, the same single piece of code information may also be assigned to two or more detectors 1. For example, if two detectors 1 are installed on the staircase, then both of these two detectors 1 have the same piece of code information "A3."

(2.2.2) Slave device (first detector)

[0053] Next, a configuration for the four slave devices 101 (detectors 1B-1E), out of the plurality of detectors 1, will be described. In the following description, any constituent element of the slave devices 101 (detectors 1B-1E), having the same function as a counterpart of the master device 102 (detector 1A) described above, will be designated by the same reference numeral as that counterpart's, and description thereof will be omitted herein as appropriate.

[0054] Each slave device 101, as well as the master device 102, is configured to detect the presence of an event (e.g., a fire in this example) that calls for disaster prevention measures. Each slave device 101 has the detection capability of detecting the presence of a fire in the facility 7 and the alarm capability of calling an alert when detecting the presence of the fire in the facility 7.

[0055] Each slave device 101, as well as the master device 102, includes the control unit 10, the storage unit 20 (holding unit HI), the first communications unit 21, the second communications unit 22, the battery 23, the detection unit 3, and the alert unit 4 (see FIG. 1). In addition, each slave device 101 further includes circuit modules such as an audio circuit and a lighting circuit.

[0056] Note that the second communications unit 22 is not an essential constituent element for the slave device 101 but may be omitted. Alternatively, if each of the plurality of detectors 1 having the same configuration is allowed to selectively operate as either the slave device 101 or the master device 102 by turning a switch, for example, then the detector 1 switched to operate as the slave device 101 does not have to use the function of the second communications unit 22, even though the detector 1 has the function of the second communications unit 22.

[0057] The installation locations L1 of the four slave devices 101 are the bedroom (space E2), the staircase (space E3), the kid's room (space E4), and the kitchen (space E5), respectively.

[0058] The storage unit 20 of each slave device 101 corresponds to the holding unit H1 and is implemented as a device selected from the group consisting of a ROM, a RAM, an EEPROM, and other storage devices. The storage unit 20 stores a unique identifier (identification information) assigned to itself (its own device). In addition, the storage unit 20 also stores verbal warning message data about the verbal warning message to be emitted as a part of the alarm sound.

[0059] Unlike the storage unit 20 of the master device 102, the storage unit 20 of each slave device 101 stores only the location information about the installation location L1 where its own device is installed and does not store the location information about the installation locations L1 where the other detectors 1 are installed. In other words, the location information held by the holding unit H1 of each slave device 101 is information about only the installation location L1 of its own device.

[0060] In addition, the control unit 10 of each slave device 101 includes the detecting and outputting unit 11, the setting and outputting unit 12, the switching unit 13, and the setting unit 14. In other words, the control unit 10 performs the respective functions of the detecting and outputting unit 11, setting and outputting unit 12, switching unit 13, and setting unit 14. The setting and outputting unit 12, switching unit 13, and setting unit 14 will be described in detail later in the "(2.5) Setting location information" section.

[0061] When its own device detects the presence of a fire (as a particular event), the detecting and outputting unit 11 outputs at least the location information to a des-

tination device to make the destination device call an alert in accordance with the location information of its own device. As used herein, the "destination device" includes the master device 102. That is to say, when the detector 1B, for example, detects the presence of a fire, the detecting and outputting unit 11 of the detector 1B outputs detection information, including the code information "A2" of its own device, to the master device 102 to make the master device 102 deliver the verbal warning message "Fire in bedroom! Fire in bedroom!" In addition, the detecting and outputting unit 11 also outputs the detection information including the code information "A2" of its own device, to the other three slave devices 101 via the master device 102 to make the other three slave devices 101 deliver the verbal warning message "Fire in bedroom! Fire in bedroom!" That is to say, when its own device detects the presence of a fire, the detecting and outputting unit 11 of each slave device 101 transmits the detection information acquired by its own device to the master device 102 via the first communications unit 21 in order to serve as the triggering device that makes all of the five detectors 1 emit the alarm sound in synch with each other.

[0062] Furthermore, when its own device detects the presence of a fire, the control unit 10 of each slave device 101 further makes the audio unit 42 of its own device start emitting an alarm sound. Furthermore, when its own device detects the presence of a fire, the control unit 10 of each slave device 101 further controls the display unit 41 of its own device to make the display unit 41 emit flashing light.

[0063] In this embodiment, when its own device detects the presence of a fire, the control unit 10 of each slave device 101 searches the association information stored in the storage unit 20 of its own device for name information associated with the code information of its own device. Then, the control unit 10 generates an audio signal including the name information and makes the audio unit 42 call an alert.

[0064] Meanwhile, on acquiring, from the master device 102, notification information that a fire has been detected in the facility 7 as the detection information via the first communications unit 21, the control unit 10 of each slave device 101 makes the audio unit 42 of its own device start emitting the alarm sound. Furthermore, the control unit 10 further controls the display unit 41 to make the display unit 41 emit flashing light.

[0065] In this case, when acquiring detection information from the master device 102, the control unit 10 of each slave device 101 extracts code information from the detection information. In this case, the code information should be the code information of any of the four detectors 1 other than its own device. The control unit 10 searches the association information in the storage unit 20 of its own device for name information associated with the code information of the triggering device (located at the origin of the fire). Then, the control unit 10 generates an audio signal, including the name information, and makes the audio unit 42 of its own device call an alert.

(2.3) External terminal

[0066] The external terminal 5 (control device) may be implemented as, for example, a home energy management system (HEMS) controller as described above and may communicate with a plurality of devices provided for the facility 7. The plurality of devices may include air conditioners and water heaters, for example. In this embodiment, the external terminal 5 may further communicate with the master device 102 (detector 1A) provided for the facility 7. In addition, the external terminal 5 may also communicate with the plurality of slave devices 101 (detectors 1B-1E) via the master device 102.

[0067] The external terminal 5 includes a control unit 50, a communications unit 53, a storage unit 54, and a display unit 55 as shown in FIG. 1.

[0068] The control unit 50 includes a computer system including a processor and a memory, for example. The computer system performs the function of the control unit 50 by making the processor execute a program stored in the memory. In this embodiment, the program to be executed by the processor is stored in advance in the memory of the computer system. However, this is only an example and should not be construed as limiting. The program may also be distributed after having been stored in a non-transitory storage medium such as a memory card or downloaded via a telecommunications line such as the Internet.

[0069] The communications unit 53 includes a first (communications) interface 53A for communicating with the master device 102 and other devices. The first interface 53A receives various pieces of information from the master device 102 and other devices by wireless communication using a radio wave falling within the second frequency band (such as the 920 MHz band). The communications unit 53 further includes a second (communications) interface 53B for communicating with the telecommunications device 6 and the external server 8 over a network NT1 (see FIG 3) such as the Internet. The second interface 53B may communicate with the telecommunications device 6 via another device such as the external server 8. Examples of the telecommunications device 6 include the facility 7 user's (e.g., resident's) own smartphone, tablet terminal, or any other device with communication capability. In this embodiment, the telecommunications device 6 is supposed to be a smartphone. In the telecommunications device 6, installed is a dedicated application software program that allows the telecommunications device 6 to wirelessly communicate with the external terminal 5.

[0070] The storage unit 54 is implemented as a device selected from the group consisting of a read-only memory (ROM), a random access memory (RAM), an electrically erasable programmable read-only memory (EEPROM), and other storage devices.

