

DESCRIPTION

SANITARY PRODUCT PROVISION APPARATUS, SANITARY PRODUCT
PROVISION METHOD, SANITARY PRODUCT PROVISION PROGRAM, AND
SANITARY PRODUCT PROVISION MANAGEMENT SERVER

5

FIELD

The present invention relates to a sanitary product
provision apparatus, a sanitary product provision method, a
sanitary product provision program, and a sanitary product
10 provision management server for providing sanitary products
from a dispenser provided in, for example, a powder room.

BACKGROUND

With the social advancement of women, the lifestyle of
women has changed greatly, which has caused some adverse
15 effects. One of them is a problem relating to menstruation,
which is a physical phenomenon peculiar to women.

During menstruation, women use sanitary products such
as napkins and tampons to prevent leakage of menstrual
blood. Thus, women generally carry such sanitary products
20 as their menstrual period approaches.

If a sanitary product with menstrual blood is left for
a long period of time, it may cause propagation of bacteria
or cause dampness and odor, even though the amount of
menstrual blood during menstruation varies from day to day.
25 Accordingly, it is usually necessary to replace the
sanitary product at a frequency of once every two to three
hours during the menstrual period.

Thus, some restaurants and hotels, for example, provide sanitary products placed in a basket in a women's restroom (e.g., beside a washstand) for female customers who do not have sanitary products because the menstrual
5 period has come earlier than scheduled. Such sanitary products can be freely taken out from the basket and used if desired.

This might be ideal; however, since they can be freely taken out, those who are not in need of them can bring them
10 home. In an extreme case, a person who is not menstruating can take them all away. Such a regrettable act ruins the favor of the provider (e.g., a restaurant or a hotel), and may ironically result in unavailability for those who actually want to use them.

15 Conversely, if sanitary products are simply placed in a basket, some people may hold back from using them, since anyone can touch them. In particular, in the midst of the COVID-19 pandemic as it stands now, touching of an object that might have been touched by someone else causes great
20 anxiety.

On the other hand, as a means for providing sanitary products to women who are in need of them, while eliminating such anxiety, a dispenser that stores sanitary products, as disclosed in Non-Patent Document 1, is known.

25 In practice, such dispensers are set up in stalls in women's restrooms in some companies as part of welfare, to allow female employees who do not have their sanitary

products because the menstrual period has come earlier than scheduled to freely utilize the sanitary products.

Since such sanitary products are usually stored inside the dispenser and are discharged one by one from the inside when they are taken out, the sanitary products are not touched by an unspecified number of people. Accordingly, the user can use the sanitary products at ease without feeling discomfort.

CITATION LIST

10 NON PATENT LITERATURE 1

<https://www.goauntflow.com/> (retrieved on October 15, 2020)

NON PATENT LITERATURE 2

<https://apps.apple.com/jp/app/clue/id657189652>
15 (retrieved on November 16, 2020)

SUMMARY

TECHNICAL PROBLEM

From this type of dispenser, sanitary products are discharged one by one in response to a user's operation; however, there is no limit to the number of products to be discharged. Accordingly, any number of sanitary products can be taken out by repeating the operation many times.

Such a dispenser is neither equipped with a communication function or the like, nor externally managed.

25 Such a dispenser is not considered to solve the above-described problem, since, in an extreme case, a person who is not menstruating can take out all the sanitary products

stored therein and bring them home.

In addition, since a conventional dispenser is not equipped with a communication function, as described above, the inventory status is not managed in real time, and the inventory is replenished by a manager who has noticed the
5 need for the replenishment on a routine patrol, or in response to a replenishment request from a user.

Accordingly, even if the inventory of sanitary products in the dispenser becomes exhausted, a considerable
10 amount of time is required until the inventory is replenished. In addition, even if the inventory is replenished, the inventory might become immediately exhausted by an act of an insensitive person as described above, causing the possibility that the inventory is
15 exhausted constantly. This may lead to a vicious circle in which those who are actually in urgent need of the sanitary products cannot use them because of the exhaustion of the inventory.

The present invention has been made in view of the
20 above-described circumstances, and its objective is to provide a sanitary product provision apparatus, a sanitary product provision method, a sanitary product provision program, and a sanitary product provision management server for providing sanitary products, making it possible to
25 inhibit unlimited provision of sanitary products to reliably provide sanitary products to users who desire to use them.

SOLUTION TO PROBLEM

To achieve the above-described objective, the present invention takes the following measures.

According to the first aspect of the invention, there
5 is provided a sanitary product provision apparatus including:

at least one dispenser configured to hold and provide a sanitary product;

an inventory management unit configured to manage an
10 inventory status of the sanitary product held in the dispenser;

a user management unit configured to manage a provision history of sanitary product provision from the dispenser to a user;

15 a determination unit configured to determine, in response to a provision request from the user requesting provision of the sanitary product, whether or not the sanitary product can be provided to the user based on the provision history; and

20 a discharge permission unit configured, upon determination by the determination unit that the sanitary product can be provided, to permit the dispenser to discharge the sanitary product held in the dispenser if the inventory status managed by the inventory management unit
25 shows that the sanitary product is in inventory.

According to the second aspect of the invention, there is provided a sanitary product provision apparatus

according to the first aspect of the invention, wherein

the at least one dispenser includes a plurality of dispensers differing in setup locations, and

the inventory management unit, the user management
5 unit, the determination unit, and the discharge permission unit are common to the dispensers.

According to the third aspect of the invention, there is provided a sanitary product provision apparatus according to the second aspect of the invention, wherein

10 the dispensers are respectively set up in a plurality of restroom stalls.

According to the fourth aspect of the invention, there is provided a sanitary product provision apparatus according to the second or third aspect of the invention,
15 wherein

the provision request is transmitted from a user terminal of the user and contains user identification information for identifying the user and dispenser identification information for identifying the dispenser to
20 which the user has made the provision request for the sanitary product, and

the sanitary product provision apparatus further includes an identification unit configured to identify the user based on the user identification information contained
25 in the provision request transmitted from the user terminal, and identify the dispenser to which the user makes the provision request for the sanitary product based

on the dispenser identification information contained in the provision request.

According to the fifth aspect of the invention, there is provided a sanitary product provision apparatus
5 according to the fourth aspect of the invention, further including:

a first transmission unit provided in each of the dispensers and configured to transmit the dispenser identification information of a corresponding one of the
10 dispensers to the user terminal in such a manner that the dispenser identification information is contained in the provision request.

According to the sixth aspect of the invention, there is provided a sanitary product provision apparatus
15 according to the fifth aspect of the invention, further including:

an encryption unit provided in each of the dispensers and configured to encrypt the dispenser identification information before the dispenser identification information
20 is transmitted by the first transmission unit.

According to the seventh aspect of the invention, there is provided a sanitary product provision apparatus according to any one of the fourth to sixth aspects of the invention, wherein

25 each of the dispensers includes:

a storage compartment configured to store the sanitary product;

a discharge signal generation unit configured,
upon discharge of the sanitary product stored in the
storage compartment in response to a permission to
discharge from the discharge permission unit, to generate a
5 discharge signal containing the dispenser identification
information; and

a second transmission unit configured to transmit
a discharge signal generated by the discharge signal
generation unit,

10 the user management unit identifies the dispenser that
has transmitted the discharge signal based on the dispenser
identification information contained in the transmitted
discharge signal, and

the inventory management unit manages the inventory
15 status of the sanitary product by updating a discharge
history of the sanitary product for each of the dispensers,
based on a result of identification of the dispenser by the
user management unit.

According to the eighth aspect of the invention, there
20 is provided a sanitary product provision apparatus
according to any one of the fourth to seventh aspects of
the invention, wherein

the user management unit manages the provision history
for each user.

25 According to the ninth aspect of the invention, there
is provided a sanitary product provision apparatus
according to the eighth aspect of the invention, wherein

the determination unit determines whether or not the user is on her menstrual period based on the provision history of the user, and determines, if it is determined that the user is on her menstrual period, that the sanitary product can be provided.

According to the tenth aspect of the invention, there is provided a sanitary product provision apparatus according to the eighth aspect of the invention, wherein

the determination unit determines whether or not the user is on her menstrual period based on the provision history of the user, and determines, if it is determined that the user is on her menstrual period and if a predetermined period of time has passed since a time of day of a latest provision of the sanitary product, that the sanitary product can be provided.

According to the eleventh aspect of the invention, there is provided a sanitary product provision apparatus according to the eighth aspect of the invention, wherein

the determination unit determines whether or not the user is on her menstrual period based on the provision history of the user, and determines, if it is determined that the user is on her menstrual period and if a number of the sanitary products that have been provided to the user during the menstrual period does not reach a predetermined number based on the provision history of the user, that the sanitary product can be provided.

According to the twelfth aspect of the invention, there is provided a sanitary product provision apparatus according to any one of the ninth to eleventh aspects of the invention, wherein

5 the determination unit determines whether or not the user is on her menstrual period based on, in place of the provision history of the user, a menstrual cycle transmitted from the user terminal.

According to the thirteenth aspect of the invention,
10 there is provided a sanitary product provision apparatus according to any one of the first to tenth aspects of the invention, wherein

 the dispenser further includes a display screen configured to display an advertisement, and

15 the sanitary product is purchased by revenue obtained from the advertisement displayed on the display screen.

According to the fourteenth aspect of the invention, there is provided a server for managing provision of a sanitary product, including:

20 an inventory management unit configured to manage an inventory status of the sanitary product stored in a dispenser;

 a user management unit configured to manage a provision history of sanitary product provision from the
25 dispenser to a user;

 a determination unit configured to determine, in response to a provision request from the user requesting

provision of the sanitary product, whether or not the sanitary product can be provided to the user based on the provision history; and

5 a discharge permission unit configured, upon determination by the determination unit that the sanitary product can be provided, to permit the dispenser to discharge the sanitary product stored in the dispenser if the inventory status managed by the inventory management unit shows that the sanitary product is in inventory.

10 According to the fifteenth aspect of the invention, there is provided a program for causing a computer to function as:

an inventory management unit configured to manage an inventory status of a sanitary product stored in a
15 dispenser;

a user management unit configured to manage a provision history of sanitary product provision from the dispenser to a user;

20 a determination unit configured to determine, in response to a provision request from the user requesting provision of the sanitary product, whether or not the sanitary product can be provided to the user based on the provision history; and

25 a discharge permission unit configured, upon determination by the determination unit that the sanitary product can be provided, to permit the dispenser to discharge the sanitary product stored in the dispenser if

the inventory status managed by the inventory management unit shows that the sanitary product is in inventory.

According to the sixteenth aspect of the invention, there is provided a sanitary product provision apparatus including:

a dispenser configured to store a sanitary product; and

a server configured to manage the dispenser, wherein the server is configured to:

determine, upon receiving a provision request from a user requesting provision of the sanitary product, whether or not the sanitary product can be provided in response to the provision request; and

send, to the dispenser, a permission signal permitting discharge of the sanitary product upon determining that the sanitary product can be provided, and the dispenser is configured to:

discharge the sanitary product in response to the permission signal.

According to the seventeenth aspect of the invention, there is provided a sanitary product provision method realized by a dispenser that stores a sanitary product and a server that manages the dispenser, wherein

the server is configured to:

determine, upon receiving a provision request from a user requesting provision of the sanitary product, whether or not the sanitary product can be provided in

response to the provision request; and

send, to the dispenser, a permission signal
permitting discharge of the sanitary product upon
determining that the sanitary product can be provided, and

5 the dispenser is configured to:

discharge the sanitary product in response to the
permission signal.

ADVANTAGEOUS EFFECTS OF INVENTION

With the apparatus, the method, the program, and the
10 management server for providing sanitary products according
to the present invention, unlimited provision of sanitary
products can be inhibited, thus making it possible to
reliably provide sanitary products to users who desire to
use them.

