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(54) Title of Invention

WIRELESS DISPLAY SYSTEM

(57) Abstract

Problem

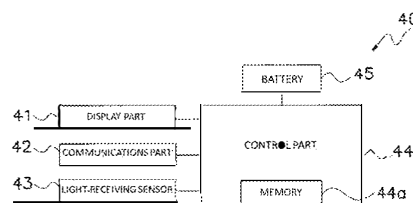
To provide a wireless display system that can ensure high responsiveness of wireless display devices when needed while curtailing the electric power consumption of those wireless display devices.

Solution

An electronic rack label system comprises a plurality of electronic rack labels 40, a server, and access points. The electronic rack labels are disposed in correspondence with a plurality of products, respectively, and display product information concerning the corresponding products. The server stores the product information and the access points transmit the product information stored in the server to the electronic rack labels. Each of the electronic rack labels comprises: a battery 45; a light receiving sensor 43; and a control part 44. The control part has, as control modes, an active mode wherein the time ratio of an awake state, in which product information can be received from the access point, is a prescribed ratio, and an energy-saving mode wherein the time ratio of the awake state is less than that in the active mode and the electric power consumption of the battery is small. Based on the detection result of the light receiving sensor, the control part switches the control mode from the energy-saving mode to the active mode.

Selected Figure

FIG. 4



CLAIMS

1. A wireless display system comprising:
 - a plurality of wireless display devices, which is disposed corresponding to a plurality of items, respectively, and displays item information related to the corresponding items;
 - 5 a server, which stores the item information; and
 - a transmitting apparatus, which transmits, to each of the wireless display devices, the item information stored in the server;
 - wherein:
 - each of the wireless display devices comprises a battery, which drives that wireless display device, a light receiving sensor, and a control part;
 - 10 the control part:
 - has, as control modes of the wireless display device, a first mode wherein a time ratio of an awake state, in which the item information can be received from the transmitting apparatus, is a prescribed ratio, and a second mode wherein the time ratio of the awake state is less than that in the first mode and the electric power consumption of the battery is less than that in the first mode; and
 - 15 switches the control mode from the second mode to the first mode based on the detection result of the light receiving sensor.
2. The wireless display system according to claim 1, wherein the wireless display device further comprises a wireless receiver, which receives the item information from the transmitting apparatus.
- 20 3. The wireless display system according to claim 1, wherein:
 - the wireless display device comprises an infrared ray receiver, which receives the item information from the transmitting apparatus; and
 - the infrared ray receiver serves double duty as the light receiving sensor.
4. The wireless display system according to any one of claims 1–3, wherein, in the situation in which the light receiving level of the light receiving sensor is a prescribed value or more, the control part switches the control mode from the second mode to the first mode.
- 25 5. The wireless display system according to any one of claims 1–4, wherein:
 - the first mode includes a plurality of sub-modes, wherein, the awake state time ratios differ;
 - the larger the awake state time ratio, the greater the electric power consumption of the battery in the sub-mode; and
 - 30 in the situation in which the control part switches the control mode from the second mode to the first mode, the control part selects one of the sub-modes based on the detection result of the light receiving sensor.
6. The wireless display system according to any one of claims 1–5, further comprising:
 - a scanner, which comprises a light emitting part and reads, from the wireless display device, information for linking the wireless display device and the item corresponding to the wireless display device;
 - 35 wherein:
 - an identifier, which is read by the scanner and serves as information, is affixed to the wireless display device in the vicinity of the light receiving sensor; and
 - when the scanner reads the identifier, the light receiving sensor detects the light emitted by the light emitting part of the scanner.
 - 40
7. A wireless display system comprising:
 - a plurality of wireless display devices, which is disposed corresponding to a plurality of items, respectively, and displays item information related to the corresponding items;
 - a server, which stores the item information; and
 - 45 a transmitting apparatus, which transmits, to each of the wireless display devices, the item information stored in the server;
 - wherein:
 - each of the wireless display devices comprises a battery, which drives that wireless display device, a near field communication means, and a control part;

the control part:

has, as control modes of the wireless display device, a first mode wherein a time ratio of an awake state, in which the item information can be received from the transmitting apparatus, is a prescribed ratio, and a second mode wherein the time ratio of the awake state is less than that in the first mode and the electric power consumption of the battery is less than that in the first mode; and

switches the control mode from the second mode to the first mode based on the result of receiving the signal of the near field communication means.

DETAILED DESCRIPTION OF THE INVENTION

FIELD OF THE INVENTION

[0001]

The present invention relates to a wireless display system and more specifically relates to a wireless display system comprising a plurality of wireless display devices, a server that stores item information, and a transmitting apparatus that transmits to the wireless display devices item information stored in the server.

BACKGROUND ART

[0002]

Conventionally, as described in Patent Document 1 (Japanese Laid-open Patent Publication 2008-168057), a wireless display system is known that comprises: a plurality of wireless display devices, which is disposed in correspondence with a plurality of items and that displays item information concerning the corresponding items; a server, which stores the item information; and a transmitting apparatus, which transmits item information stored in the server to the wireless display devices.

[0003]

In such a wireless display system, when item information is to be changed, when the item associated with a wireless display device is to be changed, or the like, the item information is transmitted from a communications apparatus to the wireless display device, and the display of the wireless display device is updated.

[0004]

Incidentally, in such a wireless display system, wireless display devices driven by batteries are generally used. With regard to such battery driven type wireless display devices, there is demand to reduce electric power consumption in order to extend battery life.

[0005]

Consequently, each wireless display device is generally configured such that it alternates between: an awake state, in which it is capable of receiving item information; and a sleep state, in which it cannot receive item information but electric power consumption is low. For example, in Patent Document 1 (Japanese Laid-open Patent Publication 2008-168057), it is disclosed that electric power consumption is further reduced by alternating between the awake state and the sleep state and by setting the sleep state time long when there is no data reception for a prescribed time period.

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006]

However, even though electric power consumption can be reduced when the sleep state time is set long in this manner, nonetheless, for example, there is a situation in which, when a worker or the like performs an operation to rewrite item information in the wireless display device, the response time of the wireless display device becomes adversely long, and thereby the work efficiency of the worker or the like decreases.

[0007]

An object of the present invention is to provide a wireless display system comprising a plurality of wireless display devices, a server, which stores item information, and a transmitting apparatus, which transmits item information stored in the server to the wireless display devices, wherein high responsiveness of the wireless display devices can be ensured when needed while curtailing the electric power consumption of the wireless display devices.

MEANS FOR SOLVING THE PROBLEMS

[0008]

A wireless display system according to a first viewpoint of the present invention comprises a plurality of wireless display devices, a server, and a transmitting apparatus. The plurality of wireless display devices is disposed corresponding to a plurality of items, respectively, and displays item information related to the corresponding items. The server stores the item information. The transmitting apparatus transmits, to each of the

wireless display devices, the item information stored in the server. Each of the wireless display devices comprises a battery, which drives that wireless display device, a light receiving sensor, and a control part. The control part has, as control modes of the wireless display device, a first mode wherein a time ratio of an awake state, in which the item information can be received from the transmitting apparatus, is a prescribed ratio, and a second mode wherein the time ratio of the awake state is less than that in the first mode and the electric power consumption of the battery is less than that in the first mode. The control part switches the control mode from the second mode to the first mode based on the detection result of the light receiving sensor.

[0009]

With regard to the wireless display system according to the first viewpoint of the present invention, based on the detection result of the light receiving sensor, the wireless display device recognizes the state as one in which there is a high probability that an operation will be performed on the wireless display device, and therefore, in response to the recognition result, switches the control mode of the wireless display device from the second mode to the first mode. Consequently, high responsiveness of the wireless display device can be ensured when there is a high probability that item information will be transmitted, while curtailing the electric power consumption of the wireless display device when there is a low probability that item information will be transmitted.

[0010]

The wireless display system according to a second viewpoint of the present invention is the wireless display system according to the first viewpoint, wherein the wireless display device further comprises a wireless receiver, which receives the item information from the transmitting apparatus.

[0011]

With regard to the wireless display system according to the second viewpoint of the present invention, by providing the light receiving sensor on the wireless display device, which performs wireless communication with the transmission apparatus, the electric power consumption of the wireless display device can be curtailed when there is a low probability that item information will be transmitted, and high responsiveness of the wireless display device can be ensured when there is a high probability that item information will be transmitted.

[0012]

The wireless display system according to a third viewpoint of the present invention is the wireless display system according to the first viewpoint, wherein the wireless display device comprises an infrared ray receiver, which receives the item information from the transmitting apparatus. The infrared ray receiver serves double duty as the light receiving sensor.

[0013]

With regard to the wireless display system according to the third viewpoint of the present invention, in the wireless display device that performs infrared ray communication with the transmission apparatus, the infrared ray receiver functions as the light receiving sensor. Consequently, the expense of separately providing the wireless display device with the light receiving sensor is unnecessary, and therefore an increase in the cost of the wireless display system can be curtailed.

[0014]

The wireless display system according to a fourth viewpoint of the present invention is the wireless display system according to the first to third viewpoints, wherein, in the situation in which the light receiving level of the light receiving sensor is a prescribed value or more, the control part switches the control mode from the second mode to the first mode.

[0015]

With regard to the wireless display system according to the fourth viewpoint of the present invention, in the situation in which the light receiving level is the prescribed value or more, the control mode is switched from the second mode to the first mode. That is, with regard to the wireless display system according to the fourth viewpoint of the present invention, the state in which the light receiving level of the light receiving sensor is high (e.g., the state in which the wireless display device is placed in a space where the illumination is turned on) is recognized as the state in which there is a high probability that an operation will be performed on the wireless display device, and therefore, in response to that recognition result, the control mode of the wireless display device can be switched appropriately.

[0016]

The wireless display system according to a fifth viewpoint of the present invention is the wireless display system according to the first to fourth viewpoints, wherein the first mode includes a plurality of sub-modes, wherein the awake state time ratios differ. The larger the awake state time ratio, the greater the electric power consumption of the battery in the sub-mode. In the situation in which the control part switches the control mode from the second mode to the first mode, the control part selects one of the sub-modes based on the detection result of the light receiving sensor.

[0017]

With regard to the wireless display system according to the fifth viewpoint of the present invention, by providing the plurality of sub-modes for the first mode, it is possible to provide responsiveness, as needed, in accordance with the circumstances of the wireless display device, while curtailing excessive electric power consumption.

[0018]

The wireless display system according to a sixth viewpoint of the present invention is the wireless display system according to the first to fifth viewpoints, further comprises a scanner. The scanner comprises a light emitting part and reads, from the wireless display device, information for linking the wireless display device and the item corresponding to the wireless display device. An identifier, which is read by the scanner and serves as information, is affixed to the wireless display device in the vicinity of the light receiving sensor. When the scanner reads the identifier, the light receiving sensor detects the light emitted by the light emitting part of the scanner.

[0019]

With regard to the wireless display system according to the sixth viewpoint of the present invention, when the identifier of the wireless display device is read by the scanner, the light from the light emitting part of the scanner is detected by the light receiving sensor. When the identifier is read by the scanner, normally the linking of the wireless display device and the item is performed, and item information, which reflects the linking result, is transmitted from the transmission apparatus to the wireless display device. Consequently, by detecting the light emitted by the scanner and changing the control mode using such as a trigger, it is possible to provide high responsiveness of the wireless display device when linking the wireless display device and the item.

[0020]

The wireless display system according to a seventh viewpoint of the present invention comprises a plurality of wireless display devices, a server, and a transmitting apparatus. The plurality of wireless display devices is disposed corresponding to a plurality of items, respectively, and displays item information related to the corresponding items. The server stores the item information. The transmitting apparatus transmits, to each of the wireless display devices, the item information stored in the server. Each of the wireless display devices comprises a battery, which drives that wireless display device, a near field communication means, and a control part. The control part has, as control modes of the wireless display device, a first mode wherein a time ratio of an awake state, in which the item information can be received from the transmitting apparatus, is a prescribed ratio, and a second mode wherein the time ratio of the awake state is less than that in the first mode and the electric power consumption of the battery is less than that in the first mode. The control part switches the control mode from the second mode to the first mode based on the result of receiving the signal of the near field communication means.