[0071] The storage unit 54 stores the respective iden-

tifiers (identification information) of the plurality of detectors 1, for example. The storage unit 54 stores the identification information such that each of the plurality of detectors 1 is associated with the installation location L1 (which is any one of the spaces E1-E5) where the detector 1 is installed. Specifically, the storage unit 54 stores, for example, the identifier of the detector 1A and the location information (code information) about the installation location L1 (space E1) where the detector 1A is installed in association with each other. In the same way, the storage unit 54 also stores, for example, the identifiers of the detectors 1B-1E and the location information (code information) about the installation locations L1 (spaces E2-E5) where the detectors 1B-1E are installed in association with each other on a one-to-one basis. Besides, the storage unit 54 further stores the association information, which is stored in common in the storage unit 20 of each detector 1, and information (such as the phone number) about the telecommunications device 6.

[0072] As shown in FIG 1, the control unit 50 includes an acquisition unit 51 and a registration unit 52. In other words, the control unit 50 performs the functions of the acquisition unit 51 and the registration unit 52.

[0073] The acquisition unit 51 is configured to acquire the detection information of the plurality of detectors 1 from the master device 102. Specifically, if any of the detectors 1 has detected a fire, then the acquisition unit 51 acquires the detection information from the master device 102 via the first interface 53A. Optionally, the control unit 50 may have location information (name information) about the installation location L1 of the detector 1 at the origin of the fire displayed on the display unit 55 based on the detection information thus acquired. If the external terminal 5 holds map information (such as a block plan) of this facility 7, then the installation location L1 of the detector 1 at the origin of the fire may be displayed, along with the map information, to be easily determinable on the map. Also, if the external server 8 is a server device under the management of a security company, for example, then the external terminal 5 may notify, based on the detection information thus acquired, the external server 8 of the presence of the fire. Alternatively, the external terminal 5 may notify, based on the detection information thus acquired, the telecommunications device 6 of the presence of the fire.

[0074] In addition, the acquisition unit 51 is further configured to acquire location information from the telecommunications device 6. In accordance with an operating command entered through the telecommunications device 6, the acquisition unit 51 acquires the location information via the second interface 53B. The registration unit 52 registers, with the storage unit 54, the location information provided by the telecommunications device 6 in association with the identifier of the detector 1.

[0075] Specifically, upon a reception request from the application software being run on the telecommunications device 6, the external terminal 5 outputs the identifier, for example, of the detector 1 currently installed or to be installed (which may be name information such as "living room" if the detector 1 is currently installed) to the telecommunications device 6. The resident may enter an operating command about, for example, the addition, change, and deletion of the location information associated with each detector 1 with reference to, for example, a list of the identifiers of the detectors 1 presented on the display screen of the telecommunications device 6.

[0076] If the external terminal 5 holds the map information (such as a block plan) of this facility 7, then the external terminal 5 may associate the identifiers of the detectors 1 with the map information and present the map information with the identifiers of the detectors 1 on the display screen of the telecommunications device 6. The resident may enter an operating command about, for example, the addition, change, and deletion of the location information associated with each detector 1 by tapping on an icon representing the detector 1, for example.

[0077] In accordance with the operating command entered through the telecommunications device 6, the registration unit 52 registers (i.e., adds, changes, or deletes), with the storage unit 54, the location information and the identifiers of the detectors 1 in association with each other. To update the storage unit 20 of the master device 102 with the registered information, the external terminal 5 outputs the registered information to the master device 102 via the first interface 53A.

[0078] Since the external terminal 5 includes the acquisition unit 51 and the registration unit 52, the user may register the location information of the detector 1 with the external terminal 5 by using his or her own telecommunications device 6.

[0079] In addition, the external terminal 5 manages the association information stored in common in the respective storage units 20 of the plurality of detectors 1. Optionally, the external terminal 5 may output the association information upon a reception request from the application software being run on the telecommunications device 6. The resident may enter an operating command about, for example, addition, change, or deletion of name information associated with each piece of code information with reference to the association information presented on the display screen of the telecommunications device 6. For example, if the code information "A1" is associated with the name information "living room" according to the association information, then the name information associated with the code information "A1" may be changed from "living room" into "kitchen." Alternatively, an association between the code information "B1" and the name information "hallway" may be newly added to the association information. Furthermore, the name information may be changed into "XX's room" (where XX is the name of the resident's kid) according to his or her preference. Optionally, the language displayed may be changed from Japanese into English.

[0080] To update the storage unit 20 of the master device 102 with the association information that has been

modified, the external terminal 5 outputs the association information to the master device 102 via the first interface 53A. In response, to update the respective storage units 20 of the slave devices 101 with the association information that has been modified, the master device 102 outputs the association information to every slave device 101 via the first communications unit 21.

[0081] Note that not all of the identifiers, the association information, the map information, the code information, the name information, and other pieces of information have to be stored in, and managed by, only the storage unit 54 of the external terminal 5. Alternatively, part or all of these pieces of information may be stored in the storage unit of the external server 8, for example. The external server 8 may manage these pieces of information on a facility 7 basis. The administrator who manages the external server 8 may designate a particular facility 7 and change the settings of various pieces of information, including the identifiers, the association information, the map information, the code information, and the name information described above, with respect to the external terminal 5 of the designated facility 7.

[0082] The display unit 55 is implemented as a thin display device such as a liquid crystal display or an organic electroluminescent (OEL) display. The display unit 55 may display the information acquired by the acquisition unit 51.

[0083] Optionally, the external terminal 5 may add, change, or delete the location information associated with each detector 1 and may modify the association information in accordance with an operating command entered through an operating unit provided for the housing of the external terminal 5. If the display unit 55 is implemented as a touchscreen panel display device, then the display unit 55 may also have the function of the operating unit.

(2.4) Operation

[0084] Next, it will be described briefly how the detector management system 200 operates when detecting a fire.

[First exemplary operation]

[0085] First, it will be described with reference to FIG 4 how the detector management system 200 operates when the master device 102 (detector 1A) has detected a fire.

[0086] The master device 102 detects a fire (in Step ST1). Then, the master device 102 calls an alert in accordance with the location information of its own device. Specifically, the master device 102 makes reference to the association information with the code information "A1" representing the location information of its own device and emits a verbal warning message "Fire in living room! Fire in living room!" including the name information "living room" continuously with a sweep sound (in Step ST2). Alternatively, the verbal warning message emitted from the master device 102 at the origin of the fire may also be simply "Fire! Fire!" as described above.

[0087] In addition, the master device 102 also transmits the detection information to the other four slave devices 101 from the first communications unit 21 that establishes wireless communication using a radio wave falling within the first frequency band (e.g., the 420 MHz band) (in Step ST3). Note that only one of the four slave devices 101 is shown in FIG. 4. On receiving the detection information, each of the four slave devices 101 extracts the code information "A1" from the detection information to determine, with reference to the association information stored in the storage unit 20 of its own device, that the name information associated with the code information "A1" should be "living room." Then, in synch with the alarm sound emitted from the master device 102, each slave device 101 emits the verbal warning message "Fire in living room! Fire in living room!" continuously with the sweep sound (in Step ST4).

[0088] Furthermore, the master device 102 transmits the detection information to the external terminal 5 from the second communications unit 22 that establishes wireless communication using a radio wave falling within the second frequency band (e.g., the 920 MHz band) (in Step ST5). In accordance with the detection information received, the external terminal 5 makes the display unit 55 display information that a fire is present in the living room (space E1) of the facility 7 and also notifies the telecommunications device 6, the external server 8, and other devices of the presence of the fire in the living room (in Step ST6).

[0089] According to this exemplary operating procedure, the master device 102 makes the slave device 101 that is the destination of the detection information call an alert in accordance with the location information of its own device, thus making the origin of the fire more easily locatable. That is to say, this increases the chances of the user quickly locating the origin of the fire based on the specifics of the alarm emitted from the detector 1.

