

TITLE

ENERGY MANAGEMENT SYSTEM

TECHNICAL FIELD

[0001] The present disclosure relates to an energy management system.

5 BACKGROUND

[0002] An energy management system that manages energy in an area including predetermined control target equipment is known. The energy management system includes a control device capable of wirelessly transmitting and receiving control signals to and from control
10 target equipment such as lights and electrical devices provided in a building (see, for example, Japanese Unexamined Patent Publication No. 2014-113002).

SUMMARY

[0003] Here, when introducing an energy management system for a
15 target area, it is required that the energy management system can be easily introduced from the viewpoint of cost reduction and the shortening of a construction period. In addition, when the work to set up the energy management system is done only on the site, there is a problem that it takes time and effort. For this reason, there has been a
20 demand for an energy management system that is easy to introduce and operate.

[0004] It is an object of the disclosure to provide an energy management system that can be easily introduced and operated.

[0005] An energy management system according to an aspect of the
25 disclosure includes: a detection slave unit provided for a detector; a control slave unit provided for control target equipment; a master unit

that receives detection information from the detection slave unit and transmits control information to the control slave unit based on the detection information; a management unit for an administrator that enables the administrator to make various settings and monitoring of an equipment system including the detection slave unit, the control slave unit, and the master unit; and a user interface unit for a user that enables the user to operate and monitor the equipment system. Power line communication is performed between the detection slave unit and the master unit, and between the control slave unit and the master unit, and remote communication is performed between the management unit and the master unit, and between the user interface unit and the master unit.

[0006] In the energy management system according to the aspect of the disclosure, the detection slave unit is provided for the detector, and the control slave unit is provided for the control target equipment. In addition, power line communication is performed between the detection slave unit and the master unit, and between the control slave unit and the master unit. According to such a configuration, the energy management system can be easily introduced simply by installing the master unit and the slave units (or control target equipment and a detector with slave units) in the existing power line system in the management target area. In addition, remote communication is performed between the management unit and the master unit, and between the user interface unit and the master unit. Therefore, the administrator can make various settings and monitoring of the equipment system from the remote location. In addition, the user can operate and monitor the equipment system from the remote location.

In this manner, the administrator and the user can easily operate the equipment system from the remote location without moving to the site. As described above, the energy management system can be easily introduced and operated.

- 5 [0007] The control slave unit may adjust a strength of an output of the control target equipment based on the control information from the master unit. In this case, the control slave unit can adjust, for example, the brightness of each light, the intensity of air conditioning, or the discharge or charge of the storage battery as well as the control of
- 10 ON/OFF switching of the control target equipment.
- [0008] The management unit may recognize addresses of the detection slave unit, the control slave unit, and the master unit in association with each other. In this case, the administrator can collectively monitor the master unit and the slave units to be managed from the remote location.
- 15 [0009] The management unit may set a grouping based on grouping for control of a plurality of pieces of the control target equipment. In this case, by freely setting the grouping, the management unit can collectively control a plurality of pieces of the control target equipment according to the situation of the management target area.
- 20 [0010] The management unit may set a signal hopping path between at least some of a plurality of the detection slave units and a plurality of the control slave units. Here, hopping is a function in which the control slave unit or the detection slave unit that receives a signal repeats the communication with sufficient strength when the strength of
- 25 the power line communication signal is not sufficient. Therefore, by setting the hopping path by the management unit, it is possible to

suppress crosstalk, attenuation, and the like of signals on the power line.

[0011] The master unit may include an external information receiving unit, and may control the control target equipment based on received external information. In this case, the master unit can appropriately control the control target equipment according to the external situation. In addition, the master unit can also perform the setting of the control slave unit and the detection slave unit for the hopping by using power line communication.

[0012] According to the disclosure, it is possible to provide an energy management system that can be easily introduced and operated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a block configuration diagram showing an energy management system according to an embodiment of the disclosure.

FIG. 2 is a schematic diagram showing an example of an equipment system.

FIG. 3(a) is a block configuration diagram of a detection slave unit, FIG. 3(b) is a block configuration diagram of a control slave unit, and FIG. 3(c) is a block configuration diagram of a master unit.