[0021]

With regard to the wireless display system according to the seventh viewpoint of the present invention, based on the result of detecting the signal of the near field communication means, which is provided by the wireless display device, the state is recognized as one in which there is a high probability that an operation will be performed on the wireless display device, and therefore, in response to the recognition result, the control mode of the wireless display device is switched from the second mode to the first mode. Consequently, high responsiveness of the wireless display device can be ensured when there is a high probability that item information will be transmitted, while curtailing the electric power consumption of the wireless display device.

EFFECTS OF THE INVENTION

[0022]

With regard to a wireless display system according to the present invention, it is possible, while curtailing the electric power consumption of the wireless display device, to ensure high responsiveness of a wireless display device when there is a high probability that item information will be transmitted.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is an overall schematic drawing of an electronic rack label system according to a first embodiment of the present invention.

FIG. 2 is a drawing that depicts a layout example of electronic rack labels of the electronic rack label system in

FIG. 1.

FIG. 3 is a drawing that shows the external appearance of the electronic rack label of the electronic rack label system in FIG. 1.

FIG. 4 is a block diagram that shows a schematic configuration of the electronic rack label of the electronic rack label system in FIG. 1.

FIG. 5 is a block diagram that shows a schematic configuration of a server of the electronic rack label system in FIG. 1.

FIG. 6 is a flow chart for explaining a control mode switching process of the electronic rack label of the electronic rack label system in FIG. 1.

FIG. 7 is an image of the change in the control mode of the electronic rack label of the electronic rack label system in FIG. 1.

FIG. 8 is a block diagram that shows a schematic configuration of the electronic rack label of the electronic rack label system according to Modified Example 1A.

FIG. 9 is an overall schematic drawing of the electronic rack label system according to a second embodiment of the present invention.

FIG. 10 is a drawing that shows the external appearance of the electronic rack label of the electronic rack label system in FIG. 9.

FIG. 11 is a block diagram that shows a schematic configuration of the electronic rack label of the electronic rack label system in FIG. 9.

FIG. 12 is a block diagram that shows a schematic configuration of the server of the electronic rack label system in FIG. 9.

FIG. 13 is a flow chart for explaining the control mode switching process of the electronic rack label of the electronic rack label system in FIG. 9.

5 MODES FOR CARRYING OUT THE INVENTION

[0024]

Embodiments of a wireless display system according to the present invention are explained below.

[0025]

10 It is noted that the embodiments below are merely illustrative and the wireless display system according to the present invention is not limited to the details described below. Other embodiments can also be adopted within a scope that does not contradict the gist of the invention.

[0026]

<First Embodiment>

15 An electronic rack label system 1 according to a first embodiment of the present invention is explained below.

[0027]

(1) Overall Configuration

20 The electronic rack label system 1 is one example of the wireless display system according to the present invention. The electronic rack label system 1 is used in, for example, a store such as a supermarket or a convenience store.

[0028]

25 As shown in FIG. 1, the electronic rack label system 1 principally comprises a plurality of electronic rack labels 40, 40, ..., a server 10, a plurality of access points 30, 30, ..., and a handy terminal 50. The number of the electronic rack labels 40, the number of the access points 30, and the number of the handy terminals 50 included in the electronic rack label system 1 are not limited to the numbers shown in FIG. 1.

[0029]

30 Each of the electronic rack labels 40 is one example of a wireless display device. Each of the electronic rack labels 40 is a portable apparatus. The electronic rack labels 40 are display apparatuses that are disposed in correspondence with a plurality of products P (one example of items) carried by the store. Each of the electronic rack labels 40 is disposed in the vicinity of its corresponding product P at a point of sale in the store and displays product information (one example of item information) concerning the corresponding product P (refer to FIG. 2). Product information is a variety of information concerning the product P and includes, for example, the name, the retail price, and the like of the product P (refer to FIG. 3).

[0030]

35 The server 10 is a common computer that performs unified management of the information of the plurality of products P carried by the store. The server 10 is disposed, for example, in the server room of the store. The functions of the server 10 include the management of the product information displayed on the electronic rack labels 40. The server 10 stores product information for displaying on the electronic rack labels 40. When stored product information has been updated, in order to update the product information displayed by
40 the relevant electronic rack label 40, the server 10 generates a command to the electronic rack label 40 (an instruction for causing the electronic rack label 40 to update the product information to be displayed) and transmits such to the electronic rack label 40. The command includes product information to be displayed on the electronic rack label 40 and, more specifically, includes image information of the product information to be displayed on the electronic rack label 40. In addition, the apparatus ID of the electronic rack label 40 that is to
45 execute the command is appended to the command. The server 10 exchanges signals with the electronic rack labels 40 via the access points 30, which are connected via a network 2 (refer to FIG. 1) of a LAN (local area network) or the like.

[0031]

50 Each of the access points 30 is a transmitting/receiving apparatus that performs radio wave type wireless communication. Each of the access points 30 exchanges various signals with the electronic rack labels 40. Specifically, the access points 30 use radio waves to transmit to the electronic rack labels 40 signals (including commands) transmitted from the server 10. It is noted that the access points 30 transmit at prescribed intervals (e.g., at 4 s intervals) a signal, which is called a beacon, for informing the electronic rack labels 40 of the presence/absence of a command transmission. In the situation in which a command is to be transmitted to
55 one of the electronic rack labels 40, that command is transmitted following

a beacon. In addition, the access point 30 receives the signal transmitted from the electronic rack label 40 by radio wave and transmits such to the server 10. The access points 30 are mounted spaced apart on, for example, the ceiling of the store. The installation location, the installation spacing, and the like of the access points 30 are determined such that an electronic rack label 40 installed in the store can communicate with one of the access points 30.

[0032]

The handy terminal 50 is a portable data collecting terminal. The handy terminal 50 is configured in a manner capable of reading identification information unique to each of the electronic rack labels 40 and each of the products P. The handy terminal 50 is principally used in a linking operation or the like, which associates the apparatus IDs of the electronic rack labels 40 with the product IDs of the products P. The linking operation is an operation for associating the apparatus IDs of the electronic rack labels 40 and the product IDs of the products P and storing such in the server 10 so that each electronic rack label 40 is caused to display the product information of the product P corresponding to that electronic rack label 40.

[0033]

(2) Detailed Configuration

The electronic rack labels 40, the server 10, and the handy terminal 50 of the electronic rack label system 1 are explained in detail below.

[0034]

(2-1) Electronic Rack Label

The electronic rack labels 40 are disposed in correspondence with the plurality of products P carried by the store, and each electronic rack label 40 displays product information concerning the corresponding product P (refer to FIG. 2). The product information displayed on each electronic rack label 40 includes the product name, the unit price by weight, and the retail price (refer to FIG. 3). However, the product information is not necessarily limited to the product name, the unit price by weight, and the retail price and may include other information either in addition to this information or instead of some or all of this information.

[0035]

As shown in FIG. 4, the electronic rack label 40 principally comprises a display part 41, a communications part 42, a light receiving sensor 43, a control part 44, and a battery 45.

[0036]

(2-1-1) Display Part

Each display part 41 is a screen for displaying product information (the image information of the product information included in the command transmitted from the server 10) stored in memory 44a of the control part 44, which is described below (refer to FIG. 3). For example, electronic paper is used as the display part 41. That is, the display part 41 is a dot matrix type nonvolatile display part comprising a plurality of pixels arrayed in a matrix. The display part 41 is capable of holding the display content even if electric power is not supplied. It is noted that the display part 41 is not necessarily constituted from electronic paper and may be constituted from, for example, a liquid crystal display.

[0037]

(2-1-2) Communications Part

The communications part 42 functions so as to perform wireless communication with the corresponding access point 30. Specifically, the communications part 42 performs radio wave type wireless communication with the access point 30. The communications part 42 receives a command, which includes the image information of the product information, from the access point 30 and inputs the received command into the control part 44. In addition, the communications part 42 transmits a response signal (ACK) to the server 10. The response signal is a signal transmitted from the communications part 42 to inform the server 10 that a command, which was transmitted to the electronic rack label 40 that has that communications part 42, has been received.

[0038]

(2-1-3) Light Receiving Sensor

The light receiving sensor 43 principally comprises a light receiving part (not shown). The light receiving sensor 43 is disposed in the vicinity of a barcode 40a, which is affixed to the front surface of the electronic rack label 40 (the surface on which the display part 41 is provided). More specifically, the light receiving part of the light receiving sensor 43 is disposed in the vicinity of the barcode 40a. In this manner, by disposing the light receiving part of the light receiving sensor 43 and the barcode 40a such that they are lined up, when the barcode 40a is read using the handy terminal 50, as described below,

the light receiving sensor 43 can detect the light emitted from the handy terminal 50. The light receiving sensor 43 is configured such that it detects the light receiving level (light quantity) of the light receiving part. The detection result (light quantity) from the light receiving sensor 43 is input into the control part 44.

[0039]

5 (2-1-4) Control Part

The control part 44 principally comprises a CPU (not shown), the memory 44a (refer to FIG. 4), etc. The control part 44 is electrically connected to the display part 41, the communications part 42, the light receiving sensor 43, and the battery 45 (refer to FIG. 4).

[0040]

10 The apparatus ID, which is an identifier unique to the electronic rack label 40, is stored in the memory 44a. In addition, the product information (the image information of the product information transmitted from the server 10) received by the communications part 42 is stored in the memory 44a.

[0041]

15 The control part 44 controls the various elements of the electronic rack label 40 by executing a program stored in the memory 44a. Specifically, the control part 44 performs the following types of control.

[0042]

For example, the control part 44 performs control so as to switch the state of the communications part 42 between a sleep state and an awake state. The sleep state is the state in which the communications part 42 cannot receive signals transmitted from the access point 30. When in the sleep state, the communications part 42 does not consume electric power of the battery 45. On the other hand, the awake state is the state in which the communications part 42 can receive signals transmitted from the access point 30. When in the awake state, the communications part 42 consumes electric power of the battery 45. It is noted that the control part 44 is configured such that it has an energy-saving mode and an active mode as the control modes of the electronic rack label 40, as described below, and such that the ratio of the sleep state time and the awake state time differ by control mode. The control modes are described in detail below.

[0043]

In addition, for example, when the communications part 42 in the awake state receives a command from the access point 30 and the received command is input from the communications part 42 into the control part 44, the control part 44 determines whether that command is addressed to itself (addressed to the electronic rack label 40 that has that control part 44). Specifically, the control part 44 compares the apparatus ID appended to the command and the unique apparatus ID stored in the memory 44a and, if these coincide, determines that the command is addressed to itself. In the situation in which it has been determined that the command is addressed to itself, the control part 44 stores in the memory 44a the image information included in the command (updates the information in the memory 44a). Furthermore, the control part 44 controls the display part 41 so as to display on the display part 41 the product information (image information) stored in the memory 44a. In addition, in the situation in which it has been determined that the command is addressed to itself, the control part 44 causes the communications part 42 to transmit a response signal to the server 10.

[0044]

40 (2-1-5) Battery

The battery 45 supplies drive power to the display part 41, the communications part 42, the light receiving sensor 43, and the control part 44 of the electronic rack label 40.

[0045]

Switches (not shown), such as FETs, are provided in the communications part 42. By controlling the switches, the control part 44 controls the supply of electric power from the battery 45 to the communications part 42. Specifically, when the state of the communications part 42 is set to the sleep state, the control part 44 turns the abovementioned switches OFF so that electric power is not supplied from the battery 45 to the communications part 42. On the other hand, when the state of the communications part 42 is set to the awake state, the control part 44 turns the abovementioned switches ON so that electric power is supplied from the battery 45 to the communications part 42.