[Second exemplary operation]

[0090] Next, it will be described with reference to FIG. 5 how the detector management system 200 operates when any of the four slave devices 101 (detectors 1B-1E) has detected a fire. In the following example, the detector 1E installed at the kitchen is supposed to have detected a fire.

[0091] The detector 1E serving as a slave device 101 detects a fire (in Step ST11). Then, the detector 1E calls an alert in accordance with the location information of its own device. Specifically, the detector 1E makes reference to the association information with the code information "A5" representing the location information of its own device and emits a verbal warning message "Fire in kitchen! Fire in kitchen!" including the name information "kitchen" continuously with a sweep sound (in Step ST12). Alternatively, the verbal warning message emit-

ted from the detector 1E at the origin of the fire may also be simply "Fire! Fire!" as described above.

[0092] In addition, the detector 1E also transmits the detection information to the master device 102 from the first communications unit 21 that establishes wireless communication using a radio wave falling within the first frequency band (e.g., the 420 MHz band) (in Step ST13). On receiving the detection information, the master device 102 extracts the code information "A5" from the detection information to determine, with reference to the association information stored in the storage unit 20 of its own device, that the name information associated with the code information "A5" should be "kitchen." Then, in synch with the alarm sound emitted from the detector IE, the master device 102 emits the verbal warning message "Fire in kitchen! Fire in kitchen!" continuously with the sweep sound (in Step ST14).

[0093] In addition, the master device 102 also transmits the detection information to the other three slave devices 101 (detectors 1B-1D) from the first communications unit 21 that establishes wireless communication using a radio wave falling within the first frequency band (e.g., the 420 MHz band) (in Step ST15). On receiving the detection information, each of the three slave devices 101 (detectors 1B-1D) emits the verbal warning message "Fire in kitchen! Fire in kitchen!" continuously with the sweep sound (in Step ST16). Note that only one of the three slave devices 101 is shown in FIG. 5.

[0094] Furthermore, the master device 102 transmits the detection information to the external terminal 5 from the second communications unit 22 that establishes wireless communication using a radio wave falling within the second frequency band (e.g., the 920 MHz band) (in Step ST17). In accordance with the detection information received, the external terminal 5 makes the display unit 55 display information that a fire is present in the kitchen (space E5) of the facility 7 and also notifies the telecommunications device 6, the external server 8, and other devices of the presence of the fire in the kitchen (in Step S18).

[0095] According to this exemplary operating procedure, the slave device 101 makes the master device 102 and the other slave devices 101 that are the destinations of the detection information call an alert in accordance with the location information of its own device, thus making the origin of the fire more easily locatable. That is to say, this increases the chances of the user quickly locating the origin of the fire based on the specifics of the alarm emitted from the detector 1. In addition, since the master device 102 includes both the first communications unit 21 and the second communications unit 22, the information may be easily transmitted from the slave device 101 to the external terminal 5. Particularly when any of the slave devices 101 detects the presence of a fire between the slave device 101 (first detector) and the external terminal 5 that use mutually different frequency bands for establishing wireless communication, the location information of the slave device 101 may be transmitted easily to the external terminal 5.

[0096] In this embodiment, the storage unit 20 (holding unit HI) of each slave device 101 stores only the location information of its own device and does not store the location of any other device. This saves, in a situation where a plurality of detectors 1 are newly installed or a single or a plurality of detectors 1 are additionally installed, the trouble of having the location information of every detector 1 stored in each slave device 101, thus lightening the load imposed by the job of setting the location information. In other words, there is no need for each detector 1 to make management of the respective locations and identifiers of the other detectors 1 in advance before the outbreak of a fire. Instead, each detector 1 just needs to call an alert in accordance with the location information received when a fire actually breaks out.

(2.5) Setting location information

[0097] Next, the setting and outputting unit 12, switching unit 13, and setting unit 14 of the control unit 10 of each detector 1 will be described along with the operation of setting the location information.

[0098] First, it will be described how to set the location information with respect to each detector 1.

[0099] The switching unit 13 is configured to switch the operation mode from one of a plurality of operation modes, including at least a detection mode for detecting the presence of a fire (as a particular event) and a setting mode for setting the location information with respect to the storage unit 20 (holding unit HI), to another. Optionally, the operation modes may include not only the detection mode and the setting mode but also an operation test mode for operation check. For example, when two operating units, implemented as push buttons (or dip switches, for example) exposed on the housing of each detector 1, are both pressed down at a time, the switching unit 13 may switch the operation mode from the detection mode to the setting mode.

[0100] When the operation mode is switched to the detection mode in each detector 1, the control unit 10 monitors for the presence of any fire. When detecting a fire, the detector 1 performs the operation that has already been described in the "(2.4) Operation" section.

[0101] On the other hand, when the operation mode is switched to the setting mode in each detector 1, the setting unit 14 accepts the settings of the location information with respect to the storage unit 20 (holding unit HI). In that case, the setting unit 14 accepts, as the location information, a single piece of information about a potential location selected from multiple pieces of information about predetermined potential locations representing a plurality of locations where the detector 1 may be installed. Specifically, multiple pieces of information about potential locations, including living room, staircase, hallway, postern, kitchen, lavatory, rest room, bedroom, and kid's room, are stored in advance in the storage unit 20 of each detector 1. Those multiple pieces of information

about potential locations are stored in the storage unit 20 to be associated one to one with the multiple pieces of code information. That is to say, multiple pieces of name information of the association information described above, which are stored in common in the storage unit 20 of each detector 1, correspond to the multiple pieces of information about potential locations.

[0102] For example, every time the user presses one of the two operating units of each detector 1, the multiple pieces of information about the potential locations are emitted one after another as the verbal warning message in the ascending order from the first potential location (e.g., living room in the example described above) through the ninth potential location (e.g., the kid's room in the example described above). Meanwhile, every time the user presses the other of the two operating units, the multiple pieces of information about the potential locations are emitted one after another as the verbal warning message in the descending order. In other words, in response to the user's pressing one of the two operating units, the setting unit 14 makes the audio unit 42 emit, as the verbal warning messages, multiple pieces of name information of the association information.

[0103] If the user presses both of the two operating units at a time when a verbal warning message, mentioning the name of his or her desired potential location, is emitted, then the information about the potential location is determined to be the location information of the detector 1 and the operation mode is switched from the setting mode to the detection mode. The control unit 10 makes the storage unit 20 store code information, associated with the information about the potential location (name information), as the location information of its own device. Alternatively, the control unit 10 may store the name information as it is as the location information of its own device.

[0104] In this embodiment, each detector 1 includes the switching unit 13 and the setting unit 14, thus allowing the location information to be set with respect to each detector 1 according to either the user's preference or the environment where the detector 1 is installed. In particular, the setting unit 14 accepts the setting by regarding a single piece of information about a potential location, selected from the multiple pieces of information about predetermined potential locations, as the location information. This allows the user to select the location information from multiple pieces of information about potential locations. This enables the job of setting the location information with respect to each detector 1 to be done more efficiently.

[0105] Next, it will be described how to register the location information of each detector 1 with the external terminal 5.

[0106] The setting and outputting unit 12 outputs the location information and identification information of its own device in order to register the location information and identification information of its own device in association with each other with the external terminal 5 when the setting unit 14 of its own device accepts the setting of the location information. In this case, the destination to which the location information and identification information are output from each detector 1 varies depending on whether its own device is a slave device 101 or the master device 102.

[0107] If the setting unit 14 of its own device accepts the setting of the location information, then the master device 102 (second detector) makes the second communications unit 22 of its own device output the location information and identification information of its own device to the external terminal 5.