15 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a configuration diagram showing an example
of a network environment that realizes a sanitary product
provision apparatus and a sanitary product provision method
according to a first embodiment of the present invention.

20 FIG. 2 is an external view showing a configuration
example of a dispenser set up in a restroom stall.

FIG. 3 is a conceptual diagram for illustrating an
internal structure of the dispenser.

FIG. 4 is a block diagram showing an example of the
25 electronic circuitry configuration of the dispenser
according to the first embodiment.

FIG. 5 is a block diagram showing an example of an

electronic circuitry configuration of a sanitary product provision management server according to the first embodiment.

FIG. 6 is a data configuration diagram showing an example of a dispenser setup location data table included in a dispenser setup location database.

FIG. 7 is a data configuration diagram showing an example of user-based provision history data tables included in a user-based provision history database.

FIG. 8 is a data configuration diagram showing an example of inventory status data tables included in an inventory status database.

FIG. 9 is a processing flow diagram illustrating an operation example of the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment of the present invention.

FIG. 10A is a flowchart (1/3) illustrating an operation example of the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment of the present invention.

FIG. 10B is a flowchart (2/3) illustrating an operation example of the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment of the present invention.

FIG. 10C is a flowchart (3/3) illustrating an operation example of the sanitary product provision apparatus and the sanitary product provision method

according to the first embodiment of the present invention.

FIG. 11 is a flowchart showing a flow of an inventory replenishment operation.

5 FIG. 12 is a front view showing an example of a dispenser in which inventory sensors are arranged.

FIG. 13 is a block diagram showing an example of an electronic circuitry configuration of a dispenser in the case where inventory sensors are applied.

10 FIG. 14 is a block diagram showing an example of an electronic circuitry configuration of a sanitary product provision management server according to a second embodiment.

15 FIG. 15 is a block diagram showing an example of an electronic circuitry configuration of a dispenser according to the second embodiment.

FIG. 16 is a block diagram showing an example of an electronic circuitry configuration of a sanitary product provision management server according to a third embodiment.

20 FIG. 17 is a block diagram showing an example of the electronic circuitry configuration of the dispenser according to the second embodiment.

DETAILED DESCRIPTION

25 Hereinafter, embodiments of the present invention will be described with reference to the drawings.

(First Embodiment)

FIG. 1 is a configuration diagram showing an example

of a network environment that realizes a sanitary product provision apparatus and a sanitary product provision method according to a first embodiment of the present invention.

5 The sanitary product provision apparatus 1 is realized by, as illustrated in FIG. 1, a sanitary product provision management server 10 connected to a communication network 200 such as the Internet, and a plurality of dispensers 60 respectively arranged in a plurality of stalls in a restroom, such as a women's restroom. In FIG. 1, dispensers 10 60-1, 60-2, ..., 60-n (where n is an integer equal to or greater than 3) are illustrated as the dispensers 60; however, the present invention is also applicable to the case where the number of the dispensers 60 is one or two.

The network environment illustrated in FIG. 1 may 15 include a LAN such as the Ethernet (registered trademark) or a WAN to which a plurality of LANs are connected via a public line or a dedicated line. In the case of a LAN, it is configured of a large number of subnets connected via a router, as needed. In the case of a WAN, a firewall, etc. 20 for connection to the public line is suitably provided; however, illustration and detailed description thereof will be omitted.

FIG. 2 is an external view showing a configuration example of a dispenser set up in a restroom stall.

25 In this manner, the dispenser 60 is set up in each stall in a women's restroom. Dispenser identification information (hereinafter referred to as a "dispenser ID")

is assigned in advance to each dispenser 60 as dispenser-unique information, and is stored in a storage device (storage device 90 to be described later).

FIG. 3 is a conceptual diagram for illustrating an
5 internal structure of the dispenser.

The dispenser 60 holds therein sanitary products S such as napkins, tampons, etc., and in response to a user's provision request made via a user terminal 100, which is, for example, the user's smartphone, discharges a single
10 sanitary product S upon receiving permission from the sanitary product provision management server 10.

At usual times, the front door 64 is kept under a lock 65, and the discharged sanitary product S falls in a discharge port 62, as shown in FIG. 3(a). The user can
15 obtain the sanitary product S that has fallen in the discharge port 62. The dispenser 60 includes a theft-prevention mechanism (not illustrated) for discouraging access to the inside of the dispenser 60 from the discharge port 62 in an attempt to prevent theft of the sanitary
20 products S stored inside.

At the time of maintenance of the dispenser 60 or replenishment of the inventory of the sanitary products S, an inventory replenisher can replenish sanitary products S to a storage compartment 61 by opening the lock 65, as
25 shown in FIG. 3(b), and opening the front door 64, as shown in FIG. 3(c).

The dispenser 60 includes a display screen 63 such as

a digital signage on the front door 64. A human-detecting sensor (not illustrated) is provided in each restroom stall, and detects the presence of a user in the restroom stall. In conjunction with the detection by the human-detecting sensor, display of an advertisement video (e.g., still images, moving images, etc.) is started on the display screen 63.

The advertisement video may be either distributed as streaming or locally installed in each dispenser 60. The display time is set to approximately two minutes for every entry of a user to the restroom stall, and a longer display is not allowed. This discourages the user from staying in the restroom for a long time gazing at the advertisement video. To effectively display advertisements during the two minutes, one or two 15-or-so-second advertisement videos, for example, are repeatedly displayed during the two minutes.

It is possible for the provider who provides services with the sanitary product provision apparatus 1 to carry out a business model of providing sanitary products S to users for free by repeating the cycle of seeking one or more advertisement sponsors, obtaining advertisement revenue by displaying one or more advertisements on the display screen 63 and/or on a user terminal 10, as will be described later, purchasing sanitary products S with part of the revenue, and replenishing the dispenser 60 with them.

Next, an electronic circuitry configuration of the dispenser 60 will be described.

FIG. 4 is a block diagram showing an example of the electronic circuitry configuration of the dispenser.

5 In response to a user's provision request made via a user terminal 100, the dispenser 60 performs an operation of discharging a single sanitary product S held in the storage compartment 61 upon receiving permission from the sanitary product provision management server 10. Thus, a
10 CPU 72, a recording medium reading unit 74, a communication unit 75, a beacon transmission unit 76, a memory 80, a storage device 90, and a display screen 63, which are connected via a bus 71, are provided as electronic circuitry for communication with the user terminal 100 and
15 the sanitary product provision management server 10 and for operation based on an instruction from the sanitary product provision management server 10.

The memory 80 stores an encryption program 81, a discharge mechanism control program 82, and a discharge
20 signal generation program 83.

Such programs 81 to 83 may be stored in advance in the memory 80, or may be read, via the recording medium reading unit 74, from an external recording medium 73 such as a memory card into the memory 80 and stored therein. These
25 programs 81 to 83 are made non-rewritable.

The memory 80 secures a writable data area 89 as an area for storing rewritable data, in addition to such a

user-unwritable area.

The CPU 72 is a computer, and controls the operation of each component of the circuitry in accordance with the programs 81 to 83 stored in the memory 80.

5 The storage device 90 is configured of, for example, a solid-state drive (SSD), a hard disk drive (HDD), etc., and stores a dispenser ID storage unit 91, an advertisement video data storage unit 92, and a shared key storage unit 93.

10 The dispenser ID storage unit 91 stores a dispenser ID.

 The advertisement video data storage unit 92 stores data for an advertisement video (hereinafter referred to as "advertisement video data"). As described above, the
15 advertisement video may be either distributed as streaming or locally installed in each dispenser 60. The advertisement video data storage unit 92 is an area for storing advertisement video data in the case where advertisement video data is locally installed. In the case
20 of the local installment of advertisement video data, advertisement video data recorded in the external recording medium 73 is read by the recording medium reading unit 74, written by the advertisement video data storage unit 92, and stored therein.

25 The shared key storage unit 93 stores a shared key K used in the encryption program 81. The shared key K is unique to each dispenser 60.

Next, a dedicated app will be described.

In order to receive provision of a sanitary product S from the dispenser 60, a dedicated app needs to be installed on the user terminal 100. The dedicated app can be installed by accessing the dedicated address from the user terminal 100 using a QR (registered trademark) code 66 or a barcode (not illustrated) that has been printed or attached to a housing of the dispenser 60 (e.g., the front door 64) with a sticker, etc.

Alternatively, in place thereof, the installment can be performed by displaying an image of a QR code 66 or a barcode on the display screen 63, and allowing the dedicated address to be accessed from the user terminal 100 by using (e.g., photographing) the displayed QR code 66 or barcode.

After the installment of the dedicated app, the user can register a user ID, a password, etc., using the dedicated app. If a user inputs user information containing a user ID, a password, etc. in accordance with the dedicated app, the dedicated app transmits user information to the sanitary product provision management server 10. Upon receiving the user information, the sanitary product provision management server 10 stores the user information in a user registration information database 35, to be described later. Thereby, the user registration is completed, and the user can request the dispenser 60 to provide a sanitary product S using the dedicated app.

The sanitary product provision management server 10 can display the above-described broadcast not only on the display screen 63 of the dispenser 60 but also on the user terminal 100 on which the dedicated app has been installed.

5 In this case, the timing of displaying the advertisement on the user terminal 100 is not particularly limited; for example, the display may be started at the same time as the timing of activation of the dedicated app, or may be performed only for the duration of a user operation by the

10 dedicated app, or may be performed by making a push notification to the user terminal 100 at a given timing, even if the dedicated app is not activated.

To request the dispenser 60 provided in a restroom stall in which the user is present to provide a sanitary

15 product S, the user brings the user terminal 100 close to the dispenser 60 by, for example, holding the user terminal 100 over the dispenser 60 with the dedicated app being activated.

On the other hand, in the dispenser 60, the encryption

20 program 81 performs a time-based hash operation based on a current time of day measured to the accuracy of minutes (e.g., "202001022304" if it is 23:04 of January 2, 2020) using a shared key K stored in the shared key storage unit 93, and encrypts the dispenser ID every minute, thereby

25 generating a beacon signal A and outputting it to the beacon transmission unit 76.

In response thereto, the beacon transmission unit 76

constantly transmits a beacon signal A with data that switches every minute by means of, for example, BLE or NFC communications.

Accordingly, being brought close to the dispenser 60,
5 the user terminal 100 can receive the beacon signal A transmitted from the beacon transmission unit 76.

If the beacon signal A transmitted by the beacon transmission unit 76 is received by the user terminal 100, the dedicated app determines whether or not the intensity
10 of the beacon signal A is equal to or higher than a predetermined intensity. Upon determining that the intensity of the beacon signal A is equal to or higher than the predetermined intensity, the dedicated app generates a provision request B requesting provision of a sanitary
15 product S. Moreover, the dedicated app allows a user ID to be contained in the provision request B. Furthermore, the dedicated app allows the beacon signal A to be contained in the provision request B, and transmits the provision request B via the communication network 200 to the sanitary
20 product provision management server 10.

In this manner, the provision request B contains a user ID, a dispenser ID of the dispenser 60 set up in a stall in which the user is present, and a beacon signal A. Since the beacon signal A is a hash of the shared key K and
25 the current time of day, it follows that the provision request B contains a user ID and a dispenser ID.

In the sanitary product provision management server

10, a shared key K identical to the shared key K stored in the shared key storage unit 93 of each dispenser 60 is associated with the dispenser ID of each dispenser 60, and stored in a shared key database 36.