FIGS. 4(a) and 4(b) are conceptual diagrams for explaining the grouping of lights.

FIG. 5 is a conceptual diagram for explaining a hopping path.

FIG. 6 is a block configuration diagram showing an energy management system according to a modification example.

FIG. 7 is a block configuration diagram showing an energy management system according to a modification example.

DETAILED DESCRIPTION

[0014] Hereinafter, an embodiment of the disclosure will be described in detail with reference to the accompanying diagrams. In the description of the diagrams, the same or equivalent elements are denoted by the same reference numerals, and repeated description thereof will be omitted.

[0015] FIG. 1 is a block configuration diagram showing an energy management system 100 according to an embodiment of the disclosure. As shown in FIG. 1, the energy management system 100 is a system for managing energy in a management target area including predetermined control target equipment 3. The energy management system 100 includes a detector 1, a detection slave unit 2, control target equipment 3, a control slave unit 4, a master unit 6, a management unit 7, and a user interface unit 8. In addition, the energy management system 100 is configured to include an equipment system 101 and a network system 102.

[0016] The equipment system 101 is a system that configures a management target of the energy management system 100. The equipment system 101 is a system including the detector 1, the detection slave unit 2, the control target equipment 3, the control slave unit 4, and the master unit 6. In the equipment system 101, the detector 1 and the detection slave unit 2 are connected to each other by a wiring W1. The detection slave unit 2 and the master unit 6 are connected to each other by a power line W2. The control target equipment 3 and the control slave unit 4 are connected to each other by a wiring W3. The control slave unit 4 and the master unit 6 are connected to each other by a power line W4. In the equipment system 101, information is

transmitted between devices by power line communication (PLC communication). The power line communication is, for example, a communication method for transmitting and receiving communication signals using a power line, in which a power waveform having a commercial frequency and a communication signal having a frequency different from the commercial frequency are superimposed and transmitted, and a communication signal having a different frequency is separated from the power waveform and received. In addition, the power line communication may be subject to the Radio Law depending on its frequency band. However, in the energy management system according to the present embodiment, power line communication in a frequency band of, for example, 100 KHz to 450 KHz may be used in order to be able to be used indoors and outdoors and to realize a certain degree of data transfer. However, power line communication in a frequency band higher or lower than the above-described frequency band is also available. For example, the frequency band may be 10 KHz or less, or may be 2 MHz or more. In addition, assuming that the power line communication in the frequency band of 100 KHz to 450 KHz is used, the modulation method is not particularly limited, and accordingly, the OFDM method may be adopted or the DCSK method may be adopted. The power line is a wiring for supplying AC power having a commercial frequency as a main purpose, and serves as a transmission line for performing power line communication. Specifically, power line communication is performed between the detection slave unit 2 and the master unit 6, and between the control slave unit 4 and the master unit 6. In the power line communication,

not only communication signals can be superimposed for AC power distribution of AC 100V, AC 200V, or the like, but also communication signals can be superimposed for DC power distribution as in the case of AC power distribution. When the detector 1 is, for example, a motion sensor or an illuminance meter, the signal from the detector 1 may once pass through the master unit 6 and power line communication with the control slave unit 4 may be performed based on the determination of the master unit 6. However, depending on the program of the master unit 6, the detection slave unit 2 may exchange commands with the control slave unit 4 by using power line communication without passing through the master unit 6.

[0017] FIG. 2 shows an example of the equipment system 101. FIG. 2 shows an example in which the energy management system 100 is adopted for a building BD having a plurality of floors F1 to FN. In addition, FIG. 2 shows that each device is provided only on the floor FN, the devices are similarly provided on the other floors. In the equipment system 101 shown in FIG. 2, the master unit 6 is connected to a distribution board 10 for the entire building BD through a power line W5A. In addition, the distribution board 10 is connected to a power line W5B for supplying power to each of the floors F1 to FN. From the power line W5B, the power line W2 for each detection slave unit 2 provided on each of the floors F1 to FN and the power line W4 for each control slave unit 4 are branched. Since the power lines W5A and W5B are power lines connecting the master unit 6, the detection slave unit 2, and the control slave unit 4 to each other, the power lines W5A and W5B function as parts of the "power line W2" and the "power

line W4" shown in FIG. 1. In addition, a distribution board for distributing power on each floor is provided on each of the floors F1 to FN, but is omitted herein.