[0108] Meanwhile, if the setting unit 14 of its own device accepts the setting of the location information, then each slave device 101 (first detector) makes the first communications unit 21 of its own device output the location information and identification information of its own device to the master device 102. In response, the master device 102 makes the second communications unit 22 of its own device output the location information and identification information, received from the slave device 101, to the external terminal 5. In addition, the master device 102 also registers the location information and identification information, received from the slave device 101, with the storage unit 20 of its own device.

[0109] On the other hand, on receiving the location information and identification information of the detector 1 from the master device 102 via the first interface 53A, the external terminal 5 registers these pieces of information with the storage unit 54 in association with each other. Optionally, the external terminal 5 may transmit the location information and identification information of the detector 1 to the external server 8.

[0110] That is to say, if the user has set the location information of a slave device 101, then the slave device 101 makes the master device 102 register the location information and identification information of its own device with the external terminal 5.

[0111] In this embodiment, each detector 1 includes the setting and outputting unit 12. This allows, in a situation where a slave device 101 (first detector) accepts the setting of the location information between the slave device 101 and the external terminal 5 that use mutually different frequency bands for wireless communication, the location information of the slave device 101 to be transmitted easily to the external terminal 5. In other words, this enables the job of registering the location information of the detector 1 with the external terminal 5 to be done more efficiently. In addition, this also allows the external terminal 5 to manage the plurality of detectors 1.

(3) Variations

[0112] Note that the embodiment described above is only an exemplary one of various embodiments of the present disclosure and should not be construed as limiting. Rather, the exemplary embodiment may be readily

modified in various manners depending on a design choice or any other factor without departing from the scope of the present disclosure. The functions of the detector 1 according to the exemplary embodiment described above may also be implemented as, for example, a method for controlling the detector 1, a computer program, or a non-transitory storage medium that stores the computer program.

[0113] Next, variations of the exemplary embodiment will be enumerated one after another. The variations to be described below may be adopted in combination as appropriate. In the following description, the exemplary embodiment described above will be hereinafter sometimes referred to as a "basic example."

[0114] The control unit 10 of the detector 1 and the control unit 50 of the external terminal 5 according to the present disclosure each include a computer system. In that case, the computer system may include, as principal hardware components, a processor and a memory. The functions of the control unit 10 of the detector 1 and the control unit 50 of the external terminal 5 according to the present disclosure may be performed by making the processor execute a program stored in the memory of the computer system. The program may be stored in advance in the memory of the computer system. Alternatively, the program may also be downloaded through a telecommunications line or be distributed after having been recorded in some non-transitory storage medium such as a memory card, an optical disc, or a hard disk drive, any of which is readable for the computer system. The processor of the computer system may be made up of a single or a plurality of electronic circuits including a semiconductor integrated circuit (IC) or a large-scale integrated circuit (LSI). As used herein, the "integrated circuit" such as an IC or an LSI is called by a different name depending on the degree of integration thereof. Examples of the integrated circuits include a system LSI, a very large-scale integrated circuit (VLSI), and an ultra-large scale integrated circuit (ULSI). Optionally, a field-programmable gate array (FPGA) to be programmed after an LSI has been fabricated or a reconfigurable logic device allowing the connections or circuit sections inside of an LSI to be reconfigured may also be adopted as the processor. Those electronic circuits may be either integrated together on a single chip or distributed on multiple chips, whichever is appropriate. Those multiple chips may be integrated together in a single device or distributed in multiple devices without limitation. As used herein, the "computer system" includes a microcontroller including one or more processors and one or more memories. Thus, the microcontroller may also be implemented as a single or a plurality of electronic circuits including a semiconductor integrated circuit or a large-scale integrated circuit.

[0115] Also, in the embodiment described above, the plurality of constituent elements (or the functions) of each of the detector 1 and the external terminal 5 are integrated together in a single housing. However, this is not an essential configuration for the detector 1 or the external terminal 5. Alternatively, those constituent elements (or functions) of each of the detector 1 and the external terminal 5 may be distributed in multiple different housings. Still alternatively, at least some functions of the detector 1 (e.g., some functions of the detector 1) may be implemented as a cloud computing system as well. Likewise, at least some functions of the external terminal 5 (e.g., some functions of the external terminal 5) may also be implemented as a cloud computing system as well. Conversely, the plurality of functions of the detector 1 may be integrated together in a single housing and the plurality of functions of the external terminal 5 may be integrated together in a single housing as in the basic example described above.

[0116] In the basic example described above, the storage unit 20 (holding unit HI) of each detector 1 holds the association information. However, the association information is not essential one and does not have to be held by the storage unit 20 of each detector 1. Specifically, in the basic example described above, when the presence of a fire is detected, the location information of the detection information transmitted and received between the slave device 101 and the master device 102 and between the master device 102 and the external terminal 5 includes code information. However, the code information does not have to be transmitted and received as location information. Alternatively, the name information representing the name of the installation location L1 may be transmitted and received as it is as the location information. Still alternatively, the detection information may include, as the location information, an audio signal representing the verbal warning message "Fire in living room! Fire in living room!" actually emitted from the audio unit 42 of the detector 1 to be activated in synchronization. Nevertheless, if the storage unit 20 of each detector 1 holds the association information and the code information is transmitted and received as the location information as in the basic example described above, then the size (or length) of data about the location information may be reduced. Particularly when the detector 1 is a battery-driven one, reducing the data length allows the power consumption of the battery 23 to be cut down.

[0117] Optionally, some of the plurality of detectors 1 may hold the association information while the other detectors 1 need not hold the association information. In that case, if any of the detectors 1 that do not hold the association information has received the detection information including the code information, then the control unit 10 of the detector 1 may make the audio unit 42 emit a verbal warning message "Fire in another room! Fire in another room!"

[0118] In the basic example described above, each detector 1 is implemented as a fire alarm device including the alert unit 4 and having the capability of alerting the other detectors 1 to the presence of a fire (alert capability) by emitting an alarm sound. However, the alert unit 4 is not an essential constituent element for each detector 1.

At least one of the plurality of detectors 1 may have no capability of alerting the other detectors 1 to the presence of a fire. At least one of the plurality of detectors 1 may just transmit the detection information to the other devices on detecting the presence of a fire.

[0119] In the basic example described above, the storage unit 20 (holding unit HI) of the master device 102 holds not only the location information of its own device but also the location information of the other devices (slave devices 101) as well. However, this is only an example of the present disclosure and should not be construed as limiting. Alternatively, the storage unit 20 of the master device 102 may also hold only the location information of its own device and does not have to hold the location information of other devices (slave devices 101). Nevertheless, the master device 102 suitably manages (stores) at least the number of the slave devices 101 and the respective identifiers of the slave devices 101.

(4) Resume

[0120] As can be seen from the foregoing description, a detector (1) according to a first aspect detects presence of any event that calls for disaster prevention measures. The detector (1) includes a holding unit (HI) to hold at least location information about an installation location (L1) where the detector (1) is installed. According to the first aspect, the holding unit (HI) holds location information. Thus, having either the detector (1) itself or another device call an alert in accordance with the location information of the detector (1) may make the specific location, where such an event that calls for the disaster prevention measures is present, more easily determinable.

[0121] A detector (1) according to a second aspect, which may be implemented in conjunction with the first aspect, suitably further includes a detecting and outputting unit (11). When detecting the presence of the event, the detecting and outputting unit (11) suitably outputs at least the location information to a destination device in order to make the destination device call an alert in accordance with the location information of the detector (1). According to the second aspect, the destination device is made to call an alert in accordance with the location information of the detector (1), thus making the specific location, where such an event that calls for the disaster prevention measures is present, even more easily determinable.