5 Accordingly, if the provision request B containing the dispenser ID is transmitted to the sanitary product provision management server 10, the sanitary product provision management server 10 calculates a hash in the same manner as the beacon signal A, using one of the shared
10 keys K of the respective dispensers 60 and the current time of day measured to the accuracy of minutes. If the calculated hash is the same as the beacon signal A, it is possible to determine that the provision request B is correct. It is to be noted that, even though the current
15 time of day at the time of encryption by the encryption program 81 and the current time of day at the time of decoding by the sanitary product provision management server 10 do not strictly match, the gap is not greater than one minute. Accordingly, with the current time of day
20 measured to the accuracy of minutes, it is possible for the sanitary product provision management server 10 to measure the same time of day as the current time of day at the time of encryption by the encryption program 81, thereby calculating the hash on the sanitary product provision
25 management server 10 using the calculated time-of-day information. If the hash and the beacon signal A have the same contents, data of the provision request B can be

determined not to be false. There may be a rare case where, for example, the current time of day at the time of encryption by the encryption program 81 is 23:4:59 on January 2, 2020 and the sanitary product provision management server 10 measures 23:5:00 on January 2, 2020 at the time of decoding, the current time of day to be used in encryption by the encryption program 81 will be "202001022304", while the current time of day to be used in decoding by the sanitary product provision management server 10 will be "202001022305", causing a mismatch. In such a case, a request can be made to the dedicated app to generate a provision request B again and transmit it.

If the calculated hash and the beacon signal A are the same, the sanitary product provision management server 10 determines that the provision request B is true. On the other hand, if the calculated hash and the beacon signal A are inconsistent, the sanitary product provision management server 10 determines that the provision request B is false, and disregards the provision request B. In this manner, the sanitary product provision management server 10 accepts only a provision request B that is true, and thus will not be affected by a cyberattack, etc. by a false provision request B.

As a modification, the user may input a dispenser ID into the dedicated app via the user terminal 100, thus omitting, from the dispenser 60, the encryption program 81 and the shared key storage unit 93.

In this case, it is necessary to inform the user of the dispenser ID by printing the dispenser ID or attaching a printed sticker onto a housing of the dispenser 60, or displaying the dispenser ID on the display screen 63.

5 Although a beacon transmission unit 76 of the dispenser 60 constantly transmits a beacon signal A' even if the encryption program 81 and the shared key storage unit 93 are omitted, if the encryption program 81 and the shared key storage unit 93 are omitted, the beacon signal
10 A' will not contain an encrypted dispenser ID. However, by causing the user to input the dispenser ID from the user terminal 100, the provision request B is allowed to contain the dispenser ID.

 Even if the encryption program 81 and the shared key
15 storage unit 93 are omitted, if the beacon signal A' transmitted by the beacon transmission unit 76 is received by the user terminal 100, the dedicated app determines whether or not the intensity of the beacon signal A' is equal to or higher than a predetermined intensity. Upon
20 determining that the intensity of the beacon signal A' is equal to or higher than the predetermined intensity, the dedicated app generates a provision request B requesting provision of a sanitary product S, allows the provision request B to contain the dispenser ID input by the user,
25 and transmits the provision request B to the sanitary product provision management server 10 via the communication network 200.

In this manner, since the provision request B can be transmitted to the sanitary product provision management server 10 even if the encryption program 81 and the shared key storage unit 93 are omitted from the dispenser 60, the sanitary product provision management server 10 can determine whether or not the provision request B is true by confirming whether or not a correct dispenser ID is contained in the transmitted provision request B.

It is to be noted that the purpose of configuring the dedicated app to generate the provision request B only if the intensity of the beacon signal A (or the beacon signal A') is equal to or higher than the predetermined intensity is to not generate a provision request B in response to a beacon signal A transmitted from a beacon transmission unit 76 of a dispenser 60 provided in an adjacent stall in the same restroom.

As will be described later, the sanitary product provision management server 10 determines whether or not a sanitary product S can be provided for each dispenser 60 upon receiving a provision request B from the user terminal 100. Accordingly, in the case where, for example, the user terminal 100 receives a beacon signal A transmitted not from a dispenser 60 in a stall in which the user is present but from a dispenser 60 in an adjacent stall, generates a provision request B, and transmits it to the sanitary product provision management server 10, even if the sanitary product provision management server 10 determines

that provision is permitted, it follows that it has been determined that provision from the dispenser 60 in the adjacent stall is permitted, and a sanitary product S is not discharged from the dispenser 60 provided in the stall in which the user is present. To avoid such inconvenience, the dedicated app generates a provision request B only if the intensity of the beacon signal A (or the beacon signal A') is equal to or higher than the predetermined intensity.

If discharge of a sanitary product S is permitted by the sanitary product provision management server 10 in response to the provision request B, a permission signal C is transmitted from the sanitary product provision management server 10 to the dispenser 60 via the communication network 200.

The communication unit 75 receives the permission signal C, and outputs it to the memory 80.

The memory 80 sends the permission signal C to the discharge mechanism control program 82. In response to the permission signal C, the discharge mechanism control program 82 instructs a discharge mechanism (not illustrated) of the storage compartment 61 to discharge a single sanitary product S stored in the storage compartment 61. The discharge mechanism, which is not particularly illustrated, can be implemented by a plurality of claws (a first claw and a second claw) that inhibit sanitary products S from falling in the storage compartment 61. At usual times, the lower side of the sanitary products S at

the bottommost layer in the storage compartment 61 is supported by the first claw, and the lower side of the sanitary products S at the second-from-the-bottom layer is supported by the second claw, and in response to a discharge instruction from the discharge mechanism control program 82, a single sanitary product S can be discharged from the storage compartment 61 to the discharge port 62 by releasing only the support by the first claw.

In response to a discharge operation of the above-described discharge mechanism, the discharge signal generation program 83 generates a discharge signal D containing a dispenser ID, and outputs it to the communication unit 75.

In place of generating a discharge signal D in response to a discharge operation of the discharge mechanism, a discharge sensor (not illustrated) for detecting discharge of a sanitary product S may be provided inside the storage compartment 61, in such a manner that the discharge signal generation program 83 generates a discharge signal D upon detection of the discharge by the discharge sensor.

The communication unit 75 transmits the discharge signal D to the sanitary product provision management server 10 via the communication network 200.

Next, a configuration of the sanitary product provision management server 10 will be described.

FIG. 5 is a block diagram showing an electronic

circuitry configuration example of a sanitary product provision management server according to the first embodiment.

5 The sanitary product provision management server 10 is a device for managing provision of sanitary products S from the respective dispensers 60 to users, and its electronic circuitry includes a CPU 12, a recording medium reading unit 14, a communication unit 15, a memory 20, and a storage device 30, which are connected to each other via a
10 bus 11.

The memory 20 stores an inventory management program 21, a user management program 22, an identification program 23, a determination program 24, and a discharge permission program 25. Such programs 21 to 25 may be stored in advance
15 in the memory 20, or may be read, via the recording medium reading unit 14 from an external recording medium 13 such as a memory card, into the memory 20 and stored therein. These programs 21 to 25 are made non-rewritable.

The memory 20 secures a writable data area 29 as an
20 area for storing rewritable data, in addition to such a user-unwritable area.

The CPU 12 is a computer, and controls the operation of each component of the circuitry in accordance with the programs 21 to 25 stored in the memory 20.

25 The storage device 30 is configured of, for example, a solid-state drive (SSD), a hard disk drive (HDD), etc., and stores an inventory status database 31, a user-based

provision history database 32, a determination condition database 33, a dispenser setup location database 34, a user registration information database 35, and a shared key database 36.

5 The inventory status database 31 includes an inventory status data table 41 that stores information relating to an inventory status of each dispenser 60.

 The user-based provision history database 32 includes a plurality of user-based provision history data tables 42
10 each storing information relating to a provision history of sanitary products S with respect to a user who has received provision of one or more sanitary products S from the sanitary product provision apparatus 1 in the past.

 The determination condition database 33 is a database
15 that stores an estimation formula for estimating the menstrual period and the menstrual cycle of the user based on information relating to a provision history of sanitary products S stored in the user-based provision history data table 42 and determination conditions to be used by the
20 determination program 24 for determining whether or not a sanitary product can be provided to the user.

 The dispenser setup location database 34 includes a dispenser setup location data table 44 that stores information relating to a setup location of each dispenser
25 60.

 The user registration information database 35 is a database that stores user information containing the user's

information, a password, etc.

The communication unit 15 performs communications with each dispenser 60, a user terminal 100, etc., via the communication network 200, and outputs the received
5 information to the memory 20 to provide it to one of the programs 21 to 25. The information output from one of the programs 21 to 25 is transmitted to the corresponding dispenser 60, the user terminal 100, etc.

The user registration information database 35 stores
10 user information containing the user's information, a password, etc. The user information is input by the user upon registration, and is transmitted to the sanitary product provision management server 10 by the dedicated app. In the sanitary product provision management server
15 10, the communication unit 15 receives the user information, and outputs it to the memory 20. If the user information is output to the memory 20, the user management program 22 writes the user information into the user registration information database 35. Thereby, the user
20 registration is completed.

The shared key database 36 stores a shared key K stored in the shared key storage unit 93 of each dispenser 60 in association with a corresponding dispenser ID.

If the provision request B is transmitted from the
25 user terminal 100, the identification program 23 receives the provision request B from the communication unit 15, and decodes the provision request B using one of the shared

keys stored in the shared key database 36 and time-of-day information measured to the accuracy of minutes.

It is to be noted that, even though the current time of day at the time of encryption by the encryption program 81 and the current time of day at the time of decoding by the identification program 23 do not strictly match, the gap is not greater than one minute. Accordingly, with the current time of day measured to the accuracy of minutes, it is possible for the sanitary product provision management server 10 to measure the same time of day as the current time of day at the time of encryption by the encryption program 81, thereby allowing the identification program 23 to calculate the hash on the sanitary product provision management server 10 using the calculated time-of-day information. If the hash and the beacon signal A have the same contents, data of the provision request B can be determined not to be false. There may be a rare case where, for example, the current time of day at the time of encryption by the encryption program 81 is 23:4:59 on January 2, 2020 and the sanitary product provision management server 10 measures 23:5:00 on January 2, 2020 at the time of decoding by the identification program 23, the current time of day to be used in encryption by the encryption program 81 will be "202001022304", while the current time of day to be used in decoding by the identification program 23 will be "202001022305", causing a mismatch. In such a case, a request can be made to the

dedicated app to generate a provision request B again and transmit it.

If decoding is performed using the time-of-day information and the correct shared key K, the
5 identification program 23 succeeds in decoding the provision request B. If the calculated hash and the beacon signal A are the same, the identification program 23 can determine that the provision request B is true. On the other hand, if the calculated hash and the beacon signal A
10 are inconsistent, the identification program 23 disregards the provision request B.

Upon determining that the provision request B is true, the identification program 23 further identifies the user based on a user ID obtained from a result of decoding the
15 provision request B, and further specifies, based on the dispenser ID from the dispenser setup location database 34, a dispenser 60 set up in a location where the user is present, namely, a dispenser 60 that is requested by the user to provide a sanitary product S.

20 FIG. 6 is a data configuration diagram showing an example of a dispenser setup location data table included in a dispenser setup location database.

The dispenser setup location database 34 includes a dispenser setup location data table 44 with a data
25 configuration shown in FIG. 6.

The dispenser setup location data table 44 is a database that stores information relating to a setup

location of each dispenser 60, and records, for example, latitude/longitude information, address information, and setup location information corresponding to the setup location for the dispenser ID of each dispenser 60. Thus, the dispenser setup location data table 44 contains items including: a dispenser ID field a for writing a dispenser ID; a latitude/longitude information field i for writing latitude/longitude information; an address information field j for writing address information; and a setup location information field k for writing setup location information.

The determination program 24 determines whether or not a sanitary product S can be provided to the user identified by the identification program 23.

For this determination, the determination program 24 accesses the user-based provision history database 32, refers to a user-based provision history data table 42 of the user identified by the identification program 23, and estimates a menstrual period and a menstrual cycle of the user using the estimation formula stored in the determination condition database 33.

FIG. 7 is a data configuration diagram showing an example of the user-based provision history data table included in the user-based provision history database.

The user-based provision history database 32 includes user-based provision history data tables 42-1, 42-2, ..., and 42-n (where n is an integer equal to or greater than 3)

provided for the respective users. The number of the user-based provision history data tables 42 is not limited to three or more; the number becomes one if the number of users is one and becomes two if the number of users is two, and the present invention is also applicable to such cases.