[0018] Returning to FIG. 1, the network system 102 is a system for remotely managing, monitoring, and operating the equipment system 101. The network system 102 is a system including the master unit 6, the management unit 7, and the user interface unit 8. In the network system 102, the communication of each device is performed through a network such as the Internet. For example, the network system 102 may be constructed by using cloud computing. As a result, remote communication is performed between the management unit 7 and the master unit 6, and between the user interface unit 8 and the master unit 6.

[0019] The detector 1 is a device that detects various kinds of information, and is a measuring instrument, a sensor, and the like. As the detector 1, for example, a motion sensor for detecting the presence of a person, an illuminance meter for detecting the brightness of a room, and an ammeter for detecting a current value are adopted (see FIG. 2). The detector 1 outputs detection information to the detection slave unit 2 through the wiring W1. In addition, the detector 1 is not limited to the above-described devices, and other measuring instruments or sensors may be adopted. For example, a measuring instrument for monitoring the amount of power generation relevant to renewable energy such as a solar cell may be adopted as the detector 1. In addition, a battery level data output unit installed in a power controller for a fixed storage battery, a vehicle-mounted storage battery, and the

like may be used as the detector 1. In addition, a carbon dioxide detector, a carbon monoxide detector, a dust detector, and the like may be used as the detector 1.

[0020] The detection slave unit 2 is a slave unit provided for the detector 1. The detection slave unit 2 converts detection information received from the detector 1 into a power line communication signal, and outputs the power line communication signal to the master unit 6 through the power line W2. The detection slave unit 2 is provided in a one-to-one correspondence with one detector 1. For example, when a plurality of detectors 1 are present on the floor FN, one detection slave unit 2 is provided for each detector 1. In the example shown in FIG. 2, the dedicated detection slave unit 2 is provided for the ammeter, the dedicated detection slave unit 2 is provided for the motion sensor, and the dedicated detection slave unit 2 is provided for the illuminance meter. When there are a plurality of motion sensors, one dedicated detection slave unit 2 is provided for each motion sensor. The detection slave unit 2 is provided at a location close to the target detector 1. Since the detection slave unit 2 is provided on the power line connected to the target detector 1, a physical one-to-one relationship is established between the detection slave unit 2 and the target detector 1. In addition, the detection slave unit 2 and the detector 1 may be constructed as one device. In this case, a unit that functions as the detection slave unit 2 and a unit that functions as the detector 1 are provided in one device. In addition, both the units are connected to each other by the wiring W1 in one device. The wiring W1 that connects the detector 1 and the detection slave unit 2 to each

other is a signal line. In addition, the detection slave unit 2 and the detector 1 do not necessarily need to have a one-to-one relationship. For example, a configuration in which information is transmitted from a plurality of detectors 1 to one detection slave unit 2 may be adopted.

5 [0021] A detailed block configuration of the detection slave unit 2 will be described with reference to FIG. 3(a). The detection slave unit 2 includes a communication unit 11, a processing unit 12, and a storage unit 13. The communication unit 11 is a unit for communicating with the master unit 6 and the detector 1. The communication unit 11 has a
10 circuit for receiving the detection information from the detector 1. In addition, the communication unit 11 has a circuit for converting the detection information from the detector 1 into a signal for power line communication with the master unit 6. The processing unit 12 is a unit for controlling the operation of the entire detection slave unit 2. The
15 processing unit 12 includes a microprocessor, peripheral circuits thereof, and the like.

[0022] The storage unit 13 is a unit that stores programs necessary for the operation of the detection slave unit 2, information necessary for the operation, and the like. The storage unit 13 includes, for example, a
20 non-volatile storage element such as a ROM (read only memory), a rewritable non-volatile storage element such as an EEPROM (electrically erasable programmable read only memory), and a volatile storage element such as a RAM (random access memory) serving as a working memory. For example, the storage unit 13 stores an address
25 indicating the location of the detection slave unit 2 in the building BD.