[0122] In a detector (1) according to a third aspect, which may be implemented in conjunction with the first or second aspect, the location information held by the holding unit (HI) is suitably information about only the installation location (L1) of the detector (1). The third aspect lightens the load of setting location information with respect to the detector (1) compared to, for example, a situation where the holding unit (HI) holds not only the location information about its own installation location (L1) but also location information about the installation locations (L1) of other detectors (1).

[0123] A detector (1) according to a fourth aspect, which may be implemented in conjunction with any one of the first to third aspects, suitably further includes an alert unit (4). When detecting the presence of the event, the alert unit (4) calls an alert in accordance with the location information of the detector (1). According to the fourth aspect, the alert unit (4) calls an alert in accordance with its own location information, thus making the specific location, where an event that calls for the disaster prevention measures is present, more easily determinable.

[0124] A detector (1) according to a fifth aspect, which may be implemented in conjunction with any one of the first to fourth aspects, suitably further includes a switching unit (13) and a setting unit (14). The switching unit (13) switches an operation mode of the detector (1) to one of a plurality of operation modes including at least a detection mode for detecting the presence of the event and a setting mode for setting the location information with respect to the holding unit (HI). The setting unit (14) accepts the location information that has been set when the operation mode has been switched to the setting mode. The fifth aspect allows the location information to be set with respect to the detector (1) either at the user's request or depending on an environment where the detector (1) is installed.

[0125] A detector (1) according to a sixth aspect, which may be implemented in conjunction with the fifth aspect, suitably further includes a setting and outputting unit (12). When the setting unit (14) accepts the location information that has been set, the setting and outputting unit (12) outputs the location information and identification information of the detector (1) to an external terminal (5) to register, with the external terminal (5), the location information and the identification information of the detector (1) in association with each other. The sixth aspect allows the detector's (1) own location information to be registered with the external terminal (5). In other words, the sixth aspect may make the external terminal (5) manage the detector (1).

[0126] In a detector (1) according to a seventh aspect, which may be implemented in conjunction with the fifth or sixth aspect, when the operation mode has been switched to the setting mode, the setting unit (14) suitably accepts the location information that has been set by regarding, as the location information, a single piece of information about a potential location selected from multiple pieces of information about a plurality of predetermined potential locations, any one of which is to be determined to be the installation location. The seventh aspect allows the location information to be selected from multiple pieces of information about potential locations, thus enabling the job of setting the location information with respect to the detector (1) to be done more efficiently.

[0127] In a detector (1) according to an eighth aspect, which may be implemented in conjunction with any one of the first to seventh aspects, the holding unit (HI) suitably further holds association information. The association information associates name information represent-

ing respective names of a plurality of installation locations (L1) with multiple pieces of code information to identify the plurality of installation locations (L1). The location information is any one of the multiple pieces of code information. The eighth aspect allows the data size of the location information to be cut down, compared to a situation where the location information is name information representing the name of the installation location (L1).

[0128] A detection system (100) according to a ninth aspect includes a plurality of the detectors (1) according to any one of the first to eighth aspects. The ninth aspect provides a detection system (100) that makes the specific location, where such an event that calls for the disaster prevention measures is present, more easily determinable.

[0129] In a detection system (100) according to a tenth aspect, which may be implemented in conjunction with the ninth aspect, the plurality of the detectors (1) suitably includes a first detector (slave device 101) and a second detector (master device 102). The first detector (slave device 101) further includes a first communications unit (21) to communicate wirelessly with another detector (1) by using a radio wave falling within a first frequency band. The second detector (master device 102) further includes the first communications unit (21) and a second communications unit (22) to communicate wirelessly with an external terminal (5) by using a radio wave falling within a second frequency band, which is different from the first frequency band. The tenth aspect allows information to be easily transmitted and received, via the second detector (master device 102), between the first detector (slave device 101) and the external terminal (5) that use mutually different frequency bands.

[0130] In a detection system (100) according to an eleventh aspect, which may be implemented in conjunction with the tenth aspect, the second detector (master device 102) suitably makes the second communications unit (22) output information, which has been received at the first communications unit (21) of its own from the first detector (slave device 101), to the external terminal (5). The eleventh aspect allows information to be easily transmitted from the first detector (slave device 101) to the external terminal (5).

[0131] In a detection system (100) according to a twelfth aspect, which may be implemented in conjunction with the tenth or eleventh aspect, when detecting the presence of the event, the first detector (slave device 101) suitably outputs at least the location information from the first communications unit (21) of its own to the second detector (master device 102). The second detector (master device 102) suitably outputs at least the location information, which has been received at the first communications unit (21) of its own from the first detector (slave device 101), from the second communications unit (22) to the external terminal (5). The twelfth aspect allows, when the first detector (slave device 101) detects the presence of an event between the first detector (slave device 101) and the external terminal (5) that use mutually different frequency bands, the location information of the first detector (slave device 101) to be easily transmitted to the external terminal (5).

[0132] In a detection system (100) according to a thirteenth aspect, which may be implemented in conjunction with any one of the tenth to twelfth aspects, the first detector (slave device 101) suitably further includes a setting unit (14) and a setting and outputting unit (12). The setting unit (14) accepts the location information that has been set with respect to the holding unit (HI). When the setting unit (14) accepts the location information that has been set, the setting and outputting unit (12) outputs the location information and identification information of the detector (1) to the external terminal (5) to register, with the external terminal (5), the location information and the identification information of the detector (1) in association with each other. The setting and outputting unit (12) of the first detector (slave device 101) suitably makes the first communications unit (21) of its own output the location information and the identification information to the second detector (master device 102). The second detector (master device 102) suitably makes the second communications unit (22) output the location information and the identification information that have been received to the external terminal (5). The thirteenth aspect allows, when the first detector (slave device 101) accepts the location information that has been set between the first detector (slave device 101) and the external terminal (5) that use mutually different frequency bands, the location information of the first detector (slave device 101) to be easily transmitted to the external terminal (5). In other words, the thirteenth aspect enables the job of registering the location information of the detector (1) with the external terminal (5) to be done more efficiently.

[0133] A detector management system (200) according to a fourteenth aspect includes: the detection system (100) according to any one of the tenth to thirteenth aspects; and an external terminal (5) to manage a plurality of the detectors (1). The fourteenth aspect provides a detector management system (200) that may make the specific location, where an event that calls for disaster prevention measures is present, more easily determinable.

[0134] In a detector management system (200) according to a fifteenth aspect, which may be implemented in conjunction with the fourteenth aspect, the external terminal (5) suitably includes an acquisition unit (51) and a registration unit (52). The acquisition unit (51) acquires the location information from a telecommunications device (6). The registration unit (52) registers the location information received from the telecommunications device (6) and the identification information of the detector (1) in association with each other. The fifteenth aspect allows the user to register the location information of the detector (1) with the external terminal (5) by using the telecommunications device (6).

[0135] A control method according to a sixteenth aspect is a method for controlling a detector (1). The control

method includes the steps of: detecting presence of an event that calls for disaster prevention measures; and holding at least location information about an installation location where the detector is installed. The sixteenth aspect provides a control method that may make the specific location, where an event that calls for disaster prevention measures is present, more easily determinable.

[0136] A program according to a seventeenth aspect is designed to cause a computer system to perform the control method of the sixteenth aspect. The seventeenth aspect provides a function that may make the specific location, where an event that calls for disaster prevention measures is present, more easily determinable.