A user-based provision history data table 42 is provided for each user ID, and each user-based provision history data table 42 contains items including: a user ID field f for writing a user ID; a time-of-day information field c for writing time-of-day information; a dispenser ID field a for writing a dispenser ID; and a sanitary product type field g for writing a sanitary product type, as illustrated in FIG. 7.

The time-of-day information is information indicating the time of day when a sanitary product S has been taken out, the dispenser ID is identification information of a dispenser 60 from which the sanitary product S has been taken out, and the sanitary product type indicates a type of the sanitary product S that has been taken out.

The user-based provision history data table 42 is updated by the inventory management program 21, as will be described later.

The determination condition database 33 stores an estimation formula for estimating a menstrual period and a menstrual cycle from the time-of-day information stored in the user-based provision history data table 42.

The determination program 24 estimates the menstrual

period and the menstrual cycle of the user using a user-based provision history data table 42 of the user identified by the identification program 23 and the estimation formula stored in the determination condition database 33. It is to be noted that the "menstrual period" used herein does not refer to the actual menstrual period, but refers to a period during which a sanitary product S may be provided. Accordingly, a longer period is set to be on the safer side, considering the shift of the actual menstrual period.

Based on the result of the estimation, the determination program 24 determines whether or not the user is currently on her menstrual period. If it is determined that the user is currently on her menstrual period, it is possible to determine that provision is permitted. The determination program 24 may further determine, based on the user-based provision history data table 42 and the determination condition database 33 in addition to the determination that the user is on her menstrual period, that a sanitary product S can be provided to the user if a predetermined period of time (e.g., two or more hours) has passed from the latest time of day when a sanitary product S had been provided. Alternatively, it is also possible to determine that provision is permitted if a maximum number of sanitary products S that can be provided to the user during her menstrual period set in advance has not been reached, in addition to the determination that the user is

on her menstrual period.

Thus, the determination condition database 33 further stores determination conditions such as the above-described predetermined period of time (e.g., two or more hours) and the maximum number.

In this manner, the determination program 24 determines whether or not a sanitary product S can be provided to the user. By such determination, it is possible to restrict provision of a sanitary product S to a user who is not on her menstrual period. Moreover, it is possible to restrict provision of more-than-necessary sanitary products S to a user who is on her menstrual period.

Also, by employing a system of storing, in the determination condition database 33, an estimation formula necessary for estimating the menstrual period and the menstrual cycle of the user and determination conditions necessary for determining whether or not a sanitary product S can be provided to the user, a change or addition, if any, to the estimation formula or the determination conditions can be easily reflected by updating the estimation formula and the determination conditions stored in the determination condition database 33.

An example has been described above in which the menstrual period and the menstrual cycle of the user is estimated based on information relating to a provision history of sanitary products S stored in the user-based provision history data table 42, and the result of the

estimation is used by the determination program 24 for determining whether or not a sanitary product S can be provided. However, a menstrual period declared by the user herself may be used as the user's menstrual period, in place of such an estimated value. Similarly, a menstrual cycle declared by the user herself may be used as the menstrual cycle, in place of such an estimated value.

In such a case, the dedicated app prompts the user to input a menstrual period and/or a menstrual cycle, and the user inputs, in response thereto, a menstrual period and/or a menstrual cycle via the user terminal 100. Thereby, the input menstrual period and/or the menstrual cycle is transmitted to the sanitary product provision management server 10, and is used by the determination program 24 for determining whether or not a sanitary product S can be provided.

In this case, the user may input, for example, the menstrual period and the menstrual cycle obtained using the app disclosed in Non-Patent Document 2. Alternatively, by linking the dedicated app with the app disclosed in Non-Patent Document 2, the dedicated app may automatically acquire the menstrual period and the menstrual cycle from the app disclosed in Non-Patent Document 2, while eliminating the user's input operation on the dedicated app.

It is to be noted that, if the user has not yet received provision of a sanitary product S in the past, a

user-based provision history data table 42 is not generated for such a user, and thus the menstrual period and the menstrual cycle cannot be estimated. Accordingly, in such a case, the processing by the determination program 24, in
5 which whether or not the user is currently on her menstrual period is determined, is skipped.

Upon determination by the determination program 24 that provision is permitted, if a dispenser 60 from which the provision request B has been transmitted carries an
10 inventory of sanitary products S, the discharge permission program 25 generates a permission signal C for permitting discharge of a single sanitary product S.

The discharge permission program 25 refers to an inventory status data table 41 of the dispenser 60 from
15 which the provision request B has been transmitted, included in the inventory status database 31, to confirm whether or not the dispenser 60 from which the provision request B has been transmitted carries an inventory of sanitary products S.

20 FIG. 8 is a data configuration diagram showing an example of inventory status data tables included in the inventory status database.

The inventory status database 31 includes inventory status data tables 41-1, 41-2, ..., and 41-n (where n is an
25 integer equal to or greater than 3) provided for each dispenser 60, namely, the dispensers 60-1, 60-2, ..., and 60-n.

The inventory status data table 41 contains items including: an event information field b for writing event information; a time-of-day information field c for writing time-of-day information; an inventory fluctuation value field d for writing an inventory fluctuation value; an inventory quantity field e for writing an inventory quantity; a user ID field f for writing a user ID; and a sanitary product type field g for writing a sanitary product type, in addition to a dispenser ID field a for writing a dispenser ID.

The inventory status data table 41 is updated by the inventory management program 21, as will be described later, in accordance with discharge of a sanitary product S from the dispenser 60 or inventory replenishment of a sanitary product S to the dispenser 60.

If "0" (zero) is written in the latest record of the inventory quantity field d, it indicates that the sanitary products S are out of inventory.

Accordingly, if "0" (zero) is not written in the latest record of the inventory quantity field d of the inventory status data table 41 of the dispenser 60 from which the provision request B has been transmitted, the discharge permission program 25 generates a permission signal C for the dispenser 60, and outputs it to the communication unit 15. On the other hand, if "0" (zero) is written in the latest record of the inventory quantity field d of the inventory status data table 41 of the

dispenser 60 from which the provision request B has been transmitted, a permission signal C for the dispenser 60 is not generated.

5 The communication unit 15 transmits, via the communication network 200, the permission signal C to the dispenser 60 from which the provision request B has been transmitted.

10 At the dispenser 60, the communication unit 75 receives the permission signal C, and outputs it to the memory 80.

15 The memory 80 sends the permission signal C to the discharge mechanism control program 82. In response to the permission signal C, the discharge mechanism control program 82 instructs a discharge mechanism (not illustrated) of the storage compartment 61 to discharge a single sanitary product S stored in the storage compartment 61.

20 In accordance therewith, a discharge mechanism operates, and a single sanitary product S is discharged from the storage compartment 61 to the discharge port 62.

25 In response to the discharge operation of the above-described discharge mechanism, the discharge signal generation program 83 generates a discharge signal D containing a dispenser ID, event information indicating a discharge event, time-of-day information indicating a time of day when the sanitary product S has been discharged, and a user ID, and outputs it to the communication unit 75.

In place of generating a discharge signal D in response to a discharge operation of the discharge mechanism, a discharge sensor (not illustrated) for detecting discharge of a sanitary product S may be provided
5 inside the storage compartment 61, in such a manner that the discharge signal generation program 83 generates a discharge signal D upon detection of the discharge by the discharge sensor.

The communication unit 75 transmits the discharge
10 signal D to the sanitary product provision management server 10 via the communication network 200.

At the sanitary product provision management server 10, the discharge signal D is received by the communication unit 15, and is output to the memory 20. Thereafter, the
15 memory 20 sends the discharge signal D to the inventory management program 21 and the user management program 22.

The user management program 22 updates the history of provision of sanitary products S from the respective dispensers 60 to each user by accessing a corresponding
20 user-based provision history data table 42 based on the user ID contained in the discharge signal D, and writing the time-of-day information and the dispenser ID contained in the discharge signal D to the time-of-day information field c and the dispenser ID field a.

25 The inventory management program 21 updates the inventory of sanitary products S in each dispenser 60 by accessing a corresponding inventory status data table 41

based on the dispenser ID contained in the discharge signal D, writing "discharge" into the event information field b based on event information indicating a discharge contained in the discharge signal D, and writing the time-of-day information and the user ID contained in the discharge signal D into the time-of-day information field c and the user ID field f.

Upon writing "discharge" into the event information field b of the inventory status data table 41, the inventory management program 21 inputs a numerical value "-1" into the inventory fluctuation value field d, performs a calculation (i.e., a computation of subtracting "1" from the current inventory quantity) of updating the inventory quantity based on the numerical value input to the inventory fluctuation value field d, and writes the result of the calculation into the inventory quantity field e. In the example of the inventory status data table 41-1 in FIG. 8, for example, as shown in the time-of-day information field c of "discharge", which is the second event from the top, the discharge signal D transmitted at 15:23:41 on December 3, 2019 causes the inventory quantity to be 11, with 1 subtracted from 12, and "11" is written into the inventory quantity field e.

Also, the type (e.g., "α1") of sanitary products S written into the sanitary product type field g of the inventory status data table 41 is written into a sanitary product type field g of the user-based provision history

data table 42 of the corresponding user.

In this manner, the inventory management program 21 manages the inventory status of sanitary products S stored in each dispenser 60 by updating the inventory status data table 41 of each dispenser 60 included in the inventory status database 31. If there is any dispenser 60 whose inventory quantity has fallen below a predetermined number or which has become out of inventory (inventory quantity field e has become "0" (zero)), a message indicating that the sanitary product S should be replenished is transmitted to a terminal of an inventory replenisher (hereinafter referred to as an "inventory replenisher terminal"), along with a dispenser ID of the corresponding dispenser 60.

In accordance therewith, the inventory replenisher heads to the dispenser 60, and replenishes the sanitary product S with the storage compartment 61. Upon completion of the replenishment operation, an inventory replenishment signal E is generated in the inventory replenisher terminal 150 such as a smartphone or a tablet of the inventory replenisher, and transmits it to the sanitary product provision management server 10 via the communication network 200.

The inventory replenishment signal E contains a dispenser ID of a dispenser 60 for which the inventory has been replenished, event information indicating an inventory replenishment event, time-of-day information indicating the time of day when the inventory has been replenished,

quantity information indicating a quantity after the inventory replenishment, and sanitary product type information (e.g., product name).

At the sanitary product provision management server
5 10, the inventory replenishment signal E is received by the communication unit 15, and output to the memory 20. Thereafter, the memory 20 sends the inventory replenishment signal E to the inventory management program 21.

The inventory management program 21 accesses a
10 corresponding inventory status data table 41 (e.g., an inventory status data table 41-1) based on the dispenser ID contained in the inventory replenishment signal E, writes "replenish" into the event information field b based on the event information indicating inventory replenishment
15 contained in the inventory replenishment signal E, writes time-of-day information contained in the inventory replenishment signal E into the time-of-day information field c, writes quantity information contained in the inventory replenishment signal E into the inventory
20 quantity field e, and writes the type of the sanitary product S with which the inventory has been replenished into the sanitary product type field g.

If "replenish" is written into the event information field b of the inventory status data table 41, the
25 inventory management program 21 invalidates the inputs to the inventory fluctuation value field d and the user ID field f. In the example of the inventory status data table

41-1 shown in FIG. 8, for example, as shown in the time-of-day information field c, since "replenish" has been written into the event information field b by the inventory replenishment signal E transmitted at 09:03:21 on December 25, 2019, the inputs to the inventory fluctuation value field d and the user ID field f are invalidated, and "NA" is displayed in these fields. Also, based on the quantity information contained in the inventory replenishment signal E, "25" is written into the inventory quantity field e, and "β1", which is the type of the sanitary product S with which the inventory has been replenished, is written into the sanitary product type field g.