[0023] The control target equipment 3 is equipment to be controlled by

the energy management system 100. As the control target equipment 3, for example, a light (LED light or the like) capable of adjusting the illuminance in the room and an air conditioner for adjusting the temperature in the room are adopted (see FIG. 2). The control target equipment 3 receives control information from the control slave unit 4 through the wiring W3. In addition, the control target equipment 3 is not limited to the above-described equipment, and other kinds of equipment may be adopted.

[0024] The control slave unit 4 is a slave unit provided for the control target equipment 3. The control slave unit 4 converts the control information based on the power line communication signal received from the master unit 6 into a signal that can be processed by the control target equipment 3, and outputs the control information to the control target equipment 3 through the wiring W3. The control slave unit 4 is provided in a one-to-one correspondence with one control target equipment 3. For example, when a plurality of pieces of control target equipment 3 are present on the floor FN, one control slave unit 4 is provided for each piece of control target equipment 3. In the example shown in FIG. 2, one dedicated control slave unit 4 is provided for each of a plurality of lights, and one dedicated control slave unit 4 is provided for each of a plurality of air conditioners. The control slave unit 4 is provided at a location close to the control target equipment 3 as a target. Since the control slave unit 4 is provided on the power line connected to the control target equipment 3 as a target, a physical one-to-one relationship is established between the control slave unit 4 and the control target equipment 3 as a target. In addition, the control

slave unit 4 and the control target equipment 3 may be constructed as one device. For example, an LED light with a slave unit may be adopted. In this case, a unit that functions as the control slave unit 4 and a unit that functions as the control target equipment 3 are provided in one device. In addition, both the units are connected to each other by the wiring W3 in one device. The control slave unit 4 may be provided on the same power line to which the control target equipment as a target is connected, and in this case, the wiring W3 is a power line. Alternatively, the control slave unit 4 may be connected to a power line different from the control target equipment as a target, and in this case, the wiring W3 is a signal line. In addition, the control slave unit 4 and the control target equipment 3 do not necessarily need to have a one-to-one relationship. For example, a configuration in which a plurality of pieces of control target equipment 3 receive control information from one control slave unit 4 may be adopted.

[0025] The control slave unit 4 adjusts the strength of the output of the control target equipment 3 based on the control information from the master unit 6. For example, the control slave unit 4 can generate a command signal for the light so as to adjust the intensity of the illuminance of the light. The control slave unit 4 can generate a command signal for the air conditioner so as to adjust the strength of the output of the air conditioner.

[0026] A detailed block configuration of the control slave unit 4 will be described with reference to FIG. 3(b). The control slave unit 4 includes a communication unit 14, a processing unit 16, and a storage unit 17. The communication unit 14 is a unit for communicating with

the master unit 6 and the control target equipment 3. The communication unit 14 has a circuit for receiving control information based on the power line communication signal from the master unit 6. In addition, the communication unit 14 has a circuit for converting the power line communication signal from the master unit 6 into a signal that can be processed by the control target equipment 3. The processing unit 16 is a unit for controlling the operation of the entire control slave unit 4. The processing unit 16 includes a microprocessor, peripheral circuits thereof, and the like. The storage unit 17 is a unit that stores programs necessary for the operation of the control slave unit 4, information necessary for the operation, and the like. The storage unit 17 may include a storage element similar to that exemplified in the storage unit 13. For example, the storage unit 17 stores an address indicating the location of the control slave unit 4 in the building BD.

[0027] The master unit 6 is a device that receives detection information from the detection slave unit 2 and transmits control information to the control slave unit 4 based on the detection information. The master unit 6 receives the detection information based on the power line communication signal from the detection slave unit 2 through the power line W2. The master unit 6 outputs control information based on the power line communication signal to the control slave unit 4 through the power line W4. The master unit 6 calculates the control information of each piece of control target equipment 3 based on at least one of the setting content set by the management unit 7, the user's operation content received from the user interface unit 8, and the detection information detected by the detector 1.