[0046]

50 (2-2) Server

The server 10 is a common computer that performs unified management of the information of the plurality of products P carried by the store. The server 10 transmits commands, which include product information, to the electronic rack labels 40 via the access points 30.

[0047]

5 The server 10 principally comprises a server communications part 11, a server display part 12, a server input part 13, a server storage part 14, and a server control part 15 (refer to FIG. 5).

[0048]

(2-2-1) Server Communications Part

10 The server communications part 11 is a communications interface for enabling communication between the server 10 on one side and the access points 30, the handy terminal 50, and the like on the other side. In addition, the server 10 is configured such that it can communicate also with devices other than the electronic rack label system 1 (e.g., the server of a POS system and a store controller, which are installed together with the electronic rack label system 1 in the store) via the server communications part 11. Commands transmitted from the server communications part 11 to the access points 30 are transmitted from the access points 30 to the

15 electronic rack labels 40.

[0049]

(2-2-2) Server Display Part

The server display part 12 is a liquid crystal display. A variety of information concerning the electronic rack label system 1 can be displayed on the server display part 12.

20 **[0050]**

(2-2-3) Server Input Part

The server input part 13 includes a mouse and a keyboard. Various instructions and various information for the server 10 can be input via the server input part 13.

[0051]

25 (2-2-4) Server Storage Part

The server storage part 14 is constituted from ROM, RAM, a hard disk, etc. Various programs executed by the server control part 15, which is described below, are stored in the server storage part 14. In addition, various information is stored in the server storage part 14. The information stored in the server storage part 14 includes a product master table 14a and an electronic rack label master table 14b (refer to FIG. 5).

30 **[0052]**

(2-2-4-1) Product Master Table

The product master table 14a is information concerning the products P handled by the electronic rack label system 1. The information concerning the products P includes, for example, product name, retail price (regular price/special sale price), unit retail price, discount rate, and the like. In addition, the information concerning the products P may include information that is principally used by employees or the like of the store, such as sales volume, inventory quantity, and the like. Product information is stored in the product master table 14a by product ID (barcode information) of the product P. The content of the product master table 14a is updated by the server communications part 11 receiving information from an external device (e.g., the POS system, which is not shown) or by the server input part 13 accepting the input of information.

40 **[0053]**

(2-2-4-2) Electronic Rack Label Master Table

The electronic rack label master table 14b is information that associates the apparatus IDs, which are for identifying the electronic rack labels 40, and the product IDs of the products P. By associating the apparatus IDs and the product IDs and storing such in the electronic rack label master table 14b, the electronic rack labels 40 and the products P corresponding to the electronic rack labels 40 are linked. In other words, by associating the apparatus IDs and the product IDs and storing such in the electronic rack label master table 14b, for any given electronic rack label 40, the product information of the product P to be displayed thereon becomes identified. The apparatus IDs and the product IDs are associated by a user performing the linking operation using the handy terminal 50, which is described below.

50 **[0054]**

(2-2-5) Server Control Part

The server control part 15 controls various elements of the server 10 by executing a program stored in the server storage part 14. Specifically, the server control part 15 performs the following types of control.

[0055]

For example, as described below, when the server communications part 11 receives the apparatus ID of an electronic rack label and the product ID of a product P to be associated and that were transmitted by the handy terminal 50, the server control part 15 associates that apparatus ID and that product ID, and stores such in the electronic rack label master table 14b.

[0056]

In addition, for example, when starting the electronic rack label system 1 or when there is a need to change the display of the electronic rack label 40, the server control part 15 generates a command that includes product information and transmits such to the electronic rack label 40 via the access point 30. The meaning of when there is a need to change the display of the electronic rack label 40 is, for example, when the content of the product master table 14a or the content of the electronic rack label master table 14b has been updated.

[0057]

Specifically, the server control part 15 performs the following process when transmitting product information to the electronic rack label 40.

[0058]

First, with reference to the product master table 14a, the server control part 15 generates, for the product P that requires a change in the display of the electronic rack label 40, image information of the product information for transmitting to the electronic rack label 40. In addition, with reference to the electronic rack label master table 14b, the server control part 15 acquires, as a transmission destination identifier, the apparatus ID of the electronic rack label 40 linked to the product P that requires a change in the display of the electronic rack label 40.

[0059]

Next, the server control part 15 generates a command that includes image information of the product information and to which the acquired transmission destination identifier (the apparatus ID of the electronic rack label 40 that is the transmission target) is appended. Furthermore, the server control part 15 transmits the generated command to the access point 30. The access point 30, having received the command, transmits that command to the electronic rack label 40 by radio waves.

[0060]

As described above, when the electronic rack label 40 receives distribution data addressed to itself, the electronic rack label 40 transmits a response signal to the access point 30. The access point 30, having received the response signal, transmits the response signal to the server communications part 11 of the server 10 via the network 2. After the transmission of the command, when the server communications part 11 receives the response signal, the server control part 15 determines that communication with the electronic rack label 40 has succeeded and terminates the process of transmitting product information to the electronic rack label 40. On the other hand, in the situation in which the access point 30 does not receive a response signal for some reason, the server control part 15 retransmits the distribution data.

[0061]

(2-3) Handy Terminal

The handy terminal 50 is a data collecting terminal that comprises a barcode read function and a data transmission function. The handy terminal 50 is one example of a scanner.

[0062]

The handy terminal 50 principally comprises a light emitting part 51, such as an LED, and a detecting part 52 (refer to FIG. 1).

[0063]

The handy terminal 50 illuminates a barcode (not shown) affixed to the product P or the barcode 40a (refer to FIG. 3) affixed to the electronic rack label 40 with the light radiated from the light emitting part 51. The detecting part 52 reads the barcode content by detecting the light reflected by the surface on which the barcode of the product P is affixed or the surface on which the barcode 40a of the electronic rack label 40 is affixed. The result of reading the barcode with the handy terminal 50 is transmitted to the server 10.

[0064]

The handy terminal 50 is principally used as below when linking the electronic rack label 40 and the

product P corresponding to that electronic rack label 40 (during the linking operation).

[0065]

The user uses the handy terminal 50 to scan the barcode 40a (refer to FIG. 3), which is affixed to the electronic rack label 40 that is the object of the linking operation and which displays the apparatus ID of that electronic rack label 40 (the same as the apparatus ID stored in the memory 44a of that electronic rack label 40). Subsequently, the user uses the handy terminal 50 to scan the barcode affixed to the product P for which the product information is to be displayed by that electronic rack label 40. The scanned apparatus ID and product ID are transmitted to the server 10 via a communications channel (e.g., a wireless LAN), which is not shown. At the server 10, the transmitted apparatus ID and product ID are associated and stored in the electronic rack label master table 14b.

[0066]

(3) Process of the Control Part Switching the Control Mode of the Electronic Rack Label

The process of the control part 44 switching the control mode of the electronic rack label 40 will now be explained.

[0067]

First, the control modes of the electronic rack label 40 will be explained. The control modes of the electronic rack label 40 are divided largely into two modes, the energy-saving mode and the active mode, in accordance with the time ratio of the awake state (the state in which the electronic rack label 40 can communicate with the access point 30 via the communications part 42).

[0068]

The energy-saving mode is one example of a second mode. The energy-saving mode is a mode in which an awake operation, wherein the state changes from the sleep state to the awake state such that commands that include product information and that are transmitted from the access point 30 can be received, is performed at comparatively long intervals of time T1 (e.g., 1 h). In one awake operation, the electronic rack label 40 enters the awake state for a prescribed period Δt (e.g., 150 ms). In the energy-saving mode, the time ratio of the awake state is $\Delta t/T1$. It is noted that control is performed so that the beacon transmission timing of the access point 30 and the awake operation timing of the electronic rack label 40 are synchronized.

[0069]

In the energy-saving mode, the awake state time ratio is short and the sleep state time ratio, in which electric power of the battery 45 is not supplied to the communications part 42, is long. Consequently, in the energy-saving mode, consumption of the electric power of the battery 45 is relatively small.

[0070]

The active mode is one example of a first mode. The active mode is a mode in which the awake operation is performed at comparatively short intervals of time T2 ($< \text{time } T1$). Prescribed period Δt , in which the electronic rack label 40 enters the awake state in one awake operation, is the same as that in the energy-saving mode. The awake state time ratio during the active mode is $\Delta t/T2$ and is greater than the awake time time ratio $\Delta t/T1$ during the energy-saving mode. Because the start state time during the active mode is long, the consumption of the electric power of the battery 45 during the active mode is greater than that during the energy-saving mode.

[0071]

The active mode has a plurality of sub-modes that differ by the awake state time ratio; in other words, that differ by the time intervals at which the awake operation is performed. Here, the active mode includes a first active mode and a second active mode as the plurality of sub-modes. The awake state time ratio in the second active mode is greater than the awake state time ratio in the first active mode. For example, in the second active mode, the awake operation is performed at 4 s intervals; in the first active mode, the awake operation is performed at 1 min intervals. In the second active mode, because the awake state time ratio is greater than that in the first active mode, the consumption of the electric power of the battery 45 is greater in the second active mode than in the first active mode. It is noted that control is performed such that, in all of the sub-modes, the beacon transmission timing of the access point 30 and the awake operation timing of the electronic rack label 40 are synchronized.

[0072]

Next, the process of the control part 44 switching the control mode of the electronic rack label 40 will be explained, with reference to the flow chart in FIG. 6. The control mode switching process is performed

continuously during the operation of the electronic rack label 40.

[0073]

The control part 44 switches the control mode based on the detection result produced by the light receiving sensor 43 (the light quantity detected by the light receiving sensor 43).

[0074]

In step S1, based on input from the light receiving sensor 43, it is determined whether the light receiving level of the light receiving sensor 43 (the detected light quantity) is a prescribed first reference value or more. The first reference value is a value that is predetermined based on, for example, the luminous flux intensity in the store during business/operation. That is, in step S1, based on the light quantity, it is determined whether the state is such that operation on the electronic rack label 40 is performed at a relatively high frequency (whether the state is such that illumination is turned ON in the store and there is a high probability that operation on the electronic rack label 40 will be performed). In step S1, in the situation in which it is determined that the light quantity is less than the first reference value (relatively dark), the process advances to step S2; and in the situation in which it is determined that the light quantity is the first reference value or more (relatively bright), the process advances to step S3.

[0075]

In step S2, in the situation in which the control mode of the electronic rack label 40 is the active mode, the control part 44 switches the control mode from the active mode to the energy-saving mode. It is noted that, in the situation in which the control mode is already in the energy-saving mode, the energy-saving mode is continued. After step S2 ends, the process returns to step S1.

[0076]

In step S3, based on input from the light receiving sensor 43, it is determined whether the light receiving level of the light receiving sensor 43 (the detected light quantity) is a prescribed second reference value or higher. The second reference value is a value that is greater than the first reference value. The second reference value is a value that is predetermined based on the light quantity in the situation in which the light receiving sensor 43 detects the light emitted by the light emitting part 51 of the handy terminal 50. That is, in step S3, based on the light quantity, it is determined whether the operation of reading the barcode 40a affixed to the electronic rack label 40 has been performed using the handy terminal 50. In step S3, when it is determined that the light quantity is smaller than the second reference value, the process advances to step S4. In step S3, when it is determined that the light quantity is the second reference value or more, the process advances to step S5.

[0077]

In step S4, in the situation in which the control mode of the electronic rack label 40 is the energy-saving mode, the control part 44 switches the control mode from the energy-saving mode to the active mode. In particular, in step S4, the control part 44 selects the first active mode as the sub-mode of the active mode. It is noted that, in the situation in which the control mode is already the first active mode, the first active mode is continued. After step S4 ends, the process returns to step S1.

[0078]

In step S5, in the situation in which the control mode of the electronic rack label 40 is the energy-saving mode, the control part 44 switches the control mode from the energy-saving mode to the active mode. In particular, in step S5, the control part 44 selects the second active mode as the sub-mode of the active mode. In addition, in step S5, in the situation in which the first active mode has been selected as the sub-mode of the active mode, the control part 44 selects the second active mode as the sub-mode of the active mode. After step S5 ends, the process advances to step S6.