In this manner, the inventory management program 21 manages the inventory statuses of the respective dispensers 60 by updating the inventory status data table 41 based not only on the discharge signal D transmitted from each dispenser 60 but also on the inventory replenishment signal E transmitted from the inventory replenisher terminal 150 at the time of inventory replenishment.

In the above-described example, time-of-day information is contained in the discharge signal D and the inventory replenishment signal E. That is, time-of-day information is generated by measuring the time of day using the clock of the dispenser 60 and the replenisher terminal 150.

However, the dispenser 60 and the replenisher terminal 150 may transmit a discharge signal D and an inventory

replenishment signal E not containing time-of-day information. In this case, upon receiving the discharge signal D and the inventory replenishment signal E, the communication unit 15 attaches the received time of day and outputs it to the memory 20. The inventory management program 21 writes the received time of day into the time-of-day information field c of the inventory status data table 41. With the above-described configuration, time-of-day information need not be contained at the time of transmission of the discharge signal D and the inventory replenishment signal E by the dispenser 60 and the replenisher terminal 150, and the data transmission amount can be reduced. It is to be noted that, even though there is a slight difference in time between the time of day of measurement by the dispenser 60 and the replenisher terminal 150 and the time of day of reception by the communication unit 15, such a time difference does not become a problem for carrying out the present invention.

Also, at the time of transmission of the discharge signal D and the inventory replenishment signal E, the dispenser 60 and the replenisher terminal 150 may suitably encrypt and transmit them. Since a publicly known technique can be used for the encryption, details of the encryption will be omitted.

Also, the method of managing the inventory status is not limited to the method of using the inventory status data table 41 as described above. For example, each

dispenser 60 may include a count sensor (not illustrated) for counting the number of sanitary products S stored in the storage compartment 61, and be configured to transmit an inventory quantity, which is the counted number, along with the dispenser ID to the sanitary product provision management server 10 from the count sensor. With such a configuration, too, the inventory management program 21 can grasp the inventory status of each dispenser 60.

In this manner, the inventory management program 21 is capable of managing the inventory status of sanitary products S stored in each dispenser 60. Inventory information Z indicating the inventory quantity of each dispenser 60 is generated, and a dispenser ID of the corresponding dispenser 60 is assigned to the generated inventory information Z, and is output to the communication unit 15. In response thereto, the communication unit 15 recognizes the dispenser 60 to be a transmission destination from the assigned dispenser ID, and transmits inventory information Z to the recognized dispenser 60.

In response thereto, the dispenser 60 to be a transmission destination receives inventory information Z at the communication unit 75, and stores inventory information Z in the storage device 90 or the writable data area 89. The dispenser 60 can display the inventory information Z stored in this manner on the display screen 63 in accordance with an operation (e.g., a touch-panel operation on the display screen 63) by an inventory

replenisher, as will be described later.

Next, functions of the dedicated app will be further explained.

In most cases, a user terminal 100 such as a
5 smartphone is normally equipped with a positioning function
such as GPS, and the dedicated app can grasp the position
of the user terminal 100 using this function.

While grasping the position of the user terminal 100,
the dedicated app accesses the dispenser setup location
10 data table 44 of the dispenser setup location database 34,
and compares the position of the user terminal 100, with
the latitude/longitude information written into the
latitude/longitude information field i, thereby displaying,
on a map on the user terminal 100, the location of the
15 dispenser 60 set up in the vicinity (e.g., within a radius
of 100 m) of the user terminal 100.

The dedicated app may also display an address, a setup
location, etc. in the vicinity of the dispenser 60
displayed on a map by referring to the address information
20 field j and the setup location information field k of the
dispenser setup location data table 44.

Moreover, the dedicated app can display, as character
information in the neighborhood of the dispenser 60
displayed on the map, the inventory quantity and the type
25 of sanitary products S stored in the dispenser 60 by
accessing the inventory status data table 41 of the
inventory status database 31 and referring to the inventory

quantity field e, and the sanitary product type field g, etc.

Furthermore, upon receiving the beacon signal A from the dispenser 60 installed in a restroom stall in which the user is present, the dedicated app can display, as character information, the inventory quantity and the type of sanitary products S stored in the dispenser 60 by identifying the dispenser ID from the beacon signal A, accessing an inventory status data table 41 (e.g., an inventory status data table 41-1) of the corresponding dispenser ID, and referring to the inventory quantity field e, the sanitary product type field g, etc.

Moreover, the dedicated app can display, on the user terminal 100, time-of-day information when the user has obtained one or more sanitary products S from the dispenser 60 in the past and history information such as the type of the obtained sanitary product S by accessing the user-based provision history data table 42 included in the user-based provision history database 32 and referring to the time-of-day information c, the sanitary product type field g, etc.

Through such functions of the dedicated app, the user can confirm, on the user terminal 100, a location in the vicinity where a dispenser 60 is set up, the quantity and type of sanitary products S stored in each dispenser 60, etc. Also, the user can confirm, on the user terminal 100, time-of-day information when she has obtained one or more sanitary products S from the dispenser 60 in the past,

history information such as the type of the obtained
sanitary products S, etc.

Next, an operation example of the sanitary product
provision apparatus and the sanitary product provision
5 method with the above-described configuration according to
the first embodiment of the present invention will be
described.

FIG. 9 is a processing flow diagram illustrating an
operation example of the sanitary product provision
10 apparatus and the sanitary product provision method
according to the first embodiment of the present invention.

FIGS. 10A to 10C are flowcharts illustrating an
operation example of the sanitary product provision
apparatus and the sanitary product provision method
15 according to the first embodiment of the present invention.

In order to request a dispenser 60 to provide a
sanitary product S, the dedicated app needs to be installed
on the user terminal 100. The dedicated app can be
installed by accessing the dedicated address from the user
20 terminal 100 by using (e.g., photographing) a QR code 66 or
a barcode that has been attached to a housing of the
dispenser 60 (e.g., the front door 64) with a sticker,
etc., printed, or displayed on the display screen 63 (S1).

Alternatively, the dedicated app may be installed in
25 advance by accessing a dedicated address using a retrieval
site and downloading the dedicated app therefrom (S1').

After the installment, the user performs user

registration. The user registration is completed if the user inputs user information such as a user ID, a password, etc. in accordance with the dedicated app using an input function of the user terminal 100, and the input user information is transmitted to the sanitary product provision management server 10 by the dedicated app and written into the user registration information database 35 (S2).

This allows the user to use the dedicated app, and to request a dispenser 60 set up in a stall to provide a sanitary product S. Besides, the user can confirm, for example, a location in the vicinity where a dispenser 60 is set up, the quantity and type of sanitary products S stored in each dispenser 60, etc., on the user terminal 100. Also, the user can confirm, on the user terminal 100, time-of-day information when she has obtained one or more sanitary products S from the dispenser 60 in the past, history information such as the type of the obtained sanitary products S. etc.

To receive provision of a sanitary product S from the dispenser 60, the user enters a restroom stall, and brings the user terminal 100 close to (holds it over) the dispenser 60 with the dedicated app being activated (S3).

Through the encryption program 81, a beacon signal A is generated and constantly transmitted to the dispenser 60 from the beacon transmission unit 76. In the encryption program 81, for example, a beacon signal A is generated by

using a shared key K stored in the shared key storage unit 93, performing a time-based hash operation based on the current time of day, and encrypting the dispenser ID of the dispenser 60 every minute, for example. Thereby, the beacon
5 signal A with data that switches every minute is constantly transmitted from the beacon transmission unit 76.

By bringing the user terminal 100 close to the dispenser 60 and allowing the beacon signal A transmitted by the beacon transmission unit 76 to be received by the
10 user terminal 100 (S4), the dedicated app determines whether or not the intensity of the beacon signal A is equal to or higher than a predetermined intensity (S5).

Upon determination by the dedicated app that the intensity of the beacon signal A is equal to or higher than a predetermined intensity (S5:Yes), the dedicated app
15 generates a provision request B requesting provision of a sanitary product S (S6). Also, after the user ID and the beacon signal A are contained in the provision request B by the dedicated app, the provision request B is transmitted
20 to the sanitary product provision management server 10 by the dedicated app via the communication network 200.

In this manner, since the provision request B is not generated if the intensity of the beacon signal A is not equal to or higher than a predetermined intensity (S5: No),
25 the provision request B is not generated by the beacon signal A transmitted from the beacon transmission unit 76 of the dispenser 60 provided in an adjacent stall in the

same restroom.

The provision request B transmitted to the sanitary product provision management server 10 is received by the communication unit 15, is output to the memory 20, and is
5 further sent from the memory 20 to the identification program 23.

In the identification program 23, the provision request B is decoded using one of the shared keys stored in the shared key database 36 and the time-of-day information.
10 If the correct shared key K is used, the provision request B is successfully decoded. If the calculated hash and the beacon signal A are the same, it is determined by the identification program 23 that the provision request B is true. On the other hand, if the calculated hash and the
15 beacon signal A are inconsistent, the provision request B is disregarded by the identification program 23. Upon determining that the provision request B is true, the identification program 23 further identifies the user based on a user ID obtained from a result of decoding the
20 provision request B, and further specifies, based on the dispenser ID from the dispenser setup location database 34, a dispenser 60 set up in a location where the user is present, namely, a dispenser 60 that is requested by the user to provide a sanitary product S (S7).

25 The determination program 24 determines whether or not a sanitary product S can be provided to the user identified by the identification program 23.

For this determination, the determination program 24 uses a user-based provision history data table 42 of the user identified by the identification program 23 and the estimation formula stored in the determination condition database 33, thereby estimating the menstrual period and the menstrual cycle of the user (S8). It is to be noted that the "menstrual period" used herein does not refer to the actual menstrual period, but refers to a period during which a sanitary product S may be provided. Accordingly, it is estimated to be longer, considering the shift of the actual menstrual period.

Moreover, based on the results of the estimation, the determination program 24 determines whether or not the user is currently on her menstrual period (S9). If it is determined that the user is currently on her menstrual period (S9: Yes), it is further determined, based on the user-based provision history data table 42 and the determination condition database 33, whether or not a predetermined period of time (e.g., 2 or more hours) has passed since the latest time of day when provision of a sanitary product S has been received (S10), and if the predetermined period of time has passed (S10: Yes), it is determined that a sanitary product S can be provided to the user (S11). Alternatively, or in addition thereto, it is possible to set in advance a maximum number of sanitary products S that can be provided to a user during her menstrual period, and determine that provision is permitted

if the maximum number has not been reached.

Since such determination conditions are stored in the determination condition database 33 along with the above-described estimation formula, even if there is a change or
5 addition to the estimation formula and/or the determination conditions, estimation and determination based on the new estimation formula and/or the determination conditions can be easily carried out by updating the estimation formula and the determination conditions stored in the
10 determination condition database 33.

If it is not determined that the user is not on her menstrual period (S9: No), or if a predetermined period of time has not passed since the latest time of day when provision of a sanitary product S has been received (S10:
15 No), it is determined that a sanitary product S cannot be provided (S12).

In this manner, whether or not a sanitary product S can be provided to the user is determined by the determination program 24. By such determination, provision
20 of a sanitary product S to a user who is not on her menstrual period is restricted. In addition, provision of more-than-necessary sanitary products S to a user who is on her menstrual period is restricted.

In the case of processing at steps S9 and S10, the
25 menstrual period declared by the user herself and/or the menstrual cycle declared by the user herself may be used, instead of using the menstrual period and/or the menstrual

cycle estimated from information relating to the provision history of sanitary products S stored in the user-based provision history data table 42.

5 In the case of the declaration by the user herself, the dedicated app prompts the user to input a menstrual period and/or a menstrual cycle, and the user inputs, in response thereto, a menstrual period and/or a menstrual cycle via the user terminal 100. The input menstrual period and/or the menstrual cycle is transmitted from the user
10 terminal 100 to the sanitary product provision management server 10, and is used by the determination program 24 for determining whether or not a sanitary product S can be provided.