[0137] Note that the constituent elements according to the second to eighth aspects are not essential constituent elements for the detector (1) but may be omitted as appropriate. Also, the constituent elements according to the tenth to thirteenth aspects are not essential constituent elements for the detection system (100) but may be omitted as appropriate. Furthermore, the constituent elements according to the fifteenth aspect are not essential constituent elements for the detector management system (200) but may be omitted as appropriate.

Reference Signs List

[0138]

100	Detection System
200	Detector Management System
1	Detector
101	Slave Device (First Detector)
102	Master Device (Second Detector)
11	Detecting and Outputting Unit
12	Setting and Outputting Unit
13	Switching Unit
14	Setting Unit
21	First Communications Unit
22	Second Communications Unit
4	Alert Unit
5	External Terminal
51	Acquisition Unit
52	Registration Unit
6	Telecommunications Device
H1	Holding Unit
L1	Installation Location

Claims

1. A detector configured to detect presence of any event that calls for disaster prevention measures,
the detector comprising a holding unit configured to hold at least location information about an installation location where the detector is installed.

2. The detector of claim 1, further comprising a detecting and outputting unit configured to, when detecting the presence of the event, output at least the location information to a destination device in order to make the destination device call an alert in accordance with the location information of the detector.

3. The detector of claim 1 or 2, wherein
the location information held by the holding unit is information about only the installation location of the detector.

4. The detector of any one of claims 1 to 3, further comprising an alert unit configured to, when detecting the presence of the event, call an alert in accordance with the location information of the detector.

5. The detector of any one of claims 1 to 4, further comprising:

a switching unit configured to switch an operation mode of the detector to one of a plurality of operation modes including at least a detection mode for detecting the presence of the event and a setting mode for setting the location information with respect to the holding unit; and
a setting unit configured to accept the location information that has been set when the operation mode has been switched to the setting mode.

6. The detector of claim 5, further comprising a setting and outputting unit configured to, when the setting unit accepts the location information that has been set, output the location information and the identification information of the detector to an external terminal to register, with the external terminal, the location information and the identification information of the detector in association with each other.

7. The detector of claim 5 or 6, wherein
the setting unit is configured to, when the operation mode has been switched to the setting mode, accept the location information that has been set by regarding, as the location information, a single piece of information about a potential location selected from multiple pieces of information about a plurality of predetermined potential locations, any one of which is to be determined to be the installation location.

8. The detector of any one of claims 1 to 7, wherein

the holding unit is configured to further hold association information that associates name information representing respective names of a plurality of installation locations with multiple pieces of code information to identify the plurality of installation locations, and
the location information is any one of the multiple pieces of code information.

9. A detection system comprising a plurality of the detectors of any one of claims 1 to 8.

10. The detection system of claim 9, wherein
the plurality of the detectors includes:

a first detector further including a first communications unit configured to communicate wirelessly with another detector by using a radio wave falling within a first frequency band; and
a second detector further including the first communications unit and a second communications unit, the second communications unit being configured to communicate wirelessly with an external terminal by using a radio wave falling within a second frequency band, the second frequency band being different from the first frequency band.

11. The detection system of claim 10, wherein
the second detector is configured to make the second communications unit output information, which has been received at the first communications unit of its own from the first detector, to the external terminal.

12. The detection system of claim 10 or 11, wherein

the first detector is configured to, when detecting the presence of the event, output at least the location information from the first communications unit of its own to the second detector, and
the second detector is configured to output at least the location information, which has been received at the first communications unit of its own from the first detector, from the second communications unit to the external terminal.

13. The detection system of any one of claims 10 to 12, wherein
the first detector further includes:

a setting unit configured to accept the location information that has been set with respect to the holding unit; and
a setting and outputting unit configured to, when the setting unit accepts the location information that has been set, output the location information and identification information of the detector to the external terminal to register, with the external terminal, the location information and the identification information of the detector in association with each other,
the setting and outputting unit of the first detector is configured to make the first communications unit of its own output the location information and the identification information to the second detector, and
the second detector is configured to make the second communications unit output the location information and the identification information that have been received to the external terminal.

14. A detector management system comprising:

the detection system of any one of claims 10 to 13; and
the external terminal configured to manage a plurality of the detectors.

15. The detector management system of claim 14, wherein
the external terminal includes:

an acquisition unit configured to acquire the location information from a telecommunications device; and
a registration unit configured to register the location information received from the telecommunications device and the identification information of the detector in association with each other.

16. A control method for controlling a detector, the method comprising the steps of:

detecting presence of an event that calls for disaster prevention measures; and
holding at least location information about an installation location where the detector is installed.