[0079]

In step S6, after the performance of step S5, it is determined whether a prescribed time (e.g., 3 min) has elapsed. Step S6 is a process that causes the second active mode to continue for the prescribed time. At the timing when the light quantity detected by the light receiving sensor 43 exceeds the second reference value, in other words, at the timing when the reading of the barcode 40a of the electronic rack label 40 by the handy terminal 50 is performed, normally the linking between the electronic rack label 40 and the product P is performed and a command that includes new product information to be displayed on the electronic rack label 40 is transmitted from the server 10. Consequently, a prescribed time at the maximum is ensured for the time within which the second active mode is set as the control mode in step S6 so that, when a command is transmitted via the access point 30, the anticipated command from the server 10

can be received promptly. In step S6, when it is determined that the prescribed time has elapsed, the process returns to step S1. When returning to step S1, the control part 44 switches the control mode of the electronic rack label 40 to the mode (e.g., the first active mode) in which the electric power consumption of the battery 45 is less than that in the second active mode. In step S6, in the situation in which it is determined that the prescribed time has not elapsed, the process advances to step S7.

[0080]

In step S7, after the second active mode has been selected in step S5, it is determined whether the electronic rack label 40 has received a command addressed to itself from the server 10. In the situation in which it is determined that a command addressed to itself has been received, the control mode switching process returns to step S1. When returning to step S1, the control part 44 switches the control mode of the electronic rack label 40 to the mode (e.g., the first active mode) in which the electric power consumption of the battery 45 is less than that in the second active mode.

[0081]

By the control part 44 performing the control mode switching process of the electronic rack label 40 as in the flow chart in FIG. 6, the control mode of the electronic rack label 40 is switched throughout the day as in, for example, FIG. 7.

[0082]

Because the light quantity detected by the light receiving sensor 43 is smaller than the first reference value during the time when the lights are turned off inside the store (e.g., during nighttime outside of business hours) (refer to FIG. 7), the control mode of the electronic rack label 40 changes to the energy-saving mode. During the time when the lights are turned off inside the store, the frequency with which product information displayed on the electronic rack label 40 is updated or the like generally is low and, in addition, there is little need to rewrite the display of product information on the electronic rack label 40 within a short period. Consequently, during the time when the lights are turned off inside the store, there is no problem with responsiveness even though the awake state time ratio is set small, and therefore it is possible to curtail the electric power consumption of the electronic rack label 40.

[0083]

On the other hand, during the time when the interior of the store is illuminated (e.g., during business and during operation), the light quantity detected by the light receiving sensor 43 is larger than the first reference value (refer to FIG. 7), and the control mode of the electronic rack label 40 changes to the first active mode. During the time when the interior of the store is illuminated, the probability that the product information displayed on the electronic rack label 40 will be updated or the like is comparatively high and therefore, in addition, is preferable that the display of the product information on the electronic rack label 40 be rewritten within a comparatively short period. Consequently, during the time when the interior of the store is illuminated, the awake state time ratio is controlled such that it is comparatively large.

[0084]

Furthermore, at the timing when the light quantity detected by the light receiving sensor 43 exceeds the second reference value, in other words, at the timing when the reading of the barcode 40a of the electronic rack label 40 is performed by the handy terminal 50 (during the linking operation), the probability that a command to update the product information displayed on the electronic rack label 40 will be transmitted is extremely high and therefore, in addition, is preferable that the display of the product information on the electronic rack label 40 be rewritten within a short period. Consequently, at the timing when the reading of the barcode 40a of the electronic rack label 40 by the handy terminal 50 is performed, the awake state time ratio is controlled such that it is comparatively large.

[0085]

It is noted that the abovementioned process of switching the control mode of the electronic rack label 40 is one example and is not limited thereto. For example, the abovementioned process of switching the control mode of the electronic rack label 40 may be configured such that step S7 is eliminated from the flow chart in FIG. 6 and such that step S6 is performed repetitively until it is determined that the prescribed time has elapsed. In addition, in the flow chart in FIG. 6, when the process returns from step S6 or step S7 to step S1, the control mode of the electronic rack label 40 may remain as is in the second active mode.

[0086]

(4) Features

(4-1)

The electronic rack label system 1, as one example of the wireless display system according to the present embodiment, comprises the plurality of electronic rack labels 40, the server 10, and the access points 30,

which serve as transmitting apparatuses. Each of the electronic rack labels 40 is one example of the wireless display device. The plurality of electronic rack labels 40 is disposed in correspondence with the plurality of products P (one example of items) and displays the product information (one example of item information) concerning the corresponding products P. The server 10 stores the product information. The access points 30 transmit the product information stored in the server 10 to the electronic rack labels 40. Each of the electronic rack labels 40 comprises: the battery 45, which drives the electronic rack label 40; the light receiving sensor 43; and the control part 44. The control part 44 has, as control modes, the active mode, which is one example of the first mode, and the energy-saving mode, which is one example of the second mode. In the active mode, the time ratio of the awake state, during which product information can be received from the access point 30, is a prescribed ratio. In the energy-saving mode, the awake state time ratio is less than that in the active mode, and the consumption of the electric power of the battery 45 is less than that in the active mode. Based on the detection result of the light receiving sensor 43, the control part 44 switches the control mode from the energy-saving mode to the active mode.

[0087]

Here, based on the detection result of the light receiving sensor 43, the electronic rack label 40 recognizes the state as one in which there is a high probability that an operation will be performed on the electronic rack label 40, and therefore, in response to the recognition result, switches the control mode of the electronic rack label 40 from the energy-saving mode to the active mode. Consequently, high responsiveness of the electronic rack label 40 can be ensured when there is a high probability that product information will be transmitted, while curtailing the electric power consumption of the electronic rack label 40 when there is a low probability that product information will be transmitted.

[0088]

(4-2)

With regard to the electronic rack label system 1 according to the present embodiment, the electronic rack label 40 comprises the communications part 42, which is one example of a wireless receiver that receives product information from the access point 30.

[0089]

Here, by providing the light receiving sensor 43 on the electronic rack label 40, which performs wireless communication with the access point 30, the electric power consumption of the electronic rack label 40 can be curtailed when there is a low probability that product information will be transmitted, and high responsiveness of the electronic rack label 40 can be ensured when there is a high probability that product information will be transmitted.

[0090]

(4-3)

With regard to the electronic rack label system 1 according to the present embodiment, in the situation in which the light receiving level (light quantity) of the light receiving sensor 43 is the first reference value or more, the control part 44 switches the control mode from the energy-saving mode to the active mode.

[0091]

Here, in the situation in which the light quantity is the prescribed value or more, the control mode is switched from the energy-saving mode to the active mode. That is, here, the state in which the light quantity is large (e.g., the state in which the electronic rack label 40 is placed inside a store where the illumination is turned on) is recognized as the state in which there is a high probability that an operation will be performed on the electronic rack label 40, and therefore, in response to that recognition result, the control mode of the electronic rack label 40 can be switched appropriately.

[0092]

(4-4)

With regard to the electronic rack label system 1 according to the present embodiment, the active mode includes a plurality of sub-modes, wherein the awake state time ratios differ. In particular, here, the sub-modes include the first active mode and the second active mode. The consumption of electric power of the battery 45 in the sub-modes is greater the larger is the awake state time ratio. In the situation in which the control part 44 switches the control mode from the energy-saving mode to the active mode, the control part 44 selects one of the sub-modes based on the detection result of the light receiving sensor 43.

[0093]

Here, by providing the plurality of sub-modes for the active mode, it is possible to provide responsiveness, as needed, in accordance with the circumstances of the electronic rack label 40, while curtailing excessive electric power consumption.

[0094]

(4-5)

The electronic rack label system 1 according to the present embodiment comprises the handy terminal 50, which is one example of the scanner. The handy terminal 50 comprises the light emitting part 51 and reads, from the electronic rack label 40, information for linking the electronic rack label 40 and the product P corresponding to that electronic rack label 40. An identifier (the barcode 40a), which serves as the information read by the handy terminal 50, is affixed to the electronic rack label 40 in the vicinity of the light receiving part of the light receiving sensor 43. When the handy terminal 50 reads the barcode 40a, the light receiving sensor 43 detects the light emitted by the light emitting part 51 of the handy terminal 50.

[0095]

Here, when the barcode 40a of the electronic rack label 40 is read by the handy terminal 50, the light from the light emitting part 51 of the handy terminal 50 is detected by the light receiving sensor 43. When the barcode 40a is read by the handy terminal 50, normally the linking of the electronic rack label 40 and the product P is performed, and product information, which reflects the linking result, is transmitted from the access point 30 to the electronic rack label 40. Consequently, by detecting the light emitted by the handy terminal 50 and changing the control mode using such as a trigger, it is possible to provide high responsiveness of the electronic rack label 40 when linking the electronic rack label 40 and the product P.

[0096]

(5) Modified Examples

Modified examples of the first embodiment are explained below. It is noted that a plurality of modified examples may be combined within a scope that is not contradictory.

[0097]

(5-1) Modified Example 1A

In the electronic rack label system 1 according to the abovementioned embodiment, the electronic rack label 40 is configured such that communication with the access points 30 is performed by radio waves, but the electronic rack label system 1 is not limited thereto.

[0098]

For example, it may be configured such that communication between a communications apparatus, which transmits commands that include product information from the server 10 to the electronic rack label, and the electronic rack label is performed using infrared rays. As shown in FIG. 8, a communications part 142 of an electronic rack label 140 used in this situation comprises a light receiving part 142a, which receives an infrared ray signal, and a light emitting part 142b, which emits the infrared ray signal. The light receiving part 142a is one example of an infrared ray receiver that receives product information from the communications apparatus.

[0099]

It is noted that when configured in this manner, instead of the electronic rack label 140 separately comprising the light receiving sensor, it is preferable that the light receiving part 142a serves double duty as the light receiving sensor that detects the light quantity. As a result, it is possible to lower the cost incurred by separately installing a light receiving sensor.

[0100]

(5-2) Modified Example 1B

With regard to the electronic rack label system 1 according to the abovementioned embodiment, the active mode of the electronic rack label 40 includes two sub-modes but is not limited thereto.

[0101]

For example, the active mode may be configured such that it includes three or more sub-modes. Furthermore, the control part 44 may be configured such that, the larger the value of the light quantity detected by the light receiving sensor 43, the higher the awake state time ratio of the electronic rack label 40 in the selected sub-mode.

[0102]

In addition, for example, the active mode does not have to include sub-modes. For example, it may be configured such that the abovementioned first active mode alone is performed as the active mode. However, to ensure high responsiveness during the linking operation performed by the handy terminal 50, it is preferable that the active mode includes the first active mode and the second active mode.

[0103]

(5-3) Modified Example 1C

With regard to the electronic rack label system 1 according to the abovementioned embodiment, in the energy-saving mode and the active mode, or in the first active mode and the second active mode, the awake time ratios may be made different by changing the frequency of the awake operation but are not limited thereto. For example, the awake time ratios may be made different by changing the awake time per awake operation.

[0104]

The awake time ratios of the first active mode and the second active mode may be made different by performing control such that, in the first active mode, the communications part 42 changes to the awake state for a first time duration (e.g., 150 ms) once per minute, and by performing control such that, in the second active mode, the communications part 42 changes to the awake state for a second time duration (e.g., 20 s) once per minute.

[0105]

(5-4) Modified Example 1D

The abovementioned embodiment describes an electronic rack label system as one example of the wireless display system according to the present invention; however, the wireless display system according to the present invention is not limited to an electronic rack label system that is installed in a store or the like.