[0028] A detailed block configuration of the master unit 6 will be described with reference to FIG. 3(c). The master unit 6 includes a communication unit 21, a processing unit 22, and a storage unit 23. The communication unit 21 is a unit for communicating with the detection slave unit 2, the control slave unit 4, the management unit 7, and the user interface unit 8. The communication unit 21 has a circuit for performing power line communication with the detection slave unit 2 and the control slave unit 4. In addition, the communication unit 21 has a circuit for performing remote communication using a cloud with the management unit 7 and the user interface unit 8. That is, the communication unit 21 of the master unit 6 includes a PLC communication unit for power line communication with the detection slave unit 2 and the control slave unit 4, and a wireless communication unit for network communication with the cloud side, such as LTE. The processing unit 22 is a unit for controlling the operation of the entire master unit 6. The processing unit 22 includes a microprocessor, peripheral circuits thereof, and the like. The processing unit 22 calculates control information for controlling ON/OFF switching of each light and each air conditioner, adjustment of output strength, and the like. In addition, the processing unit 22 calculates information to be output to the management unit 7 and the user interface unit 8.

[0029] The storage unit 23 is a unit that stores programs necessary for the operation of the master unit 6, information necessary for the operation, and the like. The storage unit 23 may include a storage element similar to that exemplified in the storage unit 13. For example, the storage unit 23 stores the addresses indicating the locations

of the master unit 6, each detection slave unit 2, and each control slave unit 4 in the building BD so as to be associated with each other. In addition, the storage unit 23 stores setting information for grouping of the control target equipment 3 and setting information for the hopping path, which will be described later.

[0030] The management unit 7 and the user interface unit 8 are communication terminals such as a PC, a smartphone, and a tablet terminal, for example. The management unit 7 and the user interface unit 8 are configured to include a CPU (central processing unit), a storage element having the same purpose as the storage unit 13, a communication interface, and an input/output interface. Various programs or data are stored in the storage element. By installing the software for the administrator on the above-described communication terminal of the management unit 7, it is possible to realize a function as the management unit 7. By installing the software for the user on the above-described communication terminal of the user interface unit 8, it is possible to realize a function as the user interface unit 8. The user interface unit 8 can be used as a tool for the customer to see. On the other hand, the management unit 7 can be used as a tool for the contractor, the installer, and the seller to see, and is a tool that enables the setting changes of the control slave unit 4, the detection slave unit 2, and the master unit 6 in every detail.

[0031] The management unit 7 is a unit for an administrator that enables the administrator to make various settings and monitoring of the equipment system 101 including the detection slave unit 2, the control slave unit 4, and the master unit 6. The management unit 7 is a unit

that enables the administrator to monitor the energy management system 100 and make various settings and changes. The management unit 7 receives the detection information of each detector 1 in the equipment system 101 and the information of control performed for each control target equipment 3 from the master unit 6 through the network by using wireless communication technology, such as LTE. The management unit 7 can set the control content for each control target equipment 3 in the equipment system 101 and change the control content. The management unit 7 outputs the information of the control content to be set or the control content to be changed to the master unit 6 through the network based on the input of the administrator.

[0032] The management unit 7 can recognize the addresses of the detection slave unit 2, the control slave unit 4, and the master unit 6 in association with each other. The management unit 7 can display for the administrator what kind of detector 1 and control target equipment 3 are present in the building BD and how many. In addition, the management unit 7 can display, for the administrator, what kind of detector 1 and control target equipment 3 are present on each floor and how many. In addition, the management unit 7 can display information for checking whether the slave units 2 and 4 to which the addresses are assigned are normally operating and communicating.

[0033] For example, the management unit 7 can display a setting screen for the administrator on the display. As an initial setting screen, the management unit 7 displays a screen on which ON/OFF conditions, output strength adjustment conditions, and the like for each piece of control target equipment can be individually input. In addition, the

management unit 7 displays a screen on which the control content and the states of the slave units 2 and 4 can be checked, and the changed content of the control content can be input. For example, the administrator may grasp the power usage status and change the control content of each piece of control target equipment to realize energy saving.