In this case, the user may input, for example, the
15 menstrual period and the menstrual cycle obtained using the app disclosed in Non-Patent Document 2. Alternatively, by linking the dedicated app with the app disclosed in Non-Patent Document 2, the dedicated app may automatically acquire the menstrual period and the menstrual cycle from
20 the app disclosed in Non-Patent Document 2 and transmit them to the sanitary product provision management server 10, while eliminating the user's input operation on the dedicated app.

Whether or not a sanitary product S can be provided
25 may be determined only by the processing at step S9, by eliminating the processing at step S10. It is to be noted that, if the user has not yet received provision of a

sanitary product S in the past, a user-based provision history data table 42 is not generated for such a user and the menstrual period and the menstrual cycle cannot be estimated, and thus the processing from step S8 to step S12 is skipped.

If it is determined, at step S11, that provision is permitted, an inventory status data table 41 of a dispenser 60 from which the provision request B has been transmitted is referred to by the discharge permission program 25, and if the dispenser 60 carries an inventory of sanitary products S (S13: Yes), a permission signal C permitting the dispenser 60 to discharge a single sanitary product S is generated by the discharge permission program 25 (S14), and is transmitted to the dispenser 60 from the communication unit 15 to the dispenser 60 via the communication network 200. On the other hand, if the dispenser 60 does not carry sanitary products S (S13: No), an inventory replenishment operation (see FIG. 11) is carried out after a shift is made to step S22, to be described later (S30).

The permission signal C transmitted to the dispenser 60 is received by the communication unit 75, is output from the communication unit 75 to the memory 80, and is further sent to the discharge mechanism control program 82 (S15). In response to the permission signal C, the discharge mechanism control program 82 instructs a discharge mechanism of the storage compartment 61 to discharge a single sanitary product S stored in the storage compartment

61 (S16).

By the discharge instruction, a single sanitary product S is discharged from the storage compartment 61 to the discharge port 62 (S17). The user can take out a
5 sanitary product S from the discharge port 62 and use it.

On the other hand, in response to a discharge operation at step S17, a discharge signal D containing a dispenser ID is generated by the discharge signal
generation program 83, and transmitted from the
10 communication unit 75 to the sanitary product provision management server 10 via the communication network 200 (S18).

At the sanitary product provision management server 10, the discharge signal D is received by the communication
15 unit 15, is output from the communication unit 15 to the memory 20, and is further sent to the inventory management program 21 and the user management program 22.

The user management program 22 updates the contents of the corresponding user-based provision history data table
20 42 based on the user ID contained in the discharge signal D (S19).

Also, the inventory management program 21 updates the contents of the corresponding inventory status data table
41 based on the dispenser ID contained in the discharge
25 signal D (S20).

In this manner, since the inventory status data table 41 is updated by the inventory management program 21, the

inventory status of sanitary products S stored in each dispenser 60 is managed. If there is any dispenser 60 whose inventory quantity has fallen below a predetermined number or which has become out of inventory (inventory quantity field e has become "0" (zero)) (S21: Yes), the inventory management program 21 transmits, along with a dispenser ID of the corresponding dispenser 60, a message indicating that the sanitary product S should be replenished to an inventory replenishment terminal (S22) to prompt an inventory replenishment operation, and an inventory replenishment operation as shown in FIG. 11 is started (S30).

Next, an operation example of the inventory replenishment operation will be described.

FIG. 11 is a flowchart showing a flow of an inventory replenishment operation.

If a message is transmitted to the inventory replenisher terminal 150 at step S22 described above, the inventory replenisher grasps, from the dispenser ID transmitted along with the message, which dispenser 60 has had its inventory of the sanitary products S exhausted (S31).

In accordance therewith, the inventory replenisher heads to the corresponding dispenser 60, and replenishes the sanitary product S with the storage compartment 61 (S32). Upon completion of the replenishment operation, an inventory replenishment signal E containing a dispenser ID

of a dispenser 60 for which the inventory has been replenished, event information indicating an inventory replenishment event, time-of-day information indicating the time of day when the inventory has been replenished, an
5 inventory quantity indicating a quantity after the inventory replenishment, and type information (e.g., product name) of sanitary products S, and transmits them from the replenisher terminal 150 to the sanitary product provision management server 10 via the communication
10 network 200 (S33).

At the sanitary product provision management server 10, the inventory replenishment signal E is received by the communication unit 15, is output to the memory 20, and is further sent to the inventory management program 21.

15 At the inventory management program 21, a corresponding inventory status data table 41 (e.g., an inventory status data table 41-1) is accessed based on the dispenser ID contained in the inventory replenishment signal E, "replenish" is written into the event information
20 field b based on the event information indicating inventory replenishment contained in the inventory replenishment signal E, the time-of-day information contained in the inventory replenishment signal E is written into the time-of-day information field c, an inventory quantity contained
25 in the inventory replenishment signal E is written into the inventory quantity field e, and the type of the sanitary product S with which the inventory has been replenished is

written into the sanitary product type field g.

In this manner, the inventory status data table 41 is updated based on the inventory replenishment signal E by the inventory management program 21 (S34), and the
5 inventory status of each dispenser 60 is managed.

As described above, with the above-described function of the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment of the present invention, if a provision request
10 B for sanitary products S is made by the user, whether or not provision is permitted is determined based on whether or not the user is on her menstrual period, the provision history of sanitary products S to the user, an inventory status of sanitary products S at the dispenser 60 for which
15 the request has been made, and, only if the provision is permitted, a sanitary product S can be provided.

Also, since the inventory quantity of sanitary products S stored in the dispenser 60 is constantly managed by updating the inventory status data table 41, an
20 instruction can be quickly made to an inventory replenisher to replenish the inventory of a dispenser 60 whose inventory has been exhausted or is nearly exhausted.

It is thereby possible not only to inhibit unrestricted provision of sanitary products S, but also to
25 constantly have an inventory in stock, thus making it possible to reliably provide a sanitary product S to a user who has accidentally forgotten to bring sanitary products

and desires to use one at once.

Also, since the display screen 63 is provided in the dispenser 60, it is possible to seek one or more advertisement sponsors, obtain advertisement revenue by displaying one or more advertisements on the display screen 63, purchase sanitary products S with part of the revenue, and store them in the dispenser 60, thereby providing sanitary products S to users for free, which makes an excellent welfare service for women.

In addition, since the sanitary products S are discharged from the dispenser 60, a great sense of ease can be offered to women, which is an important benefit. In some restaurants and hotels, for example, a basket with sanitary products is arranged beside a washstand of a women's restroom. In such a case, the sanitary products can be freely taken out from the basket and used if desired. However, sanitary products simply placed in a basket might have been touched by someone else. Some people may hesitate to use them under, in particular, the COVID-19 pandemic as it stands now, since touching of an object that might have been touched by someone else causes great anxiety.

However, according to the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment of the present invention, sanitary products S are stored in the dispenser 60 and discharged one by one at the time of use, and are not touched by an unspecified number of people. Accordingly,

the user can use a sanitary product S at ease without feeling the above-described anxiety.

In this manner, the sanitary product provision apparatus and the sanitary product provision method
5 according to the first embodiment of the present invention are capable of providing a sense of ease to the user.

In the above-described embodiment, an example in which the inventory management program 21 manages the inventory of sanitary products S by updating the inventory status
10 data table 41 and grasping the exact inventory quantity of each dispenser 60 has been described; however, the inventory management performed by the inventory management program 21 is not limited to an embodiment in which the exact inventory quantity is grasped, and may be carried out
15 in a modification of grasping a rough inventory quantity, as will be described below, without using the inventory status data table 41.

If the inventory is managed without using the inventory status data table 41, a plurality of inventory
20 sensors are provided in each dispenser 60. The inventory sensors may be, for example, optical sensors, but are not limited thereto. A case where optical sensors are applied as inventory sensors will be described using FIGS. 12 and 13.

25 FIG. 12 is a front view showing an example of a dispenser in which inventory sensors are arranged.

FIG. 13 is a block diagram showing an example of an

electronic circuitry configuration of a dispenser in the case where inventory sensors are applied.

In this example, four pairs of inventory sensors 67(#1) to (#4) are arranged in storage compartments 61 of a dispenser 60.

That is, a pair of inventory sensors 67(#1L) and 67(#1R) are arranged in the proximity of a top of a right-side storage compartment 61(#1), a pair of inventory sensors 67(#2L) and 67(#2R) are arranged in the proximity of a middle height of the storage compartment 61(#1), a pair of inventory sensors 67(#3L) and 67(#3R) are arranged in the proximity of a top of a left-side storage compartment 61(#2), and a pair of inventory sensors 67(#4L) and 67(#4R) are arranged in the proximity of a middle height of the storage compartment 61(#2).

Inventory sensors 67 forming a pair are arranged at the same height so as to face one another in each storage compartment 61, with one being a light-emitting unit and the other being a light-receiving unit. In the case of, for example, the inventory sensors 67(#1L) and 67(#1R) forming a pair, the inventory sensor 67(#1L) is a light-emitting unit, and the other inventory sensor 67(#1R) is a light-receiving unit. The light-emitting unit is adjusted in such a manner that light can be emitted toward the light-receiving unit, and the light-receiving unit is adjusted in such a manner that light from the light-emitting unit can be received. The light-receiving unit outputs a detection

signal F upon receiving light from the light-emitting unit.

In the example of FIG. 12(a), for example, the light emitted from the inventory sensor 67(#1L), which is a light-emitting unit, is received by the inventory sensor

5 67(#1R), which is a light-receiving unit, and a detection signal F(#1) is output from the inventory sensor 67(#1R).

On the other hand, in the case of the inventory sensor 67(#2), the light emitted from the inventory sensor

10 67(#2L), which is a light-emitting unit, is shielded by the sanitary products S, and is not received by the inventory sensor 67(#2R), which is a light-receiving unit.

Accordingly, a detection signal F(#2) is not output from the inventory sensor 67(#2R). Similarly, in the case of the inventory sensors 67(#3) and 67(#4), the light emitted from

15 the inventory sensors 67(#3L) and (#4L), which are light-emitting units, is shielded by the sanitary products S, and is not received by the inventory sensors 67(#3R) and (#4R), which are light-receiving units. Accordingly, the detection signals F(#3) and (#4) are not output from the inventory

20 sensors 67(#3R) and (#4R).

The communication unit 75 appends a dispenser ID to the detection signal F, and transmits it to the sanitary product provision management server 10.

25 In the example shown in FIG. 12(a), only the inventory sensor 67(#1R) outputs a detection signal F(#1).

Accordingly, the communication unit 75 appends a dispenser ID to the detection signal F(#1), and transmits it to the

sanitary product provision management server 10.

On the other hand, if the inventory is further reduced to a level below the height of the inventory sensor 67(#2), as shown in FIG. 12(b), the inventory sensor 67(#2R) also
5 outputs a detection signal F(#2). In this case, the communication unit 75 appends a dispenser ID to two detection signals F, namely, the detection signal F(#1) and the detection signal F(#2), and transmits them to the sanitary product provision management server 10.

10 At the sanitary product provision management server 10, the detection signal F to which the dispenser ID has been appended is received by the communication unit 15, and is output to the inventory management program 21.

The inventory management program 21 identifies a
15 corresponding dispenser 60 based on the dispenser ID. Furthermore, in response to the detection signal F, the inventory management program 21 grasps the inventory of the identified dispenser 60, associates the grasped result with the dispenser ID, and writes it into the inventory status
20 database 31.

As shown in FIG. 12(a), the first detection signal to be transmitted in accordance with reduction in inventory is a detection signal F(#1). If only the detection signal F(#1) is received, the inventory management program 21 can
25 grasp that equal to or greater than $3/4$, namely, equal to or higher than 75%, is in inventory.