[0106]

For example, the wireless display system may be one that is used in a hospital. Specifically, in a hospital, there are situations in which management is performed wherein drugs (injection drugs, oral medicines, and the like) are prepared according to patient at a dispensary or the like and stored in containers, and those drugs are carried to hospital rooms and the like in those containers. In such a situation, a wireless display device (a wireless display device having a device configuration the same as that of the electronic rack label 40 according to the abovementioned embodiment) is attached to each of the containers (one example of the items), and the control mode of each wireless display device may be caused to transition, based on the detection result of the light receiving sensor, from a mode in which the awake time ratio is comparatively small to a mode in which the awake time ratio is comparatively large. Information concerning the container is, for example, the name of the patient who is to take the drug contained (or to be contained) in the container, a list of the names of the drugs contained (or to be contained) in the container, etc.

[0107]

In addition, for example, the wireless display system may be one that is used in a warehouse or the like. Specifically, in a warehouse, in the situation in which items to be transported are placed in a container according to transport destination and then stored/managed inside the warehouse, a wireless display device (a wireless display device having a device configuration the same as that of the electronic rack label 40 according to the abovementioned embodiment) may be attached to each of the containers (one example of the items), and the control mode of each wireless display device may be caused to transition, based on the detection result of the light receiving sensor, from a mode in which the awake time ratio is comparatively small to a mode in which the awake time ratio is comparatively large. Information concerning the container is, for example, the transport destination of the items to be transported contained in the container, the names, quantities, and the like of the items to be transported contained in the container, etc.

[0108]

In the situation in which the wireless display system is used in a hospital or a warehouse as well, high responsiveness of the wireless display devices when there is a high probability that item information will be transmitted can be ensured while curtailing the electric power consumption of the wireless display device.

[0109]

<Second Embodiment>

An electronic rack label system 201 according to a second embodiment of the present invention is explained below.

[0110]

The electronic rack label system 201 according to the second embodiment is one example of the wireless display system according to the present invention. Because there are many points in common between the electronic rack label system 201 and the electronic rack label system 1 according to the first embodiment, principally the points of difference will be explained.

[0111]

It is noted that, in the second embodiment, elements that are assigned the same symbols as in the configuration according to the first embodiment means that the configuration, function, and the like are the same as those of the elements according to the first embodiment.

[0112]

(1) Overall Configuration

FIG. 9 is an overall schematic drawing of the electronic rack label system 201 according to the second embodiment.

[0113]

5 The electronic rack label system 201 is the same as the electronic rack label system 1 according to the first embodiment, except for a server 210, electronic rack labels 240, which serve as one example of wireless display devices, and a handy terminal 250. Because the overall configuration of the electronic rack label system 201 is the same as that of the electronic rack label system 1 according to the first embodiment, explanation thereof is omitted.

[0114]

(2) Detailed Configuration

The electronic rack labels 240, the server 210, and the handy terminal 250 of the electronic rack label system 201 are explained in detail below, focused on the points of difference from the electronic rack labels 40, the server 10, and the handy terminal 50 of the electronic rack label system 1 according to the first embodiment.

[0115]

(2-1) Electronic Rack Label

Unlike the electronic rack label 40 according to the first embodiment, the electronic rack label 240 does not comprise the light receiving sensor 43 (refer to FIG. 10 and FIG. 11). Unlike the electronic rack label 40 according to the first embodiment, the electronic rack label 240 comprises a near field communication part 246 (refer to FIG. 11). Electric power is supplied from the battery 45 to the near field communication part 246. Unlike the electronic rack label 40 according to the first embodiment, the barcode 40a is not affixed downward of the display part 41 of the electronic rack label 240 (refer to FIG. 10). In addition, a process performed by a control part 244 of the electronic rack label 240 differs partially from the process performed by the control part 44 of the electronic rack label 40 according to the first embodiment. The near field communication part 246 and the control part 244 will principally be explained below. Because the display part 41, the communications part 42, and the battery 45 are the same as those in the first embodiment, explanations thereof are omitted.

[0116]

(2-1-1) Near Field Communication Part

30 The near field communication part 246 is a passive type RF tag (radio frequency tag). Specifically, the near field communication part 246 is an RF tag that receives the supply of electric power by non-contact, electric power transmission from a near field communication part 253 of the handy terminal 250, which is described below.

[0117]

35 As shown in FIG. 11, the near field communication part 246 principally comprises an antenna 246a and an NFC chip (near field communication chip) 246b.

[0118]

40 The antenna 246a is a loop antenna (coil antenna) used in signal transmission and reception in which radio waves or magnetic fields are used. The distance over which communication is possible between the near field communication part 246 and the near field communication part 253 of the handy terminal 250 is on the order of several centimeters to several tens of centimeters.

[0119]

45 The NFC chip 246b controls the near field communication part 246 in accordance with a signal transmitted from the handy terminal 250. The NFC chip 246b performs various processes using electric power supplied from the handy terminal 250 to the near field communication part 246 by non-contact, electric power transmission. Specifically, when the NFC chip 246b receives a trigger signal, which is described below, from the near field communication part 253 of the handy terminal 250 via the antenna 246a, the NFC chip 246b outputs a control mode switching signal to the control part 244 of the electronic rack label 240. In addition, when the NFC chip 246b receives the trigger signal, the NFC chip 246b transmits, to the near field communication part 253 via the antenna 246a, the apparatus ID of the electronic rack label 240 stored in memory 246ba (refer to FIG. 11). It is noted that the apparatus ID of the electronic rack label 240 stored in the memory 246ba is information that is identical to the apparatus ID stored in the memory 44a.

[0120]

(2-1-2) Control Part

55 The control part 244 principally comprises a CPU (not shown), the memory 44a, etc. (refer to FIG. 11). The control part 244 is electrically connected to the display part 41, the communications part 42, the near field

communication part 246, and the battery 45 (refer to FIG. 11).

[0121]

The apparatus ID, which is an identifier unique to the electronic rack label 40, is stored in the memory 44a. It is noted that the apparatus ID stored in the memory 44a is information that is identical to the apparatus ID stored in the memory 246a of the near field communication part 246. In addition, the product information (image information) transmitted from the server 210 and received by the communications part 42 is stored in the memory 44a.

[0122]

By executing a program stored in the memory 44a, the control part 244 controls the elements of the electronic rack label 240. Specifically, the control part 244 performs the following types of control.

[0123]

For example, the control part 244 switches the state of the communications part 42 between the sleep state and the awake state. The definition of the sleep state and the definition of the awake state are the same as those in the first embodiment. It is noted that, the same as in the first embodiment, the control part 244 has the energy-saving mode and the active mode as the control modes of the electronic rack label 240 and is configured such that the ratios of the sleep state time and the awake state time change according to the control mode. Because the process of changing the control mode differs from that in the first embodiment, it is discussed in detail below.

[0124]

In addition, for example, when the communications part 42 in the awake state receives a command from the access point 30 and the received command is input from the communications part 42 into the control part 244, the control part 244 determines whether that command is addressed to itself (whether it is addressed to the electronic rack label 240 that has that control part 244). Specifically, the control part compares the apparatus ID appended to the command and the unique apparatus ID stored in the memory 44a and, in the situation in which these coincide with each other, determines that the command is addressed to itself. In the situation in which it has been determined that the command is addressed to itself, the control part 244 stores in the memory 44a the image information included in the command (updates the information in the memory 44a). Furthermore, the control part 244 controls the display part 41 so as to display on the display part 41 the product information (image information) stored in the memory 44a. In addition, in the situation in which it has been determined that the command is addressed to itself, the control part 244 causes the communications part 42 to transmit a response signal to the server 210.

[0125]

(2-2) Server

The server 210 is the same as the server 10 according to the first embodiment, with the exception that control performed by a server control part 215 differs partially (refer to FIG. 12). Here, the server control part 215 alone will be explained, and explanation of other aspects of the configuration will be omitted.

[0126]

(2-2-1) Server Control Part

The server control part 215 differs from the server control part 15 according to the first embodiment in that the speed at which the process of transmitting commands to the electronic rack label 240 differs for the situation in which a command that contains product information (image data) is transmitted to the electronic rack label 240 when the linking operation has been performed by the handy terminal 250 and the situation in which a command is transmitted to the electronic rack label 240 at other times. It is noted that "when the linking operation has been performed by the handy terminal 250" means when the apparatus ID of the electronic rack label 240 and the product ID of the product P to be associated have been transmitted from the handy terminal 250.

[0127]

Specifically, the server control part 215 instructs the access point 30 via the server communications part 11 to transmit a command, following one of the beacons among the beacons (which are transmitted from the access point 30 at 4 s intervals) over a 20 s interval, at a normal time (when a command containing the product information is transmitted to the electronic rack label 240 outside of the time when the linking operation is performed by the handy terminal 250) (normal command transmission mode).

[0128]

In contrast, when the linking operation has been performed by the handy terminal 250, the server control part 215 instructs the access point 30 via the server communications part 11 to transmit a command

following a beacon, the beacons being transmitted from the access point 30 at 4 s intervals (rapid command transmission mode).

[0129]

That is, by using the rapid command transmission mode, it becomes possible to shorten the average time it takes until the completion of command transmission at the server 210.

[0130]

(2-3) Handy Terminal

The handy terminal 250 is a data collecting terminal that has a barcode read function, an NFC reader function, which reads the apparatus ID of the electronic rack label 240, and a data transmitting apparatus. The handy terminal 250 principally comprises the light emitting part 51, the detecting part 52, and the near field communication part 253.

[0131]

The handy terminal 250 is configured in a manner capable of using the light emitting part 51 and the detecting part 52 to read the barcode affixed to each product P. Because the reading of the barcode is the same as that performed by the handy terminal 50 according to the first embodiment, explanation thereof is omitted.

[0132]

The near field communication part 253 is an RF tag reader/writer. The near field communication part 253 transmits, from an antenna (not shown) to the near field communication part 246 of the electronic rack label 240, information carried on radio waves or a magnetic field. In addition, the near field communication part 253 receives, via the antenna (not shown), the information transmitted from the near field communication part 246 of the electronic rack label 240 carried on radio waves or a magnetic field.

[0133]

Specifically, the near field communication part 253 transmits a trigger signal to the near field communication part 246 of the electronic rack label 240. In addition, the near field communication part 253 receives information, which was transmitted from the near field communication part 246, concerning the apparatus ID of the electronic rack label 240 of the communication counterparty. It is noted that the trigger signal is a signal in which the handy terminal 250 requests the near field communication part 246 to transmit the apparatus ID of the electronic rack label 240. In addition, the trigger signal is a signal that alerts the electronic rack label 240 to the effect that a command that includes product information will be transmitted from the server 210 via the access point 30 and is a signal for causing the electronic rack label 240 to prepare for the reception of a command that includes product information.

[0134]

The handy terminal 250 is principally used as follows when linking the electronic rack label 240 and the product P corresponding to that electronic rack label 240 (when performing the linking operation).

[0135]

The user brings the handy terminal 250 close to the electronic rack label 240 that is the object of the linking operation and manipulates the handy terminal 250 to transmit a trigger signal from the handy terminal 250 to the electronic rack label 240. The handy terminal 250, in response to the trigger signal, receives the apparatus ID transmitted from the electronic rack label 240. Subsequently, the user uses the handy terminal 250 to scan the barcode affixed to the product P for which the electronic rack label 240 that is the object of the linking operation is to display product information. The apparatus ID transmitted from the electronic rack label 240 and the scanned product ID are transmitted to the server 210 via a communications channel (e.g., a wireless LAN), which is not shown. In the server 210, the transmitted apparatus ID and the product ID are associated and stored in the electronic rack label master table 14b.

[0136]

(3) Control Mode Switching Process Performed by the Control Part of the Electronic Rack Label

The control mode switching process performed by the control part 244 of the electronic rack label 240 will now be explained.

[0137]

First, the control modes of the electronic rack label 240 in the second embodiment will be explained. The control modes of the electronic rack label 240 are divided according to awake state time ratio into the energy-saving mode and the active mode.