17. A program designed to cause a computer system to perform the control method of claim.

FIG. 1

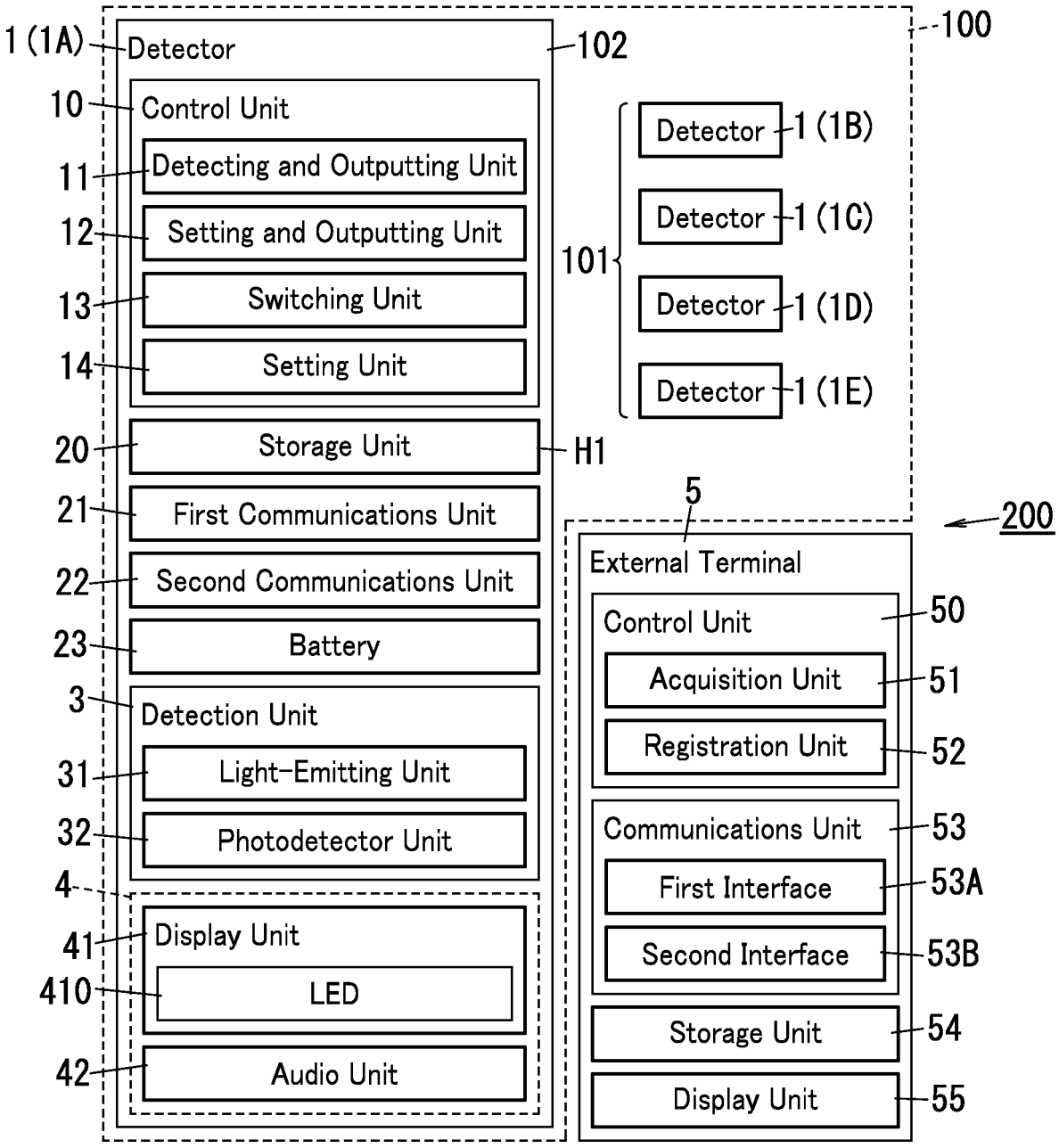

1 (1A)
Detector
102
100
10
Control Unit
11
Detecting and Outputting Unit
12
Setting and Outputting Unit
13
Switching Unit
14
Setting Unit
101
Detector
1 (1B)
Detector
1 (1C)
Detector
1 (1D)
Detector
1 (1E)
20
Storage Unit
H1
21
First Communications Unit
22
Second Communications Unit
23
Battery
3
Detection Unit
31
Light-Emitting Unit
32
Photodetector Unit
4
41
Display Unit
410
LED
42
Audio Unit
5
200
External Terminal
Control Unit
50
Acquisition Unit
51
Registration Unit
52
Communications Unit
53
First Interface
53A
Second Interface
53B
Storage Unit
54
Display Unit
55

FIG. 2

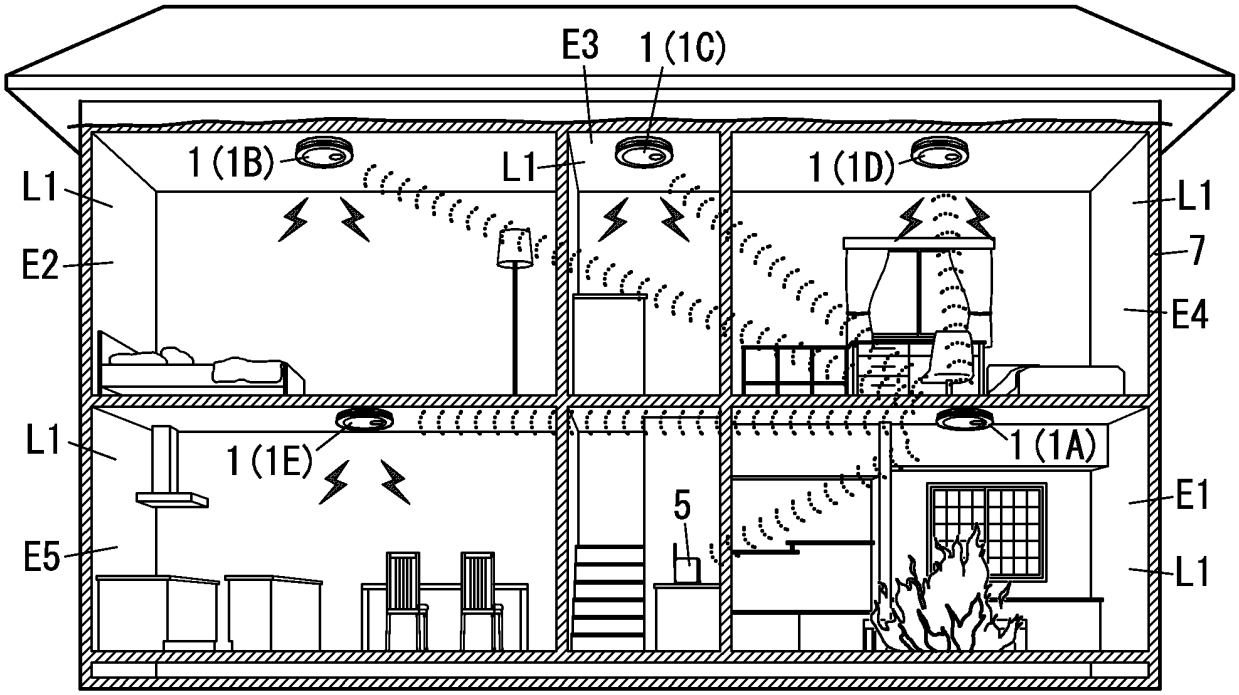

E3
1 (1C)
1 (1B)
L1
L1
1 (1D)
L1
E2
7
E4
L1
1 (1E)
1 (1A)
5
E1
E5
L1

FIG. 3

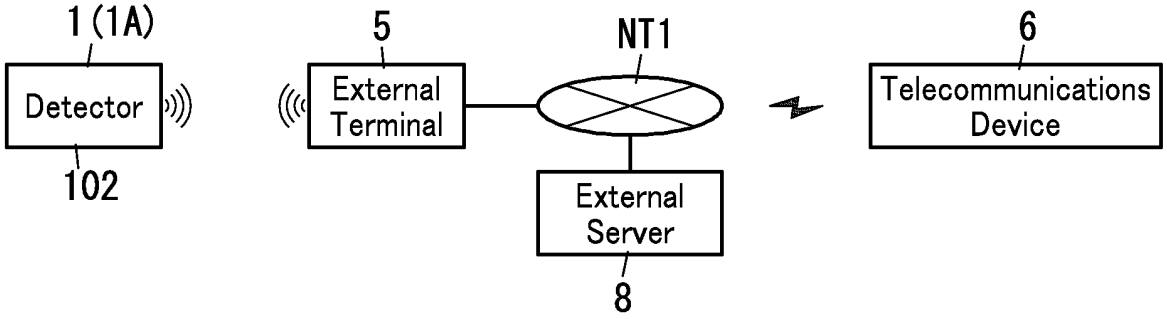

1 (1A)
Detector
102
5
External Terminal
NT1
External Server
8
6
Telecommunications Device