If the inventory is further reduced, as shown in

FIG. 12(b), a detection signal (#2) is transmitted, in addition to the detection signal F(#1). If the detection signal (#2) is received in addition to the detection signal F(#1), the inventory management program 21 can grasp that
5 equal to or greater than $2/4$ and equal to or less than $3/4$, namely, equal to or higher than 50% and equal to or lower than 75%, is in inventory.

If the inventory is further reduced and there is no sanitary product S stored in the storage compartment 61(#1)
10 and the sanitary products S stored in the storage compartment 61(#2) are discharged, a detection signal F(#3) is also transmitted, even though illustration of such a configuration is omitted. If the detection signal (#3) is received in addition to the detection signals F(#1) and
15 (#2), the inventory management program 21 can grasp that equal to or greater than $1/4$ and equal to or less than $2/4$, namely, equal to or higher than 25% and equal to or lower than 50%, is in inventory.

If the inventory is further reduced to a level below
20 the height of the inventory sensor 67(#4), the inventory sensor 67(#4R) also outputs a detection signal F(#4). If the detection signal (#4) is received in addition to the detection signals F(#1), (#2), and (#3), the inventory management program 21 can grasp that equal to or less than
25 $1/4$, namely, equal to or lower than 25%, is in inventory.

In the present modification, it is thus possible to grasp a rough inventory quantity for each dispenser 60,

without using the inventory status database 31.

Also, in the present modification, it is possible to employ an inventory replenishment method as will be described below at the time of replenishment of the inventory.

Upon grasping a dispenser 60 that carries equal to or lower than, for example, 25% in inventory, the inventory management program 21 transmits a message to the inventory replenisher terminal 150 indicating that it should be replenished with sanitary products S, along with the dispenser ID of the corresponding dispenser 60.

In response thereto, the inventory replenisher is dispatched to replenish the inventory of the corresponding dispenser 60.

However, in the case where whether or not the inventory should be replenished is determined by focusing on a single dispenser 60, in an extreme case, the inventory replenisher has to be dispatched for inventory replenishment if the inventory of one of the dispensers 60 is greatly reduced, even if the inventories of the other dispensers 60 are not greatly reduced. The efficiency of such inventory replenishment is low, since not much inventory can be replenished in a single dispatch.

Thus, the inventory management program 21 may determine whether or not the inventory should be replenished in accordance with the inventory quantities of the respective groups each including a plurality of

dispensers 60, instead of focusing on a single dispenser 60. In this case, the groups may be, for example, those in the neighborhood or in the same facility.

Assuming, for example, that m dispensers 60(#1) to 60(#m) (where m is an integer equal to or greater than 2) are set up in a facility T, and 100 sanitary products S in total are delivered in these m dispensers 60(#1) to 60(#m), this is considered to be an inventory quantity of the entire facility T.

If a single sanitary product S is utilized in a dispenser 60 (assumed to be a dispenser 60(#1) herein) set up in a facility T, the inventory management program 21 recognizes not only that the inventory quantity of the dispenser 60(#1) has been reduced by one, but also grasps the total inventory quantity of all the m dispensers 60(#1) to 60(#m) set up in the facility T being 99, having been reduced by one from 100.

With such a mechanism of inventory management, it is possible to grasp not only the inventory statuses of individual dispensers 60 but also the inventory status of the entire facility T. That is, since the inventory of the entire facility T can be managed in real time, if the inventory quantity of the sanitary products S in the entire facility T has fallen below a predetermined quantity set in advance, the inventory management program 21 can automatically place an order for a preset quantity of sanitary products S with an external party via the sanitary

product provision management server 10.

It is thereby possible to automatically order sanitary products S, thus improving the efficiency of the inventory ordering operation.

5 A case has been described above where a notification is made from the sanitary product provision management server 10 to the inventory replenisher terminal 150 if the inventory needs to be replenished; however, the inventory replenisher may access, if necessary, the inventory status
10 database 31 from the inventory replenisher terminal 150 to voluntarily grasp the inventory of each dispenser 60. It is thereby possible to grasp in advance the inventory of which dispenser 60 should be replenished with high priority, or how much inventory should be prepared.

15 Also, as described above, since the inventory information Z can be displayed on the display screen 63 of each dispenser 60, the inventory replenisher can cause the inventory information Z to be displayed on the display
screen 63 through, for example, a touch-panel operation on
20 the display screen 63 at the site, thus grasping the inventory quantity of the dispenser 60 in front of himself/herself.

(Second Embodiment)

25 Next, a sanitary product provision apparatus and a sanitary product provision method according to a second embodiment of the present invention will be described.

The sanitary product provision apparatus and the

sanitary product provision method according to the second embodiment are modifications of the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment. Accordingly, in the description of the second embodiment, redundant descriptions will be omitted and different features will be described by denoting portions identical to those of the first embodiment using identical reference numerals.

FIG. 14 is a block diagram showing an example of an electronic circuitry configuration of a sanitary product provision management server 10A according to the second embodiment.

The sanitary product provision management server 10A shown in FIG. 14 differs from the sanitary product provision management server 10 shown in FIG. 5 in that an encryption program 26 is stored in the memory 20.

FIG. 15 is a block diagram showing an example of an electronic circuitry configuration of a dispenser 60A according to the second embodiment.

The dispenser 60A shown in FIG. 15 differs from the dispenser 60 shown in FIG. 4 in that a decoding program 84 is stored in the memory 80, a Bluetooth (registered trademark) communication unit 77 is connected to the bus 71, and the communication unit 75 is not provided.

In the first embodiment, as shown in step S14 of FIG. 10B, the permission signal C is generated by the discharge permission program 25 at the sanitary product

provision management server 10, and the generated permission signal C is transmitted from a communication unit 15 to the dispenser 60 via the communication network 200. The transmitted permission signal C is received by the dispenser 60 as shown in step S15 in FIG. 10C. The permission signal C is not encrypted.

The present embodiment differs from the first embodiment as will be outlined below.

First, if a permission signal C is generated by a discharge permission program 25 at the sanitary product provision management server 10A, the encryption program 26 encrypts the permission signal C using a shared key K associated with a dispenser ID stored in the shared key database 36. The encryption program 26 causes the encrypted permission signal C to be transmitted not to the dispenser 60A but to the user terminal 100 from the communication unit 15 via the communication network 200. Upon receiving the encrypted permission signal C, the user terminal 100 transmits it to the dispenser 60A.

Details of the features of the present embodiment differing from those of the first embodiment will be described below.

First, encryption will be described.

As described in the first embodiment, the permission signal C is generated in response to a provision request B transmitted from the user terminal 100 to the sanitary product provision management server 10. The provision

request B contains a user ID, a dispenser ID, and a beacon
signal A. In the shared key database 36, a shared key K
stored in the shared key storage unit 93 of each dispenser
60 is stored in association with a corresponding dispenser
5 ID.

Accordingly, the encryption program 26 extracts the
dispenser ID from the provision request B. The shared key K
stored in association with the dispenser ID is acquired
from the shared key storage unit 93. The permission signal
10 C is encrypted using the shared key K.

The encryption program 26 causes the communication
unit 15 to transmit the encrypted permission signal C not
to the dispenser 60A but to the user terminal 100 to which
the provision request B has been transmitted via the
15 communication network 200.

The dedicated app is activated at the user terminal
100 from which the provision request B has been
transmitted. The dedicated app receives the encrypted
permission signal C using a communication function of the
20 user terminal 100.

If the encrypted permission signal C is received by
the user terminal 100, the dedicated app connects with the
dispenser 60A using the Bluetooth (registered trademark)
function of the user terminal 100.

25 After the connection, if Bluetooth communications
between a Bluetooth communication unit 77 and a user
terminal 100 are enabled, the dedicated app transmits the

encrypted permission signal C to the Bluetooth communication unit 77 using the Bluetooth function of the user terminal 100.

5 The Bluetooth communication unit 77 receives the encrypted permission signal C, and outputs it to the memory 80 via the bus 71.

10 If the encrypted permission signal C is output to the memory 80, the decoding program 84 decodes the encrypted permission signal C using the shared key K stored in the shared key storage unit 93. Since this shared key K is the same as the shared key K used at the time of encryption by the encryption program 26 of the sanitary product provision management server 10A, the decoding program 84 can decode the encrypted permission signal C using the shared key K, and obtain a permission signal C.

15 Thereafter, the dispenser 60A operates in a manner similar to the dispenser 60, as shown in steps S15 to S17 in the flowchart of FIG. 10C, and in response to the permission signal C, the discharge mechanism control program 82 instructs a discharge mechanism of the storage compartment 61 to discharge a single sanitary product S stored in the storage compartment 61, and the discharge mechanism of the storage compartment 61 operates and discharges a sanitary product S in accordance with the discharge instruction. Thereby, the user can take out a sanitary product S from the discharge port 62 and use it.

In accordance with the discharge operation, the dispenser 60A operates as shown in step S18 of the flowchart in FIG. 10C, and the discharge signal generation program 83 generates a discharge signal D containing a dispenser ID. The discharge signal generation program 83 transmits the generated discharge signal D from the communication unit 75 to the sanitary product provision management server 10 in the first embodiment; however, in the present embodiment, it is transmitted to a user terminal 100 to which connection is made using the Bluetooth function from the Bluetooth communication unit 77.

The dedicated app activated on the user terminal 100 receives the transmitted discharge signal D using the Bluetooth function of the user terminal 100. If the discharge signal D is received by the user terminal 100, the dedicated app transmits the discharge signal D to the sanitary product provision management server 10A via the communication network 200 using the communication function of the user terminal 100.

At the sanitary product provision management server 10A, the discharge signal D is received by the communication unit 15, and is output to the memory 20 via the bus 11.

Thereafter, the sanitary product provision management server 10A operates as shown in steps S19 to S22 in the flowchart of FIG. 10C, similarly to the sanitary product

provision management server 10, and performs user management and inventory management.

As described above, with the sanitary product provision apparatus and the sanitary product provision method according to the second embodiment of the present invention, it is possible to realize functions similar to the sanitary product provision apparatus and the sanitary product provision method according to the first embodiment; however, communications between the sanitary product provision management server 10A and the dispenser 60A are not directly performed, and may be relayed by the user terminal 100.

Thus, the dispenser 60A does not need to include a communication unit 75 as included in the dispenser 60, thereby simplifying the configuration and reducing the cost.

In the case where the communications between the sanitary product provision management server 10A and the dispenser 60A are relayed by the user terminal 100, in particular, in the case where the user terminal 100 receives a permission signal C from the sanitary product provision management server 10A and transmits the received permission signal C to the dispenser 60A, if the permission signal C is not encrypted, the permission signal C might be falsely rewritten and the dispenser 60A may be falsely used in the user terminal 100. However, in the present embodiment, since the encrypted permission signal C is

transmitted from the sanitary product provision management server 10A to the dispenser 60A, the permission signal C is not rewritten falsely, thus preventing the dispenser 60A from being used falsely.

5 If there is no need to consider preventing such false usage, it is also possible to eliminate the encryption program 26 from the sanitary product provision management server 10A, and transmit the permission signal C from the sanitary product provision management server 10A to the
10 user terminal 100 without encrypting the permission signal C.

 In this case, since the permission signal C need not be decoded, it is also possible to eliminate the decoding program 84 from the dispenser 60A.

15 (Third Embodiment)

 Next, a sanitary product provision apparatus and a sanitary product provision method according to a third embodiment of the present invention will be described. The sanitary product provision apparatus and the sanitary
20 product provision method according to the third embodiment are modifications of the sanitary product provision apparatus and the sanitary product provision method according to the second embodiment. Accordingly, in the description of the third embodiment to be described below,
25 redundant descriptions will be omitted and different features will be described by denoting portions identical to those of the first and second embodiment using identical

reference numerals.

FIG. 16 is a block diagram showing an example of an electronic circuitry configuration of a sanitary product provision management server 10B according to a third embodiment.