[0138]

The energy-saving mode is one example of the second mode. The energy-saving mode is a mode in which an awake operation, wherein the state changes to the awake state in which a command that includes product information can be received from the access point 30, is performed at comparatively long intervals of time T3 (e.g., 20 s). The electronic rack label 40 enters the awake state for the prescribed period Δt (e.g., 150 ms) in one awake operation. In the energy-saving mode, the awake state time ratio is $\Delta t/T3$. It is noted that the beacon transmission timing of the access point 30 and the awake operation timing of the electronic rack label 240 are controlled such that they are synchronized. In the energy-saving mode, the awake state time ratio is small, and consequently the electric power consumption of the battery 45 is comparatively small.

[0139]

The active mode is one example of the first mode. The active mode is a mode in which the awake operation is performed at comparatively short intervals of time T4 (< time T3). Time T4 is, for example, 4 s. Prescribed period Δt , in which the electronic rack label 240 enters the awake state in one awake operation, is the same as in the energy-saving mode. The awake state time ratio in the active mode is $\Delta t/T4$ and is greater than the awake time time ratio $\Delta t/T3$ in the energy-saving mode. Because the start state time in the active mode is long, the electric power consumption of the battery 45 is greater than in the energy-saving mode.

[0140]

Next, the process of switching the control mode of the electronic rack label 240, which is performed by the control part 244, will be explained, with reference to the flow chart in FIG. 13. The control mode switching process is performed continuously during operation of the electronic rack label 240.

[0141]

With regard to the electronic rack label 240 according to the second embodiment, the control part 244 switches the control mode based on the result of receiving the trigger signal from the near field communication part 246. It is noted that, when the electronic rack label 240 starts up, the control mode of the electronic rack label 240 is the energy-saving mode.

First, in step S201, it is determined whether there was an input of a control mode switching signal from the near field communication part 246, in other words, whether the near field communication part 246 has received a trigger signal. Step S201 is performed repetitively until it is determined that the near field communication part 246 has received a trigger signal. While step S201 is being performed repetitively, the control mode of the electronic rack label 240 is the energy-saving mode.

[0142]

In step S202, the control part 244 switches the control mode of the electronic rack label 240 from the energy-saving mode to the active mode. Subsequently, the process advances to step S203.

[0143]

In step S203, it is determined whether the prescribed time (e.g., 1 min) has elapsed since the performance of step S202. Step S203 is a process in which the active mode is caused to continue for the prescribed time. When a trigger signal is transmitted from the handy terminal 250, normally, product information (a command) is subsequently transmitted from the server 210 in the rapid command transmission mode. The control mode of the electronic rack label 240 changes to the active mode, and furthermore a command is transmitted from the server 210 in the rapid command transmission mode, and therefore the display of the electronic rack label 240 is updated in a short time. When it is determined in step S203 that the prescribed time has elapsed, the process advances to step S204.

[0144]

In step S204, the control part 244 switches the control mode of the electronic rack label 240 from the active mode to the energy-saving mode. Subsequently, the process returns to step S201.

[0145]

It is noted that the abovementioned control mode switching process is one example but is not limited thereto. For example, it may be configured such that, the same as in the first embodiment, in the situation in which the electronic rack label 240 has received a command from the server 210, the process advances to the process in step S204 prior to determining in step S203 whether the prescribed time has elapsed.

[0146]

(4) Features

The electronic rack label system 201, as one example of the wireless display system according to the present embodiment, comprises the plurality of electronic rack labels 240, which serve as one example of the plurality of wireless display devices, the server 210, and the access points 30, which serve as the transmitting

apparatuses. The plurality of electronic rack labels 240 is disposed in correspondence with the plurality of products P (one example of items) and displays the product information (one example of item information) concerning the corresponding products P. The server 210 stores the product information. The access points 30 transmit the product information stored in the server 210 to the electronic rack labels 240. Each of the electronic rack labels 240 comprises: the battery 45, which drives the electronic rack label 240; the near field communication part 246, which serves as one example of a near field communication means; and the control part 244. The control part 244 has, as control modes, the active mode, which is one example of the first mode, and the energy-saving mode, which is one example of the second mode. In the active mode, the time ratio of the awake state, during which product information can be received from the access point 30, is a prescribed ratio. In the energy-saving mode, the awake state time ratio is less than that in the active mode, and the consumption of the electric power of the battery 45 is less than that in the active mode. Based on the detection result of the near field communication part 246, the control part 244 switches the control mode from the energy-saving mode to the active mode.

[0147]

Here, based on the result of detecting the trigger signal of the near field communication part 246, which is provided by the electronic rack label 240, the state is recognized as one in which there is a high probability that an operation will be performed on the electronic rack label 240, and therefore, in response to the recognition result, the control mode of the electronic rack label 240 is switched from the energy-saving mode to the active mode. Consequently, high responsiveness of the electronic rack label 240 can be ensured when there is a high probability that product information will be transmitted, while curtailing the electric power consumption of the electronic rack label 240.

[0148]

(5) Modified Examples

The details of the first embodiment and the second embodiment may be combined together within a scope that is not contradictory. For example, the electronic rack label 240 may further comprise a light receiving sensor and may be configured such that the control mode of the electronic rack label 240 changes in accordance with the light quantity received by the light receiving sensor and that the control mode of the electronic rack label 240 changes also when the near field communication part 246 has received a trigger signal.

[0149]

Modified examples of the second embodiment are explained below. It is noted that the plurality of modified examples may be combined within a scope that is not contradictory.

[0150]

(5-1) Modified Example 2A

With regard to the electronic rack label system 201 according to the abovementioned embodiment, the electronic rack label 240 is configured such that communication with the access points 30 is performed by radio waves but is not limited thereto. For example, it may be configured such that communication between the communications apparatus, which transmits commands that include product information from the server 210 to the electronic rack label, and the electronic rack label is performed using infrared rays.

[0151]

(5-2) Modified Example 2B

With regard to the electronic rack label system 1 according to the abovementioned embodiment, the awake time time ratios of the energy-saving mode and the active mode are made different by changing the frequency of the awake operation but is not limited thereto. For example, the awake time time ratios may be made different by changing the awake time each time.

[0152]

(5-3) Modified Example 2C

With regard to the electronic rack label system 1 according to the abovementioned embodiment, the handy terminal 250 comprises the near field communication part 253 but is not limited thereto. For example, a portable terminal that differs from the handy terminal 250, such as a smart phone that is held by the user, may function as the near field communication means. When configured in this manner, in the second embodiment as well, the handy terminal 250 may be configured to scan the barcode affixed to the electronic rack label.

[0153]

(5-4) Modified Example 2D

The abovementioned embodiment describes the electronic rack label system 201 as one example of the wireless display system according to the present invention, but the wireless display system according to the present invention is not limited to an electronic rack label system that is installed in a store or the like. As

described in Modified Example 1D of the first embodiment, the wireless display system may be one that is used in, for example, a hospital, a warehouse, or the like.

[0154]

A wireless display system used in a hospital is configured such that, for example, after a nurse or the like has finished carrying drugs contained in containers to hospital rooms, treatment rooms, or the like, the nurse uses the portable terminal, which is capable of communicating with the near field communication part of the wireless display device (the wireless display device having the same device configuration as that of the electronic rack label 240 according to the abovementioned embodiment) to switch the control mode of each wireless display device affixed to the containers, for which carrying has been completed, from the energy-saving mode to the active mode. Furthermore, it is configured such that a command, which instructs the change (deletion or the like) of the information (patient name, etc.) displayed on the wireless display device is transmitted from the server to each wireless display device that was switched to the active mode.

[0155]

In addition, the wireless display system used in the hospital may be configured such that, for example, when the nurse or the like has confirmed that the drug displayed on the wireless display device and the drug contained in the container coincide with each other, the nurse uses the portable terminal, which is capable of communication with the near field communication part of the wireless display device (the wireless display device having the same device configuration as that of the electronic rack label 240 according to the abovementioned embodiment) to switch the control mode of the wireless display device affixed to the container, for which the check has been completed, from the energy-saving mode to the active mode. Furthermore, it is configured such that image information of the characters "Check Completed" together with a command that instructs the supplemental display of an image are transmitted to the wireless display device that was switched to the active mode.

[0156]

In addition, the wireless display system used in a warehouse is configured such that, for example, when a worker or the like finishes inspection of items to be transported inside a container, the worker uses the portable terminal, which is capable of communicating with the near field communication part of the wireless display device (a wireless display device having the same device configuration as that of the electronic rack label 240 according to the abovementioned embodiment) to switch the control mode of the wireless display device affixed to the container, for which inspection has been completed, from the energy-saving mode to the active mode. Furthermore, it is configured such that image information of the characters "Outgoing Quality Check Completed" together with a command that instructs the supplementary display of an image are transmitted from the server to the wireless display device that was switched to the active mode.

[0157]

By being configured in this manner, when there is a high probability that information (an instruction) will be transmitted from an access point to the wireless display device, it is possible to ensure high responsiveness of the wireless display device and to speedily change the display of the wireless display device while curtailing the electric power consumption of the wireless display device.

INDUSTRIAL APPLICABILITY

[0158]

The wireless display system according to the present invention is useful as a wireless display system that can ensure high responsiveness of the wireless display device when needed while curtailing the electric power consumption of the wireless display device.

EXPLANATION OF THE REFERENCE NUMBERS

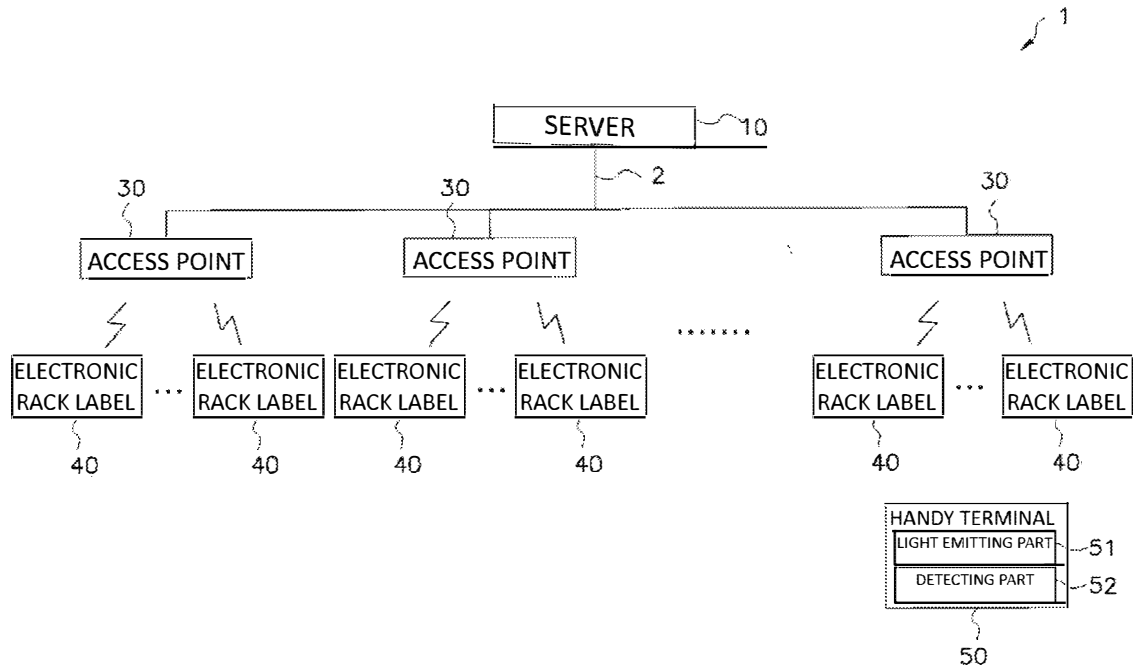
[0159]