FIG. 4

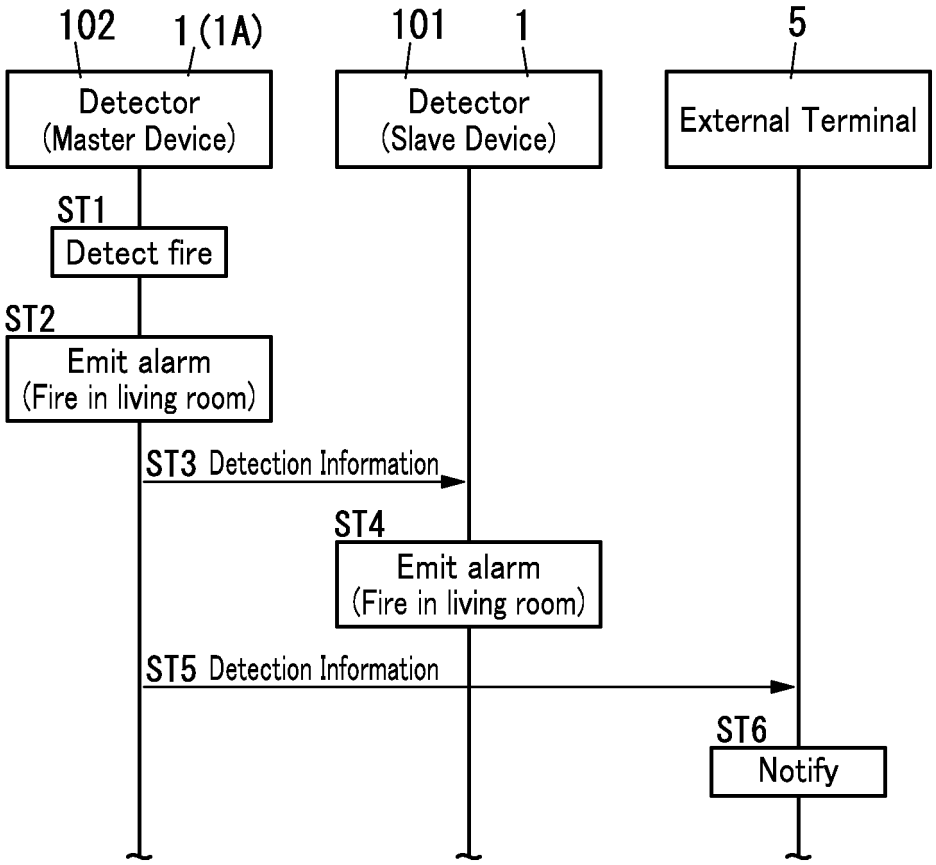
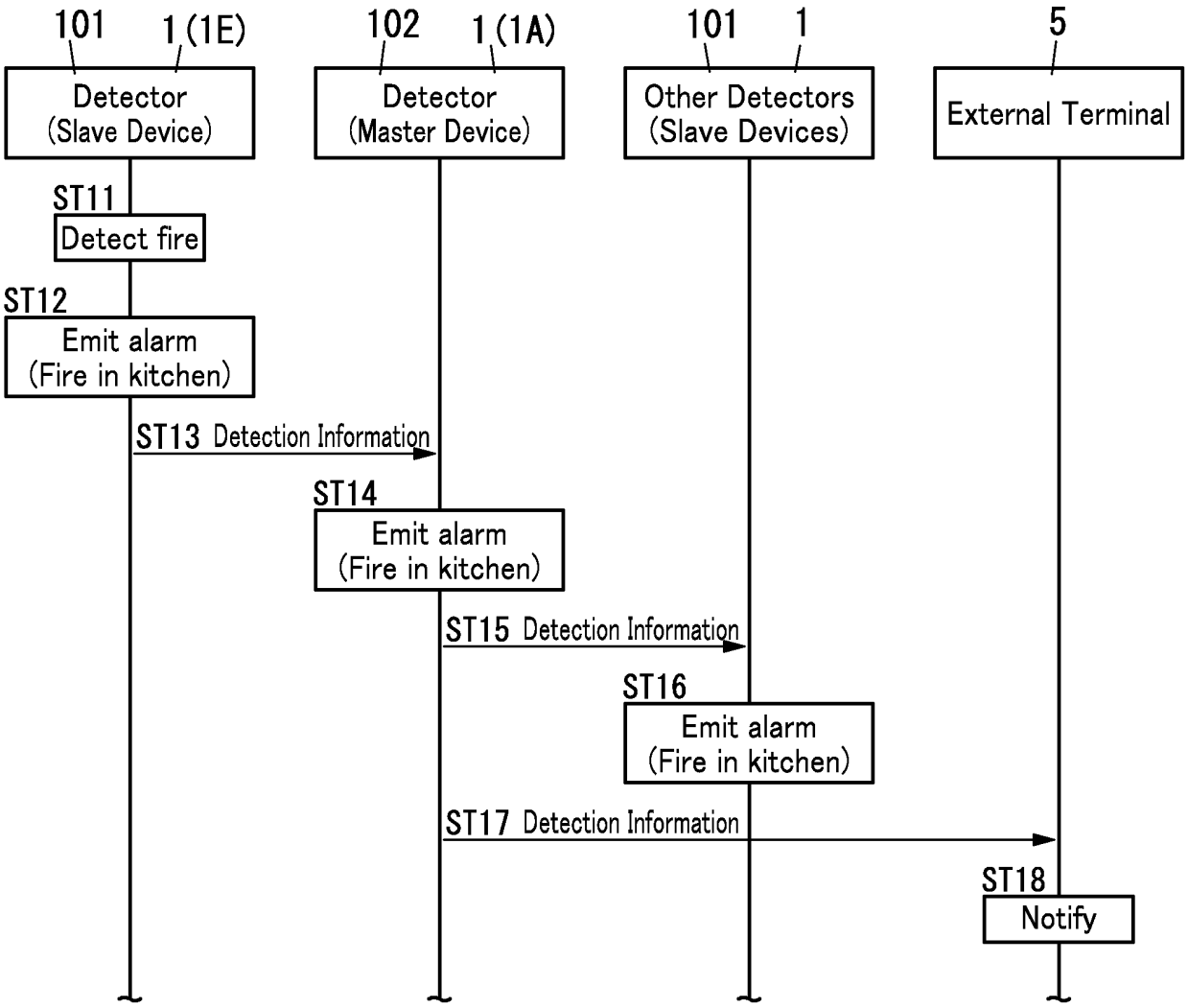

102
1 (1A)
101
1
5
Detector
(Master Device)
Detector
(Slave Device)
External Terminal
ST1
Detect fire
ST2
Emit alarm
(Fire in living room)
ST3 Detection Information
ST4
Emit alarm
(Fire in living room)
ST5 Detection Information
ST6
Notify

FIG. 5


101
1(1E)
Detector
(Slave Device)
102
1(1A)
Detector
(Master Device)
101
1
Other Detectors
(Slave Devices)
5
External Terminal
ST11
Detect fire
ST12
Emit alarm
(Fire in kitchen)
ST13 Detection Information
ST14
Emit alarm
(Fire in kitchen)
ST15 Detection Information
ST16
Emit alarm
(Fire in kitchen)
ST17 Detection Information
ST18
Notify

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/042447

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. G08B17/00(2006.01)i, G08B23/00(2006.01)i, G08B25/10(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)
Int. Cl. G08B17/00, G08B23/00, G08B25/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2019
Registered utility model specifications of Japan 1996-2019
Published registered utility model applications of Japan 1994-2019

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 01-134596 A (NOHMI BOSAI KOGYO CO., LTD.) 26 May 1989, page 3, upper left column, lines 1-4, page 4, upper left column, lines 3-6, page 6, upper left column, line 8 to lower left column, line 12, page 7, upper left column, line 5 to upper right column, line 8, fig. 4-6 (Family: none)	1-3, 9, 16-17 4-8, 10-15
Y	WO 2012/105614 A1 (PANASONIC CORP.) 09 August 2012, paragraphs [0004], [0027], [0032], [0034], [0035], [0038], [0044], [0045], fig. 2 & EP 2672774 A1, paragraphs [0004], [0032], [0034], [0035], [0038], [0044], [0045], fig. 2	4-8, 10-15

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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
13.12.2019	24.12.2019
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/042447

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2011-248910 A (HOCHIKI CORP.) 08 December 2011, paragraph [0053] (Family: none)	4-8
Y	JP 2001-109972 A (AIPHONE CO., LTD.) 20 April 2001, paragraphs [0006], [0019], [0021], [0030], [0032] (Family: none)	4-8
Y	JP 2013-003881 A (NOHMI BOSAI LTD.) 07 January 2013, paragraph [0034] (Family: none)	5-8
Y	JP 2016-540281 A (GOOGLE INC.) 22 December 2016, paragraphs [0002], [0003], [0024], [0097] & WO 2015/054288 A1, paragraphs [0002], [0003], [0056], [0129]	6-8, 13-15
Y	JP 2017-028401 A (HOCHIKI CORP.) 02 February 2017, paragraphs [0019]-[0021], [0024], fig. 1 (Family: none)	10-15
Y	JP 2003-109154 A (HOCHIKI CORP.) 11 April 2003, paragraphs [0009], [0010], [0086]-[0090], fig. 1 & US 2003/0058093 A1, paragraphs [0274]-[0278], fig. 22	15

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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