[0034] The management unit 7 can set a grouping based on grouping for control of a plurality of pieces of control target equipment 3. The grouping for control is, for example, to collectively control ON/OFF switching and output strength adjustment. The management unit 7 can form a group of control target equipment 3 that is a target of such collective control. In addition, the management unit 7 can easily change such grouping. Specifically, as shown in FIGS. 4(a) and 4(b), the management unit 7 can freely group lights 3A to 3H of the plurality of pieces of control target equipment 3 according to the layout of a set of desks on the floor FN.

[0035] As shown in FIG. 4(a), a desk set A is arranged at a location corresponding to the lights 3A and 3E, and a desk set B is arranged at a location corresponding to the lights 3B and 3F so as to face the desk set A. In addition, a desk set C is arranged at a location corresponding to the lights 3C and 3G, and a desk set D is arranged at a location corresponding to the lights 3D and 3H so as to face the desk set C. In this case, the management unit 7 sets the lights 3A, 3B, 3E, and 3F as a group G1 for collective control. The management unit 7 sets the lights 3C, 3D, 3G, and 3H as a group G2 for collective control. In this case, the management unit 7 can set a plurality of lights 3A, 3B, 3E, and 3F in

the group G1 to be collectively controlled with the same control content. In addition, the management unit 7 can set a plurality of lights 3C, 3D, 3G, and 3H in the group G2 to be collectively controlled with the same control content and independently of the group G1.

5 [0036] As shown in FIG. 4(b), a desk set A is arranged at a location corresponding to the lights 3A and 3B, and a desk set B is arranged at a location corresponding to the lights 3C and 3D so as to be adjacent to the desk set A in the longitudinal direction. In addition, a desk set C is arranged at a location corresponding to the lights 3E and 3F, and a desk set D is arranged at a location corresponding to the lights 3G and 3H so as to be adjacent to the desk set C in the longitudinal direction. In this case, the management unit 7 sets the lights 3A, 3B, 3C, and 3D as a group G1 for collective control. The management unit 7 sets the lights 3E and 3F as a group G2 for collective control. In addition, the management unit 7 sets the lights 3G and 3H corresponding to the desk set D as independent lights in terms of control. In this case, the management unit 7 can set a plurality of lights 3A, 3B, 3C, and 3D in the group G1 to be collectively controlled with the same control content. In addition, the management unit 7 can set a plurality of lights 3E and 3F in the group G2 to be collectively controlled with the same control content and independently of the group G1. In addition, the management unit 7 can set the lights 3G and 3H to be controlled with the control content that the lights 3G and 3H are independent of the other lights.

25 [0037] The management unit 7 sets a signal hopping path between at least some of the plurality of detection slave units 2 and the plurality of

control slave units 4. The hopping path is a path formed by transmitting a signal to the specific slave units 2 and 4 with the other slave unit 2 or 4 as relay points. Hopping is a function of the slave units 2 and 4 and the master unit 6, which is used when data does not reach the slave units 2 and 4 from the master unit 6 or when data does not reach the master unit 6 from the slave units 2 and 4. When hopping is required, the administrator sets the hopping by remotely changing the parameters in the master unit 6 or by setting a flag for data hopping within the range where data can be further reached from the master unit 6 by power line communication. For example, in the example shown in FIG. 5, a hopping path HP1 is formed between the control slave units 4A and 4B, a hopping path HP2 is formed between the control slave units 4B and 4C, and a hopping path HP3 is formed between the control slave units 4C and 4D. In addition, in FIG. 5, the hopping paths HP1 to HP3 are indicated by virtual arrow lines for ease of understanding, but the signal flowing through the hopping paths HP1 to HP3 flows through the power line W4 between the control slave units 4.

[0038] For example, when the master unit 6 transmits a signal of control information to the control slave unit 4D, the master unit 6 transmits a signal of control information for the control slave unit 4D to the control slave unit 4A instead of directly transmitting the signal to the control slave unit 4D through the power line W4. Then, the control slave unit 4A transmits the signal to the control slave unit 4B (hopping path HP1). Then, the control slave unit 4B transmits the signal to the control slave unit 4C (hopping path HP2). Then, the control slave unit

4C transmits the signal to the control slave unit 4D (hopping path HP3). As a result, the control slave unit 4D can receive the signal of control information from the master unit 6 with the other control slave units 4A, 4B, and 4C as relay points. The master unit 6 can also transmit the signal of control information to the other control slave units 4B and 4C by using the same method.