The sanitary product provision management server 10B shown in FIG. 16 differs from the sanitary product provision management server 10A shown in FIG. 14 in that, in the memory 20, the encryption program 26 is not stored, and a time-based hash generator 27 is stored.

FIG. 17 is a block diagram showing an example of an electronic circuitry configuration of a dispenser 60B according to the third embodiment.

The dispenser 60B shown in FIG. 17 differs from the dispenser 60A shown in FIG. 15, in that, in the memory 80, the decoding program 84 is not stored, and a hash verifier 85 is stored.

In the first embodiment, as shown in step S14 of FIG. 10B, the permission signal C is generated by the discharge permission program 25 at the sanitary product provision management server 10, and the generated permission signal C is transmitted from the communication unit 15 to the dispenser 60 via the communication network 200. The transmitted permission signal C is received by the dispenser 60, as shown in step S15 of FIG. 10C. The permission signal C is not encrypted.

The present embodiment differs from the first

embodiment as will be outlined below.

In the present embodiment, if, at the sanitary product provision management server 10B, the discharge permission program 25 generates a permission signal C, the time-based hash generator 27 generates a time-based hash H using a shared key K associated with a dispenser ID stored in the shared key database 36. The time-based hash generator 27 transmits a time-based hash H together with the permission signal C from the communication unit 15 to the user terminal 100 from which the provision request B has been transmitted via the communication network 200.

The dedicated app is activated at the user terminal 100 from which the provision request B has been transmitted. The dedicated app receives the time-based hash H together with the permission signal C using a communication function of the user terminal 100.

The user terminal 100 and the dispenser 60B are connected using Bluetooth, as described in the second embodiment.

If the time-based hash H and the permission signal C are received by the user terminal 100, the dedicated app transmits the time-based hash H and the permission signal C to the Bluetooth communication unit 77 using the Bluetooth function.

The Bluetooth communication unit 77 receives the time-based hash H and the permission signal C, and outputs them to the memory 80 via the bus 71.

On the other hand, as described in the first embodiment, a time-based hash operation is performed in the encryption program 81.

5 If the time-based hash H and the permission signal C are output to the memory 80, the hash verifier 85 verifies whether or not the time-based hash H output to the memory 80 is identical to the time-based hash computed in the encryption program 81.

10 Upon confirming that they are identical, the hash verifier 85 sends the permission signal C output to the memory 80 to the discharge mechanism control program 82.

15 Thereafter, the dispenser 60B operates in a manner similar to the dispenser 60, as shown in steps S15 to S17 in the flowchart of FIG. 10C, and in response to the permission signal C, the discharge mechanism control program 82 instructs a discharge mechanism of the storage compartment 61 to discharge a single sanitary product S stored in the storage compartment 61, and the discharge mechanism of the storage compartment 61 operates and
20 discharges a sanitary product S in accordance with the discharge instruction. Thereby, the user can take out a sanitary product S from the discharge port 62 and use it.

25 In accordance with the discharge operation, the dispenser 60B operates in a manner similar to the dispenser 60A in the second embodiment, and in the sanitary product provision management server 10B, a discharge signal D transmitted from the user terminal 100 is received by the

communication unit 15 and output to the memory 20.

Thereafter, the sanitary product provision management server 10B operates as shown in steps S19 to S22 in the flowchart of FIG. 10C, similarly to the sanitary product provision management server 10, and performs user management and inventory management.

As described above, with the sanitary product provision apparatus and the sanitary product provision method according to the third embodiment of the present invention, it is possible to prevent false usage of the dispenser 60B even if the communications between the sanitary product provision management server 10B and the dispenser 60B are relayed by the user terminal 100, similarly to the second embodiment.

However, such a configuration differs from that of the second embodiment in that, in the sanitary product provision management server 10B, the permission signal C can be realized without encrypting it by generating a time-based hash H and verifying whether or not it is identical to a time-based hash generated in the dispenser 60B.

The best mode for carrying out the present invention has been described with reference to the accompanying drawings; however, the present invention is not limited to such a configuration. A person skilled in the art could arrive at various modifications and corrections within the scope of the technical idea based on which the claims are made, and such modifications and corrections are considered

to belong to the technical scope of the present invention.

REFERENCE SIGNS LIST

- 1: Sanitary product provision apparatus
- 10, 10A, 10B: Sanitary product provision management server
- 5 11: Bus
- 12: CPU
- 13: External recording medium
- 14: Recording medium reading unit
- 15: Communication unit
- 10 20: Memory
- 21: Inventory management program
- 22: User management program
- 23: Identification program
- 24: Determination program
- 15 25: Discharge permission program
- 26: Encryption program
- 27: Time-based hash generator
- 29: Writable data area
- 30: Storage device
- 20 31: Inventory status database
- 32: User-based provision history database
- 33: Determination condition database
- 34: Dispenser setup location database
- 35: User registration information database
- 25 36: Shared key database
- 41: Inventory status data table
- 42: User-based provision history data table

	44: Dispenser setup location data table
	60, 60A, 60B: Dispenser
	61: Storage compartment
	62: Discharge port
5	63: Display screen
	64: Front door
	65: Lock
	66: QR Code
	67: Inventory sensor
10	71: Bus
	72: CPU
	73: External recording medium
	74: Recording medium reading unit
	75: Communication unit
15	76: Beacon transmission unit
	77: Bluetooth communication unit
	80: Memory
	81: Encryption program
	82: Discharge mechanism control program
20	83: Discharge signal generation program
	84: Decoding program
	85: Hash verifier
	89: Writable data area
	90: Storage device
25	91: Storage unit
	92: Advertisement video data storage unit
	93: Shared key storage unit

100: User terminal

150: Inventory replenisher terminal

200: Communication network

CLAIMS

1. A sanitary product provision apparatus comprising:
at least one dispenser configured to hold and provide
a sanitary product;

5 an inventory management unit configured to manage an
inventory status of the sanitary product held in the
dispenser;

a user management unit configured to manage a
provision history of sanitary product provision from the
10 dispenser to a user;

a determination unit configured to determine, in
response to a provision request from the user requesting
provision of the sanitary product, whether or not the
sanitary product can be provided to the user based on the
15 provision history; and

a discharge permission unit configured, upon
determination by the determination unit that the sanitary
product can be provided, to permit the dispenser to
discharge the sanitary product held in the dispenser if the
20 inventory status managed by the inventory management unit
shows that the sanitary product is in inventory.

2. The sanitary product provision apparatus according
to claim 1, wherein

the at least one dispenser includes a plurality of
25 dispensers differing in setup locations, and

the inventory management unit, the user management
unit, the determination unit, and the discharge permission

unit are common to the dispensers.

3. The sanitary product provision apparatus according to claim 2, wherein

the dispensers are respectively set up in a plurality
5 of restroom stalls.

4. The sanitary product provision apparatus according to claim 2 or 3, wherein

the provision request is transmitted from a user
terminal of the user and contains user identification
10 information for identifying the user and dispenser
identification information for identifying the dispenser to
which the user has made the provision request for the
sanitary product, and

the sanitary product provision apparatus further
15 comprises an identification unit configured to identify the
user based on the user identification information contained
in the provision request transmitted from the user
terminal, and identify the dispenser to which the user
makes the provision request for the sanitary product based
20 on the dispenser identification information contained in
the provision request.

5. The sanitary product provision apparatus according to claim 4, further comprising:

a first transmission unit provided in each of the
25 dispensers and configured to transmit the dispenser
identification information of a corresponding one of the
dispensers to the user terminal in such a manner that the

dispenser identification information is contained in the provision request.

6. The sanitary product provision apparatus according to claim 5, further comprising:

5 an encryption unit provided in each of the dispensers and configured to encrypt the dispenser identification information before the dispenser identification information is transmitted by the first transmission unit.

7. The sanitary product provision apparatus according to any one of claims 4 to 6, wherein

each of the dispensers includes:

a storage compartment configured to store the sanitary product;

15 a discharge signal generation unit configured, upon discharge of the sanitary product stored in the storage compartment in response to a permission to discharge from the discharge permission unit, to generate a discharge signal containing the dispenser identification information; and

20 a second transmission unit configured to transmit a discharge signal generated by the discharge signal generation unit,

25 the user management unit identifies the dispenser that has transmitted the discharge signal based on the dispenser identification information contained in the transmitted discharge signal, and

the inventory management unit manages the inventory

status of the sanitary product by updating a discharge history of the sanitary product for each of the dispensers, based on a result of identification of the dispenser by the user management unit.

5 8. The sanitary product provision apparatus according to any one of claims 4 to 7, wherein

the user management unit manages the provision history for each user.

10 9. The sanitary product provision apparatus according to claim 8, wherein

the determination unit determines whether or not the user is on her menstrual period based on the provision history of the user, and determines, if it is determined that the user is on her menstrual period, that the sanitary
15 product can be provided.

10 10. The sanitary product provision apparatus according to claim 8, wherein

the determination unit determines whether or not the user is on her menstrual period based on the provision
20 history of the user, and determines, if it is determined that the user is on her menstrual period and if a predetermined period of time has passed since a time of day of a latest provision of the sanitary product, that the sanitary product can be provided.

25 11. The sanitary product provision apparatus according to claim 8, wherein

the determination unit determines whether or not the

user is on her menstrual period based on the provision history of the user, and determines, if it is determined that the user is on her menstrual period and if a number of the sanitary products that have been provided to the user during the menstrual period does not reach a predetermined number based on the provision history of the user, that the sanitary product can be provided.

12. The sanitary product provision apparatus according to any one of claims 9 to 11, wherein the determination unit determines whether or not the user is on her menstrual period based on, in place of the provision history of the user, a menstrual cycle transmitted from the user terminal.

13. The sanitary product provision apparatus according to any one of claims 1 to 10, wherein the dispenser further includes a display screen configured to display an advertisement, and

the sanitary product is purchased by revenue obtained from the advertisement displayed on the display screen.

14. A server for managing provision of a sanitary product, comprising:

an inventory management unit configured to manage an inventory status of the sanitary product stored in a dispenser;

a user management unit configured to manage a provision history of sanitary product provision from the dispenser to a user;

a determination unit configured to determine, in response to a provision request from the user requesting provision of the sanitary product, whether or not the sanitary product can be provided to the user based on the provision history; and

a discharge permission unit configured, upon determination by the determination unit that the sanitary product can be provided, to permit the dispenser to discharge the sanitary product stored in the dispenser if the inventory status managed by the inventory management unit shows that the sanitary product is in inventory.

15. A program for causing a computer to function as:
an inventory management unit configured to manage an inventory status of a sanitary product stored in a dispenser;

a user management unit configured to manage a provision history of sanitary product provision from the dispenser to a user;

a determination unit configured to determine, in response to a provision request from the user requesting provision of the sanitary product, whether or not the sanitary product can be provided to the user based on the provision history; and

a discharge permission unit configured, upon determination by the determination unit that the sanitary product can be provided, to permit the dispenser to discharge the sanitary product stored in the dispenser if

the inventory status managed by the inventory management unit shows that the sanitary product is in inventory.

16. A sanitary product provision apparatus comprising:
a dispenser configured to store a sanitary product;

5 and

a server configured to manage the dispenser, wherein the server is configured to:

determine, upon receiving a provision request from a user requesting provision of the sanitary product,
10 whether or not the sanitary product can be provided in response to the provision request; and

send, to the dispenser, a permission signal permitting discharge of the sanitary product upon determining that the sanitary product can be provided, and
15 the dispenser is configured to:

discharge the sanitary product in response to the permission signal.

17. A sanitary product provision method realized by a dispenser that stores a sanitary product and a server that
20 manages the dispenser, wherein

the server is configured to:

determine, upon receiving a provision request from a user requesting provision of the sanitary product, whether or not the sanitary product can be provided in
25 response to the provision request; and

send, to the dispenser, a permission signal permitting discharge of the sanitary product upon

determining that the sanitary product can be provided, and
the dispenser is configured to:

discharge the sanitary product in response to the
permission signal.