1, 201	Electronic rack label systems (wireless display systems)
10, 210	Servers
30	Access point (transmitting apparatus)
40, 240	Electronic rack labels (wireless display devices)
40a	Barcode (identifier)
42	Communications part (wireless receiver)
43	Light receiving sensor
44, 244	Control parts
45	Battery
50, 250	Handy terminals (scanners)
51	Light emitting part
142	Communications part (wireless receiver, infrared ray receiver, light receiving sensor)
246	Near field communication part (near field communication means)

P Product (item)
 PRIOR ART LITERATURE
 Patent Documents
 [0160]

- 5 Patent Document 1
 Japanese Laid-open Patent Publication 2008-168057

FIG. 1



10 FIG. 2

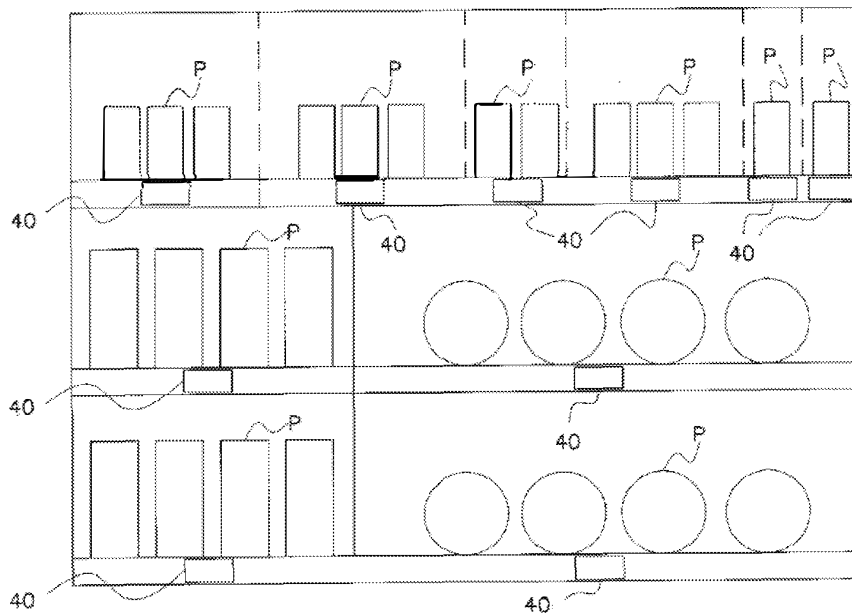


FIG. 3

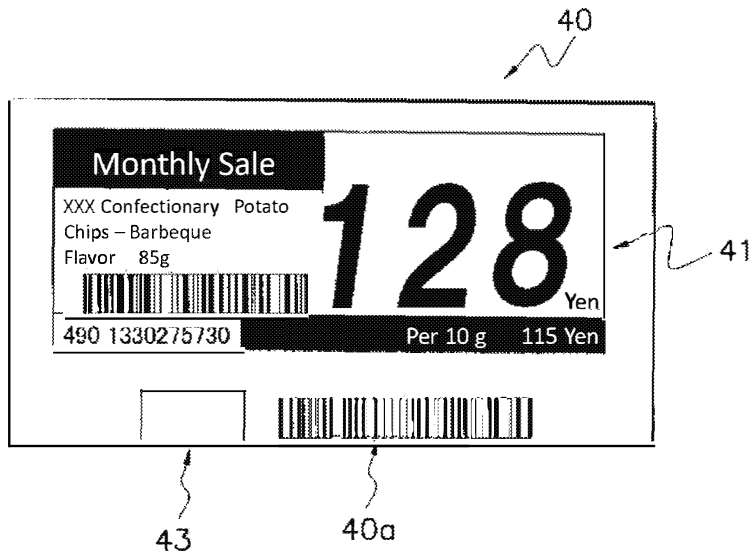


FIG. 4

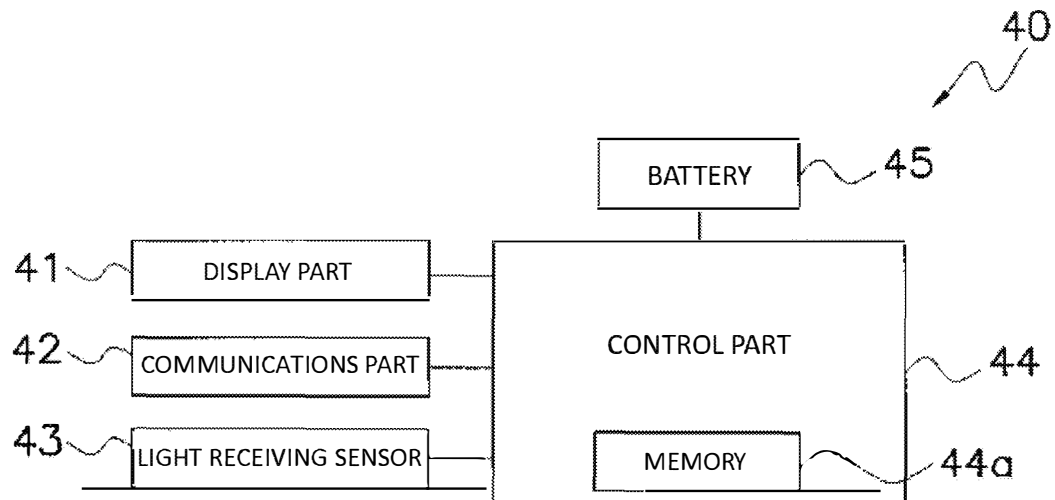


FIG. 5

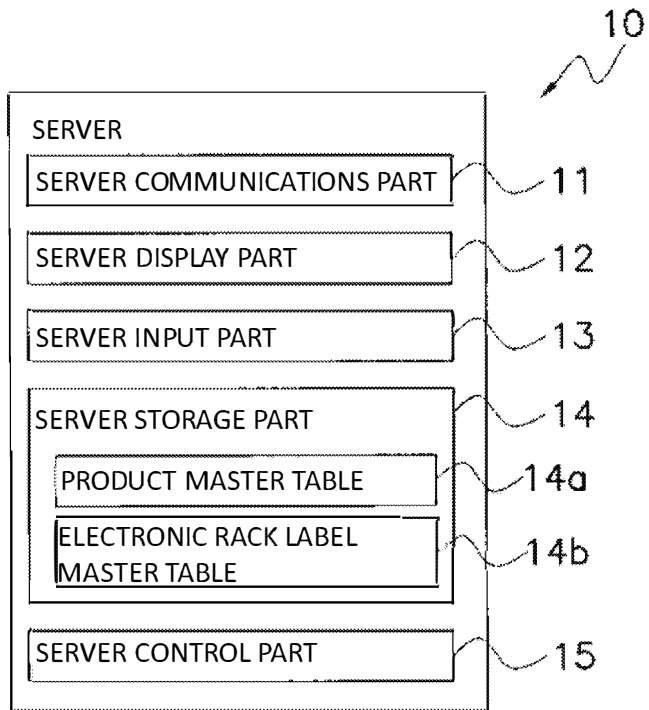


FIG. 6

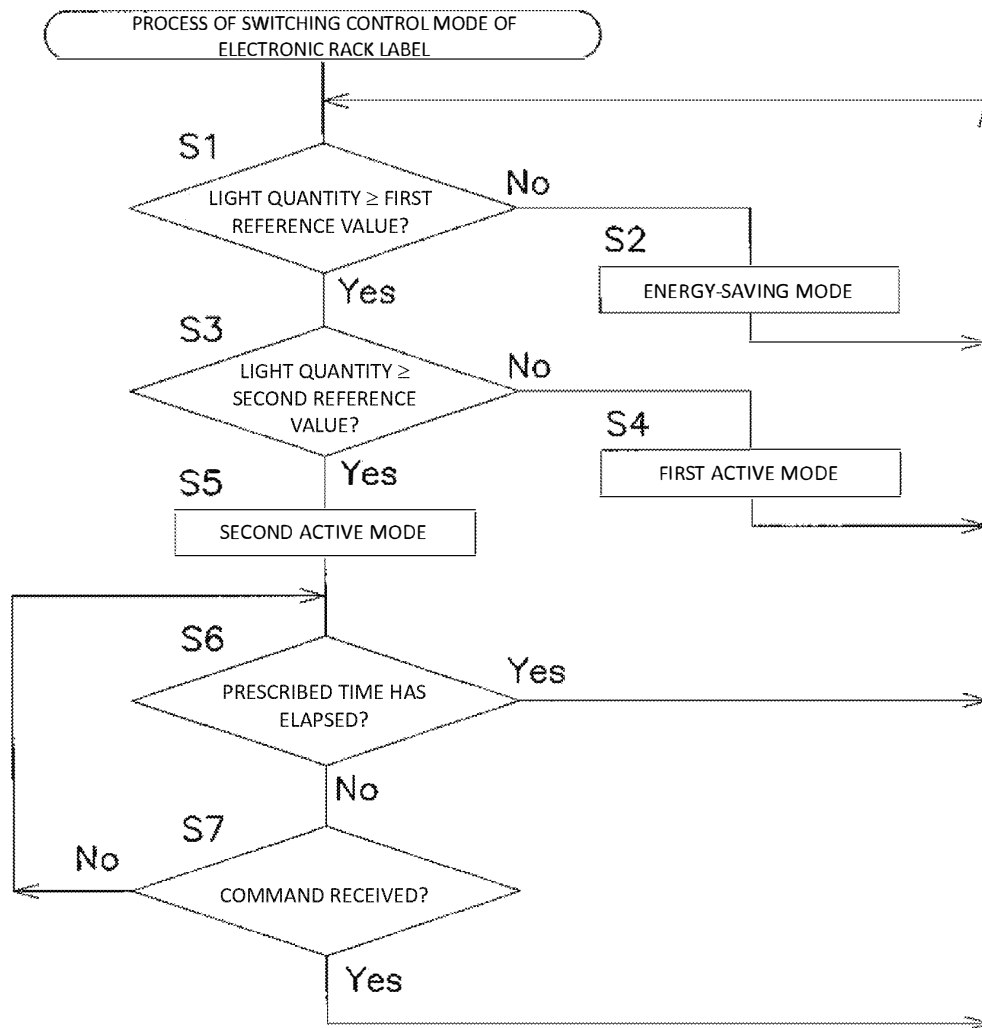


FIG. 7

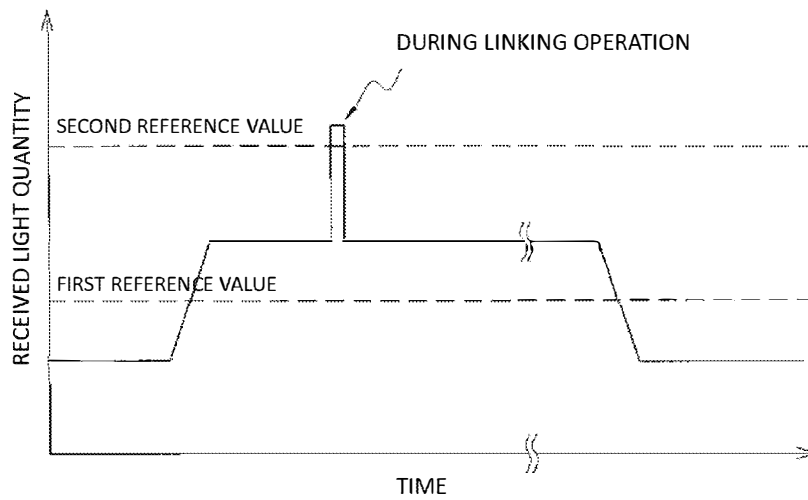


FIG. 8

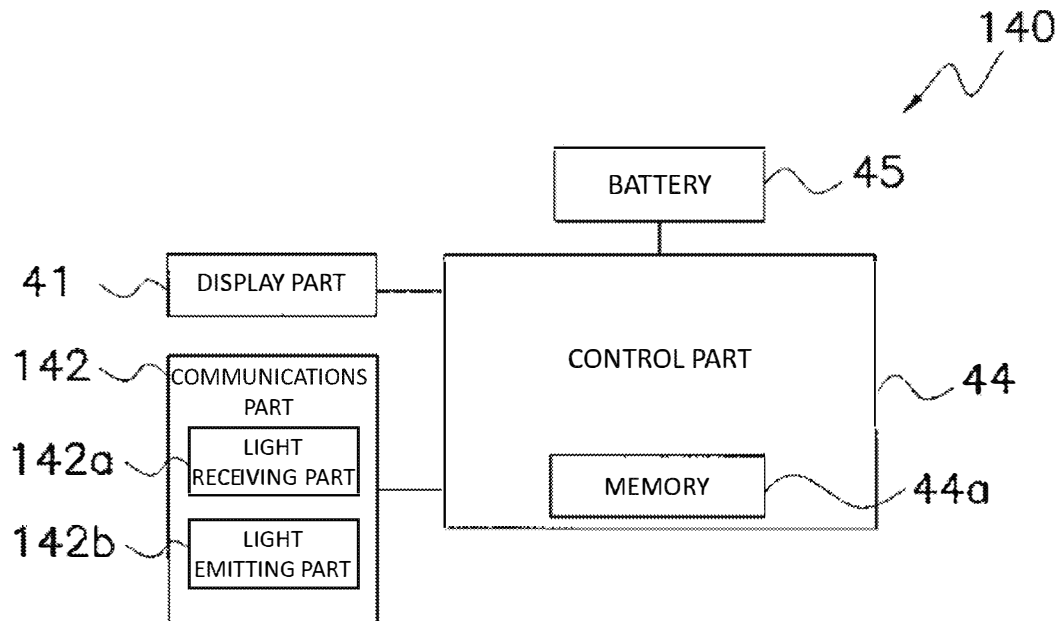


FIG. 9

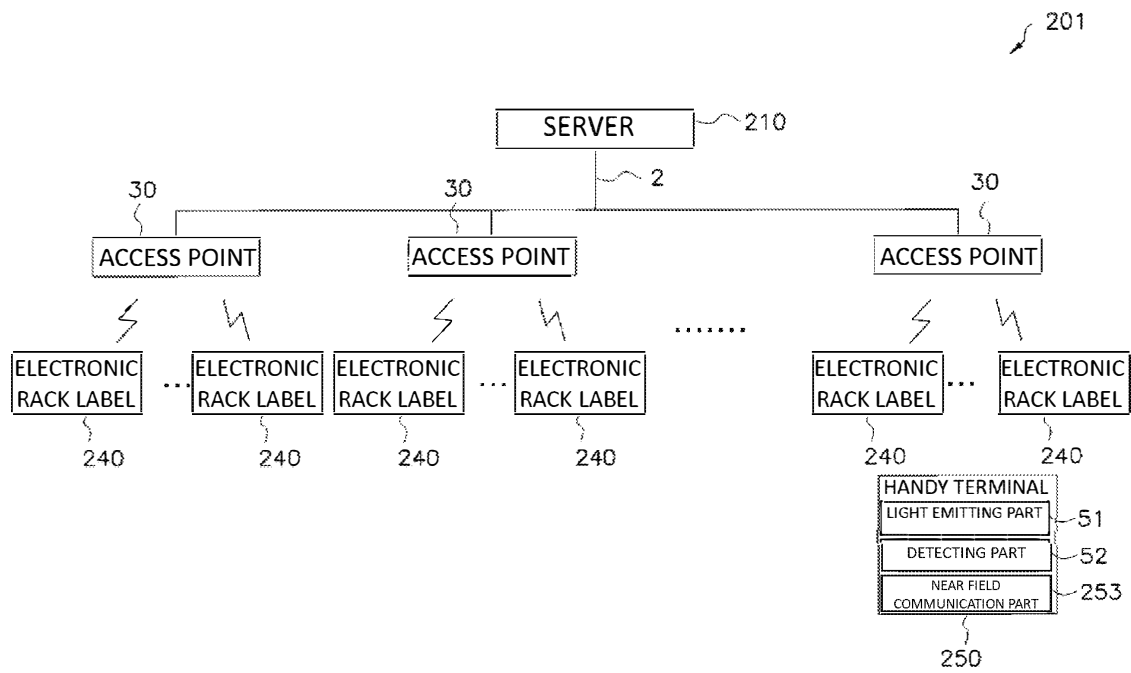


FIG. 10



FIG. 11

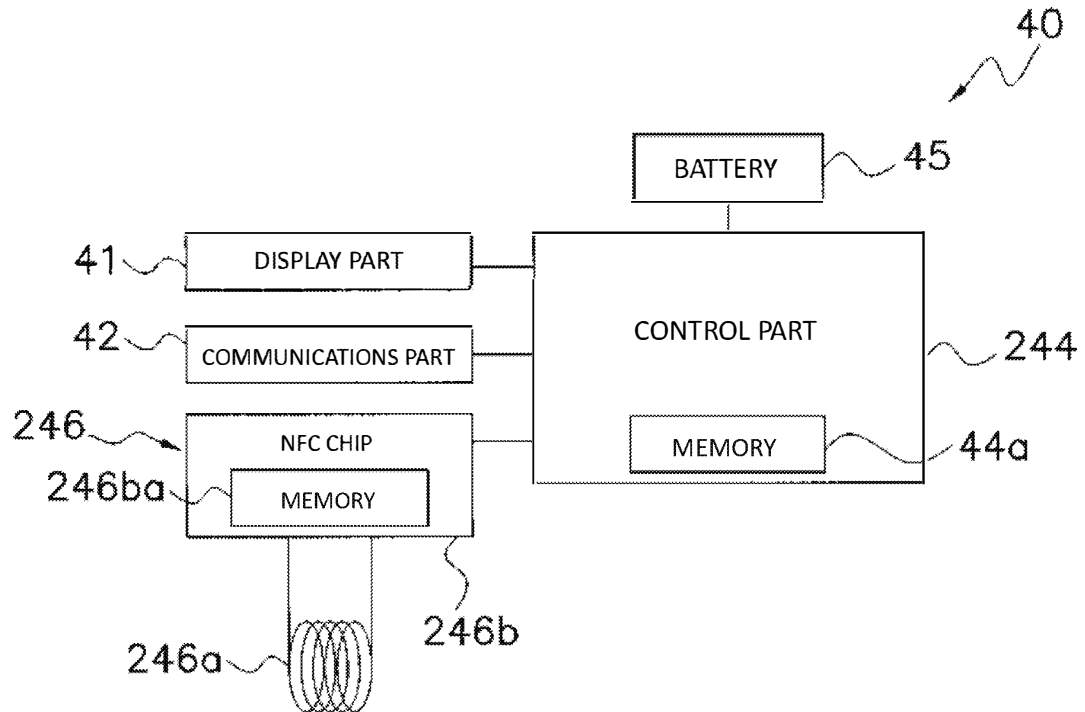


FIG. 12