[0039] A hopping path to the same effect is set for the detection slave unit 2. In this case, when a specific detection slave unit 2 outputs a signal of detection information, the signal of detection information is transmitted to the master unit 6 through the hopping path using the other detection slave units 2 as relay points. In addition, the management unit 7 may set a hopping path between the control slave units 4 and set a hopping path between the detection slave units 2, or may omit one of the hopping paths. In addition, the management unit 7 may set a hopping path between any of the control slave units 4 and any of the detection slave units 2.

[0040] The user interface unit 8 is a unit that enables the user to operate and monitor the equipment system 101. The user interface unit 8 is a unit that enables the user to monitor the energy management system 100 and perform various operations. The user interface unit 8 receives user information regarding the equipment system 101 from the master unit 6 through the network. The user interface unit 8 outputs information of the content of an operation on the equipment system 101 to the master unit 6 through the network. The user interface unit 8 customizes the information regarding the equipment system 101 for the user and displays the information on the display.

[0041] For example, the user interface unit 8 may display the transition of the power consumption in the building BD (or each floor). At this time, the user interface unit 8 may display the power consumption on a daily, monthly, or yearly basis. In addition, the user interface unit 8 may display the timing of the control start and the control end of the specific control target equipment 3. The user interface unit 8 may display the amount of power generated by the solar cell, the amount of power used in the building BD, the amount of charge, and the like. When the user performs an operation to change a part of the control content that is allowed to be changed by the user, the user interface unit 8 transmits the changed content to the master unit 6.

[0042] Next, the function and effect of the energy management system 100 according to the present embodiment will be described.

[0043] In the energy management system 100 according to the present embodiment, the detection slave unit 2 is provided for the detector 1, and the control slave unit 4 is provided for the control target equipment 3. In addition, power line communication is performed between the detection slave unit 2 and the master unit 6, and between the control slave unit 4 and the master unit 6. According to such a configuration, the energy management system 100 can be easily introduced simply by installing the master unit 6 and the slave units 2 and 4 (or control target equipment with slave units) in the existing power line system in the management target area (building BD).

[0044] For example, as a comparative example, an energy management system can be mentioned in which all the lights in the building BD are replaced with dedicated lights for dimming and a communication line

different from the existing power line is provided to connect each light and the master unit to each other with the communication line. In such an energy management system, all the lights need to be replaced and communication lines for all the lights need to be provided. For this reason, the construction cost increases and the construction period becomes long. As another comparative example, an energy management system can be mentioned in which all the lights in the building BD are replaced with dedicated wireless lights, a wireless transmitter is installed on each floor, and a communication line different from the existing power line is provided to connect the master unit and the transmitter on each floor to each other with the communication line. In such an energy management system, it is necessary to replace all the lights with expensive wireless lights, install the transmitter on each floor, and provide the communication line. For this reason, the construction cost increases and the construction period becomes long. On the other hand, the energy management system according to the present embodiment can be introduced simply by installing the master unit 6 and the slave units 2 and 4 on the existing power line that connects the distribution board 10 with the detector 1 and the control target equipment 3. Therefore, the construction cost and the construction period can be shortened. This work is completed simply by installing a slave unit together with the replacement of the light.

[0045] In addition, remote communication is performed between the management unit 7 and the master unit 6, and between the user interface unit 8 and the master unit 6. Therefore, the administrator can make various settings and monitoring of the equipment system 101 from the

remote location. In addition, the user can operate and monitor the equipment system 101 from the remote location. In this manner, the administrator and the user can easily operate the equipment system 101 from the remote location without moving to the site. As described
5 above, the energy management system 100 can be easily introduced and operated.

[0046] The control slave unit 4 may adjust the strength of the output of the control target equipment 3 based on the control information from the master unit 6. In this case, the control slave unit 4 can adjust, for
10 example, the brightness of each light, the intensity of air conditioning, or the discharge or charge of the storage battery as well as the control of ON/OFF switching of the control target equipment 3.

[0047] The management unit 7 may recognize the addresses of the detection slave unit 2, the control slave unit 4, and the master unit 6 in
15 association with each other. In this case, the administrator can collectively monitor the master unit 6 and the slave units 2 and 4 to be managed from the remote location.

[0048] The management unit 7 may set a grouping based on grouping for control of a plurality of pieces of control target equipment 3. In
20 this case, by freely setting the grouping, the management unit 7 can collectively control a plurality of pieces of the control target equipment 3 according to the situation of the management target area (building BD).

[0049] The management unit 7 may set a signal hopping path between
25 at least some of the plurality of detection slave units 2 and the plurality of control slave units 4. Here, hopping is a function in which the

control slave unit 4 or the detection slave unit 2 that receives a signal repeats the communication with sufficient strength when the strength of the power line communication signal is not sufficient. Therefore, by setting the hopping path by the management unit 7, it is possible to suppress crosstalk, attenuation, and the like of signals on the power line.

[0050] The disclosure is not limited to the embodiment described above.

[0051] For example, the configuration of the energy management system 100 is not limited to the configuration shown in FIG. 1. For example, in FIG. 1, the user interface unit 8 directly exchanges information with the master unit 6, but instead, the user interface unit 8 may exchange information with the master unit 6 through the management unit 7.

[0052] The master unit 6 includes an external information receiving unit, and may control the control target equipment 3 based on the received external information. The external information receiving unit may be configured by the communication unit 21 shown in FIG. 3(c). In this case, the master unit 6 can appropriately control the control target equipment 3 according to the external situation. In addition, the master unit 6 can also perform the setting of the control slave unit 4 and the detection slave unit 2 for the hopping by using power line communication.

[0053] For example, the energy management system 100 shown in FIG. 6 may be adopted. In the energy management system 100, a power company 200 (or a new power company) predicts the amount of power used and the amount of power generated on the day, and sends a request

for power saving or storage to each house. In each house, the master unit 6 controls control target equipment in response to the request from the power company.

[0054] In addition, the energy management system 100 shown in FIG. 7 may be adopted. In the energy management system 100, a plurality of grids cooperate with each other in one cloud to share the information of the amount of power used and the amount of power generated. The master unit 6 of a grid GR1 controls the control target equipment 3 according to the situation on the other grids GR2, GR3,

REFERENCE SIGNS LIST

[0055] 1: detector, 2: detection slave unit, 3: control target equipment, 4: control slave unit, 6: master unit, 7: management unit, 8: user interface unit, 100: energy management system, 101: equipment system.

WHAT IS CLAIMED IS:

1. An energy management system, comprising:
 - a detection slave unit provided for a detector;
 - a control slave unit provided for control target equipment;
 - 5 a master unit that receives detection information from the detection slave unit and transmits control information to the control slave unit based on the detection information;
 - a management unit for an administrator that enables the administrator to make various settings and monitoring of an equipment
 - 10 system including the detection slave unit, the control slave unit, and the master unit; and
 - a user interface unit for a user that enables the user to operate and monitor the equipment system,
 - wherein power line communication is performed between the
 - 15 detection slave unit and the master unit, and between the control slave unit and the master unit, and
 - remote communication is performed between the management unit and the master unit, and between the user interface unit and the master unit.
- 20 2. The energy management system according to claim 1,
 - wherein the control slave unit adjusts a strength of an output of the control target equipment based on the control information from the master unit.
- 25 3. The energy management system according to claim 1 or 2,
 - wherein the management unit recognizes addresses of the detection slave unit, the control slave unit, and the master unit in

association with each other.

4. The energy management system according to any one of claims 1 to 3,

5 wherein the management unit sets a grouping based on grouping for control of a plurality of pieces of the control target equipment.

5. The energy management system according to any one of claims 1 to 4,

10 wherein the management unit sets a signal hopping path between at least some of a plurality of the detection slave units and a plurality of the control slave units.

6. The energy management system according to any one of claims 1 to 5,

15 wherein the master unit includes an external information receiving unit, and controls the control target equipment based on received external information.