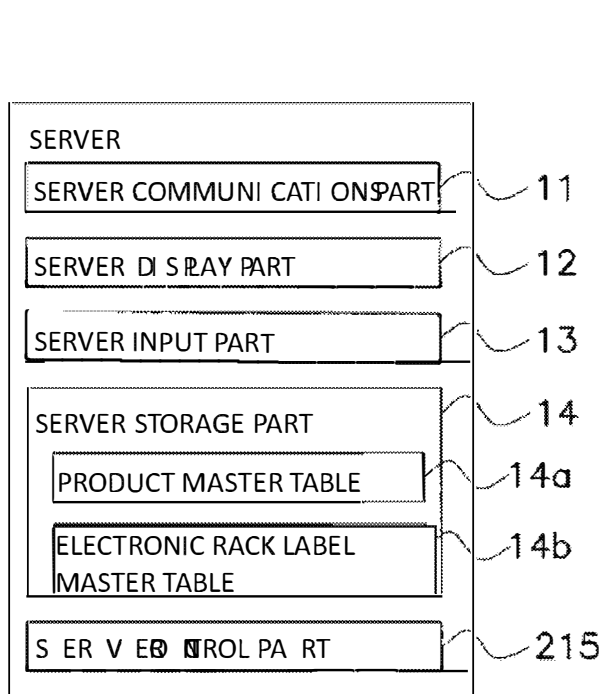
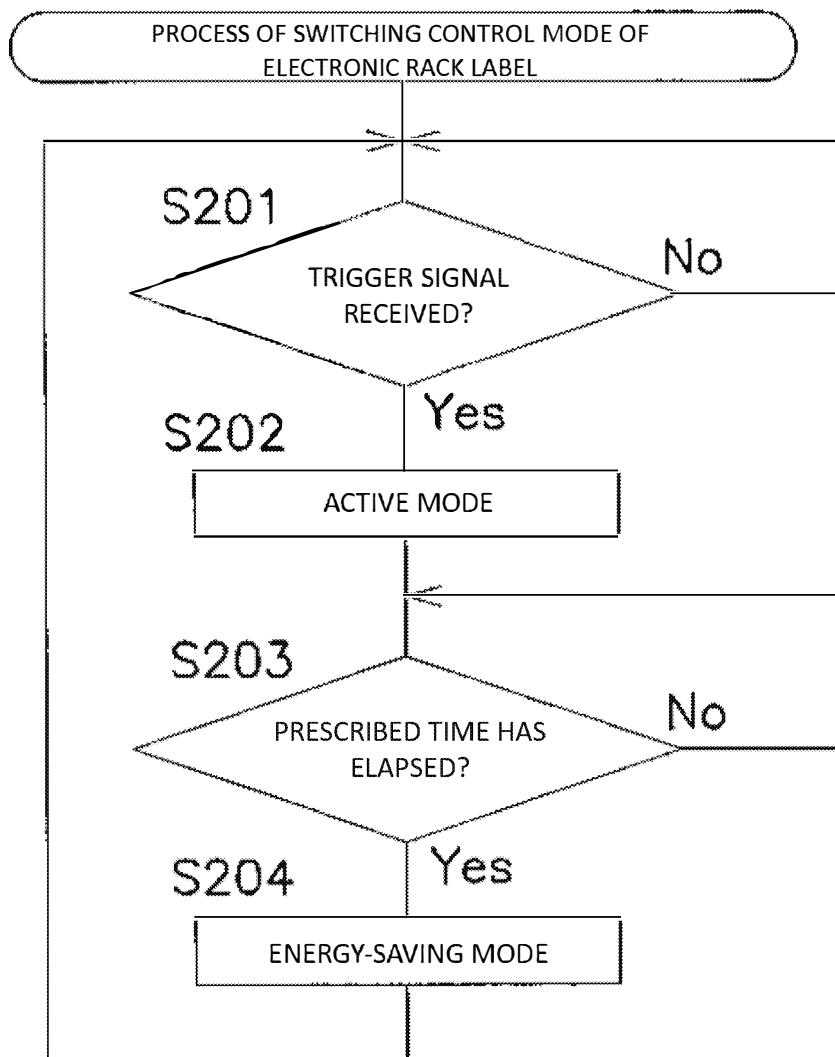


FIG. 13



Continuation of front page

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	G 0 9 G 3/20	6 3 3 Q
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	G 0 9 G 3/20	6 2 1 A
	G 0 9 G 3/20	6 1 1 F
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JJ07 KK17 KK26 KK31
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DA66

CERTIFICATION OF TRANSLATION

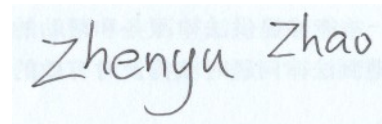
Original text full file name: JP2016-140368A

Translation full file name: JP2016-140368A-English

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I am a Japanese to English translator; I am competent to perform Japanese to English translations.

I declare under the penalty of perjury under the laws of the United States that the foregoing is true and correct; and further declare that I am aware that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 1001 of Title 18 of the United States Code.

A handwritten signature in cursive script that reads "Zhenyu Zhao". The signature is written in dark ink on a light blue rectangular background.

Name: Zhenyu Zhao

Date: February 20, 2025